American Behavioral Scientist
2015, Vol. 59(4) 475–491

DOI: 10.1177/0002764214556809
abs.sagepub.com

Networked Entrepreneurs: How Entrepreneurs Leverage Open Source Software Communities

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Abstract

In the contemporary economy, work is increasingly becoming freelance-based while moving online. Open source software communities are rapidly becoming arenas in which individuals identify, cocreate, and realize opportunities through shared resources and expertise. Operating in a communal setting, these individuals, who we label *open entrepreneurs*, work and collaborate with members of their own open source community. In this article, we investigate how networked work benefits open entrepreneurs, and in particular, we focus on how open entrepreneurs are connected to other community members and how these networks affect entrepreneurial processes. Our results suggest that through different aspects of networked work, open entrepreneurs fulfill their profit motives not only in the short term but also in the long term as their networking activities facilitate the overall functioning and sustainability of the community.

Keywords

networked work, open entrepreneurship, open source software communities (OSS)

Introduction

The freelancing economy has created a new economic reality that has grown significantly in size and importance in the past decade, changing employment practices and

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organizational forms that further reinforce this new economic reality. As work, as we know it, is increasingly becoming freelance-based, it is also moving online. The online economy has made it possible to organize economic activity in different ways by enabling individuals and companies to establish and maintain their businesses through new business models and value propositions. The power of electronic networks is fundamentally changing the way work is done as connected freelancers join together into fluid and temporary networks to produce and sell goods and services in the contemporary economy (Malone & Laubacher, 1998).

The global adoption of Internet-based communication technologies has also led to the development of collective environments for innovation and knowledge creation, such as open source software (OSS) communities (e.g., Lee & Cole, 2003). LINUX, Apache, and MySQL are well-known open source communities, in which individuals across the globe self-organize online around a shared interest and common practices to create value through sharing knowledge and innovating.

OSS communities are increasingly becoming arenas for entrepreneurs, individuals who found an organization for the purpose of obtaining economic benefits through the sale or use of his/her product and/or service (Shane & Venkataraman, 2000), to conduct business. In this article, we label entrepreneurs who conduct their business by identifying, cocreating, and realizing opportunities through shared resources and expertise in open source communities as *open entrepreneurs* (Teigland, Di Gangi, Yetis, & Huitfeldt, 2012). Since open entrepreneurs operate in a communal setting, they work and collaborate with members of the same open source community to a great extent. Given this situation, we aim to investigate how open entrepreneurs are connected to other community members and how their networks affect their entrepreneurial processes. In particular, we are interested in understanding how networked work benefits open entrepreneurs and how they work and collaborate with other community members. Because our research tackles the issue of agency, the level of analysis is at the individual level. However, the level of analysis is occasionally raised to the group level as we are also interested in the creation of business networks that support networked work.

Background

To date, researchers studying networked work tend to focus on corporate settings (Ahuja & Carley, 1999; Cross & Parker, 2004; McAfee, 2006; Parker, Borgatti, & Cross, 2002) or research organizations (Dimitrova et al., 2013; Rhoten, 2003; Shrum, Chompalov, & Genuth, 2001), with recent studies finding that the nature of networked work is more complex than earlier deductive expectations predicted. For example, Quan-Haase and Wellman (2004) found patterns of glocalization when a high proportion of communication occurs within the local work unit and within the organization rather than further afield. Furthermore, according to Dimitrova et al. (2013), the existing preponderance and overlap of some ties in the network of scholarly organizations can affect knowledge exchange while low boundary spanning exchanges can be observed at the early stages of the network.

