CLASSIFYING VENTURE CAPITAL BACKED OPEN SOURCE SOFTWARE STARTUPS USING PUBLICLY AVAILABLE INFORMATION

by

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ABSTRACT

This research uses a data mining process and information on companies' websites to classify 61 venture capital (VC) backed open source software (OSS) startups. It delivers a classification for OSS startups and observations about their market offers which are relevant to: (i) top management teams who wish to attract VC funding; (ii) Canadian VC investors who do not fund OSS startups; (iii) academics who are interested in data mining; and (iv) entrepreneurs who need to define their companies' market offers. The results suggest that open source companies seek to concurrently add value to their customers and the external communities on which they depend. They also suggest that the market offers of VC funded startups can be grouped into: (i) products and applications; (ii) consulting, training and testing services; and (iii) commercial licenses and support. The results from this research are consistent with previous research that classified market offers that rely on open source projects and ways in which companies integrate OSS into their market offers.

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1 INTRODUCTION

The first quarter of 2008 was the most successful quarter in history in terms of open source software (OSS) startups raising venture capital (VC) funding. Yet, not a single OSS startup in Canada received VC funding and not a single VC fund in Canada invested in OSS companies.

1.1 Objective

The objective of this research is to classify VC funded OSS startups in terms of the information on their market offers and businesses that is available online.

For the purpose of this research, an OSS startup refers to a company that: (i) was established after 2000; (ii) has no public offering; (iii) is not a subsidiary of a parent company; and (iv) generates revenue through market offers that rely on OSS.

A VC funded OSS startup refers to an OSS startup that has received institutional financing from one or more independent VC firms and bank-based VC firms. OSS startups that only use funds from founders, friends, family, and angel investors are not deemed to be VC funded.

A market offer refers to the generic product or service and the set of augmenting services, programs, and systems that a firm offers potential customers (Alam, 2006; Anderson, Carpenter, and Narus, 2001).

1.2 Deliverables

The deliverables of this research are:

1. A classification of VC funded OSS startups using information published on their websites.
2. Observations about the market offers of VC funded OSS startups that are relevant to top management teams of startups, investors, academics, and entrepreneurs.

1.3 Relevance

This research is relevant to: (i) top management teams of OSS startups who wish to attract VC funding; (ii) Canadian VC investors who do not fund OSS startups; (iii) academics who are interested in web-based content mining methodologies; and (iv) entrepreneurs who need to define their companies' market offers.

Top management teams of startups who wish to attract VC funding will find this research relevant because they may be interested in knowing the types of market offers which VC backed companies develop and sell.

This research is relevant to VC investors in Canada who do not yet fund OSS startups. They may be surprised to learn the extent to which venture capitalists in the United States invest in OSS startups.

This research provides academics with a "how to" approach to mine information on companies' websites. This knowledge will enable opportunities for further research.

Academics who are interested in web-based content mining methodologies will find the process used in this research relevant.

Finally, this research will be relevant to the entrepreneurs who drive OSS startups. They will be able to use the results of the Factor Analysis as a template when deciding how to (i) structure their portfolios of products and services, and (ii) add value to the external communities on which they depend.

1.4 Contribution

This research makes at least three contributions. First, it provides evidence that VC funded OSS startups seek to concurrently add value to their customers as well as the external communities anchored around the OSS projects and customers on which their market offers rely.

Second, this research contributes a categorization of market offers from VC funded OSS startups. These market offers can be categorized into three groups: (i) products and applications; (ii) consulting, training and testing services; and (iii) commercial licenses and support.

Third, this research contributes new insights about the breakdown of the market offers from VC funded OSS startups. A greater number of VC funded OSS startups sell services than products and applications. Most startups that sell products or applications, also sell services. This suggests that VCs are funding OSS startups for reasons other than their R&D capability.

1.5 Organization

This thesis is organized into six chapters. Chapter 1 provides the introduction. Chapter 2 provides the literature review. Chapter 3 describes the research method used when undertaking this research. Chapter 4 provides the results of this research. Chapter 5 provides a discussion of the results. Finally, Chapter 6 provides conclusions, limitations and suggestions for future research.

2 LITERATURE REVIEW

This chapter has six sections. The first section examines the studies on VC investment in OSS companies. The second section reviews the literature on websites as corporate identities. The third section reviews the literature on market offers that rely on OSS. The fourth section reviews the literature on open source community development. The fifth section reviews the literature on web based content mining. Finally, the sixth section discusses the lessons learned from the literature review.

2.1 VC investment in OSS companies

In this section, the literature on VC interests in OSS companies and ways to evaluate OSS startups is reviewed.

2.1.1 VC interests in OSS companies

A recent 451 Group report (Aslett, 2008) noted that: (i) the first quarter of 2008 was the most successful quarter in history in terms of open source vendors raising VC funding, with the amount raised being $203.75 million, up from $100.40 million in the same quarter of 2007; and (ii) the amount of VC funding in the first quarter of 2008 was greater than the previous record of $193.7 million in the fourth quarter of 2006. According to figures collated by Computer Business Review (Aslett, 2007), venture capitalists invested $475.2 million in open source vendors in 2006, up 61.6% from $294.0 million in 2005. In contrast, the amount of money invested in software vendors actually decreased from $1.66 billion in 2005 to $1.60 billion in 2006.

This suggests that it is hard to raise capital with the old traditional model, and there could be more money to be made from open source than proprietary software models in the long term (Aslett, 2007). One major reason for this trend is that venture capitalists are looking for a market with high growth at the early adopter stage. OSS is enabling the creation of thousands of entrepreneurs who open up previously untapped portions of the market (Sterne and Herring, 2006). The fact that large corporations are shifting to open source is another reason why venture capitalists are investing in OSS companies (Cook, 2005). Therefore, as a disruptive technology, OSS will nibble, or maybe even someday gobble, the customer base of commercial software companies (Blau, 2006). OSS companies serve customers by either developing extensions to the existing OSS products or implementing business solutions that significantly rely on OSS (Sterne and Herring, 2006).

What attracts investors to OSS companies is the higher probability of innovative ideas, the quicker time to market, and the ability to develop niche markets (Byfield, 2008) and communities (Pienaar, 2007). However, the sustainability of open source business models is still not proven, and the question "where is the value?" needs to be solved (Pienaar, 2007). Haapanen (2007) suggested that OSS startups should know their products and services well, and assess the risks and opportunities. OSS startups need to plan in advance how to mitigate the risks in the business models and prepare from the beginning for possible VC transactions.

