Personal networks typologies: A structural approach

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ABSTRACT

Building typologies allows to compare networks on multiple dimensions, and to approach a generalization grounded on empirical data. In this article, we present a typology of personal networks only based on indicators related to the structure of relations between alters. It is designed from very detailed data on young French people who were involved in a longitudinal study. Our typology mobilizes a small number of indicators to discriminate the types that compose it. In so doing, we intend to make it applicable to various surveys.

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1. Introduction

How can personal networks be compared? Social sciences are based upon comparison: between contexts, between categories of individuals, between periods, and so on. Network analysis has shown its great potential for the study of intermediate social forms and their dynamics. It has developed many indicators providing very relevant information for social scientists: the size of the network, its composition, density, centrality, modularity, and so on. These indicators help describe networks systematically.

The information they provide has very specific sociological meanings that contribute to the understanding of the multiple ways in which a person's social circles develop and get structured. Whether the network is extended or concentrated, homogeneous or heterogeneous, dense or segmented enlightens us about the forms of socialization that constitute, according to Simmel, the very object of sociology (Simmel, 1950). In this perspective Burt (1992), for example, in his analysis of personal networks, highlights the fact that the central person of this network, ego, manages its diversity and controls potential exchanges between alters who make up the network. These degrees and arrangements of connections between alters in a network form its structure. In the field of analysis of the impact of network structure, various indicators are thus used to describe this structure.

In this article, we focus on personal networks, for which connections between alters are described by ego, while for complete networks each network member is interviewed and asked to describe his own connections. As McCarty (2002) reminds us, networks of ties between alters of the same ego can be analyzed using the same techniques as for the "complete" networks. Some indicators relate to the scope of the personal network and its composition. The aim is to evaluate the "social surface" of a person by measuring (and comparing to others) the number of alters in the network and their diversity. The latter indicates the multiplicity of social circles to which that person has access. The issue of homophily has become a classic question of network analysis in social sciences (McPherson et al., 2001; Di Maggio and Garip, 2012).

Other indicators focus on the overall personal network structure. This is the case for density, which indicates its general level of cohesion, depending on the extent to which alters are interconnected.

More complex indicators relate to different parts of the network. One approach is to highlight dense areas in the network; these are referred to with the ambiguous but now widespread term of "communities". Various indicators have been constructed in order to assess to what extent such communities differ from their neighborhoods in the network (Blondel et al. 2008; Newman and Girvan, 2003). Finally, structural indicators may be applied to individual alters. This is the case for various kinds of centrality (degree centrality, betweenness centrality, proximity centrality), which show that some alters occupy a position that gives them a specific role. One can measure the distribution of these centralities within the network, to obtain a comprehensive indicator of its global structure.

Having stable typologies of personal networks based on structural criteria becomes more and more interesting given the increasing amount of available data generated by online activities, in which little information beyond the networks and their struc-

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tures is given. It also facilitates comparisons between the different surveys on personal networks.

In this article our aim is to develop a basis for a systematic comparison of personal networks articulating different perspectives while giving a synthetic view of the structure of these networks. We undertook the task of building structural typologies by seeking combinations of criteria which allow us to efficiently sort personal networks and to assign them to the most relevant types. To do so, we rely on a longitudinal survey of personal networks of young French people living in the Caen area, as they enter adulthood. We have already explored the biographical dynamics of these networks from various perspectives in previous studies (Bidart and Lavenu, 2005; Degenne and Lebeaux, 2005; Bidart and Cacciuttolo, 2013; Bidart, Degenne and Grossetti, 2011).

We are now using this empirical investigation to elaborate a typology of personal network structures. This typology should be sufficiently complex and account for enough characteristics for the social scientist not to stray too far from the social reality, which is itself complex; but, ideally, it should also be simple enough to suggest applications to larger numbers of personal networks stemming from various surveys. Our knowledge of these data enables us to construct a typology that is realistic. Naturally, this is a first step and this typology will be tested on other datasets.

