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Venture Financing in the Mobile Ecosystem

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Abstract

Venture financing (VF) is a critical catalyst for the growth and evolution of the converging mobile ecosystem. VF has helped to create and nurture many innovative companies that have fundamentally transformed the ecosystem. The objective of this study is to understand the structure of mobile VF using an ecosystem lens. Based on a triangulated dataset of 46,447 funding rounds for 21,299 companies by 8,049 informal and institutional funding entities from 2007-2012, and using a modified multidimensional scaling approach, we explore the structural properties and strategies of VF in the mobile ecosystem. Our analysis is complemented by large-scale network visualizations. The study contributes to our theoretic understanding of VF networks, differentiated by early- and late-stage investments, in converging business ecosystems. The paper concludes with future research opportunities.

Keywords: Mobile Ecosystem, Venture Financing, Network Analysis, Visualization.

1 Introduction

Innovation is a critical integrant for the growth and evolution of business ecosystems (Iansiti and Levien, 2004) and commonly occurs in entrepreneurial settings, in particular startup firms (Drucker, 2006). Startup firms, however, are wealth constrained and often require external capital to become revenue generating companies (Shane and Cable, 2002). Due to organizational size, asset and stage, startup firms often cannot seek capital from traditional sources, such as banks and public markets. Instead, they must turn to venture financing (VF) provided by informal (i.e. business angels) or institutional funding entities (i.e. VC firms) (Gompers and Lerner, 2001).

VF differs from traditional financing in that it focuses on young, high-growth companies, takes higher risks in exchange for potential higher returns, often has a longer investment horizon, and actively monitors portfolio companies through board participation, strategic marketing, governance, and capital structure (Gompers and Lerner, 2001). Given the inherent risk and uncertainty of investing in relatively unproven firms with emerging technologies, funding entities often form relationships, or syndicate networks, to jointly pursue investment opportunities to reduce and share risks, share expertise, and generate deal flows (Bygrave, 1988; Gompers, 1995).

Despite its importance, there remains a lack of understanding of the fundamental nature of mobile VF. While there are a plethora of studies that examine the role of firm and founding member characteristics (e.g. Shah et al., 2011), venture capital (e.g. Florida and Kenney, 1988), and geography (e.g. Feldman, 1994) on innovation and entrepreneurship, none of these studies focus on the mobile ecosystem context specifically. This is somewhat surprising given VF's significant contribution to the transformation of the mobile ecosystem. Android Inc., a maker of mobile phone software, received Angel funding in 2003, before being acquired by Google in 2005. Today Android is a leading mobile platform used by major mobile device manufacturers (Basole and Karla, 2011). Siri Inc. received $24M in venture funding before being acquired by Apple in 2010. Now it is a core product in Apple's iOS. Google received $100K in Angel funding in 1998 and $25M in venture capital in 1999 from two prominent Silicon Valley VC firms, Kleiner Perkins Caufield & Byers and Sequoia Capital (Vise and Malseed, 2008). Skype, founded in 2003, received both Angel and multiple rounds of VC funding from 2002-2004 before being acquired by eBay in 2005. Zynga, a mobile/social games company founded in 2007 received nearly $900M in VF before going IPO in 2011. The examples are endless.

The most salient shortcoming in the literature, however, pertains to a systemic understanding of the structural properties of the syndicate network that shapes VF in the mobile ecosystem. Two notable exceptions include the foundational studies by Huhtamäki et al. (2011) and Rubens et al. (2011), which, using socially-curated data, examine innovation ecosystems broadly. The objective of this study is to fill this important gap and apply an ecosystem lens to the converging mobile ecosystem. Based on a comprehensive, triangulated dataset, we analyze the complex VF network in the mobile ecosystem, identify differences in segmental investment strategies by type of funding entity (business angels versus venture capital firms), and characterize early and late-stage investments. Our analysis is complemented by large-scale network visualizations of VF in the mobile ecosystem. Theoretically, we contribute to our systemic understanding of the role of VF, the underlying interfirm network structure, and the transformative forces that funding entities provide in shaping the converging mobile ecosystem. From a managerial perspective, we provide longitudinal insight into the differing strategies used by funding entities in the mobile ecosystem, the speed with which entrepreneurial firms obtain funding, and an approach with which investors can map the complex VF network.

The remainder of the study is organized as follows. Section 2 reviews the related work. Section 3 describes our research methodology. In Section 4, we present and discuss results. Section 5 concludes the study with implications and opportunities for future research.