While not specifically focusing on networked work, researchers have shown that network theory increases our understanding of entrepreneurial processes, partially

because network interactions are important for the identification, evaluation, access, and exploitation of business opportunities (Slotte-Kock & Coviello, 2010). For example, Hills, Lumpkin, and Singh (1997) found that approximately 50% of entrepreneurs identify new venture ideas through their social networks. Birley (1985) suggests that the network of an entrepreneur plays an important role when starting a business, while Maurer and Ebers (2006) argued that networks accelerate the emergence and growth of firms. Additionally, entrepreneurs, who in many cases possess unique resources, require access to various sorts of complementary resources such as information, exchange, and influence (Aldrich & Zimmer, 1986; Davidsson & Honig, 2003; Terjesen & Elam, 2009), all of which can be accessed through networks. Larson and Starr (1993) showed that when establishing a firm, networks play an important role for the exchange of information, while in later stages of the business, networks provide assistance with resource acquisition. Entrepreneurs thus spend significant resources to establish their networks and pay attention to forming networks that match the requirements of their venture (Hite & Hesterly, 2001).

As mentioned by Hienerth and Lettl (2011), previous literature on entrepreneurial networks has focused on ties to friends, family members, relatives, colleagues, experts, and venture capitalists while "less attention has been paid to social networks that emerge and center around a field or topic of shared interest, as is the case in user communities" (p. 178). Researchers investigating one such user community, open source communities, have revealed an increasing tendency of individuals to conduct entrepreneurial activities in and contribute resources to open source communities (Giuri, Rullani, & Torrisi, 2008; Gruber & Henkel, 2006; Haefliger, Jäger, & von Krogh, 2010; Piva, Rentocchini, & Rossi-Lamastra, 2012; Priem, Li, & Carr, 2012; Shah, 2005; Shah & Tripsas, 2007; Stam, 2010; Stam & Elfring, 2008; Teigland et al., 2012; Thistoll, 2011; von Krogh & Haefliger, 2010; Waguespack & Fleming, 2009). Being physically and organizationally dispersed, these entrepreneurs are involved in networked work, suggesting participation in multiple teams often for multiple purposes (Rainie & Wellman, 2012).

Given the dearth of research on entrepreneurial involvement and the role of multiple networks in open source communities as well as the complex reality of networked work, our aim with this article is thus to investigate how open entrepreneurs participate in multiple teams and how this networked and distributed work may affect entrepreneurial processes in open source communities. The present study therefore contributes to the stream of research on the subject by addressing networked work in the field of entrepreneurship.

Data Collection and Analysis

Data Collection

In order to study the characteristics of networking and distributed work of entrepreneurs in open source communities, we chose to interview entrepreneurs in the OpenSimulator OSS community. OpenSimulator is an open source multiplatform, multiuser 3D application server that was launched in 2007 and that operates under the Berkeley Software

Distribution, a weak copyleft license that enables individuals and firms across the globe to customize and commercialize their virtual worlds based on their technology preferences. OpenSimulator participants can participate in and contribute to the community in multiple ways, for example, communicating with others through Internet Relay Chat (IRC), the community wiki and mailing lists, Twitter (#opensim), reporting on community issues through posting on individual websites or blogs, and developing the software through writing code, testing, and reporting and fixing bugs.

We selected entrepreneurs based on the following criteria: (a) demonstrating a high level of participation in the OpenSimulator community (those who regularly participated in the discussion on the mailing lists and IRC and who regularly contributed code to the OpenSimulator repository) and (b) representing different backgrounds, experiences, and activities, in order to have full coverage of possible entrepreneurial acts in an open source community. To collect the data, we conducted semistructured interviews via Skype, each lasting 40 to 110 minutes. All interviews were recorded and then transcribed. Each interviewee was asked to recommend other entrepreneurs within the community for interviews. A total of 10 entrepreneurs were interviewed based in Canada, Germany, Sweden, Israel, New Zealand, the United Kingdom, and the United States, with no two of them in the same city. Areas of primary investigation were (a) how interviewees use their networks; (b) how they design, organize, and deal with networked and distributed work; and (c) how they deal with the challenges of entrepreneurship in an open source community setting. During the interviews, we explained the purpose of our study in detail and received their consent to audio-record the interview and to use the interview material for our research. Nevertheless, due to ethical considerations, we chose to anonymize our interviewees while trying to provide as much as possible on their activities as open entrepreneurs.

