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Foundations of Competitive Intelligence System to form Business Coalitions

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ABSTRACT: This study shows how a business can identify the networks allowing to form coalitions to obtain French procurement contracts. To this end, we have represented, by a graph, the 2008 co-branding system. We have detected, in this graph, 1360 strategic networks of which the organization reveals, on the one hand, identical characteristics within business networks, and on the other hand, the role of the dominant parties as to access to industrial labor. From these results, we propose a network cartography allowing us to consider new applications for competitive intelligence.

KEYWORDS: Coalitions, competitive intelligence, procurement contracts, cartography, network analysis.

1. Introduction

French state procurement contracts, regional authorities and public corporation contracts add up to over 80 billion euros per year. To ease the way for small and medium-sized companies, the reform of the French state procurement code, initiated in January 2006 and applicable since January 2008, encourages responses to invitation to tender through co-transaction. Co-transacting is the process by which tendering companies can ally with a group of companies, to tender a collective offer when they cannot, on their own, assume the necessary competences and resources.

Effectively, co-transacting means forming coalitions, that is to say, “temporary alliances, which are devised, if not negotiated, amongst those who participate” (Lemieux, 1998). But organizing a

coalition, to share or to distribute resources to respond to the needs of a project, is not easy for companies with sometimes different interests; So, how can a company analyze its (complex) environment to form a coalition and obtain markets?

We begin with the following assumptions: the network is a business structure, and the coalition is a specific structure of the network. We present as the main hypothesis that a coalition is formed according to the structure of relations. In consequence, we consider that a company must be able to interpret its strategic environment as to find good partners, and to understand how the structure of interactions determines the formation of the coalition.

The Management science literature has shown a lot of interest in network alliances. But, studies on the networks, up to now, have mostly looked into the reasons linked to their formation than an understanding of the inter-organizational relations that they imply. The developments surrounding control (piloting) of the networks have been, for the most part, treated as annexes to more general problematic, essentially economic, sociological and strategic (Gulati & Nohria, 2000). The aim of this communication is to suggest a new perspective concerning non-cooperative projects (Yi & Shin, 2000), mainly reached through operational research. The issue today is to go beyond the limits of game theory, to aim for an actors theory (Massé et al., 2000). To this aim, we wish to suggest the basis of a competitive intelligence system which will permit a reticular perspective of the strategy, keeping in account the complex environment (that's to say interactive and dynamic).

We will attempt, in a first stage, to present the theoretical basis of emerging networks within the markets. Then, we will explain the method used to encapsulate and study numerous alliance relationships. Finally, we will discuss the results obtained through a cartography that enables to localize partners of strategic networks.

2. Contributions of economic sociology

Interorganizational relationships can be considered as *"a coordinated system of heterogeneous parties, developing transactions founded on a co-operational relationship, as to collectively pursue a shared aim"* (Voisin et al., 2004). This system is the result of a process within which the partners bond to exact a mutual benefit. That is to say, a network of parties which is subjected to business circles, and forced to define a balance with its environment. As defined by Assens (Assens, 2003), the concept of a network puts forward the inter-connection of parties able to participate in exchanges. The link between the parties gives the nature of the exchanges, their periodicity, their strength, their density. The parties hold positions that are apt to evolve, but that testify to a role or a function held in face of the other parties.

To understand the frame of a network, many authors (Calon, 1989), (Cohendet & Diani, 2003), prefer the study of relationships between members, rather than a focus on the nature of the parties themselves. They thus judge an approach to networking as a form of transitional organization, of a hybrid tendency, between the market and the hierarchy (Williamson, 1985).

Which is why Granovetter (Granovetter, 1985) considers that the functioning of a market depends on business conditions. He thus shares, with other protagonists of economic sociology (White, 1981;

Baker, 1984), the conviction that economic action is a social action, led by various motivations: sociability, recognition, social status and power. To prove the integration of economic actions within business relation systems Granovetter (Granovetter, 1985) suggests the concept of *"embeddedness"*. He makes a point of proving that business relations and institutions allow a market to function. A relation is then distinguished by its content (the exchange of a resource), its direction and its strength (level of exchange).

By the same perspective, interorganizational relationships can be considered as a means to control environment uncertainty accessing complementary resources. The rating of a company becomes clear when examining the relations network into which it is encompassed. This *"strategic network"* (Gulati & Nohria, 2000) relates to all the links held with partners, whether clients, suppliers, competitors or subcontractors.