Table 1 presents a summary of the literature on the VC interests in OSS companies.

Table 1: Literature on the VC interests in OSS companies

Study	Highlights
Pienaar (2007)	▪ VC interests in OSS companies: (i) Sustainable business models and size of community (developers and users); (ii) Open source companies considered an ecosystem by venture capitalists. ▪ What is needed to be more successful: (i) CIOs do not care about source code, and they care about support; (ii) Need a clear proposition of value and differentiation; (iii) Need a clear strategy on how to work with and leverage community: a) Strong partner model is key to success, e.g., SugarCRM; b) Accountability of eco-community. (iv) Scalability and security is still a major issue to compete with traditional proprietary software companies for enterprise customers; (v) Support and service level still weak: a) Service level and project management thinking needs to improve; b) How to get out of cost mindset. ▪ Where is the opportunity: (i) Corporate customers are looking for solutions, not software modules; (ii) The open source ecosystem plays an important role: a) Open source community ecosystem, i.e., Free Software Foundation (FSF), Open Source Initiative (OSI), Linux Foundation, Apache Foundation, Eclipse Foundation, and so on; b) Open source commercial ecosystem, i.e., original equipment manufacturers (OEMs), independent software vendor (ISVs), service providers, Open source companies, technology consumers, investment community, startups, and so on. (iii) Consumer applications see strong growth.
Haapanen (2007)	▪ VC interests in OSS firms: (i) Excellent business idea; (ii) Exceptionally high potential for growth; (iii) Value at the market; (iv) Financial returns; (v) Successful exit within the planned timeframe; (vi) Awareness of risks related to transaction. ▪ OSS analysis: (i) Information on OSS as part of products; (ii) List of OSS components – completeness and accuracy of the listed components; (iii) List of OSS licenses and right holders; (iv) Software architecture – information how the OSS components are used in the product development as well as products. ▪ Obvious OSS risks that may impact on VC transactions: (i) Breach of OSS license terms: a) Notice requirements; b) Distribution of source code. (ii) Contamination of proprietary code; (iii) Unbalanced liabilities with regard to OSS in supply agreements; (iv) Infringement of third party Intellectual Property Rights (IPRs); (v) Dilution of own patents.

Byfield (2008)	▪ VC interests in OSS firms: (i) The higher probability of innovative ideas: a) Open source has a disruptive feature in technology and distribution; b) A successful innovation means a greater return on investment. (ii) Build products more cheaply and market them in less time: a) OSS builds on existing code and can benefit from community contributions; b) OSS companies produce a quicker return on investment. (iii) The ability to develop niche markets that were previously too small to develop profitably (e.g., Krugle): a) OSS companies do not have to compete with the giants in their field; b) A decent return on investment from specialization is possible.

2.1.2 Ways to evaluate OSS startups

Innovation in small technology firms is difficult to finance because of four fundamental problems: high uncertainty, information asymmetry, intangible soft assets, and sensitivity to volatile market conditions (Callahan and Muegge, 2003). A VC valuation reflects both the entrepreneur's determination of the acceptable amount of ownership that may be given in return for the VC, and the venture investor's determination of the risks and rewards of the investment (Callow and Larsen, 2003). Therefore, it is in the entrepreneur's best interest to understand the short-term and long-term capital requirements of the company, and work with investors to develop a financing strategy based on building value from one financing stage to the next and understanding how value will be measured.

VC valuation methodologies may differ by the stage of investment and the availability of quantitative and qualitative data. However, the basic components of VC valuation are universal. These include: proof of concept, the quality of the management team, human capital, technical assets, market size, intellectual property (IP), milestones achieved thus far, comparable company valuations, rationalized revenue forecasts, multiples of revenue,

and so on.

Venture capitalists expend a great deal of time and resources to evaluate transactions, and screen deals based on such factors as investment stage, investment size, industry sector, geography, the strength of the core management team, future market and technology trends (Callahan and Muegge, 2003; Callahan and Charbonneau, 2003).

However, Puhakka and Jungman (2005) found that some venture capitalists recognized that there were distinctly different elements when evaluating OSS startups. Although more than $2 billion has been invested in open source companies, the sustainability of open source business models is still not proven (Pienaar, 2007). For example, SourceForge shows relatively low revenues, and most open source companies are still sponsored. Expected cash flows are likely to be greater in OSS companies than those in similar traditional software companies thanks to the savings in licensing fees and innovation approaches. However, at the same time, the discount rate, or the cost of capital, is higher due to the uncertainties in the profitability of the business model, revenue streams, market acceptance, community commitment, competitive reactions, and the quality of software.

Wood (2005) proposed that before a product is released under an open source license, the line between open source and proprietary features should be clearly depicted, and the product segmentation should be implementable. He also indicated that venture capitalists may tend to invest in complementary technologies in the hope that their portfolio

comprised of open source companies can help each other succeed. Entrepreneurs can find potential investment partners simply by studying existing open source investment announcements, and do not need to approach VC companies blindly (Byfield, 2008).

At the stage of the pre-money valuation, the early involvement of developers and users in the community, which contributes bug fixes or feedback on desired features, provides an early indication of whether an investment will pay off (Aslett, 2007; LaMonica, 2005). To some extent, in the consumer Internet space, the size and characteristics of the open source community can be used to project market share (Roblimo, 2006). Therefore, OSS startups need to emphasize a community-building approach, and focus on monetizing ancillary services like technical support.

Table 2 presents a summary of the literature on the ways to evaluate OSS startups.

