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Review of network research in scientific journal 'Entrepreneurship Theory and Practice'

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Abstract:

This article aims at presenting a systematic review of publications that verified the network theory and the theory of networks empirically, published in the entrepreneurship journal with the highest Impact Factor: "Entrepreneurship Theory and Practice". We present how publication frequency evolved over time, and classify papers into major streams of entrepreneurship research. Our findings suggest the theory of networks is an under-researched area promising for further advancing the theory of entrepreneurship. We also find increasing publication frequency of network related research over time. Results oriented research were most often present in reviewed articles, while relationship among network variables and innovation was only tested in two articles so far which suggests that more research is needed in this direction in the future. We belief that verification of theories of networks in entrepreneurship and verification of relationship between network variables and innovation within the network theory are most promising. The originality of this work lies in identification of research opportunities and dynamics of empirical verification of network studies in the field of entrepreneurship.

Keywords: network theory; theory of networks; literature review; entrepreneurship; network society
JEL codes: L26, D85

1. INTRODUCTION

Entrepreneurs and organisations established by them operate in a complex mix of relationships. To explain antecedents of these relationships, find patterns that enable to understand their complexity, and inquire into consequences of observed patterns, Entrepreneurship scholars increasingly use network theorizing. The study of entrepreneurship through network lenses has been increasingly visible, as indicated by earlier review of the filed (Hoang & Antoncic, 2003). This review identified 70 papers that have been published on the role of networks in the entrepreneurial context in scholarly journals specializing in entrepreneurship, sociology, and strategic

management already in 2003. Since that time number of publications that use network approach in organization science has increased substantially, that enabled clarification on network related theorizing in social science (Borgatti & Halgin, 2011). Building on advances in network theory we decided to apply two major categories of network theorizing: the theory of networks and the network theory in systematic review of network research in the leading journal in the field – Entrepreneurship Theory and Practice.

Network theorizing raised out of a metaphor that was creatively used and turned into rigorous theoretical propositions, inter alia, by Harrison White, the founder of Harvard Revolution in sociology, and Bruno Latour, the author of the actor-network theory. Harrison White (1992) put forward a general sociological theory based on organisations (and individuals) seeking to control their identities through embeddedness in netdoms. Bruno Latour (1988) wrote that the network metaphor indicates concentration of resources in few network nodes. His actor-network theory treats both machines and humans as actors of social processes, emphasizing the key importance of their interactions in today's organisations and societies. That theory anticipates phenomena that have been recently called the Internet of things or the Internet of everything, visions of a global network connecting not only people but also objects. In the world where hundreds of millions of Internet users are constantly exchanging huge amounts of information, the network metaphor seems to be commonly comprehensible. Thinking about social networks, we imagine the world entangled by relationships among exchange participants who use modern information technologies.

The network metaphor usefulness is not confined to explaining the Internet phenomena solely or even those that occur in social systems. The widespread existence of networks is evidenced by a growing number of studies and theoretical proposals developed by physicists, mathematicians, computer scientists, biologists and epidemiologists. Also artists are interested in networks, as exemplified exquisitely by Mark Lombardi's drawings collected by the Museum of Modern Art (MoMA) in New York. Understanding the rules of information and resources flow within a network structure also has crucial practical implications. For example, it allowed for designing Google PageRank algorithm (Brin & Page, 1998), reducing costs and improving effectiveness of the fight against addiction to nicotine (Christakis & Fowler, 2008), detecting and combating terrorist networks (Krebs, 2002), and effectively placing innovations in the market (Valente, 1996).

In institutional economics, Powell (1990) points to networks as the third mechanism of economic organisation, along with markets and hierarchies. White (2001) and Granovetter (1985) argue that markets are theoretical concepts separated from reality, whereas, in fact, economic processes unfold primarily in social networks of exchange and cooperation. Granovetter's (1985) theory of social embeddedness of economic processes contrasted with classical economic theories that disregarded the social aspect and were dominated by individualistic, transactional explanations of economic mechanisms. Castells (1996) writes about an emerging network society that develops as modern communication technologies become

widespread and global actors become more and more interconnected. The network metaphor allows him to reveal a comprehensive picture of the organisation of modern societies that are being constantly reconfigured. The network society processes cannot be effectively regulated by national laws since the network extends beyond the borders of a single country. Citizens of the network society smoothly switch between organisations, associations or coalitions of interests.