As such, preference goes to working with a particular partner, depending on the level of interactions, sufficient to obtain an optimal transaction, through optimal human links rather than economic ones (Voisin et al., 2004). Parties using *"strong links"* (Granovetter, 1985) imply frequent contacts, a supply of reciprocal services, and this justifies a sharing of resources.

With this approach, the social relationship helps regulate opportunistic behavior, ensures data sharing, and facilitates collective solutions to problems.

Uzzi (1996) has shown that a relationship based on trust can enhance company advantages (shared risk, ability to react to markets changes, organizational apprenticeship), that purely commercial relationships cannot offer. And as explained by Gulati and Singh (Gulati & Singh, 1998), the economic parties tend to exchange, in priority, with known parties, to diminish uncertainty linked to transactions.

When a party knowingly mobilizes its network to follow a given strategy, trust becomes a resource of the network, that allows to save on the transaction costs (Williamson, 1985), to share resources (Richardson, 1972), to reduce measures of control or incitement (Gérard, 2000), to avoid asymmetrical data amongst partners (Akerlof, 1970), to contain opportunistic attitudes (Olson, 1971). As such, one of the main aims of studies on networks was to put to light the cohesion within members as a means to access, share or control resources. Beyond opportunistic explanations, linked notably to proximity (geographical or social), two main principles can explain the formation of links and interactions (Lin et al., 2001). When parties have the same level of resources and that they are moved by recognition, exchange or protection of their

business status, we speak of homophile interactions. In this case, the aim of links is to maintain a level of resources. When, on the contrary, the hierarchical levels are different, and the actions are motivated by the need to obtain better or supplementary resources, this becomes heterophile interactions.

In a more general way, parties interact with other parties because they seek backing or safety which allows them to control their turbulent environment, and find a certain stability. This search for control gives rise to regularities (relationships) which form the basis of business networks. The structure of these regularities can be identified. It's the principal of structural equivalence (White, 2001). As reminded by Grosseti and Godard (2007), two entities are structurally equivalent, within a network, if they occupy the same place or the same position, that is to say, if they have the same trade relations (or relatively similar relations) with given parties. The notion of structural equivalence thus allows to return to the classic notion of a role (or of position), but from a purely structural point of view, through a network analysis, without conjecturing on the weight of these roles.

3. Analysis

Social Network Analysis considers society as a system of business parties linked by relationships. It is an adapted method to understand and formalize complex phenomenon calling for an interactive system of relations. As such, this method allows to describe, and reconstruct, a network, in a simplified way by a graph. The graph represents the interactions between objects related by links. The development of a quantitative method, originally issuing from sociometry and completed by the help of the theory of graphs, allows today to put forward a set of properties which form a changeable topology. For network analysis (Borgatti et al., 2009), three main dimensions (*table 1*) can be used.

The first aims to identify the networks and to describe the manner in which the structures of these networks can burden the members. The connectivity is an indicator which allows to define the limit of the network in a chart. There is a network if there is always a link between two summits of the whole. A network is thus a related component of a graph.

The second dimension enables to identify the position, more or less dominant, of a party in the network. It can be assessed through centrality as defined by Freeman (1979).

The degree of centrality shows the popularity of a party within the network, that is to say, the number of direct connections of one company with the others. The centrality of proximity identifies the

companies closest to the sources of power and influence, that is to say, swiftly reached by the other members of the network.

The third dimension aims to define the cohesion of homogeneous groups within the network, to analyze structural similarities of the network. 2 parties are thus structurally equivalent if they have identical relationships with the other parties of the network (White, 1981). Partitioning techniques allow to detect groups of parties of structural equivalence (Navarro & Cazabet, 2011).

table 1 network analysis

network analysis	Points of links	distance
		equivalence
	Position of nodes	Degree centrality
		Proximity centrality
	Network structure	Density
		Connectivity

4. Methodology

To analyze business networks, we have chosen to study the responses, through co-transacting, to invitation to tender in French public markets. Our study is based on the analysis of coalition relationships within company groups. Let's be reminded that invitation to tender procedures find themselves in a system aiming to enhance the transparency of deals within the two categories of contributors. The contractors, meaning with the power to adjudicate, can be: the State (ministries), territorial collectivities (administrative districts, departments, regions), public establishments linked to the State and to collectivities, public establishments outside of a business and/or commercial character (universities, schools, certain museums, etc.). The companies making an offer are "submitters".