2 Related Work

Our study draws on two broad areas of research at the intersection of entrepreneurship, strategy, finance, and technology management, namely venture financing networks and converging business ecosystems.

2.1 Venture Financing Networks

VF is a highly collaborative business activity commonly involving multiple funding entities, which together form extensive syndicate networks and often invest in a diverse set of ecosystem segments (Lerner, 1994). Relationships thus are central to VF. There are many different reasons why funding entities form VF relationships (Sorenson and Stuart, 2001). In the pre-investment phase, relationships enable funding entities to find and evaluate potential target companies (Lockett and Wright, 2001; Manigart et al., 2006). During the investment decision phase, investors may not be able or willing to raise the necessary capital individually and need help from others (Gompers, 1995). Investors may also form relationships to reduce risks through portfolio diversification or share expertise in the form of due diligence and market knowledge (Lockett and Wright, 2001). After the investment is made, these relationships enable investors to share costs for providing portfolio companies monitoring, advising, and consulting services, as well as leverage geographic proximity to portfolio companies (Bygrave, 1987). From a startup perspective, entrepreneurs can leverage their investors' syndicate networks to have access to new partners, markets and other resources through their joint investments (Bygrave, 1988; Sorenson and Stuart, 2001).

Many financial markets are characterized by strong relationships and networks, rather than arm's-length transactions (Hochberg et al., 2007). The study of economic exchanges using a social lens has therefore been a topic of great interest in finance, entrepreneurship, and strategic management (Hite and Hesterly, 2001; Shane and Cable, 2002; Uzzi, 1999). Relationships and networks are pervasive in VF (Hoang and Antoncic, 2003). Previous studies have examined the composition of social relationships (Stam and Elfring, 2008), the spatial clustering of these social networks (Florida and Kenney, 1988; Sorenson and Stuart, 2001), and the impact of social networks on investment performance (Hochberg et al., 2007). We build on and extend this literature by identifying the structural characteristics of VF in the converging mobile ecosystem.

2.2 Converging Business Ecosystems

The conceptualization of industries and markets as business ecosystems has been gaining increasing traction in the management, strategy, and information systems literature (Iansiti and Richards, 2006; Moore, 1996). The ecosystem perspective, adapted from the biological/ecological sciences, is based on the premise that industries consist of many, and potentially diverse, constituents that co-create value and are co-dependent for survival (Iansiti and Levien, 2004). Business ecosystem players come from a variety of different segments and are interconnected through a complex value network (Basole and Rouse, 2008).

The mobile ecosystem is a particularly interesting domain as it is a highly dynamic environment that brings together a variety of different technology market segments globally (Basole, 2009). Segments include mobile network operators, mobile device manufacturers, platform providers, application developers, and content providers, among many others. The role and power of existing players is challenged by continuously emerging new players, creating an interesting dynamic and tension of who will ultimately emerge as leaders. Innovation is a fundamental activity in the mobile ecosystem. Previous studies have analyzed interfirm relationships in this converging ecosystem (Basole, 2009; Rosenkopf and Padula, 2008), investigated the role of platforms (Basole and Karla, 2011), and evaluated different business models and strategies (Bouwman et al., 2008; Looney et al., 2004; Peppard and Rylander, 2006). One role that has largely been ignored in the study of business ecosystems, in general, and the mobile ecosystem in particular, is the role of funding entities and startup firms. In this study, we explore the interfirm relationships that funding entities form when jointly investing in startup firms across all segments of the converging mobile ecosystem.

3 Methodology

3.1 Data

Our study uses two complementary datasets, namely CrunchBase and Thomson Financial's ThomsonOne. CrunchBase[1], our primary dataset, is a wiki-style open-source directory of global technology companies, people, and investors. All additions and edits in this dataset undergo an approval process before they are released online. CrunchBase provides detailed data on funding entities (i.e. business angels and venture capitalist firms), portfolio companies (e.g. founding date, executive team, office locations, etc.), funding round (e.g. date, amounts, and type), and exit status of portfolio companies (i.e. acquired, IPO). Furthermore, each portfolio company is classified into one of fourteen broad technology categories and assigned descriptive tags. We selected categories relevant to our study based on the mobile ecosystem segments identified in Basole (2009). Relevant categories include "mobile/wireless", "software", "search", "semiconductor", "network hosting", "communications", "games/video", "ecommerce", "hardware", "security", and "web". Due to page constraints, we are not including the list of all relevant descriptive tags. It is available upon request.