In the network society, where interrelated individuals are involved in the exchange of resources and information, an entrepreneur's success inevitably depends on his or her position and characteristics of the network in which he or she operates. Position in the network structure determines opportunities and imposes restrictions on freedom of action. Network characteristics govern dynamics and possibilities of exchange and access to resources and information.

Our article aims at presenting a systematic review of publications that verified the network theory and the theory of networks empirically and were printed in the entrepreneurship journal with the highest Impact Factor: "Entrepreneurship Theory and Practice". Our literature review outlines key theoretical proposals for a network approach: the network theory and theory of networks. To introduce this theoretical approaches we briefly introduced their key assumptions and illustrated each by example of a seminal study conducted in these traditions. Then, we introduce methodology of our study and present the results of our systematic literature review of "Entrepreneurship Theory and Practice" publications in 1995–2015. Resorting to the Scopus database, we selected 71 articles published in the last 20 years that use the word "network" in their abstracts. Subsequently, we divided the articles into those addressing theoretical proposals and those reporting empirical research to verify the theories. Since our review seeks to establish how advanced empirical research into links between networks where entrepreneurs operate and their performance is, the next step left out articles aimed at examining other relationships. We do not analyse in detail theoretical articles that contain no empirical research results, either. We selected 38 articles for our final analysis, considering them as an attempt to verify two broad theoretical traditions that we introduced earlier. Our literature review indicates popularity of these two approaches in the journal when mainstream entrepreneurship research is presented. We also describe changes in the number of publications in question in the studied period of 20 years. In conclusions, we identify promising areas of future research that strives to verify the network theories in the field of entrepreneurship.

2. NETWORK THEORY AND THE THEORY OF NETWORKS

The growing importance of the network approach in the organisation and management theory was mentioned by Borgatti and Foster (2003), who indicated that its popularity increased exponentially, as measured by the number of publications in scientific journals. A network may be made up of any set of objects connected by relationships that form analysable patterns. Objects may be alternatively referred to

as actors, nodes or vertices, and their interrelations may be termed ties, lines, connections or edges of a network. A network analysis highlights the fundamental importance of relationship patterns that form the ground for explaining the phenomena addressed by social sciences and for the entrepreneurship theory developed based on such sciences.

A social network analysis aims at clarifying links between the structure of relationships and connections and characteristics of the social system. It comprises two key aspects: mechanisms governing the formation of the social system and its characteristics, and consequences of network configuration (Tsai & Ghoshal, 1998; Rowley, Behrens & Krackhardt, 2000). Borgatti and Halgin (2011, p. 1168) point to the distinction between those two theoretical network issues that are analytically separate, defining them as the theory of networks and the network theory.

The theory of networks explains the origins and characteristics of an observed network, for example its non-scalability, i.e. the fact that the relationships between network nodes are distributed exponentially. Such a distribution may result from preferential connections, namely the tendency of nodes to establish relationships with popular network objects (Barabasi & Albert, 1999). Another research project, in line with the theory of networks, would define network properties, for instance its density as a measure of network relationships in proportion to all possible relationships. Networks where entrepreneurs operate are expected to have different densities, depending on the culture of a country. If entrepreneurs tend to be driven by more individualistic values, the network density is expected to be low, resulting in slower dissemination of practices and innovation and greater differentiation of entrepreneurs' attitudes. Empirical studies under the theory of networks are, therefore, conducted as macro-analyses of entrepreneurship determinants described by measurements of global network properties.