Data used for this study issues from the attribution notices from of the French Official Journals (BOAMP). The French Official Journals publishes the transactions attributed by a French public guarantor, for market sums above €4.000 before tax.

From transactions made in 2008, we have selected, with key words, the transactions held only by groups of companies. *Table 2* details the census of the observed businesses. It shows the number of parties that we identified within the groups.

table 2 : characteristics of the identified companies

Total number of transactions	54.181
Number of transactions undertaken by groups	4.203
Number of companies within the groups	6.563
Number of cooperation links	10.377

Obtaining this data goes through a multi-stage process: extraction, cleaning, filtering, formatting, dedoubling and indexing. The nature of the data used to analyze the groups of companies is held by three variables. The first is allotted to the identification of the parties (business reasons). The second is ascribed to the type of beneficiaries of the transactions (company groups). The third variable concerns the cooperative relation which links the parties within a group. We have considered that there is a cooperative relationship with two companies when they obtain a market within the bounds of co-transaction (a belonging to a group of companies).

5. Results

We have organized the relational data in the form of a list of adjacency. The list sets out, for each company, all the companies close to it. Then, we used the software *GraphViz* (www.graphviz.org is a series of open source tools created by the research labs of AT&T, which allow to represent and analyze graphs) to obtain a complete graph of the co-operation relations within the French public market in 2008.

The graph highlights numerous sub-graphs (related components) within which there exists a link between any two clusters. These sub-graphs are strategic networks. The graph is composed of 1360 strategic networks having between 2 and 2233 clusters. *Figure 1* represents the repartition of strategic networks according to their size. The visualization of the complete graph shows company aggregates which correspond to a concentration of links over a limited amount of companies.

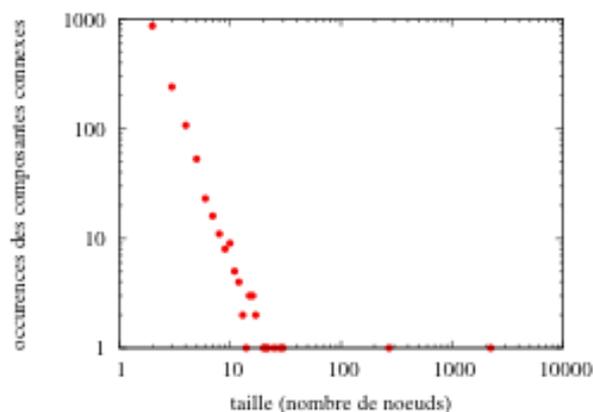


Figure 1: network distribution according to size

To understand the manner by which the strategic networks are constituted, we have isolated them. An in-depth study of the largest strategic network allows to produce a number of indicators on the

structure of relations:

- global density of the graph is low (0,0004). It reports the number of existing links and the the number of possible links;
- local density, or clustering coefficient, is high (0,47). It corresponds to the probability of two close members of a same party being linked;
- the average distance between two companies is 6,45. This distance corresponds to the length of relationship links between random members of the network.

To evaluate the position of parties within the largest related component, we have measured degree centrality. The distribution of degrees (*figure 2*), that is to say the number of connections a company has in the network, is heterogeneous. The majority of companies have a low degree, and only few companies have a strong degree. Put more clearly, we are close to the Zipf-Pareto law by which 20% of companies attract and generate 80% of network links. These companies are shown up statistically, but also visually in the graph.

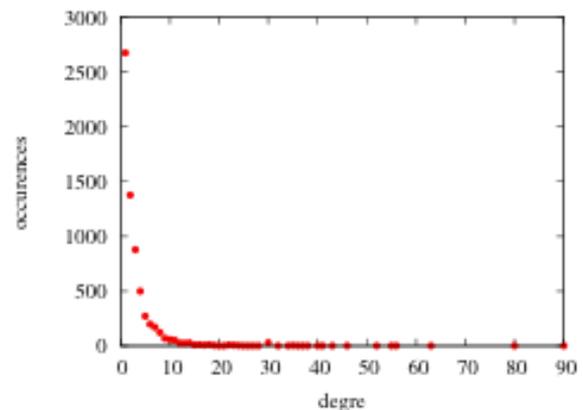


Figure 2: distribution of degrees within the network

6. Discussion

The analysis of the largest strategic network in French public markets reveals non-trivial characteristics common to other business networks, such as: acknowledgment networks (two individuals are related if they know each other), physical contact networks (two individuals are related if they have been in physical contact), collaboration networks (two individuals are related if they have worked together), exchange networks (two entities are related if they have exchanged for example an email). As such, the great business networks all possess a low global density, a strong local density, shortcuts to the summits, a