Table 2: Literature on the ways to evaluate OSS startups

Study	Highlights
Puhakka and Jungman (2005)	▪ Two case studies: BlueRun Ventures, and Nexit Ventures. ▪ It is widely accepted that the three key investment decision criteria are: (i) management team; (ii) market projections; (iii) product. ▪ The valuation of OSS companies is challenging, because there is yet neither history nor guidelines, due to the uncertainties for example in: (i) the profitability of business model; (ii) revenue streams; (iii) market acceptance; (iv) community commitment; (v) competitive reactions; (vi) the quality of software. ▪ The valuations on OSS startups are not made with transparent scientific methods, but are rather results of negotiations.
Byfield (2008)	▪ For the most part, investors are looking for the same criteria in an open source company as they are in any company. ▪ VC firms considering investment in open source show a marked preference for certain business models: (i) dual-licensing; (ii) software as a service (SaaS). ▪ VC firms are looking for a strong sense of branding: a company that has its own identity and innovations, rather than one that simply repurposes existing OSS. ▪ Experienced VC investors are looking for startups with: (i) a large and active community; (ii) those who maintain good relations with the community.
Wood (2005)	▪ Case study: a VC funded startup relying on OSS. ▪ Practical considerations for segmenting commercial product offerings with open source components are important. ▪ Intellectual property should be managed properly. ▪ Startups need strategies to ensure the safe and effective use of OSS.
Aslett (2007), LaMonica (2005), Roblimo (2006)	▪ The early involvement of a developer and user community gives an early indication of whether an investment in OSS is paying off. ▪ The size and characteristics of open source community can be used to project market share.
▪ In summary, the business model for open source needs to evolve and demonstrate sufficient returns and exit strategies to justify continued investment, and OSS startups need to emphasize building their communities.	

2.2 Websites as corporate identities

2.2.1 Corporate identity

A corporate identity is a summation of those tangible and intangible elements that make any corporate entity distinct (Balmer, 2001). In 1995, the British Standards Institution

defined corporate identity as what an organization is, what it stands for, what it does and how it goes about its business (Hicks, Libaers, Porter, and Schoeneck, 2006).

Corporate identity is multidisciplinary in scope and is a melding of strategy, structure, communication and culture. It is manifested through communication channels that encapsulate product and organizational performance, employee communication and behavior, controlled communication, stakeholder, and network discourse (Balmer, 2001).

Schmidt's (1995) identity mix comprises a quintet of elements, while Birkigt and Stadler's (1986) identity mix consists of a quartet of elements. Balmer and Soenen (1999) developed the ACID Test approach to differentiate four types of identity. Balmer (2001) acknowledged that there were two critical stages in communication (sending and receiving), and introduced a new category type, thus making a total of five identity types. The revised approach has been called Balmer's AC2ID Test.

Table 3 presents a summary of the literature on corporate identity.

Table 3: Literature on corporate identity

Study	Highlights
Birkigt and Stadler (1986)	▪ Business identities includes: (i) Corporate personality; (ii) Corporate behavior; (iii) Communication; (iv) Symbolism.
Schmidt (1995)	▪ Business identities includes: (i) Corporate culture; (ii) Corporate behavior; (iii) Market condition and strategies; (iv) Product and services; (v) Communication and design.
Balmer and Soenen (1999)	▪ Corporate identity includes: (i) Actual identity: what the organization is; (ii) Communicated identity: how the organization communicates its identity, internally and externally; (iii) Ideal identity: the optimum positioning of the organization in its market or markets taking cognizance of its strengths and abilities in addition to environmental considerations; (iv) Desired identity: the identity which the chief executive and management board wishes to acquire.
Balmer (2001)	▪ Corporate identity includes: (i) Actual identity: internal values, organizational behavior, activities, market scope, performance and positioning; (ii) Communicated identity: the various organizational messages conveyed via primary, secondary and tertiary communications; (iii) Conceived identity: the images/representations, reputational profile held of the organization by stakeholder groups and networks; (iv) Ideal identity: the optimum positioning for the organization in a given time frame; (v) Desired identity: the vision as articulated by corporate founder and/or the chief executive and management board.

In general, all corporate identity theories focus on: (i) corporate design; (ii) corporate communication; and (iii) corporate behavior.

2.2.2 Corporate identities demonstrated by websites

Corporations use their websites as a vehicle for image building (Chun and Davies, 2001; Maynard and Tian, 2004) and dissemination of corporate information (Fisher, Oyelere, and Laswad, 2004).

Opoku (2005) proposed that a web presence can be used to communicate core messages such as brand personalities. Berthon, Pitt, and Watson (1996) provided a vivid description of various websites' applications. Sullivan (1999) found that image creation is the most important function of corporate websites. Corporate websites have become powerful tools for promoting corporate identities and building relationships with audiences (Topalian, 2003).

Pollach (2005) used content analysis, quantitative linguistic analysis and discourse analysis to examine the "About Us" sections of 20 well-known corporate websites. He found that companies' self-presentation on the websites presents opportunities that are presented in Table 4. Opoku (2005) sought to exploit the potential of websites to assess corporate identity. He developed a dictionary of terms associated with each of the five dimensions of brand personality: sincerity, excitement, competence, sophistication, and ruggedness. The frequencies of the keywords on the websites of 30 business schools in the United States were then obtained, and the pattern of occurrence of the keywords was assessed to classify the business schools by their brand "personality".

Hicks et al. (2006) argued that corporate websites universally articulate corporate identities. Their study was similar in style to that of Opoku (2005). They began with a theoretically informed immersion in the text of the websites of 80 highly innovative small firms, and developed a set of keywords from their websites. The pattern of occurrence of the keywords was used to classify the commercialization strategies of these firms.

Table 4 presents a summary of the literature on corporate identities as demonstrated by websites.

Table 4: Literature on corporate identities demonstrated by websites

Study	Highlights
Opoku (2005)	▪ A Web presence appears to be effective for: (i) creating brand, product and corporate awareness and image; (ii) providing product and other information; (iii) handling customer complaints, queries and suggestions; (iv) generating qualified leads; (v) providing customers access to the extranet.
Berthon et al. (1996)	▪ Websites' applications include: (i) providing detailed product information and specifications; (ii) gaining access to previously unknown or inaccessible buying influences; (iii) projecting a favorable corporate image; (iv) fostering and encouraging consumer involvement with the product range; (v) establishing interactivity, offering product samples, and building a customer database; (vi) handling customer complaints, questions, and suggestions, and providing product distribution.
Topalian (2003)	▪ Communication is now significantly easier through advances in information technology and the evolution of the Internet. ▪ Corporate websites could be very powerful vehicles for corporate identities.
Pollach (2005)	▪ Companies' self-presentation on the websites presents opportunities: (i) Websites are capable of transmitting an unlimited amount of information to all potential audiences, including customers, vendors, employees, job seekers, investors, financial analysts, journalists, students, researchers and the public at large; (ii) Audiences have much more control over what they want to see than in traditional media; (iii) The messages companies send to their audiences are controlled exclusively by the companies themselves; (iv) Websites enable companies to learn more about their audiences by including interactive features.
Opoku (2005), Hicks et al. (2006)	▪ Corporate websites universally articulate corporate identities. ▪ A set of keywords on the websites were developed to assess identity.