Data Analysis

Our first step of data analysis was to code the transcribed interviews. To develop the coding scheme, we drew predefined coding categories and subcategories from theory and our prior knowledge of the networked entrepreneurs in open source communities while allowing for categories to emerge as we coded the interviews. This method of data analysis frees the researcher from entanglement in the details of the raw data and encourages higher level thinking while at the same time helping with generalizations and with identifying the theory (Neuman, 2000). The predefined coding matrix consisted of 4 categories and 12 subcategories, and during the process of coding one coding category with 3 subcategories emerged from the data (Table 1).

We then conducted cross-case thematizing, whereby quotations coded for the categories and subcategories were collected from all the interviews, to determine what the interviewees conveyed for each coding category.

In addition to the interview data, we also collected secondary materials to understand how entrepreneurs' online behavior relates to their entrepreneurial activities and how secondary materials are used, or not used, for business purposes. We collected all relevant data from their profiles in social media, their blogs, and their personal and

Table 1. Coding Scheme.

Predefined categories	Subcategories
Entrepreneurial capacity	Networking skills
Opportunity	Opportunity identification
	Opportunity evaluation
	Opportunity exploitation
	Business model
Work environment (setting)	Spatially distributed work
	Boundary spanning activities
	Interplatform user transfer
	Choice of platform
Network position	Centrally located
	Peripherally located
	Bridging role
Emergent category	**Subcategories**
Benefits	Experience
	Independence
	Financial benefits

company websites including entrepreneurs' own content and the content they reposted from other sources. Data were used for supporting and validating results obtained in the process of interviews' coding.

Entrepreneurial Profiles

Before presenting the findings of our analysis focusing on how the multiple networks of entrepreneurs affect the entrepreneurial processes in open source communities, we present the profiles of three "typical" entrepreneurs to enable a better understanding of the open source entrepreneurs we studied. Being participants of one open source ecosystem, they represent three different types of entrepreneurial activities—consulting, running a virtual world, and in-world entrepreneurship.

For each of the entrepreneurs we also present a figure depicting their individual entrepreneurial process (Figures 1-3).

Entrepreneur J

J, a British national, is a male, self-employed software engineer who joined the OpenSimulator community in 2007 after having previously worked as a software engineer at a large software multinational. An active and important core community member, J has a high level of developer expertise in the OpenSimulator project and only participates in a few other OSS communities. As a core developer, J contributes to the

