General processes of networks' emergence and sustainability

Conditions Of Emergence Of Firms' Networks In The International Space

Abstract: The Internationalization process of Multinational firms is treated by a large economic and management literature focusing on international conditions of the processes of firms' extensions. Three main fields were developed:

1. The OLI approach introduced by Dunning (1993) focusing on the properties of the home countries of the owner (O), of the host countries of location (L) and of the internal organization of firms (I);
2. The approach focusing on the transaction cost theory and its sociological criticism (Coase, 1937; Williamson, 1985; Granovetter, 1985; Powell, 1990), which describes the conditions of creation of a new firm (Green-field) or firms acquisition or make a join-venture. Other approaches search in which cases internationalization replace or is complementary to international trade.
3. The approaches of management on the structural form of firms and their organization and expansion in the international context (Perlmutter, 1969; Bartlett and Ghoshal, 1988).

We suggest a geographical approach that observes the process of firms' creation through transnational flows of investment within a world already organized by international linkages. International linkages (between countries) differentiate both integrated economic regions facilitating connections and political or economic borders restraining them. We develop an agent-based simulation model for exploring the plausible network configuration resulting from the transnational dynamics of firms as applied on these international networks. Starting from the "basic principles" (Grimm et al., 2010) of an individual firm N located in place A and looking forward investing in other places, we model analytically the probability to create a link from the place A to a foreign place B. It will be suggested that this probability is conditional of A (Owner space), conditional of B (Location space), conditional of A-B (Differences-resemblances of A and B and distance(s) from A to B), conditional of the whole firm network, conditional of other networks (resources, trade, collaborations and competitions) and of general conditions (growth or crisis: access to capital). Then we also explore the conditions of the sustainability of the link A-B, according to previous connections between A and B (path dependencies hypothesis), and the attractiveness of B in the international system (preferential attachment hypothesis). Finally, considering the overall objectives and architecture of the model, scales and "basic principles", we'll discuss the capabilities of the model to simulate the emergence or adaptive traits or behavior (of individual firms or collective groups of firms) according to international rules.

Bérengère Gautier
Institute of Complex Systems, Géographie-Cités

Berengere Gautier is post-doctoral researcher hosted in the P.A.R.I.S team of UMR Geographie-Cité and the Complex Systems Institute of Paris (ISC-PIF). Her Ph.D. from the University of Lausanne in 2012, led by Pr. Céline Rozenblat, allowed her to analyze integration and development processes of cities through financial networks of agro-food corporations. Her current research focuses on simulations of growth and integration of cities by networks of multinational firms.

Denise Pumain
University of Paris-Sorbonne 1, Géographie-Cités

Denise Pumain is Professor at University Paris I Panthéon-Sorbonne, member of the Institut Universitaire de France and Director of Cybergeo, European Journal of Geography and co-director of l'Espace Géographique. Former Chair of the Commission on Urban Development and Urban Life of the IGU, co-founder of the laboratory Géographie-cités (CNRS), founder of the European Research Group S4 (Spatial Simulation for Social Sciences), she is specialised in urban modelling and theoretical geography. Her last books "Hierarchy in natural and social sciences" and "Complexity perspectives in innovation and social change" are published by Springer in the Methodos Series. Awards: Academia Europaea, doctor honoris causa University of Lausanne, and University of Liège, silver medal CNRS, Vautrin Lud International prize in Geography, advanced grant from the European Research Council, corresponding member of the Austrian Academy of Sciences. http://www.parisgeo.cnrs.fr/spip.php?article164&lang=en