We leveraged the CrunchBase API and developed custom scripts to extract data on funding entities, funding rounds, and portfolio companies meeting our criteria above. We stored and organized the data in a relational database for ease of access and further analysis. The extract of the full database identified 71,000+ funding rounds for 62,000+ companies by 8,049 funding entities (41% business angels, 59% venture capital firms) from 2007-2012 in the mobile ecosystem. After dropping incomplete entries like missing dates, missing funding round information, and not considering startups which have not been funded yet, our final dataset included 46,447 funding rounds for 21,299 companies (both U.S. and non-U.S.) by the same number of funding entities.

The final list of funding entity firms and funding rounds was corroborated using ThomsonOne. ThomsonOne contains comprehensive data both on financing rounds (e.g. date, type, venture firm and portfolio company identities, size of each venture firm's contribution to the round) as well as venture firm fundraising (e.g. size, close date). It is a commonly used dataset in finance, strategic management, and entrepreneurship (Bottazzi et al., 2008; Fitza et al., 2009; Mann and Sager, 2007).

3.2 Network Construction

We coded a tie r_{ij} between two funding entities i and j as 1 if they have invested together in a portfolio company in the same investment round at least once in a given calendar year, and 0 otherwise. We weighed each tie by the number of co-investments. We did not differentiate between the originator and receiver of a tie, implying that a tie reflects participation of both. This coding approach resulted in an undirected valued adjacency matrix of 8,049 funding entities (nodes) and 52,198 relationships (ties). Furthermore, we categorized ties in our network into two time periods: early-stage and late-stage investments. Early-stage investments refer to Angel investments, grant, seed, and Series A. Late-stage refers to Series B-F, acquisition, and IPO. This approach allowed us to compare the network structures at different investment phases.

[1] http://www.crunchbase.com/

3.3 Network and Node Metrics

Based on graph theory, we compute several statistical properties of the VF network structure. As we are interested in understanding the structural characteristics of the entire network as well as individual funding entities, we compute both network- and node-level properties (Wasserman and Faust, 1994). Network-level measures include average degree, average degree of partners, average path length, average clustering coefficient, and network density. Node-level measures include degree, clustering coefficient, betweenness centrality, and eigenvector centrality.

3.4 Segment Diversification

Most funding entities invest in more than one ecosystem category. To compare the (dis)similarity of investment strategies of any two funding entities i and j, we evaluated their segment investment portfolio. While traditional multidimensional scaling (MDS) relies on Euclidean distances, it is not sufficient in studying segment investment diversity because it does not weigh distances by the proportion of segment investments. We therefore combined a proportionally weighted Simpson's diversity index (Simpson, 1949) with the MDS approach (Torgerson, 1958). Simpson's index of diversity D_i is the arithmetic mean weighted by its own probability p_{ij} and is computed by $D_i = 1 - \sum_{j=1}^{m} p_{ij}^2$. The values of this index range from [0,1], with values closer to 1 indicating a greater spread of proportions across ecosystem segments. In traditional MDS, the Euclidean distance is used as the dissimilarity metrics and is defined as $d_{ij} = \left[\sum_{k=1}^{m}\left(a_{ik} - a_{jk}\right)^2\right]^{\frac{1}{2}}$, where ik denotes the i^{th} firm in the k^{th} ecosystem category, and m is the total number of ecosystem categories. Distances between i and j are obtained to create a symmetric dissimilarity matrix. Let $\delta_{ij} = p_{ij} - p_{kj}$, then the proportional difference weighted (PDW) metric is $S_{ij} = \sum_{j=1}^{m} \delta_{ij}^2$, where S_{ij} are the elements in the nxn symmetric matrix S. The elements in the dissimilarity matrix represent the square difference in proportions summed across m categories for a corresponding pair of venture financing firms. In R, we used the `dist()` to create the symmetric dissimilarity matrix and `cmdscale()` to generate a two-dimensional set of points. The results are plotted on a two dimensional plane allowing visual representation of the similarities of investment compositions across firms.

3.5 Implementation

We used Gephi 0.8.2 for computation of metrics and visualization of the co-investment network structure (Bastian et al., 2009). Gephi is open-source software for visualizing and analyzing large network graphs.[2] We used R, a free software environment for statistical computing and graphics, for multidimensional scaling and statistical analysis.[3]

4 Analysis & Results

4.1 Growth of Mobile VF

Investment in the mobile ecosystem has steadily increased over the past decade. Since the introduction of the market-changing iPhone in 2007, overall investments increased significant in 2008, but have dipped significantly in 2012, as shown in Figure 1. 2011 saw the largest total investment amount ($131.1 billion) with 3144 investments across all segments. While the total number of investments in software and web firms substantially outnumbers any other ecosystem segments, the average investment in communications (e.g. network & infrastructure) and security firms has been higher.