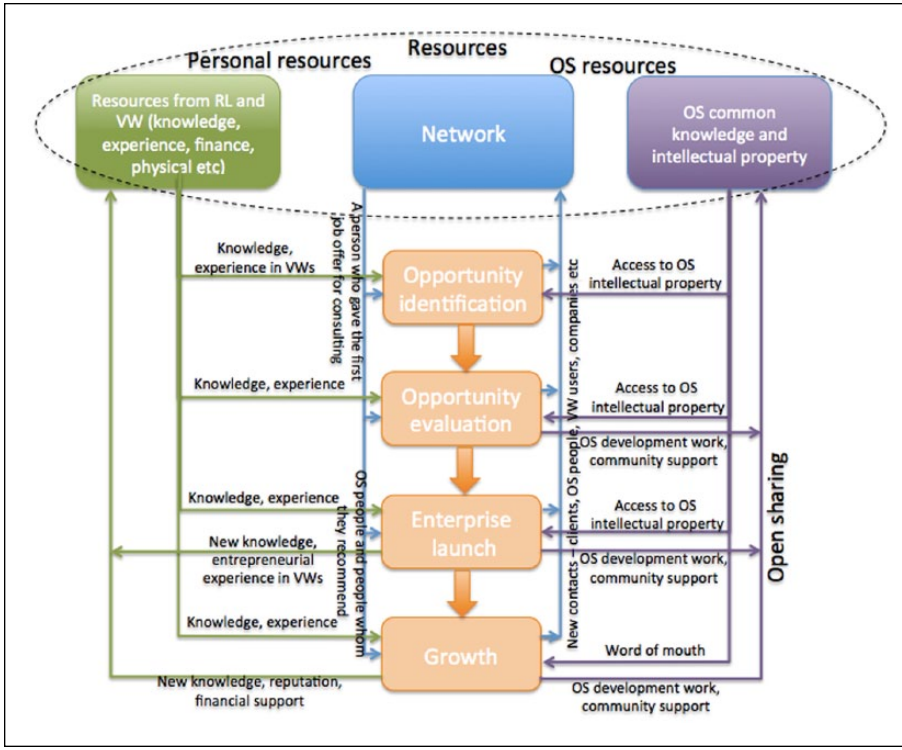

Figure 1. Open source entrepreneurial process of Entrepreneur J.

code base and spends a considerable amount of time fixing bugs or introducing new features. He also has his own blog devoted to the OpenSimulator project where he writes about all the updates and novelties in the community as well as posts the results of other developers and in-world meetings. Through all different activities, J has established a broad network of personal contacts, and most people in the community are aware of his extensive expertise. As a result, individuals and organizations tend to ask J for consulting work because they have heard of him or he has been recommended, seen his activities in OpenSimulator. J's contribution to open source work is an important component in his network. J receives frequent requests for consulting work due to his active contribution to the OSS project. Through his vast network all over the globe, J manages to financially support himself by doing software and engineering consulting for both small and large size companies.

Entrepreneur M

M, a German national, is a female entrepreneur who is the founder and director of a commercial, immersive 3D virtual environment for entertainment, education, and

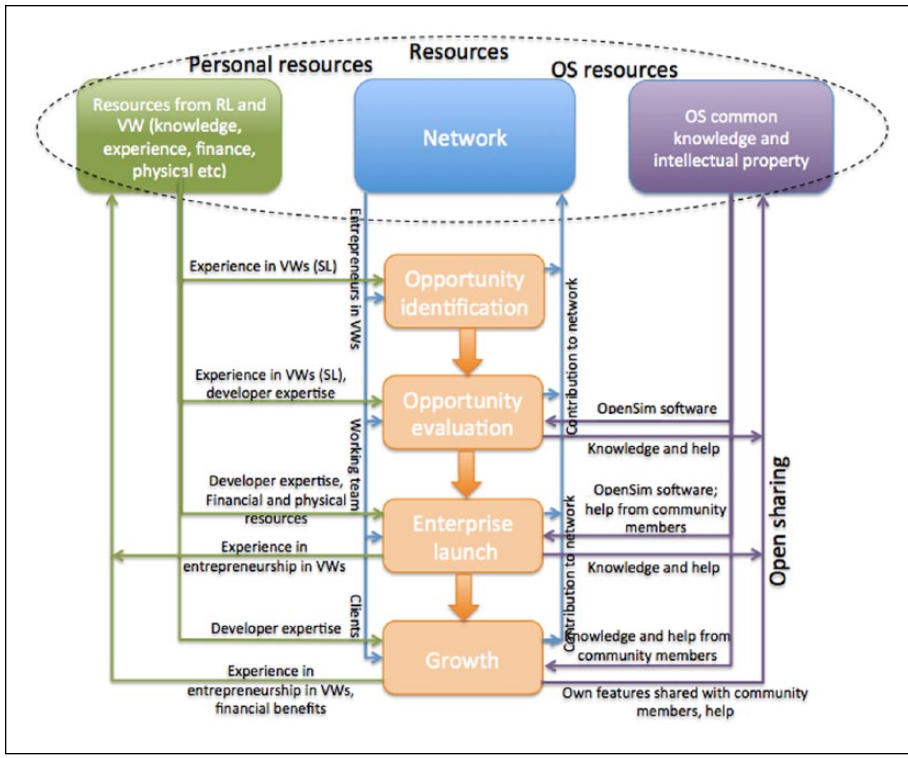

Figure 2. Open source entrepreneurial process of Entrepreneur M.

commerce. Her project was created on the OpenSimulator software, but M and her team went further and developed their own features using the OpenSimulator code as the base. When these features become old, her company releases them for free to the OpenSimulator community. Being a core member of the OpenSimulator project with a high level of developer expertise, M actively interacts with other members of the OpenSimulator community. This interaction is based on reciprocity and sharing. She contributes to the development of OpenSimulator in order to use the developments of the community for her own venture in the future. Simultaneously, keeping in touch with members of OpenSimulator through such communication channels as the mailing lists and IRC, she receives help from the community when needed.