We first mention some contributions to the study of network structures and clarify the relevance of some indicators commonly mobilized in descriptions and typologies. We then depict the data collected by the longitudinal qualitative study we are mobilizing, which was conducted in France in four waves of survey over the course of nine years. We then present our own progression and technique in order to bring out the fundamental characteristic traits we retain for constructing an inductive typology. We unfold the steps of the analytical work which allows us to characterize the personal networks in this survey in a simple manner and compare them. To give it a heuristic value, we then seek to find out what indicators and thresholds enable us to account as accurately as possible for their structures. Our aim is to propose a reproducible way to synthesize personal network structures via these types.

We check the relevance of this typology by measuring its distribution based on a key variable for the social sciences, namely social class, which is measured here by the parents' occupation and the educational pathways of respondents.

Based on empirical data, this typology is therefore meant to be an attempt to produce structural measures of personal networks that are realistic and can be applied generally.

2. Typifying personal networks

The large numbers of surveys on personal networks have stabilized recurring results such as the correlation between network size and level of education, or the importance of family ties. There are fewer stable results on the structural characteristics of personal networks, even though we know that such characteristics are closely linked to social situations and to the composition of networks.

When focusing on the network structure, one must seek to gather information on the links between the alters cited by ego (the respondent). The most common method is to show the respondent the list of names obtained through the name generators, presented as a matrix, and ask him/her who is related to whom. The result is a network of nodes and links between them, to which the same measures can be applied as to a complete network. McCarty (2002) used the same methods for analyzing personal networks as for complete networks because they allow the analyst to take into account the structure of the relational system. However, when the number of alters is low (in classic surveys by Wellman (1979, 1981) and

Marsden (1987) for example, this number is about four on average), one can hardly engage in detailed structural analyses. For that reason we are using a survey which does not limit personal networks' size and thus allows a wider scope and diversity of structures.

The place given to structural measures in network analysis is variable. Some typologies are based on the composition of the network in terms of alters' characteristics (age, level of education, occupation, and so on) or in terms of characteristics of ties (duration, strength, multiplexity, and so on); others involve some network structure indicators; yet others adopt a purely structural perspective, and only afterwards analyze the links between the resulting typology and other variables. We present here some of these attempts to build personal network typologies.

Typologies based on the attributes of alters are the most common. In a recent meta-analysis of personal networks, researchers identified 277 studies whose results they were able to reexamine in order to analyze changes in networks and life events (Wrzus et al., 2013). To do so, they mainly used the composition of networks rather than structural parameters, because the field of such an analysis was wider.

Thus, for example, Clare Wenger (1991) studied seniors' networks, in terms of the support and care they can provide. Personal networks were classified according to the proportion of family members, friends, neighbors or others such as members of associations. In such a study, alters were mainly identified in terms of role.

Agneessens et al. (2006) also studied networks of older people, but they focused on the support functions of alters (emotional, instrumental and accompanying). They used a method of latent class to sort the networks according to the distribution of alters in these types. They retained a model made up of three types: "no support", "companionship" and "companionship and emotional support." Among the most recent typologies, Eric Gianella and Claude Fischer (2016) used 21 variables that combine the attributes of the alters woth some structural aspects (size and density).

These studies are just presented here briefly as some examples of elaborations of typologies, in these cases based on the characteristics of alters or their relational roles. Scholars mobilized factors they hypothesized as relevant for their social question, that is the link between social integration of egos and usefulness of their network. All these analyses were using classifications, but network structure was not involved.

In another group of studies, structural indicators were mixed with other indicators.

In some cases, scholars studied the links between structure of networks and the qualities of ties. For example, Haythornthwaite (2000) studied personal networks of 52 students participating in a graduate degree program completed at a distance via the Internet. She asked students to describe their links with the other students in the same class, using categories that refer to the strength of ties (close friend, friend, work only). She did not build a typology of networks, but she examined the correlations between the structural characteristics of the network obtained (composition, density, size) and uses of different types of communication media.

In other cases, structural indicators were mixed with indicators of composition of personal networks.

For example, McCarty (2002) used indicators of structure and position of the networks of 46 individuals, to which he subsequently added a characterization of relational roles. In his survey, each person was asked to list the names of 60 people he or she knows and say whether there was a link between those named. The author thus had 46 adjacency matrices. He then calculated six structural variables for each network: density, measures of dispersion of three kinds of centrality (degree, proximity and betweenness) (Freeman, 1978), an indicator based on the number of cliques, and the number of related components of the network.Based on these