[2] https://gephi.org/
[3] http://www.r-project.org/

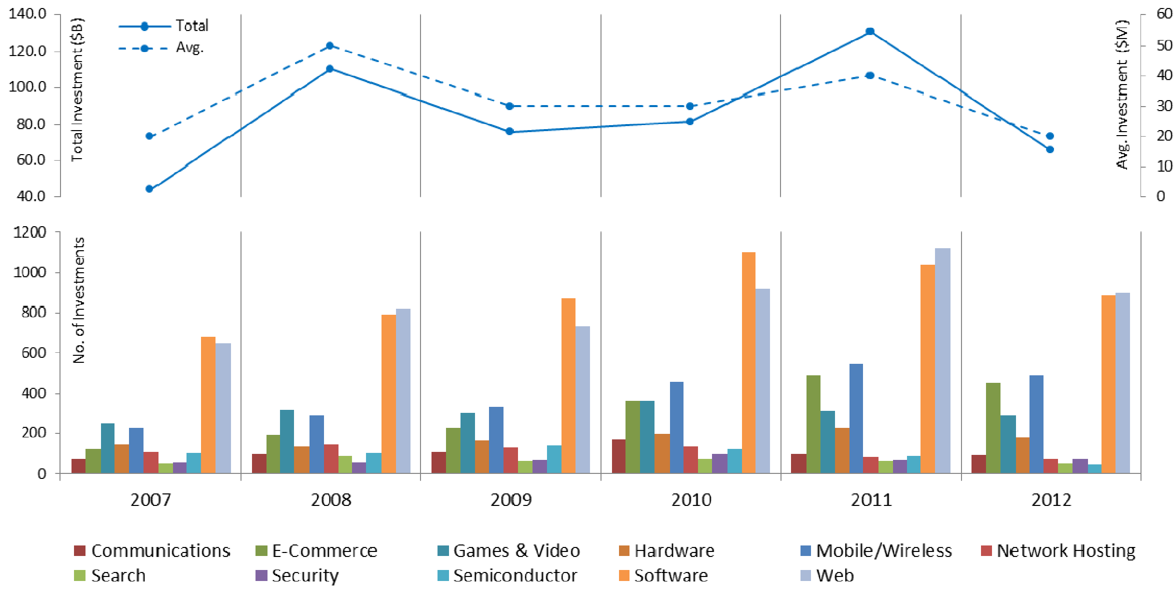


Figure 1. Evolution and segment distribution of venture financing in the mobile ecosystem.

