Professional Network Value in Business Incubator Models

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Abstract. Professional networking is an important service provided by the business incubators, which nurture the relationships with access to necessary resources. In this extended abstract, we introduce an approach to use the professional social networking applications for demonstrating the networking service of business incubators and incorporating the gathered information in the agent based model of ecosystems. Our initial web-based solution automatically generates and analyzes the professional social networks of incubator inhabitants and create a combined social network view of the business incubator.

Keywords: Business Incubators, Social Networks, Agent Based Modeling

1 Introduction

Business incubators provide the social environment, technological and organizational resources and managerial expertise for the transformation of a business idea into a financially viable company with the potential to create jobs and commercialize new technologies [10]. There has been a growing interest in business incubators for the last 20 years [7] and the number of incubators have increased as they have been considered to be effective in supporting the creation and the growth of start-ups [11].

The success of a business incubator is often measured by the number of companies that "graduate" (i.e. no longer require the incubator's resources) or the employment contribution of the graduated companies [9]. There have been various approaches to evaluate all dimensions of the incubation [1] and to define the most important aspects of the incubation process [8]. Professional social networking is accepted as an important part of the entrepreneurial action, nurturing relationships that provide access to necessary resources [11]. However, there is a lack of understanding of the underlying networking processes and their actual impacts on the start-up success.

To explore the impact of business incubation, Hollander et al. proposed an agent-based model (ABM) of innovation ecosystems [6], [3] that incorporates principles and ideas from the resource-based view of the firm [12], Schumpeterian creative destruction, and generative systems [5]. In the latest version of the ABM,

the population of agents evolves to maximize economic performance, as measured by a fitness function that accounts for trade activity and personal wealth. We currently work on incorporating the networking effect in the ABM and defining the networking characteristics of the agents. For this purpose, we plan to utilize the professional social network data of the inhabitants of a real-life business incubator.

In this extended abstract, we introduce our ongoing work dealing with the problem of automatically generating and analyzing the professional social networks of incubator inhabitants, creating a social network view of the incubator and making suggestions based on the analyses.

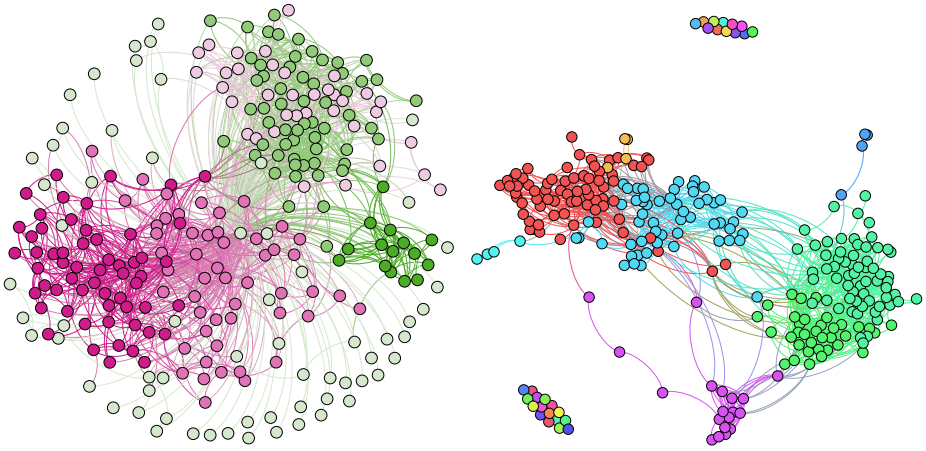
2 Incubator network generation

We use a web-based application to create professional social network analyses and services for the incubator inhabitants. As each start-up company is registered with the incubator, founders of the company register to this service with their online professional network accounts and become the users of the service. After the initial registration phase, the users log in to the same web service periodically as a part of their incubation experience. The periodically collected data provide our approach the capability to analyze the change in the professional social network of the user and make suggestions accordingly.

The social network web sites are used by over a billion people everyday and they conveniently connect the users to a digital social network of friends and acquaintances [2]. Consequently, users want to use these services for other purposes such as leveraging their professional networks. Hence, websites designed for professional networking started as early as 2001 [14]. Currently, LinkedIn [13] is the dominant online professional social network with the largest network for business-related connections. Therefore, LinkedIn is the chosen professional network application for our approach. LinkedIn provides an API, which can be used by custom desktop or mobile web-based applications. The API enables access to public data of the users such as the connections, companies, and newsfeed. There are various applications in both academic literature and industry, which use the API to analyze and visualize the networks of professionals. Socilab [15] is a well-known example of these applications. It is a web-based social network analysis tool using Javascript and the LinkedIn API to calculate several social network metrics and generate a dynamic network graph of the user's contacts classified by industry. We follow an approach similar to Socilab for the initial data gathering part of our apporach. Our application interacts with the API of the professional network to gather network data for analysis.