Céline Rozenblat
University of Lausanne

Céline Rozenblat is Professor of Urban Geography at the University of Lausanne, Switzerland. MS (1988), PhD (1992) University of Paris 1, Habilitation (2004) University of Montpellier. She developed studies of cities' systems at European and world scale, multinational firms networks, inter-urban dynamics, comparative urban data, mapping and visualization of networks in geography, Spatial analysis. Her researches are widely directed on the relations between location evolutions and networks dynamics into cities' systems. In order to develop these topics in a comparative point of view, she built many databases on large European cities samples and on networks. In particular, she has dealt since 1990 with databases on located multinational firms networks, on cities properties and evolution at the level of Europe and the World in a multi-dimensional and long temporal approach. Diachronic and dynamic studies supply materials to develop spatial and dynamic models and visualizations. For several years she deals on the relation between networks' developments and multi-level urban processes. She participates to different European programs as ESPON FOCI 2008-2011, FP7 FET Insite, FP7 Multiplex. She is vice-chair of the IGU Urban Commission, and president of the scientific committee of the European Research Group S4 (Spatial Simulation for Social Sciences). http://www.unil.ch/unisciences/celinerozenblat

Relation Content In Multiple Networks Revisited, A Strategy To Handle Bimodal Networks

Abstract: Social network analysis mostly relies on the analysis of homogeneous graph data gathering entities (nodes) either assumed to be of a same type. Two-mode networks differ from this simplistic situation in that entiti es split into two different groups. Actors interacting through posts on forums, or authors interacting through paper publications are two typical examples of such a situation. Common SNA approaches computing metrics or running graph algorithms will often fail in finding patterns or structures that fully takes into account the bimodal property of such a network. The situation becomes even worse for multiple relation network. We plan to discuss analytical approaches based on past ideas by Burt and Schott that were revisited and extended in order to offer a more faithfull analysis of bimodal networks. Astutely turning a bimodal network into a dual pair of unimodal network, we moreover compute a cohesion index on groups of entities. The hope is to use this index in order to qualify interaction intensity and homogeneity among subgroups. The discussion will use examples to exhibit the cohesion index and develop on its potential use in SNA.

Guy Melançon
Labri, INRIA - University of Bordeaux

Guy Melançon is a world leading network visualization scientists, head of the INRIA GRAVITE group in Bordeaux, France. His research interest led him to contribute results in the study of complex systems exploiting network theory and network visualization. His team develops the Tulip framework as part of its research agenda and is distributed as opensource software on sourceforge. Tulip experiences a thousand downloads per month, with a vivid and growing user community. http://www.nature.com/nphys/journal/v8/n1/fig_tab/nphys2180_F4.html

Emergence and sustainability from multi-partite networks

Studying Teams At The Hyperedge

Abstract: Social network analysis has long been used to capture relational properties in social systems. Network researchers interested in collectives have typically employed one of two general approaches. The first is to capture actor-to-actor relationships and represent their structure; the second is to capture the linkages of actors to collectives (e.g., bipartite networks linking individuals to teams). The former fails to represent the entitivity of the collective, rather entitivity is inferred from structural patterning in relationships. The latter approach links individuals to collectives, but fails to capture individuals' relations with one another, and the relations among collectives. This presentation will advance hypergraphs as a promising way to more fully capture collectives in social systems. Hypergraphs may be particularly insightful when representing naturally occurring collectives (e.g., teams) that have overlapping members, and/or for representing networks with more than two types of nodes (e.g., individuals and teams). We detail the conditions under which hypergraphs are most useful and the questions they are most useful in answering. We develop hypergraph extensions of metrics commonly used in 1-mode networks and illustrate the utility of these newly proposed metrics for understanding emergence, characteristics, and performance of group ecosystems.