Research under the theory of networks is also exemplified by analyses of the extent to which the structure examined has the characteristics of a small-world network. The concept of small-world network refers to the classical theoretical proposal put forward by Milgram (1967), who stated that actors of even very extensive networks are separated by only a few direct connections, usually not more than six. A small-world network is a specific class of networks with many strongly interrelated subgroups and a relatively short path of connections between nodes (Watts & Strogatz, 1998). Uzzi, Amaral and Reed-Tsochas (2007) discussed the applications of small-world network research methods, pointing to the existence of such networks in a wide variety of organisational systems, for instance networks of relationships between musicians and actors, networks of alliances, research networks examined through mutual citations, inter-organisational networks built through personal relationships among board members, patent cooperation and energy networks. The fact that small-world networks prevail in different types of inter-organisational and personal networks proves high efficiency of network action coordination mechanisms and resilience of those systems to disruptions.

The network theory aims at explaining the consequences of network variables such as centrality, operation in structural holes and characteristics of ties for the

performance of network participants (Granovetter, 1973; Freeman, 1979; Burt, 1992). Granovetter used the characteristics of ties to develop the theory of strength of weak ties (SWT) (Granovetter, 1973). He was directly inspired by research into the job seeking process that found that weak ties provide valuable information about job offers. It is the information from acquaintances weakly tied with job seekers, rather than from closely related friends, that increase the probability of success in the labour market. This is because persons closely related with job seekers live in the same environment and usually have access to similar information. Valuable information is communicated by people who have access to multiple groups with different information. Weak ties accelerate flows in a network and provide fast access to its remote parts.

Examination of links between the effects of action and the quality of relationships is also well illustrated by one of the most frequently cited scientific articles addressing networks (Uzzi, 1997). Its author investigated women's fashion companies in New York and found that two distinctive types of relationships existed between those companies and their suppliers. Those types are also included in the SWT theory described above. Respondents talked about them in different ways. The first type includes relationships marked by social embeddedness and called "close" or "special" by CEOs of examined companies. Such relationships are based on reciprocity, emotional involvement, intensive exchange of information, trust, joint problem solving and a longer time horizon. The second type comprises market transactions (arm's length ties), individual agreements where suppliers were selected chiefly according to the lowest price criterion. Uzzi stated that embeddedness was associated with saving time (economies of time), i.e. the ability to seize emerging market opportunities quickly. Embeddedness also reduces transaction costs because partners having a long-term relationship tend to trust each other. He also highlighted that excessive embeddedness restricted access to information about changes outside the network of a company's close relationships.

The theory of structural holes is a perfect example of reasoning in the context of the network theory, which states that the positions of nodes affect their performance. It was developed by Ron Burt (1992) on the basis of research into issues similar to those that became the foundation for Granovetter's theory of strength of weak ties. Burt focused on the impact of a diversified egocentric network structure, i.e. a network of people directly related with candidates, on the speed of promotion. He put forward the hypothesis that promotion is linked with structural holes in egocentric networks. Holes also exist where two people tied with a candidate for promotion do not have mutual relationships. Structural holes allow the candidate to control information flow between unrelated contacts and access knowledge from many sources. This affects his or her expert position and should be positively correlated with promotion likelihood, as confirmed by that author's research. In his argumentation, he does not focus on the quality of relationships but on their structure and the position of candidates for promotion.

We have drawn a distinction between the network theory and the theory of networks in this section. We introduced the essence of each of these theories and

discussed seminal studies that illustrate both. In order to achieve this we have chosen the most frequently cited works that examined network structures and effects of network actors' positions. In the next chapter, we analyse those two types of theories in the entrepreneurship literature based on a review of texts published in "Entrepreneurship Theory and Practice" during 20 years. We were curious how often in mentioned journal the issue of network was the topic of articles and, considering the entrepreneurship field, in what context it was analysed. The aim was to determine what areas were taken into consideration in the analysis of the network in ETP.

3. MATERIALS AND METHODS

In this article, we report preliminary research that we want to develop into a systematic review of entrepreneurship literature. We intend to provide a comprehensive review of publications aimed at verifying network theories empirically. We would like to include more scientific journals addressing entrepreneurship and expand the scope of our analyses. At the present stage of preliminary research, we have chosen to analyse the entrepreneurship journal with the highest IF: "Entrepreneurship Theory and Practice". Based on the Scopus database, we limited our selection of articles to 1995–2015.