4.2 Time to Mobile VF

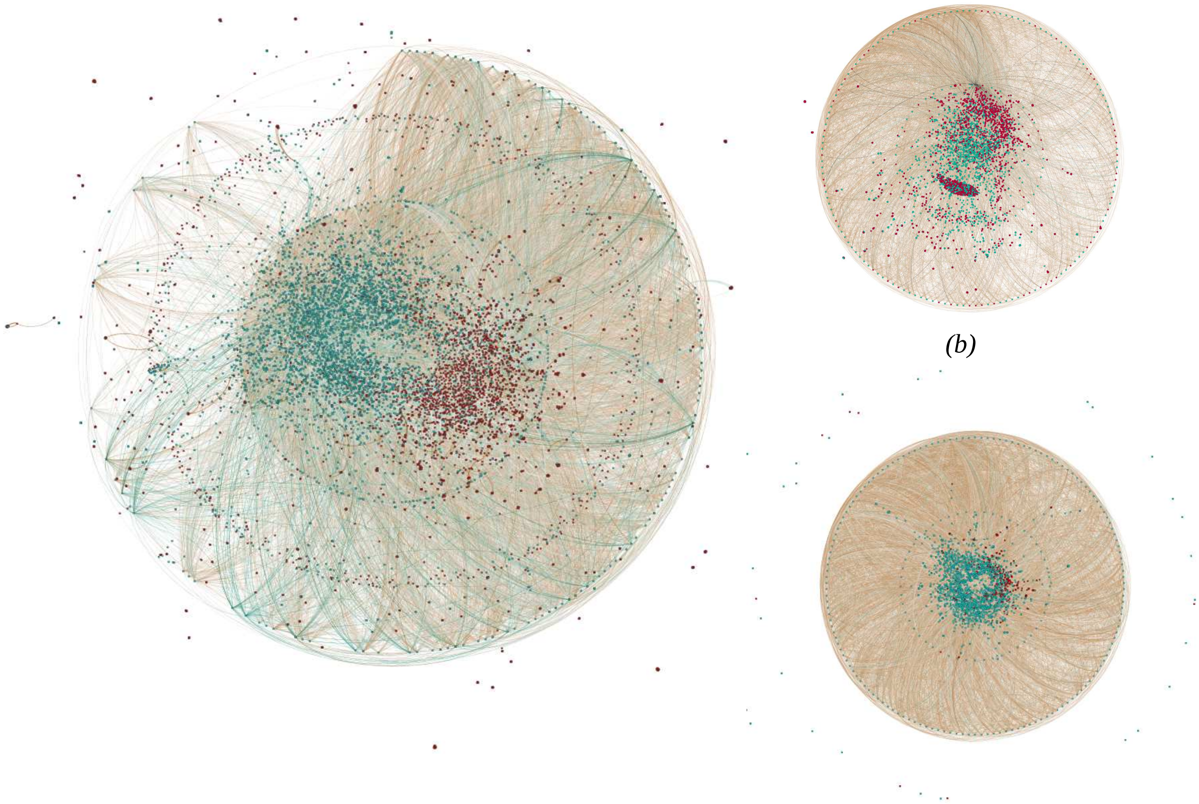
Table 1 describes the average time it takes from founding date for a firm to obtain seed, angel, and venture capital funding and ultimately be acquired or go IPO. Considering the entire mobile ecosystem, it takes entrepreneurial firms over 1.07 years to get seed and 2.55 years to get Series A funding. Firms get acquired, on average, in 7.34 years, and go IPO in over 10 years. More interestingly, firms focused in the mobile/wireless segment are the fastest to Series A funding (2.15 years) and one of the fastest to be acquired (5.74 years) and to go IPO (6.66 years). Hardware firms take the longest to be acquired or to go IPO, at 11.73 and 21.27 years respectively.

		Early Stage			**Late Stage**			
Segment	**N**	**Seed**	**Angel**	**Series A**	**Series D**	**Series F**	**Acquired**	**IPO**
Communications	649	0.83	1.23	2.96	5.16	8.94	9.34	10.53
E-Commerce	1481	0.88	1.45	2.28	4.68	9.85	6.22	7.65
Games & Video	1574	1.10	1.21	2.39	6.61	5.22	5.64	5.84
Hardware	848	1.20	2.14	3.06	5.87	7.11	11.73	21.27
Mobile/Wireless	2201	1.01	1.35	2.15	5.86	8.38	5.74	6.66
Network Hosting	716	1.11	1.77	2.67	5.03	9.23	7.33	8.45
Search	339	1.07	1.44	2.19	4.22	5.20	5.57	8.56
Security	443	1.01	1.65	3.07	6.21	7.44	9.15	13.09
Semiconductor	743	4.11	4.60	2.66	5.87	7.89	9.44	13.64
Software	5434	1.27	1.90	3.35	6.89	7.33	9.42	9.32
Web	4338	0.94	1.31	2.00	4.83	5.53	5.12	6.84
Overall	19,324	1.07	1.48	2.55	5.96	7.56	7.34	10.22

Table 1. Average time-to-VF as measured in years from company founding date.

4.3 The Macrostructure of Mobile VF

Figure 2 visualizes the early- and late-stage co-investment network. Business angels and venture capitalist firms are depicted by green and red nodes respectively. We first apply a force-directed algorithm (ForceAtlas2) and then a dual circle layout. Firms with higher co-investment levels are drawn closer together. The dual circle layout improves the aesthetics of the graph by moving more connected nodes to the inner circle in order to reduce edge overlap. We incorporate the proportional difference weighted distance (PDW) to color-code edges. Firms with similar investment portfolios are drawn in shades of brown, firms with more dissimilar portfolios are color-coded in green. Figure 2 suggests that the network does have a core and periphery. Angels tend to co-invest more with angels and VCs more with VCs. Proportionally, pairs of funding entities with dissimilar portfolios also have fewer co-investments.



(a) *(b)* *(c)*

Figure 2. Structure of (a) overall, (b) early-, and (c) late-stage VF network.