2.3 Market offers based on OSS

Alam (2006) reviewed the critical literature on market offers and examined market offers that rely on OSS projects. Table 5 includes Alam's review of the market offer literature.

Table 5: Literature on market offers reviewed by Alam (2006)

Study	Highlights
Kotler and Turner (1995)	▪ A product or market offer is anything that is offered to the market for attention, acquisition, use, or consumption that might satisfy a want or need. ▪ These add-ons might be in the form of packaging, customer services, advertising, financing, and other things that deliver value to the customer. ▪ The five product levels include: (i) core benefit: fundamental service or benefit the customer buys; (ii) generic product: basic version of product; (iii) expected product: attributes and conditions the buyer normally expects; (iv) augmented product: distinguishes from others; (v) potential product: augmentations and transformations that might undergo in the future.
Levitt (1980)	▪ The value of the market offer is proportion to the perceived ability to solve a problem or meet a need.
▪ In summary, a market offer perspective includes physical products, services, the process by which the customers evaluate, buy and consume, and etc.	

Based on the model advanced by Kotler and Turner (1995) and Anderson, Carpenter, and Narus (2001), Alam (2006) identified 24 OSS market offers provided by 12 companies. He classified these market offers into six types: (i) hosting and content services; (ii) training and testing services; (iii) support services; (iv) subscription services; (v) commercial licenses; and (vi) products/applications. In addition, Alam (2006) identified ten ways companies integrated OSS into their market offers. He examined the extent of the integration between the OSS and the company's proprietary assets (minimal or comprehensive) and the extent to which OSS contributes to the value of the market offer (significant or insignificant).

Table 6 presents the ten ways companies integrated OSS into their market offers indentified by Alam (2006).

Table 6: Ten ways to integrate OSS identified by Alam (2006)

		Can OSS contribute significantly to the company's market offer?	
		No	**Yes**
How extensive is the integration between proprietary assets and OSS?	**Minimal**	(i) OSS is used as one of the components to the network that delivers the hosting and content services.	(ii) OSS is used to anchor training and testing services. (iii) The company uses OSS projects it established to create attractive market offers. (iv) The company integrates software from OSS projects established by others and proprietary software from other companies into a stack, adds advanced functionalities, perform tests, and certify the integrated software. (v) The company incorporates OSS from partner companies, and uses commercial and trademark licenses as its market offer.
	Comprehensive	(vi) OSS is integrated with proprietary software or hardware into an interface module that is a small part of the product.	(vii) OSS is integrated with proprietary software and/or hardware to create a product or application. (viii) The company integrates OSS with network infrastructure to provide subscription services. (ix) The company uses OSS to seed demand for the company's proprietary application. (x) The company integrates OSS with other complementary products to work together as a system; OSS community develops complementary content that is required by the software.

In seven open source strategies examined by Koenig (2004), five types of OSS market offers can be identified. After surveying the industry segment of open source in the United States, Pienaar (2007) found ten open source business models, in which six types of OSS market offers can be identified.

Table 7 presents a summary of the literature on OSS market offers.

Table 7: Literature on OSS market offers

Study	Highlights
Alam (2006)	▪ Six types of OSS market offers: (i) Hosting and content services that rely on a content delivery network allows content creators to outsource delivery of their digital multimedia content, e.g., RealNetworks; (ii) Training and testing services that provide professional certifications for those who want to show they have the skills, knowledge, and capability to work with the software, e.g., JBoss, MySQL, JBoss, Red Hat; (iii) Support services that provide fixes to the software, advice and suggestions for deploying the software in their customers' environment, e.g., ActiveGrid, SpikeSource; (iv) Subscription services that enable customers to subscribe to receive updates, upgrades, monitoring and management capabilities of their software deployments, e.g., JBoss, Sourcefire; (v) Commercial licenses that provide undisputed rights to the software products, e.g., SGI; (vi) Products/applications that may provide advanced features and capabilities over what is available in the open source version, e.g., JasperSoft, Digium.
Koenig (2004)	▪ Five types of OSS market offers: (i) Commercial licenses that require a metric by which customers are charged, e.g., MySQL, Bitrock; (ii) Consulting services that deliver a customer solution involving integration of hardware, software and maintenance, e.g., Cognizant, 10X, Optaros; (iii) Support services that provide engineering services, customer training and education, e.g., Red Hat, Openlogic; (iv) Hosted services that take software as a service (SaaS), e.g., Salesforce, Netsuite; (v) Hardware products that are embedded in OSS, e.g., Neoteris, Digium.
Pienaar (2007)	▪ Six types of OSS market offers: (i) Commercial licenses; (ii) Subscription services; (iii) Freemium offers that provide basic services for free while charging a premium for advanced or special features; (iv) Professional services that include technical support, consulting, and training and testing services; (v) Hosting services that provide Web space for use by customers; (vi) Applications and tools sales.

2.4 Open source community development

2.4.1 Rationales for open source community

Dahlander and Magnusson (2005) examined several studies on the incentives for taking part in open source communities. Table 8 shows a summary of the rationales for open source communities.

Table 8: Literature on the rationales for open source communities (Dahlander and Magnusson, 2005)

Perspective	Motivation
Economic	▪ Monetary rewards (Hertel, Niedner, and Herrmann, 2003; Lerner and Tirole, 2005) ▪ Low opportunity cost (Lakhani and von Hippel, 2003) ▪ Signaling incentives - the contributors are concerned about future careers (Lerner and Tirole, 2002)
Social	▪ Belonging to a community (Raymond, 2001) ▪ Intellectual challenges - helping others may increase self-esteem, demonstrating technical expertise, earning respect and status, and responding to norms of mutual aid (Himanen, 2001; Raymond, 2001) ▪ Altruism or general reciprocity (Raymond, 1999a)
Technological	▪ Learning (Lakhani and von Hippel, 2003) ▪ Feedback and help (Raymond, 2001) ▪ Working with new technologies

Community members developing OSS are much more likely to be driven by social factors than traditionally employed software developers (Dahlander and Magnusson, 2005).