Initially, we tried to look for texts addressing the network theory and the theory of networks. However, regardless of the search phrase, the results comprised the same 16 articles. We, therefore, decided to broaden our search and selected articles that contained the word "network" in their abstracts. This resulted in more texts, namely 71. Thus, we were able to prepare a broader analysis of the issue in question and verify which theory is actually used for data analysis.

Following the initial selection, we rejected 9 thematically irrelevant articles that contained the word "network" in a meaning different from "a network of relationships" or that concerned, for example, citation links between entrepreneurship researchers (Grégoire, Noël, Déry & Béchard, 2006). One article covered a literature review of research into networks in entrepreneurship (Slotte-Kock & Coviello, 2010). 23 publications presented studies on the impact of a network on a selected phenomenon. The objective of our review was to identify articles that verified empirically the network theory and the theory of networks described in the previous chapter. We wanted to find out how researchers analyse networks, what they research and what network characteristics are described, which helped us to outline the research programme in the conclusions. Based on the review of abstracts and an overview of the methodology and methods of analysis of the collected data, we classified 38 articles for final analysis.

When reviewing publications on networks, we wanted to answer the following questions:

– Which theory is mainly used to do research into networks in entrepreneurship (theory of networks vs. network theory)?

– In which context of entrepreneurship are networks most frequently researched?
– Which network characteristics are most often analysed in research into networks in entrepreneurship?

We divided the selected articles according to the area researched, network theory used and the method of network analysis, and matched the articles to network characteristics that were described in the studies: size, density, relationship type, centrality, structure or content. We also identified 6 themes that were discussed in the articles in the entrepreneurship context of research: innovation, company development understood also as company growth, resources and resource accumulation, achievement understood also as the number of agreements concluded, effectiveness, etc., financing – all methods of financing, collaboration with banks, lending and cooperation including texts describing cooperation between companies, suppliers, entrepreneurs and institutions. Above themes arose from the grouping of articles in the thematic area. Reviewing articles enabled us to define the main topics which were discussed, and categorize them into thematic categories. Our main analytical frame was to distinguish papers as either fitting concepts of network theory or theory of networks as proposed by Borgatti and Halgin (2011). At more detailed level we assigned papers according to specific measures and network concepts used by their authors. We have looked for commonly used network concepts such as: density, centrality, type of relationship, structure and content. Some articles are classified in several categories as the use of concepts and measures is not mutually exclusive.

4. RESULTS AND DISCUSSION

The analysis of abstracts of 39 articles selected for review allowed us to classify them to two theoretical areas mentioned in the preliminary literature analysis and to one of 6 research area categories. We classified them independently, and when opinions differed, we read whole articles in order to assign them to appropriate categories. The results of our review are provided in Table 1 below.

It appeared that most studies – as many as 14 or 37% of all articles on network research published in the journal that we chose – focused on business achievements. As illustrated in Table 1, researchers concentrated primarily on analysing the type of relationship and its impact on entrepreneurs' achievements, hence used the network theory more frequently, although network structures and sizes were also examined. Among the selected texts, the article by Greve and Salaff (2003) has most citations and describes networking patterns among entrepreneurs and their impact on business operations, exemplified for 4 different countries. The second most frequently cited article is that by Louise, Althanassiou and Crittenden (2000), who presented the influence of the founder's central position on strategic business management, and thus on company performance. Based on the concept of social network and the founder's central position, they developed a model for further examination of strategic business management. The third most often cited (150) text by

Hite (2005) builds on case studies and analyses embeddedness of entrepreneurs in the context of recognising opportunities, seeking resources and effective management. The next most often cited (121 citations) study presents the network structure of academic entrepreneurs managing companies in various stages of development (Mosey & Wright, 2007). The research involved interviews with academic entrepreneurs who were asked to describe the structure, content and management of their networks at the beginning of the research and again after one year. In his text, cited 82 times, Westhead (1995) addresses achievements depending on the type of high-technology company managers and the type of their relationships. A quite often cited article (70 citations) by Lester and Cannella (2006) is about building social capital by family businesses and its impact on their survival. Other articles in this group focused mainly on the type of relationships, type of persons in the network and their impact on achievements (Godwin, Stevens & Brenner, 2006; Wu, Wang, Chen & Pan, 2008; Huse & Swartz, 2010; Scarbrough et al., 2013; Sautet, 2013; Ebbers, 2014), also with reference to success achieved by transnational entrepreneurs (Wenhong & Tan, 2009).