Noshir Contractor
Kellogg School of Management at Northwestern University, USA

Noshir Contractor is the Jane S. & William J. White Professor of Behavioral Sciences in the School of Engineering, School of Communication and the Kellogg School of Management at Northwestern University, USA. He is the Director of the Science of Networks in Communities (SONIC) Research Group at Northwestern University. He is investigating factors that lead to the formation, maintenance, and dissolution of dynamically linked social and knowledge networks in communities. Specifically, his research team is developing and testing theories and methods of network science to map, understand and enable more effective networks in a wide variety of contexts including communities of practice in business, science and engineering communities, disaster response teams, public health networks, digital media and learning networks, and in virtual worlds, such as Second Life. His research program has been funded continuously for the past 18 years by major grants from the U.S. National Science Foundation with additional funding from the U.S. National Institutes of Health (NIH), U.S. National Aeronautics and Space Administration (NASA), Air Force Research Lab, Army Research Institute, Army Research Laboratory, the Rockefeller Foundation, the MacArthur Foundation as well as the Bill & Melinda Gates Foundation. Professor Contractor has published or presented over 250 research papers dealing with communicating and organizing. His book titled Theories of Communication Networks (co-authored with Professor Peter Monge and published by Oxford University Press in English and published by Renmin University Press in simplified Chinese in 2010) received the 2003 Book of the Year award from the Organizational Communication Division of the National Communication Association. He is the lead developer of C-IKNOW (Cyberinfrastructure for Inquiring Knowledge Network On the Web) a network recommender system to enable communities using cyberinfrastructure, as well as Blanche, a software environment to simulate the dynamics of social networks. His papers have received Top Paper awards from the International Communication Association and the National Communication Association. In 2000 he was awarded the

Outstanding Member Award by the Organizational Communication Division of the International Communication Association. He has served on the editorial boards of Human Communication Research, Journal of Applied Communication Research, Journal of Communication, Management Communication Quarterly, Organization Science, and the World Wide Web Electronic Journal of Computer-Mediated Communication. He has consulted with Procter & Gamble, Livestrong Foundation, Boeing, Charles Schwab, Fiat, Illinois Power, Merrill Lynch, Paramount Pictures, and Vodafone. He developed one of the first graduate and undergraduate "virtual" courses on "Emerging Technologies in the Workplace" that were webcast and cablecast by Jones International University. Internationally, Professor Contractor has also conducted workshops on social network analysis and the management of knowledge networks in China, Finland, India, Israel, Italy, Japan, Netherlands, Spain, Thailand, and the United Kingdom. His other appointments include Chairman of Syndio Social, an organizational network analytics firm based in Chicago, Trustee of the Web Science Trust based in the UK, and an honorary professor at the School of Management at Fudan University in Shanghai. Professor Contractor holds a Ph.D. from the Annenberg School for Communication at the University of Southern California and a Bachelor's Degree in Electrical Engineering from the Indian Institute of Technology in Madras (Chennai). He was on the faculty at the University of Illinois at Urbana-Champaign for twenty years prior to joining Northwestern in 2007. http://nosh.northwestern.edu/

Sustainability And Formation Of Dynamic Urban Networks

Abstract: Although inter-urban relational data has historically been difficult to obtain, there are now many resources that allow the analysis of urban networks. In this presentation, I discuss two types of urban network data at two geographic scales that can be used to explore issues of sustainability and network formation. First, at the national scale, the Origin-Destination Survey can be used to construct several different dynamic networks air airline traffic among US cities, including route networks, origin-destination networks, and networks by passenger type (e.g. leisure vs. business). Each of these networks has unique properties and evolves in unique ways, with some indicating a tendency toward sustainable growth and others not. Second, at the global scale, firm location data can be examined as a bipartite network (i.e. cities-to-firms), or as a projected one-mode network (i.e. cities-to-cities via firms). Focusing on the one-mode projection allows consideration of the processes through which inter-urban economic networks form. Drawing on this context, I suggest a general model for the emergence of networks through co-location and a statistical test that can be applied to weighted one-mode projections.