2.4.2 Community-based innovation

Partner or cooperative innovation combines elements of process and product innovation within a "network structure" to create a product-service response that neither partner can create by using its own resources (Walters and Rainbird, 2007). In contrast, community-driven initiatives result in products more akin to a public good, leading to value capture that is diffused across an ecosystem (Chesbrough and Appleyard, 2007).

Consistent with the finding that larger companies were more likely to build on external knowledge (Almeida, Dokko, and Rosenkopf, 2003), West and Gallagher (2006) found

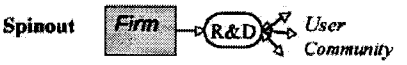
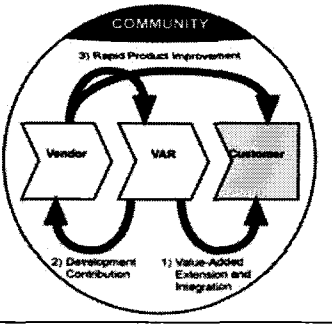
that large IT firms with a broad scope of products were involved in open source because they could not ignore any significant source of external innovation that was available to rivals. Small companies aligned their innovation strategies with open source in order to seek niches unoccupied by competitors.

OSS development is an example of a horizontal innovation network supported by a community (von Hippel and von Krogh, 2003). Open source style R&D is not only community based, but also adoptable for businesses (Ueda, 2006). Through the development community, additional functionality for OSS products can be developed to satisfy real customer needs far more rapidly than those for traditional proprietary software products (Wallace, 2006).

West and Gallagher (2006) identified three fundamental challenges for companies in applying the concept of open innovation: (i) finding creative ways to exploit internal innovation; (ii) incorporating external innovation into internal development; and (iii) motivating outsiders to supply an ongoing stream of external innovations. They found that the collaborative development using donated labor is a key component for open source innovation strategy. They further examined how the activities of companies in OSS supported their innovation strategies, and identified two approaches driven by the structural relationship of contributor-participants.

Table 9 presents a summary of the literature on the community-based innovation in OSS.

Table 9: Literature on the community-based innovation in OSS

Study	Highlights
Chesbrough and Appleyard (2007)	▪ A new approach, i.e., open strategy, is to make strategic sense of innovation communities, ecosystems, networks, and their implications for competitive advantage. ▪ The value of openness is actually enhanced with every user in two ways: (i) Users directly contribute ideas and content to improve the quality and variety of the product, e.g., Wikipedia relying on individuals for both data entry and editing, and Linux relying on a global innovation community; (ii) The more users, the more momentum behind the product such that other companies producing complementary goods or services would be attracted to the mass of users, e.g., the value of Linux's contributions to global computing reflected in the value of its ecosystem. ▪ Open strategy balances the powerful value creation forces that can be found in creative individuals, innovation communities, and collaborative initiatives with the need to capture value in order to sustain continued participation and support of those initiatives.
von Hippel and von Krogh (2003), Ueda (2006)	▪ Open source community supports a horizontal user innovation network, which is characterized by user innovation, collective invention based on free revealing of innovations, and independence from manufacturers. ▪ Diffusion of innovations by users is low cost and can compete with commercial production and distribution.
West and Gallagher (2006)	▪ The traditional integrated approach of software development within the firm:  ▪ Structural approaches for open innovation in OSS: (i) Pooled R&D: firms donate intellectual property (IP) to the open-source project while exploiting the common benefits of all contributors to facilitate the sale of related products, e.g., Linux, Mozilla;  (ii) Spinouts: firms transform internal development projects to externally visible open source projects, e.g., Jikes, Eclipse, Beehive;  (iii) These two structural approaches can be combined with each other.
Wallace (2006)	▪ The value chain of OSS with feedback mechanism: (i) The open source development model is to extend and customize the product to meet the customers' specific needs; (ii) The extensions can be contributed back into the product through the development community that surrounds its OSS. 

2.4.3 Open source community

The World Wide Web is the major platform for tools that people can use to communicate in their networks, and makes massive decentralized projects possible. A wide range of applications can be found, from static web pages to e-mail and blogs, and numerous social-software-mediated platforms that are essential for large scale conversations, (Weber, 2006). These tools make it easier to reference, store, retrieve, and archive online information or data. This makes collaboration in non-geographic communities more convenient (Benkler, 2006).

Communication channels are becoming more open and easily accessible for everybody. The transfer of information has become less costly and the quality of the information spread became almost independent of locations. Users join together in open source communities, which underlie a certain organization providing structure and tools useful for interaction to support the distribution of new innovations (von Hippel, 2005).

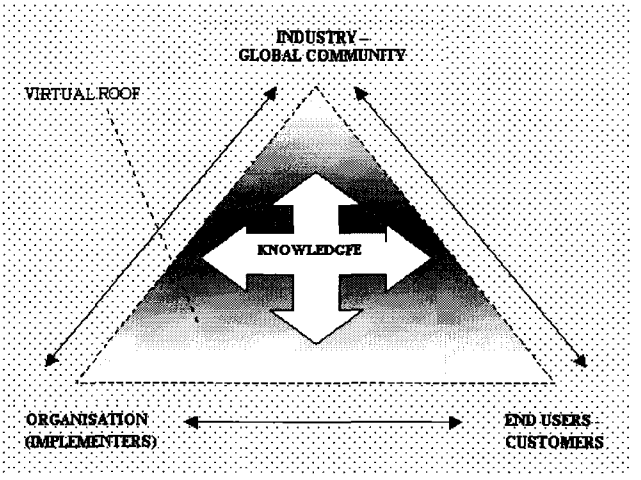
Research on large, successful open source projects, such as Linux and Apache, assumes that the size of the user-programmer community may be a key independent variable (West, 2003). Anecdotal evidence suggests that the major reason open source projects fail is due to a lack of users and contributors to do the work (West, 2003).

Figure 1 illustrates the Dafermos (2001) model. Rothfuss (2002) used this model to highlight the attributes of the virtual organization that are beneficial to the success of

open source projects. He thought that the answer to the question, "what can the virtual organization do that the physical organization can not?", lay on the fact that the virtual organization generates massive knowledge and exploits it in the most effective way by bringing the physical organization, the surrounding industry, and the end users together.

