Learning and Individual Differences 34 (2014) 63–69

Contents lists available at ScienceDirect

Learning and Individual Differences

journal homepage: www.elsevier.com/locate/lindif

# Personality correlates of key roles in informal advice networks ☆

Elisa Battistoni [1], Andrea Fronzetti Colladon *,[1]

*Department of Enterprise Engineering, "Tor Vergata" University of Rome, Via del Politecnico 1, 00133 Rome, Italy*

ARTICLE INFO

*Article history:*
Received 10 April 2013
Received in revised form 10 April 2014
Accepted 16 May 2014

*Keywords:*
Social Network Analysis
Key roles
Advice network
Personality
Performance

ABSTRACT

Prior research has emphasised the importance of informal advice networks for knowledge sharing and peer learning. We use Social Network Analysis to detect individuals who play a strategic role in advice networks. Even if roles have been extensively described, how to identify people within them is still an open issue. Furthermore, we investigate whether an association between key players and the big five personality traits exists, by means of nonparametric statistics. To achieve this, we present a case study which involves roughly 180 university students. We found 21 of them playing a key role. Results give evidence of significant associations between key positions and Conscientiousness, Neuroticism and Agreeableness; whereas no evidence is found for a relationship with Extraversion or Openness to Experience. Consistently, personality emerges as a relevant indicator for predicting people who are more likely to play a strategic role, even when connection patterns are unknown.



## 1. Introduction

During the last decades, teaching and learning strategies have changed a lot. More and more, students are learning from each other without direct teacher intervention (Boud, Cohen, & Sampson, 1999). Informal interactions with peers are also predominant in the academic profession (Boud, 1999) and in business contexts (e.g., Boud & Middleton, 2003; Cross, Parker, Prusak, & Borgatti, 2001). Prior research has emphasised the importance of social relationships for acquiring information (e.g., Burt, 1995; Granovetter, 1973) and to learn others' work (Brown & Duguid, 1991; Lave & Wenger, 1991). People's relationships have a significant impact on their capability to learn, to obtain relevant information and to solve problems (Cross et al., 2001). As a result, knowledge and information flows in informal networks emerge as critical resources to be addressed and managed (Grant, 1996). From this point of view, advice-seeking networks are particularly important for they show the prominent players on whom others depend to solve problems (Krackhardt & Hanson, 1993) and they are a means for individuals to share resources such as information and knowledge (Sparrowe, Liden, Wayne, & Kraimer, 2001). Nonetheless, informal networks are not frequently assessed neither in learning environments nor in business organisations — even if managers recognise their critical value (Cross, Prusak, & Parker, 2002). The Social Network Analysis (SNA) is probably one of the most useful approaches in this setting and is increasingly applied in business and learning contexts (Wasserman & Faust, 1994). This methodology analyses social relationships and can describe, explore and understand how complex links work and evolve in time. Each actor is represented as a node in the network and is tied to other actors by one or more specific types of interdependence, such as friendship, information exchange or common interests.

In literature, many authors use SNA to analyse informal networks (e.g., Cross & Parker, 2004; Morton, Brookes, Smart, Backhouse, & Burns, 2004). Some of them, in particular, try to spot key roles taking into account the different kinds of relationship between actors and their positions in the network. Nodes, indeed, do not always have the same level of importance. For example, we could find actors with a critical role for they are in a very central position, linking to many others in and out. Many authors have analysed the topic of measuring centrality (e.g., Bonacich, 1991; Freeman, 1979; Freeman, Borgatti, & White, 1991; Katz, 1953) and also investigated its possible associations with power (e.g., Bonacich, 1987; Gomez et al., 2003; Mizruchi & Potts, 1998). Being in a central position can provide easy access to information or advice and can be helpful for endorsing personal ideas, thanks to the great number of connections and a bigger visibility or influence (Klein, Lim, Saltz, & Mayer, 2004); peripheral nodes are often lacking all these elements. Key players are those actors who exhibit a role which is often critical for the performance of the entire network (Chan & Liebowitz, 2006) and one of the best categorisations is given by Cross and Prusak (2002), who refer to central connectors, peripheral specialists, boundary spanners and information brokers. A main concern is to identify such – or other – key players in networks. Some attempts have been made in this direction in order to define metrics which can be used in static scenarios or considering multiple networks or even their evolution over time (e.g., Brendel & Krawczyk, 2010, 2011; Lu, Li, & Liao, 2012; Pasqualino, Barchiesi, Battistoni, & Murgia, 2012).

☆ Funding source: Telecom Italia S.p.A. provided financial support for the conduct of this research with no other involvement.

* Corresponding author. Tel.: +39 06 72597293; fax: +39 06 91712663.
*E-mail addresses:* battistoni@dii.uniroma2.it (E. Battistoni), fronzetti.colladon@dii.uniroma2.it (A. Fronzetti Colladon).

[1] The authors contributed equally to this work and are listed in alphabetical order.

http://dx.doi.org/10.1016/j.lindif.2014.05.007
1041-6080/

However, a common problem often arises for many of these metrics: they are developed for specific kinds of relationship or uncommon roles, or require a large set of data to be applied (e.g. pictures of a network at different stages of its evolution). In this paper we start from Cross and Prusak's key roles and propose specific identification approaches – mainly based on existing metrics and mapping techniques – which can overcome some of the above-mentioned limitations: they can be applied to a static picture of the network, do not require multiple sets of data and could be extended to go beyond the single kind of relationship they were conceived and tested on.

Nevertheless, in real contexts we face many situations where we are not provided with sufficient information to map an informal network and therefore we cannot use any metric to spot key players; in this case, we have to look for other attributes characterising people who are involved in informal interactions.