Table 2 shows common network-level properties for early- and late-stage VF networks in the mobile ecosystem. The average degree indicates the number of connections a funding entity has at a given time. Recent studies have shown that real-world networks are not random, but rather are scale-free and follow a power-law distribution, in that the majority of nodes have few connections and only a few have many (Albert and Barabási, 2002). Columns A in Table 1 show contrasting trends between early-stage and late-stage VF networks. While the average degree of funding entities in late-stage decreased (from 7.586 in 2007 to 6.205 in 2012), it increased for funding entities in early-stage. An explanation for this is that funding entities are forming more relationships in early stages to decrease risk, but want to reap the benefits in later-stages by forming fewer syndicates. An unpaired t-test showed that the differences in average degree between early- and late-stage are statistically significant at $p<0.01$.

The average degree of partners refers to the average number of connections that a funding entity's syndicate partners have at any given time. A high value indicates that a funding entity has indirect connections to a larger set of the VF network, providing greater channels for information and resource access. Funding entities thus seek to partner with other entities that are well connected. Columns B in Table 2 show that the average partner degree nearly doubled in early-stage (from 8.341 to 15.764) and decreased substantially in late-stage (from 19.637 to 13.912). The differences between early- and late stage are statistically significant at $p<0.01$.

The average path length refers to the average number of steps it takes to reach a particular entity in the VF network. Short path lengths indicate faster communication and easier access to resources (Iyer et al., 2006). Columns C in Table 2 show that the average path length decreased for funding entities during early-stage (from 4.67 to 3.74) and relatively stable in late-stage.

Clustering coefficient (Columns D) of a funding entity captures the degree to which syndicate partners are also partners of each other. While clustering in early-stage increased by nearly 10%, it remained the same during the late-stage (from 0.75 to 0.73).

Columns E capture the network density (i.e. ratio of actual/possible connections) of the VF network. Both early- and late-stage networks have very low density and remain that way from 2007-12.

	Early-Stage					**Late-Stage**				
	(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(A)**	**(B)**	**(C)**	**(D)**	**(E)**
2007	3.958	8.341	4.67	0.713	0.006	7.586	19.637	3.50	0.75	0.009
2008	3.977	7.161	5.26	0.761	0.007	6.539	14.454	3.77	0.71	0.008
2009	4.439	10.061	4.29	0.774	0.008	6.144	13.294	3.75	0.72	0.009
2010	5.939	16.486	3.59	0.790	0.007	5.761	12.624	3.74	0.75	0.010
2011	6.555	19.937	3.55	0.778	0.006	6.856	18.136	3.59	0.76	0.010
2012	5.663	15.764	3.74	0.798	0.005	6.205	13.912	3.66	0.73	0.011

Note: (A) Avg. Degree, (B) Avg. Degree of Partners, (C) Avg. Path Length, (D) Clustering Coefficient, (E) Network Density

Table 2. VF network properties.

4.4 Core Component of Mobile VF

Figure 3 depicts the top 50 funding entities in the core component of the VF network. The figure was generated using the Fruchterman-Reingold layout, a force-directed algorithm (Fruchterman and Reingold, 1991). Only 1% of all nodes and 2% of all edges are visualized. The edge thickness corresponds to the number of co-investments between funding entities. The figure shows that the core component is very dense (i.e. highly interconnected), with Intel Capital at the center of the network. Only a small number of companies have high levels of co-investment. A notable exception is DAG ventures, which co-invests heavily with Kleiner Perkins Caufield & Byers and Benchmark. The figure also reveals that funding entities in the core component co-invest with very similar partners (as indicated by the brown edge color). We also observe that there are only a few corporate VCs in the core component, such as Motorola Ventures and Google Ventures.

Table 3 lists the node-level structural properties of the Top 10 VC firms. *Degree* of a VF entity refers to the number of direct connections, possibly weighted by strength of tie (Wasserman and Faust, 1994). The more direct connections a VF entity has, the greater the probability that one has the resource it needs. *Clustering coefficient* measures the proportion of pairs of direct connections that are connections (Wasserman and Faust, 1994). *Betweenness centrality* measures the number of times that a VF entity falls along the shortest path between two other VF entities (Freeman, 1979). Firms with high betweenness link together firms who are otherwise unconnected, creating opportunities for exploitation of information and control benefits. *Eigenvector centrality* measures the extent to which the VF entity is connected to other firms who are well-connected (Bonacich, 1987).

The results in Table 3 confirm what we already observed in Figure 3: Intel Capital enjoys a very prominent position in the VF network. First, it has a very large network of direct connections (562) and has a high betweenness level (1.0). Very few of those investment partners co-invest (0.04), but those partners are very well-connected otherwise (1.0), enabling Intel Capital to leverage a much broader VF network.