Value chain analysis can be applied to the virtual organization (Walters and Rainbird, 2007). The whole point of the approach is to identify optimal solutions that are acceptable to all stakeholders: customers, suppliers, investors, and so on. The need for agile responses to meet the increased expectations of customers results in creating virtual structures that network with each other and using or leveraging the capital investments made by their partners.

Figure 1: Knowledge exchange in a virtual organization (Rothfuss, 2002)



e-Cology Corporation (2003) found that self-sustaining OSS communities rarely emerge spontaneously. Simply releasing software as open source does not guarantee an open

source community. Proactive effort to form and incubate communities is essential to improve the odds of success. Thus, the OSS companies face a particularly important challenge: to attract enough of the right sort of users early enough to improve the quality and features of their OSS products.

Yang (2005) followed the approach in Bailetti and Callahan (1995) to develop a model that describes the structure an OSS company uses to generate sales from OSS projects. She identified that OSS community management is a key value creation process. As a virtual organization, an OSS company's community should be aware of the structure of the value adding processes within its industry and also its own location within this "structure".

Figure 2 depicts a basic OSS community with the multiple and overlapping roles played by vendors, users, consumers, and volunteers (e-Cology Corporation, 2003).

Figure 2: Basic OSS community

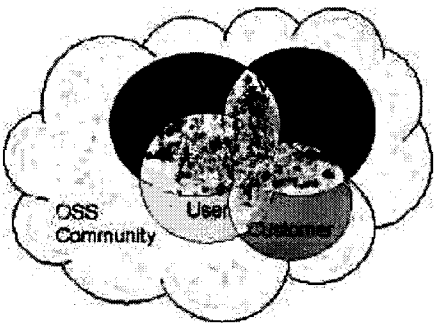


Table 10 presents a summary of the literature on open source communities.

Table 10: Literature on open source communities

Study	Highlights
von Hippel (2005)	▪ Innovation communities are defined as nodes consisting of individuals or firms interconnected by information transfer links which may involve face-to-face, electronic, or other communication. ▪ Innovation communities are often specialized, serving as collection points and repositories for information related to narrow categories of innovations. ▪ Innovation communities offer additional important functions to participants, e.g., chat rooms, email lists, tools. ▪ Innovation communities are by no means restricted to the development of OSS.
Rothfuss (2002)	▪ The open source community is influenced by mix of sociological, software engineering and economic forces. ▪ Management theory that has embraced the concept of virtual organizations can be applied to open source development community. ▪ Ticketing system provides a good framework for assigning tasks in virtual teams. (i) Ticketing system is used to keep track of open issues, bug reports, and feature requests; (ii) Ticketing system allows open source participants to learn quickly about the state of a project.
e-Cology Corporation (2003)	▪ The OSS community can help companies guide the development of software products. ▪ More community participation may be an indicator of a more sophisticated level of adoption of OSS and deeper penetration into organization culture. ▪ There may be a critical size threshold for community effectiveness. ▪ The concept of "token currency" is a key element of open source community transactions. ▪ The most common path that leverages participation in open source communities is to establishing contacts and partners through the involvement in open source projects. ▪ The development community may be chaotic and therefore unreliable. So, successfully establishing collaborative communities requires the right conditions for their startup and nurturing: (i) Key elements that should be investigated are the role, structure and governance of not-for-profit organizations, and stewards, coordinators and facilitators in the virtual commons; (ii) Government is uniquely positioned to stimulate community "aggregation"; (iii) The foundation acts as a mediating entity between OSS development communities and companies.

Yang (2005)	▪ Six agents are included in the model to describe the structure an OSS company uses to generate sales from OSS projects includes: (i) focal company; (ii) partners; (iii) resellers; (iv) OSS developers; (v) customers; (vi) venture capital firms. ▪ Key activities of the OSS community management process include: (i) Set up (e.g., decide on the OSS license) and maintain (e.g., define OS tree and roadmap, provide infrastructure) OSS project; (ii) Attract, retain and grow relationships with many skilled OSS developers who are distributed worldwide; (iii) Manage two networks of developers: (a) network of those who are paid by the company; and (b) network of developers that are volunteers; (iv) Act on the feedback from OSS community; (v) Certify OSS developers; (vi) Manage risks of OSS project dependence; (vii) Hire and motivate partners and customers to hire OSS developers; (viii) Attract and retain top management team seen as credible by OSS developers.

2.4.4 Relationships between OSS companies and their communities

OSS companies explicitly try to utilize the resources within their communities in order to create and appropriate value. Dahlander and Magnusson (2005) studied four OSS companies and identified three basic approaches that these companies used to interact with their OSS communities. They also identified a set of managerial challenges a company might encounter along with operational means an OSS company might adopt. Table 11 summarizes their key findings.

Table 11: Relationships between OSS companies and their communities (Dahlander and Magnusson, 2005)

	Symbiotic (firm gains - community gains)	**Commensalistic (firm gains - community indifferent)**	**Parasitic (firm gains - community loses)**
Nature of relationship	A company gives something to the community, which often is established by the company.	A company obtains useful input from the community.	A company obtains useful inputs from the community, while does not obey the OSS values, and rules.
Company's influence on community	High	Low	None
Managerial challenges	(i) Respecting OSS norms and values (ii) Obeying license (iii) Resource consumption of developing community	(i) Respecting OSS norms and values (ii) Obeying license (iii) Getting acceptance of the community for using its resources in commercial applications	(i) Avoiding direct conflicts
Operational means of subtle control	(i) Attracting developers (ii) Aligning different interests (iii) Resolving ambiguity about control and ownership (iv) Devoting personnel to work in communities (v) Creating and maintaining reputation (vi) Fringe benefits (vii) Interaction tools (viii) Selling development tasks	(i) Devoting personnel to work in community	

2.5 Web-based content mining

2.5.1 Content analysis of websites

The advent of universally accessible, ubiquitous organizational websites has provided scholars with an opportunity to apply methods of content analysis (Hicks et al., 2006). Content analyses of corporate websites have been conducted by Ho (1997), Liu, Arnett,

Capella, and Beatty (1997), and Perry and Bodkin (2000). Recent studies on website communication have focused on how websites are used to build relationships with stakeholders (Kent, Taylor, and White, 2003), how companies present themselves as socially responsible corporate citizens on their websites (Pollach, 2003), and how they use their websites to disclose financial information (Marston, 2003).