Personality was revealed to be an important driver for academic performance (e.g., Busato, Prins, Elshout, & Hamaker, 2000; Chamorro-Premuzic & Furnham, 2003), creativity (Batey, Furnham, & Safiullina, 2010; Furnham & Bachtiar, 2008; Shalley & Gilson, 2004) and innovation behaviour (Âmo & Kolvereid, 2005); it was also shown to be linked to some of the key roles (e.g., Burt, Jannotta, & Mahoney, 1998; Klein et al., 2004; Williams, 2002) even if the association of enduring personal characteristics with network positions has only rarely been examined. According to Williams (2002, p. 110) – for example – boundary spanners are 'characterised by their ability to engage with others and deploy effective relational and interpersonal competencies' and they are also creative, innovative, reliable and tolerant people. In our paper, we try to find a relationship between the role played by a person in a network and some combinations of his/her personality traits. In assessing personality traits, we refer to the five-factor model of personality, which is a widely used construct, has gained acceptance as a general taxonomy (Judge, Bono, Ilies, & Gerhardt, 2002) and transcends language and other cultural differences (Yamagata et al., 2006).

## 2. Key roles in informal advice networks

When looking for key players in a social network it is essential to know how the social interdependencies between actors have been mapped. Since we analysed an information network in a learning environment, an incoming arrow indicates that someone is being asked for information or advice and an outgoing arrow that someone is asking for information or advice (Pasqualino et al., 2012). When analysing study relationships some people might be much more influential in giving advice or sharing knowledge than others; therefore arcs have to be valued. We consider a directed graph where each node represents an actor in the advice-seeking network; so there is an arc from actor *a* to actor *b* if *a* is asking *b* for advice. Every arc is then assigned with a value depending on the frequency of the interaction: the more advice or knowledge *a* receives from *b*, the higher the weight of the arc from *a* to *b*. Not every arc is bi-directed and the act of giving advice or sharing knowledge is not necessarily symmetrical. In such a network, we want to look for the four types of key players described by Cross and Prusak (2002). These roles were identified by analysing more than fifty large organisations (Cross & Prusak, 2002) and many studies refer to them when dealing with advice, knowledge or information networks (e.g., Chan & Liebowitz, 2006; Pasqualino et al., 2012; Whelan, Collings, & Donnellan, 2010). The identification of key students in learning environments can be vital for the optimisation of information flows and for the improvement of the general performance.

### 2.1. The central connector (CC)

Central connectors are the people with the highest number of social links in networks, those who know who can provide critical information and those who almost everyone in the group talks to. Even if their role is not always recognised by the formal organisational chart, they are highly valuable knowledge resources upon whom network performance relies (Chan & Liebowitz, 2006). They are also often valuable in indirectly connecting other actors (Cross & Parker, 2004; Otto & Simon, 2008). In any case, some of them may end up creating bottlenecks and hold back the informal network. Moreover, being a CC is usually very time consuming. In a learning environment CCs are valuable students, with many direct contacts, who can often help their peers find the information or advice they are looking for.

When searching for CCs, we focus on actors with high values of in-degree and out-degree — so linking to many other nodes in and out. In addition, total ties weight must be significant when compared with other nodes (the weighted degree of a vertex is defined as the sum of the weights of its incident edges). Each arc weight represents the frequency of interaction between two nodes (in one direction), when giving or receiving advice. To sum up, we search for actors who are reached by many arcs – balanced inward and outward – and who frequently interact with others, exchanging a significant amount of knowledge. Consistent with this view, we refer to degree centrality measures (Freeman, 1979) in order to identify CCs. Threshold values for weighted in- and out-degrees have to be set by the analyst, so as to identify the most central people. These values have to be chosen considering the specific kind of relationship mapped and the network density. In fact, when a graph is highly connected with many strong ties there may be no need to isolate the most central people; even removing some of them, indeed, the information flows would probably not be compromised. In our case study, an appropriate threshold is the 75th percentile for both in- and out-degree measures.

We also excluded those actors who are not connected to at least three colleagues.

### 2.2. The boundary spanner (BS)

Boundary spanners are people who nurture connections outside their informal network, serving as bridges with other communities, departments or even organisations. They go beyond their personal affiliations and play a vital role in exchanging experiences and knowledge and in building up strategic alliances. They are in a very good position for recognising innovation opportunities (Chan & Liebowitz, 2006), favouring intergroup transactions and managing intergroup conflicts (Callister & Wall, 2001). In learning environments it may be easy to find subgroups in which the interaction is more intense and BSs are those students who can facilitate communication flows between different cohesive clusters (Pasqualino et al., 2012) — so as to create the conditions for trust and interdependencies.

Before identifying BSs we need to isolate the communities they belong to. The problem of finding communities is considered a data clustering problem: it can be solved by assigning each node to a cluster, in a meaningful way (De Meo, Ferrara, Fiumara, & Provetti, 2011). In our data, we were not given an already clustered network – as in the case, for example, of business departments – so we used the VOS mapping technique (van Eck, Waltman, Dekker, & van den Berg, 2010) to find communities; this choice is not mandatory and we recommend using the method that best fits the specific network analysed, also taking into account that the number of BSs is sensitive to the number of communities identified. As a second step, we identified BSs as those actors who connected their cluster to others.

### 2.3. The information broker (IB)

Information brokers are people who have a huge importance in making information flow in the network as they keep different subgroups linked together. Even when they have only a few direct connections, they can have the same power as CCs, which comes from the preservation of connectivity. In fact, removing an IB would split the network into two or more smaller and less effective segments (Chan & Liebowitz, 2006), facing the possibility of interrupting important