Entrepreneur B

B, an American national, is a male entrepreneur who conducts trainings about project management using virtual world technologies. For his work, he creates virtual classrooms using OpenSimulator software. Being a virtual world fan, he firmly believes that 3D technologies make the educational process much more effective and easily

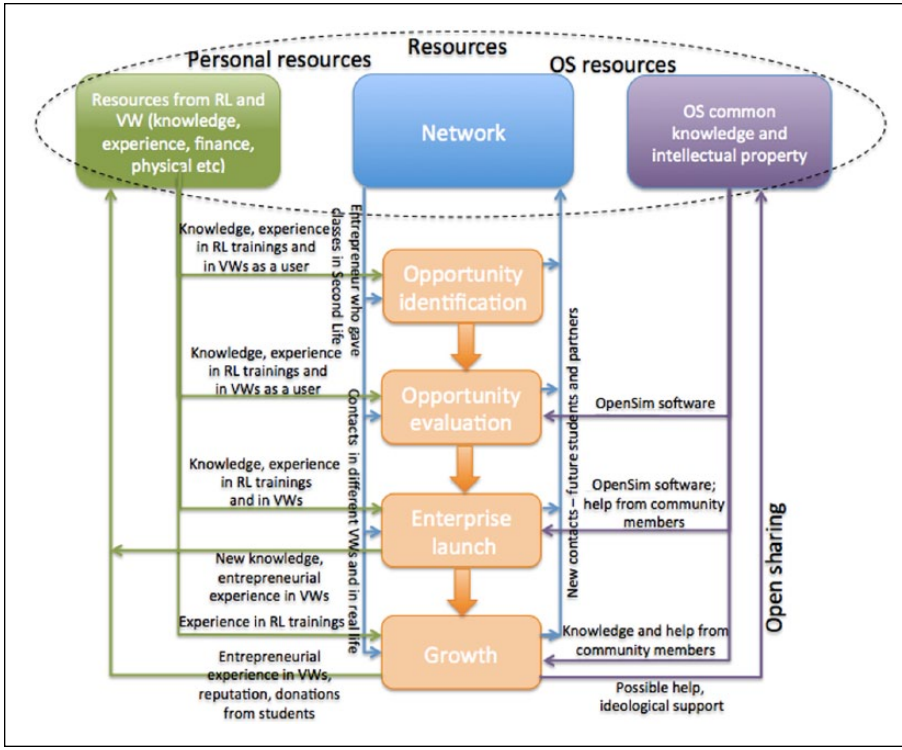

Figure 3. Open source entrepreneurial process of Entrepreneur B.

acceptable for everyone, providing not only better data visualization but also the possibility of cocreation and sharing. B's partners are distributed—they work from home, from different cities and different continents, and his students come from all over the globe (mostly from the eastern United States to Western Australia due to the time zone). Having a full-time job in real life, B is not strongly focused on the profitability of his virtual project, thus his business model is based on donations. However, he is planning to retire from his full-time job in the future and will live off the proceeds of his OpenSimulator project only. To ensure this, B is actively strengthening his network and building his reputation among the virtual world community.

Findings

Below, we present the findings from our analysis and discuss different aspects of networked work affecting the entrepreneurial processes of entrepreneurs in open source communities: networking through working on multiple teams, taking on a mediating role, engaging in a sharing environment, networking via social media, engaging in distributed work, and networking across the virtual and real life boundary.