Table 1. Division of articles by area, theory and network analysis area

Area	No. of articles	Network theory	Theory of networks	Size of network	Density of network	Type of relationship in the network	Centrality	Structure of the network	Content of the network
Innovation	2	1	1		1	1	1		
Company development	4	2	2		1	3		1	1
Resources	5	4	1	2		4	1	1	1
Achievements	14	9	5	5		9	2	5	3
Financing	7	6	1			6		3	1
Cooperation	7	6	1	3		7		3	1
Total	39	28	11	10	2	30	4	13	7

Source: own elaboration.

We assigned seven texts to the thematic area of cooperation and seven articles to the topic of raising funds by entrepreneurs.

As regards articles describing research into the impact of networks on cooperation among entrepreneurs, investors etc., it can also be noted that the researchers concentrated chiefly on studying types of network relationships (Webb et al., 2010; Karra, Tracey & Phillips, 2006), then the network structure (Ring, Peredo & Chrisman, 2010) and the network size (Kuhn & Galloway, 2015; Patel & Conklin, 2009). Only one article used the theory of networks (Ring, Peredo & Chrisman, 2010) and others employed the network theory (i.a. Bartholomew & Smith, 2006; Daspit & Long, 2014).

That was also the case for articles on the impact of networks on the search for financing by entrepreneurs where the authors also primarily analysed relationship types, chiefly using the network theory (i.a. Chen & Tan, 2009; Du, Guariglia & Newman, 2015), with only one article resorting to the theory of networks (Fiet, 1996). The research mostly concerned methods of building networks in order to gain easier access to loans (Saparito, Elam & Brush, 2013; Du, Guariglia & Newman, 2015) or generally to raise funds more effectively (Jonsson & Lindbergh, 2013; Kreiser, Patel & Fiet, 2013).

Another group of five articles (13%) presented networks in the context of resource accumulation. Again, what could be noticed was the popularity of network relationship type analyses with account being taken of those relationships that allowed for successful use of resources (Haugh, 2007; Khayesi, George & Antonakis, 2014), then the popularity of network size analyses (Semrau & Werner, 2014), and finally centrality (Keil, Maula & Wilson, 2010) and generally network structure and content (Sullivan & Ford, 2014). No article assigned to the topic of resources and their accumulation used the theory of networks.

Four articles were categorised as addressing company development and the fewest texts dealt with innovation (2 articles). In analysing networks in the context of company development, the first study examined the impact of relationship types on company operations in different stages of development (Arregle et al., 2015), whereas the second one focused on the role played by networks and their densities in internationalisation of companies (Musteen, Datta & Butts, 2014). In their research, De Carolis, Litzky and Eddieston (2009) attempted to find out what type of networks and network relationships has a positive effect on company development. Their research results are quite often cited – 70 citations. They analysed the types of people involved in entrepreneurs' networks. Hansen (1995) studied growing organisations with a focus on the types and frequency of interactions among their members.

In the area of innovation, one article addressed network density and centrality and their consequences for business innovation (Tan, Zhang & Wang, 2015). The authors of the second study analysed the type of network relationships and commercialisation of innovations (Partanen, Chetty & Rajala, 2014). Tan, Zhang and Wang's (2015) publication used both network theory and theory of networks.

To summarise, based on our analysis, we noticed that research into networks in entrepreneurship mostly concentrated on types of relationships and their effects on achievements, financing, cooperation and resource accumulation. The fewest studies addressed density, centrality and other network variables. Researchers least frequently referred to studies related to the theory of networks, which means that there is a gap in the entrepreneurship literature.

What we also found interesting was an analysis of the number of articles based on network research over the last 20 years, as presented in the table below.