The professional network data is in the form of an adjacency matrix when it is parsed from the LinkedIn API. Then this matrix is recorded for further analysis. The capture of the users' professional social network provides the initial values of the parameters such as number of degrees, modularity and clustering coefficient. Fig. 1 (a) demonstrates the professional social network of an example user with 300 connections. The user acts as the hub in the professional network

and the mutual connections among the other connections of the user are also demonstrated. These various connections form several communities in the network, which correspond to the professional networks the user has interacted in real life. For instance, the contacts from previous employers or collaborations become visible in the network as the communities are detected. The community extraction method by Blondel et al. [4] is used to find these networks and group the contacts of the user according to their social network characteristics. Fig. 1 (b) shows the same network without the self connections of the user. The analysis of the user's network characteristics without the self connections is critical since it gives a clear view of the user's connecting role in the network and the professional communities that the user is involved.



(a) Professional social network of the example user.

(b) Professional social network of the example user without self connections.

Fig. 1: Professional social network of an example user.

The values for the average degree, network diameter, number of communities (and communities with multiple members), modularity and clustering coefficient of the example user's professional social network are given in Table 1. The same parameters are recorded periodically to follow the changes in the professional network of the incubator inhabitants as well as the incubator.

Table 1: Professional network statistics for the example user.

Network	Avg. Degree	Diameter	Communities	Modularity	C. Coefficient
With Self Conn.	11.074	2	6 (6)	0.492	0.492
Without Self Conn.	4.557	9	34 (5)	0.586	0.315

The additional angles of this ongoing study are the analysis of user network characteristics over time and the identification of incubator's role in the combined network of inhabitants and the industry or academia connections. One of the main goals of the incubators is to form and maintain connections between the venture capitalists, industry and the startup companies. Our approach continuously records the changes in network connections and updates the growing network, in which the incubator acts as the main connector unit. Therefore, the evolution and the current form of the dynamic incubator social network and its corresponding data will be provided by our approach. The available data will enable the view of companies as members of a large network with its own history instead of isolated units.

3 Discussion

The professional social network data of the incubator inhabitants reveal their professional ego networks. The information collected about these networks are invaluable when it is used in conjunction with the literature on incubators and the social networks. Additionally, the dynamic view and the evolution of the combined incubator network provide important data that will be utilized using predictive models. These models are able to use the data in the user's professional network along with the other available data in the business incubator to find patterns in the structure and dynamics of professional networks. The research directions and potential outcomes of our approach are summarized as follows:

Modeling the networking effect: Our real "life-data based approach" improves the understanding of the role of networks in the incubation process. The longterm results of the study will be utilized to design the networking characteristics of the agents in our agent based model. The social interactions of the incubator inhabitants are not considered in most innovation ecosystem ABMs although they are proven to be very critical in the start-up success. The social ties drive organizational decisions and their outcomes affect shareholders in demonstrating the predictive power of social network analysis. Therefore, our approach provides an important insight into incubators and improves the modeling of the innovation ecosystem.

Risk and opportunity indicator for companies and investors: The companies are not isolated units in the innovation ecosystem. Therefore, their connections with other companies or any other member of the ecosystem through their employees are important factors for the success of the companies. Hence, investors must analyze the interconnections between different companies to identify risks and opportunities. Our approach utilizes social network analysis to identify and resolve the clusters among the companies and their impact on the innovation ecosystem. We also provide suggestions or warnings for each company by using the historical data of similar companies and the status of the

professional networks of the company founders. These analyses provide insights to identify risks or opportunities for the investors.

Detection of missing connections: Our approach creates the view of the industry from a social networking perspective, which brings several additional advantages for incubator inhabitants. One of these advantages is the detection of important social connections that the incubator inhabitant doesn't have. The longterm incubator data of the companies reveal the important properties of the individual and combined professional network and enable the discovery of the essential connections in network.

4 Conclusion

The process of business incubation and the best practices for its use are still subjects of research. There has been studies using ABM to explore how business incubation can impact the technology space of an innovation ecosystem. However, the networking effect of the business incubators are not incorporated in most of these models. To leverage the networking service of business incubators in the ABMs, we introduce an approach to use real-life data collected from the inhabitants of an incubator. We propose a web-based solution to automatically generate and analyze the professional social networks of incubator inhabitants, creating a social network view of the business incubator.

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