Networking Through Working on Multiple Teams

The entrepreneurs in our study often work in multiple teams in a number of open source communities. This serves as a way for them to build diverse networks and to further increase the likelihood of finding work through different channels. Interviewees describe themselves as boundary spanners, working for large companies, public sector organizations, and academia as clients. One entrepreneur explains the benefit of working in multiple teams in the following way:

> Basically the role it [working in multiple teams/networks] plays is people recommending me for potential consulting work. So they know what I do, what I have done because I've worked for them directly or because what I do in the open source field. So I think they make personal recommendations or people hear of me and contact me because they know of other people who worked with me and would recommend me.

Working on multiple teams is also a way for entrepreneurs to explore new combinations, exploit synergies, and transfer best practice between environments. This tendency is illustrated by the following quotation by an entrepreneur who is working in two different virtual world open source communities and transferring elements from one to the other: "I need to make money—which means that I do not just do OpenSimulator—I use other technologies, for instance one called Unity3d—I can actually take an OpenSimulator island and convert it to run natively in Unity3d." Embedding themselves in multiple networks not only helps entrepreneurs in creating and implementing new business opportunities but also makes it possible for them to access different types of resources such as information, exchange, and influence (Aldrich & Zimmer, 1986; Davidsson & Honig, 2003; Terjesen & Elam, 2009).

Taking on a Mediating Role

In addition to working on multiple teams, the interviews revealed that some entrepreneurs take on the task of bridging the gap between community groups. The communities within which the interviewed entrepreneurs participate tend to be highly heterogeneous in their composition, with participants representing groups as diverse as hobbyists, entrepreneurs, academics, and large firm and public sector employees. Partly as a result of this diversity, all interviewees discussed tensions within the community on the individual level as well as on the group level, ranging from individual fights over software-related issues (individual level) to debates over profit-making and intellectual property issues (group level). On the group level, these conflicts are often the result of differing institutional logics and motivations. One entrepreneur, whose business is based on the OpenSimulator source code, explained:

> A lot of the users tend to get frustrated with the developers and they end up storming off a lot and feeling like developers are just ignoring them, not understanding what they are trying to say. So I try to get in between them a lot and tell everybody to come to me instead of going to the developers. I have been pretty good at being that middle guy—and that is pretty much one of the things that I do most of time in the OpenSimulator project.

While this mediation function is important for the overall functioning of the communities, it is particularly in the interest of the entrepreneurs to take the mediating role. They are heavily invested in the stability of the community because the competitiveness of their businesses depends on it. As many of the entrepreneurs note, if the community fails, they fail.

In order to fulfill this mediating role, entrepreneurs in open source communities need to develop political skills, defined by Ferris et al. (2005) as "the ability to effectively understand others at work, and to use such knowledge to influence others to act in ways that enhance one's personal and/or organizational objectives" (p. 127). Entrepreneurs not only bridge the different stakeholders in the community through their political skills but they also acquire access to the resources critical for their success. Connections, friendships, network building, alliances, and coalition building represent critical aspects of political skills (Bacharach & Lawler, 1998; Pfeffer, 1981, 1992), and individuals with strong political skill are adept at developing and using diverse networks of people (Ferris et al., 2005). These abilities are important assets for entrepreneurs and they legitimize their position in an open source community through these assets. Social capital built through these assets enable entrepreneurs to take up important positions, such as a core developer position, in open source communities. The entrepreneur we quoted above also mentioned that his political skills have been the key to him becoming a core developer in the OpenSimulator community.

Engaging in a Sharing Environment

Interviewees often discuss the concepts of helpfulness and sharing. When asked whether he had received help from the community when he needed it, one of the entrepreneurs responded the following:

> Always! . . . So for example J.C. is an Australian and she has her own grid. . . . She's so incredibly helpful. She will tell you how to set up or "think about this"—any question on education—she'll help you with anything! . . . I'm on the board of directors of the O. University because they were so helpful. . . . People from R. University helped me to set up so I could really build an infrastructure.