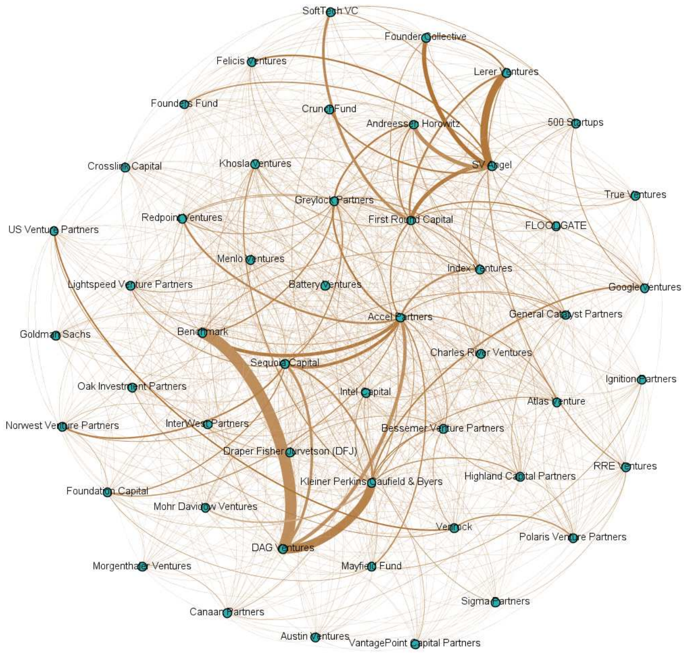


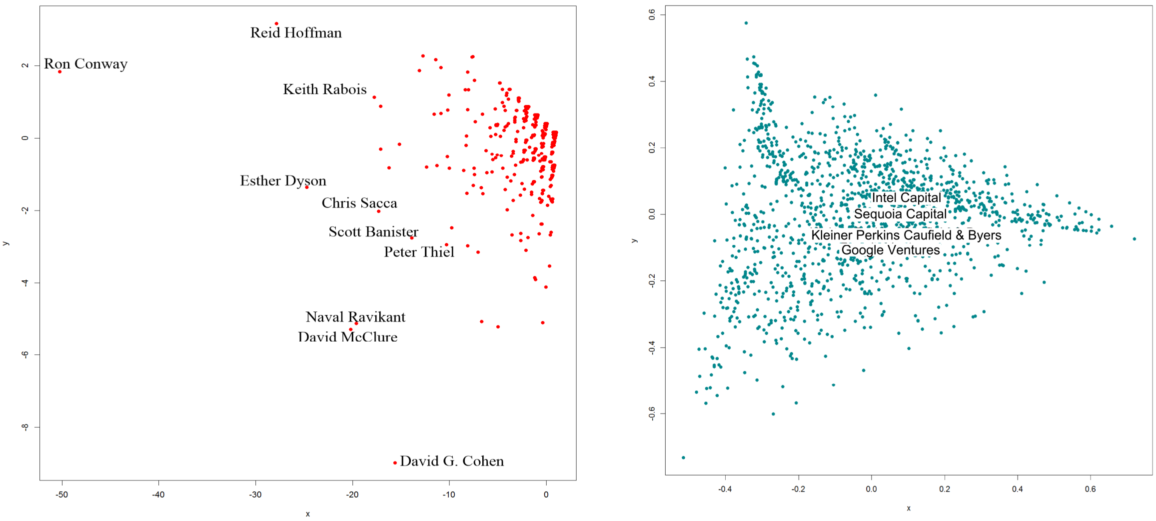
Figure 3. Structure of VF network of top 50 VC firms in the core component (2007-12).

Funding Entity	**Location**	**Degree**	**Clustering Coefficient**	**Betweenness Centrality**	**Eigenvector Centrality**
Intel Capital	Santa Clara, CA	562	0.04	1.00	1.00
Accel Partners	Palo Alto, CA	426	0.06	0.55	0.90
Sequoia Capital	Menlo Park, CA	336	0.08	0.22	0.79
Draper Fisher Jurvetson	Menlo Park, CA	428	0.05	0.50	0.88
New Enterprise Associates	Menlo Park, CA	473	0.05	0.59	0.95
First Round Capital	Philadelphia, PA	446	0.06	0.38	0.91
Benchmark	Menlo Park, CA	260	0.10	0.10	0.68
Kleiner Perkins C&B	Menlo Park, CA	417	0.06	0.34	0.87
Greylock Partners	Menlo Park, CA	318	0.09	0.18	0.80
Menlo Ventures	Menlo Park, CA	281	0.10	0.15	0.75

Table 3. Top 10 funding entities in the mobile ecosystem, ranked by number of investments.