Ho (1997) proposed three frameworks for evaluating corporations' websites: (i) promotion of products and services; (ii) provision of data and information; and (iii) processing of business transactions.

Liu et al. (1997) analyzed the content of homepages by looking for a set of features. They identified 14 features: company overview, products and services, what is new, a search function, employment opportunities, interactive feedback, customer assistance, index and directory, financial facts, links to other sites, online business, a guest book, frequently asked questions (FAQs) and messages from the Chief Executive Officer (CEO). They organized these features into five categories: (i) promotion; (ii) provision; (iii) transactions; (iv) communications; and (v) sensationalism.

Most of these researchers' classifications were based upon marketing activity on the websites, not upon online communications. Other studies on content analysis of websites focused on companies and how they built their image and reputations online. Jo and Jung (2005) concluded that public relations seemed to be a significant function of corporate websites even more than traditional advertising or marketing.

Table 12 presents a summary of the literature on content analysis of websites.

Table 12: Literature on content analysis of websites

Study	Research purpose	Sample size	Variables studied	Analytical approach
Ho (1997)	Evaluate websites from a customer's perspective of value-added	1000 companies across 40 industries in North America	Features or functions that fit each of the purpose-value combination	A crude measure of the breadth
Jo and Jung (2005)	Compare companies' websites both in USA and South Korea to identify the differences in terms of a model of public relations	30 companies in USA and 30 companies in South Korea	Features based upon a model of public relations	Chi-square test
Kent et al. (2003)	Examine the relationship between website design and organizational responsiveness to stakeholder information needs	150 organizations	levels of resource dependency on publics	Separate *t* tests
Liu et al. (1997)	Provide valuable insight into the future trends of home page usage by large business organizations	322 companies	Main features of the home pages	The percentage distribution of main content categories
Marston (2003)	Examine the extent of financial disclosure on the Internet by leading Japanese companies	78 companies in Japan	Capital employed, turnover, profit	Kruskal-Wallis test, and Chi-square test
Perry and Bodkin (2000)	Indentify differences in marketing communications use on websites across different firms and different industries	100 companies	Product advertising, company specific advertising, sales promotion, public relations, direct marketing, etc.	An analysis of variance (ANOVA)
Pollach (2003)	Explore how companies communicate their ethical stance on their websites	6 companies	Employee diversity, environmental responsibility, philanthropy, or ethics within the organization	case studies, and cross-case analysis

2.5.2 Content mining approaches

Weiss (2005) defined the popularity of an open source project as being proportional to the number of web pages that mention this project success somehow. This popularity can be measured using web search engines to collect online data on several ideas, i.e., objective point of view, relevance, and up-to-date information. He designed a practical experiment to verify four methods of measuring the popularity of open source projects. The experimental results from quantitative analysis on open source projects showed that that backlinks counting and refined backlinks counting seemed to demonstrate relevant and sensible properties.

Hicks et al. (2006) searched for innovative keywords on firms' websites and then found that high-tech strategies can be found on known high-tech small firms but not on the control group. The hit counts for each keyword on each firm's website were obtained and normalized by the size of the website using a Google's Simple Object Access Protocol (SOAP) Application Programming Interface (API). Factor Analysis detected a pattern in use of the keywords and delineated six factors to interpret six high technology commercialization strategies used by small firms. The web searching method presented in their paper holds promise for capturing more than just business strategies, and in some circumstances, can be a cost-effective way to replace surveys and reduce respondent burden.

Table 13 presents a summary of the literature on content mining approaches.

Table 13: Literature on content mining approaches

Study	Highlights
Weiss (2005)	▪ Four methods of measuring the popularity of open source projects: (i) simple word counting: count the number of pages containing words; (ii) license-reference counting: count the number of pages containing a phrase required by the project's license; (iii) backlinks counting: count the number of hypertextual references; (iv) refined backlinks counting: subtract the total number of pages found in the project's domain from the total backlink count.
Hicks et al. (2006)	▪ Indentify a set of innovative keywords on firms' websites ▪ Obtain the number of pages mentioning the keywords ▪ Normalize the hit counts for each keyword on each firm website by the size of website ▪ Finalize a firm-by-keyword matrix ▪ Use Factor Analysis to detect a pattern in use of the keywords and classify small high-tech firms

2.6 Lessons learned from the literature review

The following lessons were learned from examining the literature:

Lesson 1: Need to examine the market offers of VC funded OSS startups

Although several researchers have studied companies' market offers based on OSS (Alam, 2006; Koenig, 2004; Pienaar, 2007), the classification of VC funded OSS startups in terms of their market offers is not known. The ways in which OSS is integrated into companies' market offers have been identified (Alam, 2006). However, the ways VC funded startups integrate OSS into their market offers are not known.

Lesson 2: Articulate the corporate identities from their websites

The official websites are very powerful vehicles to establish and manage corporate identities (Opoku 2005; Pollach, 2005; Topalian, 2003). Through their websites, organizations speak of three areas: (i) corporate design; (ii) corporate communication; and (iii) corporate behavior.

Lesson 3: Lack of content analysis research on the websites of OSS companies

Studies of websites focus on how traditional organizations build images, public relations, reputations, and marketing activities. There is a lack of content analysis research on the websites of OSS companies.

Lesson 4: Self-sustaining OSS communities rarely emerge spontaneously

The OSS community development may be chaotic and unreliable (e-Cology Corporation, 2003). The right conditions must exist for OSS communities to start and grow. Social-software-mediated web applications, such as blogs, make collaboration in OSS communities more convenient (Weber, 2006; von Hippel, 2005).

Lesson 5: Uncertainties in the VC valuation of OSS startups

It is difficult to finance small technology companies (Callahan and Charbonneau, 2003). Unknown factors affect the present value of OSS startups, and distinctly different elements affect OSS startup evaluation (Puhakka and Jungman, 2005). The business model for OSS still needs to evolve to justify VC investment.

3 RESEARCH METHOD

This chapter has three sections. The first two sections describe the unit of analysis and identify the study period. The third section describes the research method.

3.1 Unit of analysis

The unit of analysis is a VC funded startup that sells products and/or services that rely on OSS projects.