Furthermore, the following quote by one of the interviewees illustrates how entrepreneurs within the community are helping each other:

> [O]thers come in. Like for instance, J looks at things that I tell him, "Something is wrong, just look at the code, could you just tell what the matter is with the code?" Then he looks at it and fixes it. It's the same way the other way around. Somebody says something and I give them advice and information.

These quotations not only reveal the degree to which people in the community help each other but also the extent to which this helping is a community norm that influences one's image.

We found that open source entrepreneurs need to build and maintain a reputation for helpfulness to be able to mobilize the resources of the communities for their business needs. With the success of their businesses tied to the ability to reach out and ask for help from others in the community, and much of the work done in the community open for anyone to see, entrepreneurs must achieve a balance between giving and taking that is acceptable by the rest of the community. They receive help from others but also need to show that they themselves are willing to share ideas and contribute to solving others' problems in the community. This kind of *open entrepreneurship* (Teigland et al., 2012), where entrepreneurs freely reveal intellectual property in return for feedback and help from the community, is characteristic of the entrepreneurs in the open source communities studied. Thus, the boundary between competition and cooperation between the communities' entrepreneurs is blurred.

Networking via Social Media

The open source entrepreneurs in our study utilize social media to a great extent for connecting with others such as entrepreneurs, partners, and end users to promote their enterprises and build their networks. All entrepreneurs from our study have Facebook, LinkedIn, and Twitter profiles while five entrepreneurs have Google+ profiles and six have their own website or blog. However, the patterns of their usage of internal channels and social media platforms as well as the content they share are different. Via mailing lists and IRC, entrepreneurs mostly exchange highly technical information, ask very specific questions, and discuss internal topics relevant to other members of the open source community or experts in this area. Social media platforms are used for sharing more general information aimed at the general public, end users, and people who are not that deeply engaged in this space. Content such as announcements about conferences and trainings held in virtual world or real life, latest news about virtual worlds and 3D technologies, and publications about their own projects are likely posted on entrepreneurs' private pages in Facebook, Twitter, or Google+. Entrepreneurs are quite active in LinkedIn (social media for professional networking) where they present their expertise in virtual world technologies.

Engaging in Distributed Work

The communities within which entrepreneurs participate are not only diverse in terms of interests but also in terms of geography. As noted above, the participants interviewed for this study alone were based in Canada, Germany, Sweden, Israel, New Zealand, the United Kingdom, and the United States, and no two based in the same city. Community members do not experience physical distance or not having face-to-face contact as a challenge to networking and collaboration. One interviewee said, " . . . 'travel less, do more' was my slogan. . . . 70% of the people I worked with last year are distributed. They work from home, they are in different cities."

Although the Western world is overrepresented among the participants of the communities, many of them are also from Asia and Latin America. This provides the

community with a global perspective and set of experiences that entrepreneurs tap into to enhance their competitiveness. The following quotation from a U.S.-based entrepreneur illustrates this:

> My company size of full time employees is 1—but in any given month I am generally working with up to five to ten individuals scattered all around the world—last month I paid individuals from South Africa, Brazil, China, Vietnam, Serbia, UK, USA. And this month already I have been paying a guy in India, and others in the USA, South Africa, Serbia, and Brazil.

Our interviews confirm earlier studies suggesting that "digital media have made it easier for geographically distributed bit workers to work physically apart" (Wellman, Dimitrova, Hayat, Mo, & Smale, 2014, p. 9). Due to their decentralized nature, open source communities call for modularity, an extreme form of task decomposition, which is particularly suited for distributed work (Moon & Sproull, 2000). Organizing their business operations in a modular way makes it possible for open entrepreneurs to take advantage of distributed work and thereby reduce coordination costs. By hiring individuals who are physically both near and far, the OpenSimulator community shows examples of the interplay between local and global work.

Networking Across the Boundary Between Virtual and Real Life

Entrepreneurship within the open source environment based on principles of networking and distributed work affects not only the space of open source communities but also tends to transgress the boundary between the virtual and the real affecting the area of traditional entrepreneurship.