4.5 VF by Mobile Ecosystem Segment

Figures 4a and 4b show the PDW MDS for all angel investors and VC firms, respectively. Angel investors are tightly clustered, indicating very little differences. One explanation for this is that angels stick to their core strengths. The exceptions are Super Angels, which are represented by the dots furthest away. The PWD-MDS for VC firms reveals an interesting triangular pattern, which are formed by the three heavily invested mobile ecosystem segments: software, web, and mobile. The majority of VC firms are inside this triangle, showing very little differentiation. The few on the side of the triangle and further out are smaller VCs with only few investments.



(a) Angel Investors *(b) VC Firms*

Figure 4. Proportionally weighted distance MDS map of funding entities (2007-12).

The argument that angels and VC firms differ in their investment diversification strategies is further underlined by the heatmaps shown in Figure 5. It is a common assumption that funding entities diversify by investing in different ecosystem segments. Not surprisingly, it is evident from Figure 5 that mobile, software, and web form the core investment segments of funding entities. It can also be observed that funding entities invest in adjacent/related ecosystem segments. VCs investing in communications, also invest in network hosting, for instance. Funding entities investing in the security segment tend to invest in software and web as well. This can in part be explained by deep industry expertise and knowledge that is being leveraged to invest in related areas. However, while there are many commonalities there are also some stark differences between angel investors and VC firms. Angels, for instance, rarely invest in capital-intensive industries, such a hardware, semiconductor and even security. VCs on the other hand are fully diversified across all ecosystem segments.

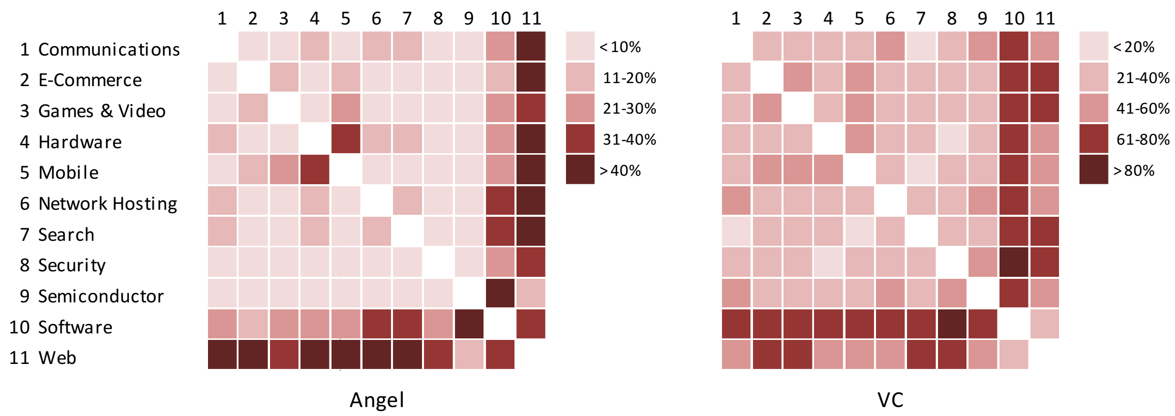


Figure 5. Heatmap of ecosystem segment co-investments by angels and VC firms.

5 Concluding Remarks

This study examined the structure and strategies of VF in the converging mobile ecosystem. Our results show that software, web, and mobile are the most heavily invested segments. Our study reveals that the structure and strategy of mobile VF differs both by funding entity (angels vs. VC firms) as well as stage (early vs. late) and has changed over time (2007-2012). The most prolific funding entities tend to be well-connected, have low clustering, but high network reach. Further, our study shows that funding entities are forming higher number of relationships in the early stages of VF to offset risks. In later stages, however, funding entities are forming fewer syndicate relationships, in an attempt to solely reap the benefits of portfolio firm exit. Our results also show that in the overall VF network, funding entities prefer to co-invest not only among their own type, but also with funding entities with similar portfolios. Our analysis also reveals that there are some stark differences in time-to-VF by segment and that emerging mobile ecosystem segments are particularly fast to funding and acquisition.

Our study has important theoretical implications for understanding the structure and dynamics of VF in the mobile ecosystem and extends the work on interfirm networks in entrepreneurship and finance and contributes to the study of business ecosystems. Future research opportunities include an empirical investigation into the relation between structural characteristics and investment performance (e.g. subsequent funding, acquisition, IPO), the nature of geographic proximity of VC firms and portfolio companies, and an evaluation of regional and global entrepreneurship.

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