Zachary Neal
Michigan State University

Zachary Neal is an assistant professor of sociology and global urban studies at Michigan State University. He is an associate editor at Global Networks, a member of the editorial board at City and Community, and co-editor of The Metropolis and Modern Life book series. His research focuses on using network theory and methods to understand urban phenomena at multiple scales, ranging from the micro-level role of cohesion in neighborhood formation to the macro-level dynamics of transportation and economic networks among world cities. He is the author or co-author of more than 25 articles and books, including "The Connected City: How Networks are Shaping the Modern Metropolis" (Routledge, 2013), and has recently begin writing network analysis software for use in Stata. http://sociology.msu.edu/faculty/profile/neal-zachary/

Emergence and sustainability from multiple networks

Co-Evolution Of Social And Semantic Networks In Knowledge Communities

Abstract: Knowledge communities involve actors who interact within a social network and who produce, share and exchange information. Scientific communities, communities of bloggers, online forums, media stories, etc. are examples of such knowledge networks taking place in different public arenas. Multi-networks provide an appealing formalism to model knowledge communities hybrid dynamics. Dynamical socio-semantic network enables to study both the dynamics of the social network, the evolution of the semantic network representing the structure of knowledge within the community, and more importantly the coupling between social and semantic dimensions. We propose to use a multi-network approach to understand how social and semantic dimensions co-evolve. At the micro-level, we investigate how individual dynamics is correlated to the distribution of knowledge, and dually, how the underlying social network affect the diffusion of semantic objects. At the meso-level, we propose a general reconstruction framework allowing to track main topics circulating in knowledge communities along with their transformation. Phylomemetic networks provide a high-level representation of knowledge landscape transformations featuring special dynamical events such as emergence or disappearance of fields, forking and merging of branches. Again we will try to understand how individual dynamics is affected by/affects the semantic network meso-level dynamics.

Jean-Philippe Cointet
INRA-SenS and Institute of Complex Systems

Jean-Philippe Cointet, 32 years old, works at INRA-SenS research unit (IFRIS) and ISC-PIF as a researcher. He holds a PhD from the Ecole Polytechnique (2009) with a background in general engineering (Ecole Polytechnique, 2005). He has done extensive work on knowledge networks defined as socio-semantic systems focusing on their multi-level dynamics. His empirical studies encompass various digital fields: scientific databases (academic publications, patents), online media (blogs, forums, social network sites), or press. His research interests include the following interrelated topics: morphogenesis of socio-semantic networks, knowledge dynamics mapping, diffusion processes in social networks, framing dynamics in public spaces, science evolution modeling. http://jph.cointet.free.fr/wp/ http://www.iscpif.fr/tiki-index.php?page=jeanphilippecointet

Robustness Of A Network Of Networks

Abstract: Complex networks appear in almost every aspect of science and technology. Nearly all network results have been obtained by analyzing isolated networks, but many real-world networks do in fact interact with and depend on other networks. Very recently an analytical framework for studying the percolation properties of interacting networks has been developed. Here we review the analytical framework and the results for the robustness properties of a ``network of networks" (NON) formed by "n" interdependent random networks. The percolation properties of a network of networks differ greatly from

those of isolated networks. In particular, networks with broad degree distributions, such as scale free networks, that are robust when analyzed as isolated networks, become vulnerable in a NON. Moreover, in a NON, cascading failures appear due to failure of dependent nodes in other networks and the system collapse abruptly, in contrast to single networks.

Jianxi Gao
Shanghai Jiao Tong University and Boston University

Jianxi Gao is a researcher in Automation department in SJTU from 2008, and is a research fellow in Physics department in Boston University. He collaborates with H. E. Stanley from Boston University and Shlomo Havlin from Bar-Ilan University. Jianxi Gao studied recently the robustness of complex network and collaborative control theory. He has focused primarily on the percolation on network of interdependent networks and the optimum synchronization on self-propelled agent systems. He developed a general analytical framework for studying percolation of n interdependent networks and illustrated the analytical solutions in many distinct examples. Jianxi Gao proposed a system of iterative equations somewhat analogous to Kirchhoff equations for the resistor network in the field of percolation of interdependent networks. He has been recently invited to present his results in several conferences such as "EU-China workshop on Complexity Science" in Switzerland (2011) and " APS March Meeting" in Boston (2012). http://www.nature.com/nphys/journal/v8/n1/fig_tab/nphys2180_F4.html