heterogeneity of degrees and a low average degree. These characteristics are generally attributed to graphs of a large field (Strogatz, 2001), in reference to the “small world” in the experience of Travers and Milgram (Travers & Milgram, 1969). These characteristics thus compose a organizational model of inter-organizational networks. Furthermore, the distribution of degrees within the network highlights the existence of zones more densely connected than others. These zones correspond to groups of companies more strongly connected to each other than to others. They correspond to an entity of companies with common points and between which the links are naturally stronger.

From a more general point of view, the complete graph of the co-joining of companies to a group of companies shows us a number of indicators to describe the phenomena of strategic networks within the public markets. But, to profit from these indicators, we need to determine, on an ongoing basis, the position occupied by each company, to understand its role and importance, or which are the affinities allowing a company to acquire or keep a central position in the network.

This purpose renders the use of cartography essential. The cartography stems from the graph of each company with its alliance relationships. The chart represents the strategic space within which influences are played out, and the topology allows to classify the companies according to their relationship proprieties. Cartography then becomes a reticular lay-out, representing business interactions in the public markets. This lay-out is a space in which the parties communicate information and interact with each other.

In fine, the main asset of cartography is its ability to analyze, on an ongoing basis, transactions and relationships within the public markets. This network analysis allows to:

- represent the companies and their relationships,
- navigate through the company networks,
- identify the position of each company on the market,
- measure the strength of the links (affinities) amongst the companies,
- determine the role and the status of each company.

From this network cartography, we can recognize and act on the strategic environment of a company, and use it as tool of competitive intelligence. In

effect, competitive intelligence can be considered as a process with the aim of reducing the part of uncertainty in the taking of any strategic decision (Revellic, 1998). So, to be intelligent is the ability to find a solution in a complex environment (Massé et al., 2006). This corresponds to the capacity of absorption (Zahra & George, 2002) of information to a strategic end, that is to say to its acquisition, its assimilation, its processing and its development.

7. Conclusion and future research

This study, carried out through data issued by the French Official Journals (BOAMP), is an analysis of French public markets throughout 2008. Thus, from 54.181 transactions carried out between the contractors and the submitting companies, we were able to observe 4.203 transactions undertaken by coalition companies. The growth of these transactions, with relational information, allowed us to set up a structural analysis. From this, we constitute a data basis on interorganizational relationships.

The main contribution of this study is to offer a framework of strategic network analysis within public markets. We set up a cartography giving a graphic representation of alliance networks. It eases their visualization and reveals non-trivial characteristics common to other business networks. But the aim of this study is to propose the basis of an competitive intelligence system. For competitive intelligence can be considered as a process aiming to reduce the uncertainty factor in the taking of any strategic decision (Moinet, 2011). The aim, then, would be to provide companies a system of new links references, to help them form coalitions within public markets.

To devise an competitive intelligence system, we need to keep in account that networks are where business interactions are made and undone. They can evolve, but also disappear. So we must keep on with this study. To this end, our perspective is to follow up, in a dynamic way, the evolutions and movements of network alliances within public markets over a period of several years. The longitudinal study will try to put forth the emergence and the evolution of strategic networks within public markets. The analysis will be based on the way in which businesses link themselves up and would use the preferential attachment concept described by Barabasi and Albert (1999).

Then, the approach that we are considering, the building a system of recommended links would be the following: Through a longitudinal study over several years, we would be able to predict new emerging links, which will connect the companies already present in the networks, but which had never been linked previously. Supervised training

techniques (Benchettara et al., 2011) could, then, be applied to build a prediction pattern of new links within the networks to help businesses form winning coalitions.

Making the decision to form a coalition within public markets means constructing a particular structure of links within a complex system of relations. Building a coalition can be considered as a plan of strategic decisions, in which the parties (the companies) can group to obtain earnings (transactions) through their choices (temporary alliances) and keep within the rules (implicit or explicit) which frame or curb their their performances. The earnings depend upon the decisions of parties exterior to the plan, and of which the distribution does not respond to a known probabilist law (uncertain environment). This decision will be defined by the taking into consideration of multiple criteria linked to the scores of relational properties. It will imply, amongst others, the diversity of considered options and the in-depth assessment of each of them, in considering possible profits.

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