Being virtual organizations, open source platforms have an advantage over traditional organizations with regard to entrepreneurship, in that they require lower start-up costs (Ahmed & Sharma, 2008). The easiness and speed of starting a business in open source platforms give the entrepreneurs the possibility to test their ideas and businesses without bearing the bigger entrepreneurial risks in real life. Even if they fail in the virtual world, they will lose much less in monetary terms but gain a unique experience. Several interviewees mentioned this advantage. As one explained:

> I have seen some people who've used the entrepreneurial experience gained in virtual worlds to then create successful real life companies doing actually the same thing. For instance [one member] who's making jewelry within SL, she switched to making real life jewelry and now is doing it quite well.

Here we see how advances in technology bring the ability for technological convergence in which the virtual, social, and physical worlds are colliding, merging, and coordinating (Rheingold, 2000). As the line between the physical and virtual worlds continues to blur through virtual world platforms, we observe a tendency among entrepreneurs to embed themselves in both physical and virtual environments leveraging affordances from both spaces. This is especially important since entrepreneurial

success, to a great extent, depends on the entrepreneur's ability to bridge and leverage both the physical and virtual networks in their business area. Our findings indicate that those entrepreneurs who can bridge the physical and virtual platforms not only make the most out of both worlds but also create a unique platform in which online and offline interactions flow into one another. This is a reality that is possible only if entrepreneurs embed themselves in both physical and virtual networks.

Conclusions

The aim of this article was to contribute to the growing literature on entrepreneurial activity within online communities, and in particular open source communities, with the purpose of increasing our understanding of how open entrepreneurs conduct networked work. Our findings provide further support that computer networks are indeed social networks that link people, organizations, and knowledge (Wellman, 2001).

Our study reveals that entrepreneurs through different aspects of networked work within open source communities, for example, networking through working on multiple teams, taking on a mediating role, engaging in a sharing environment, networking via social media, engaging in distributed work, and networking across the virtual and real life boundary, not only can fulfill their profit motives for the short term but also for the long term as these activities facilitate the overall functioning and sustainability of the community.

In line with the findings of Birley (1985), our study found a direct impact of social capital on the performance of entrepreneurs' businesses. Because much of the business for open entrepreneurs comes from, or via, other participants in their community, building and maintaining effective social ties are crucial. Our study shows that open entrepreneurs engage in networked work with diverse members of the community and continuously work on building their social capital within the community. Our findings correspond with those of Stam and Elfring (2008), suggesting that social capital may play an important role in overcoming legitimacy challenges that open source business models face. By building and using their social capital, entrepreneurs steadily act as a bridge to legitimize their roles and businesses both inside and outside the community. This liaison role they take up enables them to access the crucial resources they need for their business while creating a sharing and collaborative atmosphere in the community. An interesting finding we have is that entrepreneurs rely on their social capital and political skills, especially at the exploration stage of the entrepreneurial process, through activities such as hiring qualified workforce and promoting their businesses and products.

Our research further suggests that open entrepreneurs take advantage of the blurring boundaries between the virtual and physical worlds. By bridging online and offline platforms, open entrepreneurs create a unique environment in which they identify, evaluate, access, and exploit opportunities. While this transgression of the virtual–real life boundary is not that widespread yet due to reasons such as technical barriers and the impression of virtual worlds among a large number of users as a game, the number of open source communities, virtual worlds, and their

users continues to grow, which will more than likely lead to a continued increase in entrepreneurial activity within open source communities as well as between the physical world and the virtual.

One of the most interesting discussions that our study highlights is the one on community boundaries. Entrepreneurs as well as other members of the community experience a common ground in the shared experience of being part of the same community, which makes it easier for them to work across geographical and cultural boundaries. Therefore, one can assert that the boundaries of the community are highly permeable, connecting individuals who are interested around the development and use of OSS. Entrepreneurs specifically contribute to the permeable nature of the community by conducting networked work. By bridging different stakeholders of the community, reinforcing a sharing environment, and engaging in distributed work, entrepreneurs create synergies, enriching and sustaining the community while achieving their own business goals.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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