As can be observed, articles reporting network analyses are not very popular in "Entrepreneurship Theory and Practice". By 2005, only single or no texts were actually published. It was only after 2005 when we can notice an increased interest

in research into networks in the field of entrepreneurship. Especially over the last 5 years, this subject seems to have been attracting more and more interest, although the number of publications has remained more or less the same since 2010. In recent years, roughly since 2006, such topics as cooperation, financing, search for resources have earned recognition, and since quite recently, innovation and company development have become more popular.

Table 2. Distribution of 39 selected articles in 1995–2015 by year and popularity of the topic

Year/thematic area	1995	1996	2000	2003	2005	2006	2007	2008	2009	2010	2013	2014	2015
Innovation								1				1	1
Company development	1											1	1
Resources							1			1		3	
Achievements	1		1	1	1	2	1	1	2	1	2	1	
Financing		1							2		3		1
Cooperation						2			1	2		1	1
Total no. of articles	2	1	1	1	1	4	2	2	5	4	5	7	4

Source: own elaboration.

5. CONCLUSIONS

Our analysis allowed us to answer the questions that we asked. It turned out that research to verify the theory of networks empirically is much less frequently published in the entrepreneurship literature than research aimed at verifying the network theory. This offers a huge potential for exploring that scientific branch and looking at entrepreneurship from a different perspective than before. It is worth reflecting on projects intending to describe global network structures among entrepreneurs, examine network density and other characteristics and reasons for the formation of networks whose importance cannot be overemphasised in modern entrepreneurship. It seems interesting to study the differences in relationship types and other characteristics across individual countries and examine them in the context of cultural differences. Cultural differences, for example individualism versus collectivism, should be relevant to the characteristics of networks of entrepreneurs operating in different countries. A promising research field should also cover analyses of transnational networks of entrepreneurs and their adaptation to various structures that determine dynamics of the flow and exchange of resources and information. It is notworthy that studies of embeddedness-initiated in economic sociology by Granovetter (1973) are very promising in the field of entrepreneurship. In particular, exploring effects of weak and strong ties (Granovetter, 1973; Burt, 1992) on entrepreneurial behavior in different context and across geographies could extend our knowledge of determinants of success.

Studies based on the network theory are rarely published in the journal "Entrepreneurship Theory and Practice", although the dynamics of publications that we have presented indicates their growing popularity. Particularly promising research

directions that will verify the importance of entrepreneurs' position within networks seem to be those that will explore links between networks and innovation processes. Network models explaining the dynamics of innovation spread indicate different roles of network nodes, depending on their position (Valente, 1996). The small number of articles could be caused by the fact that that issue is still under researched. Other reason could be that researchers from the entrepreneurship field consider this area as a not very suitable for entrepreneurship research. The biggest problem is that our review is narrowed to one journal and this topic could be not very suitable for the journal requirements.

Another promising direction of such research where we have seen relatively few publications so far is an analysis of correlations between constraints and opportunities for company development, ensuing from the position in the network structure. Although researchers mostly paid attention to relationship types and their impact on achievements, that topic has not been exhausted. Investigation done by Uzzi (1997) should be useful for researchers in these area. Few of the studies presented use standard measures of centrality, density and occurrence in structural holes that were operationalised as part of the social network analysis. This suggests that this discipline may be developed by applying social network analysis methods in entrepreneurship.

The biggest limitation of our review is probably the focus on only one scientific journal. However, the goal of our article was to highlight the fact that network analysis is very useful and interesting and to indicate a possible direction for entrepreneurship research development. We are aware that the issue of networks in innovation may be more frequently addressed in journals focused primarily on innovation, hence the small number of texts on this topic, though perhaps network analyses are not conducted in that direction. This requires verification. A weakness of our analysis also lies in confining it mostly to reading abstracts, with hardly skimming whole articles. This makes information incomplete. Nonetheless, it is a good suggestion for in-depth analyses.

Our literature review shows that the network theory and the theory of networks are becoming important approaches that make it possible to look at key and unchanged issues of entrepreneurship from a new perspective. In the network society, where the importance of relationships for the results achieved by individuals seems to be growing, we expect further dynamic expansion of entrepreneurship research resorting to theoretical perspectives discussed in this article. Our classification of articles could be helpful in identifying areas where the network approach is rarely used.

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Author Contributions

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