3.2 Study period

The study period is from January, 2008 to February, 2008. During this period the Google search utility was used to collect the requisite information from the websites of the companies included in the sample.

3.3 Research method

The research method used in this research is based on the method used by Hicks et al. (2006). Table 14 provides the steps carried out in this research.

Table 14: Steps in research method

Step	Activity
1. Get started	▪ Define research objective
2. Select sample	▪ Set criteria for sample selection ▪ Identify and verify the websites of OSS startups
3. Collect data	▪ Select web pages used to develop keywords ▪ Identify a list of potentially informative keywords ▪ Acquire data in terms of the frequency of occurrence of these keywords on the websites ▪ Finalize the list of keywords
4. Analyze data	▪ Use Factor Analysis to analyze data ▪ Interpret the factors that emerged from the Factor Analysis
5. Discuss results	▪ Cluster companies in terms of the factors ▪ Compare the results with those in the literature

3.3.1 Get started

The objective of this research is to classify VC funded OSS startups using the information on their market offers and businesses that is available online.

3.3.2 Select sample

The criteria used to select the sample are:

- The company was established in North America during the period from January 1, 2000 to February 1, 2008.
- The company was funded by one or more VCs.
- The company has no public offering.
- The company is not a subsidiary of a parent company.
- The company provides market offers that rely on one or more OSS projects.
- The company's website has more than ten pages and it is in English.

A database that includes VC funded OSS startups does not exist. Thus, a database of these firms was compiled using information available online. The Google search utility was used to identify VC funded OSS startups.

The following process was used to create the database:

1) Enter into the Google search utility the following phrases: "open source company", "open source firm", "open source startup", "open source software company", "open source software firm", or "open source software startup".
2) Retrieve pages that fall into two types:

   (i) pages that mention the names of an open source company. For example, on the page at http://opensource.sys-con.com/read/268326.htm, Open Source Firm Funambol Announces Bounties for its Community Code Sniper Program, the open source company Funambol was founded.

   (ii) pages that mention a list of open source companies. For example, the page at http://1vc.typepad.com/soaring_on_ridgelift/2006/08/open_source_sof.html, Open Source Software Companies, includes the names of 63 open source companies.

3) For each firm identified, use the sample selection criteria to determine whether or not it was an OSS startup. For example, according to the information on the official website, the company Adaptive Planning was founded in the United States in 2003, is not a subsidiary of a parent company, has no public offering, provides products and

services based on OSS, and the size of its website is more than ten pages. Thus, Adaptive Planning was identified as an OSS startup.

4) For each startup, determine whether or not it was a VC funded OSS startup. To accomplish this task, the researcher:

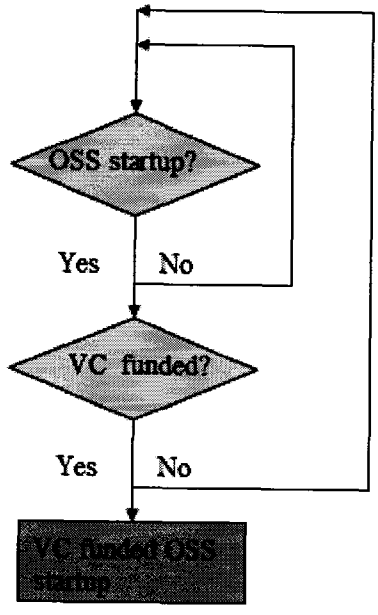
   (i) Entered "VC fund + <the name of the OSS startup>", "venture capital + <the name of the OSS startup>" into the Google search utility. The information on the search results was investigated to determine whether or not the company was a VC funded OSS startup. For example, after entering "VC fund Adaptive Planning" into the Google search utility, the page at http://www.venturedeal.com/News/2008/1/22/Adaptive-Planning-Nets-$10-Million-New-Funding, Adaptive Planning Nets $10 Million New Funding, indicated that the company, Adaptive Planning, is VC funded.

   (ii) Checked the website of each of the OSS startups. The information found on its official websites was investigated to determine whether or not the startup was a VC funded OSS startup. For example, on the official website of Adaptive Planning, the page http://www.adaptiveplanning.com/company/investors.php provides the information on the VC that invested in the company. Thus, the company was deemed to be VC funded.

If the OSS startup was found to be VC funded, it was included in the sample.

Figure 3 depicts the Google search process for VC funded OSS startups.

Figure 3: Process used to identify VC backed OSS startups



The sources of information that were used included: OSS startup websites, open source websites, online news releases, online industry reports, online academic papers and working papers.

3.3.3 Collect data

Keyword development

A list of keywords was prepared using two steps:

1) A list of potential keywords was compiled.

This set of keywords was identified using the literature on market offers and business activities that rely on OSS (Alam, 2006; Chesbrough and Appleyard, 2007; Hicks et al., 2006; Wallace, 2006).

2) The list of potential keywords was verified using the information on six OSS startups' websites.

   The pages on the startups' websites that were manually examined included:

   (i) Introductory page.

   (ii) Page that describes product/service portfolio offerings.

   (iii) Page that highlights relevant open source projects.

   (iv) Page that describes license issues.

   (v) Page that describes the startup's community or ecosystem, and partners' involvement.

   (vi) Page that describes the firm's historical background and milestones.

To perform the search, Boolean strings consistent with the requirements of the Google search utility were adopted. For instance, Boolean OR must be capitalized; "AND" is assumed; quotation marks are placed around terms to search exact phrases.

Website search and data acquisition

Data sources are the websites of the VC funded OSS startups included in the sample.

Data was collected as follows:

1) Identify keywords.

2) Identify URLs of the websites of the VC funded OSS startups.

3) From January to early February 2008, the Google search engine was used to develop a firm-by-keyword matrix. The matrix recorded the frequency of occurrence of each keyword on each company's website.

The total number of pages on the website of a startup was attained by typing " site: the URL of the target startup" into the search box and hitting the 'Enter' key or clicking on the Google Search button. For example, after " site: http://www.coupa.com" was entered into the search utility and 'Enter' was hit, the line of search statistics on the top right of the screen indicated the total number of pages, 42, as well as the time of how long the search took to complete.

The hit count of each word on each website was obtained by typing the keyword into the search box and hitting the 'Enter' key or clicking on the Google Search button. For example, after "product OR application site: http://www.coupa.com" was entered into the search utility and 'Enter' was hit, the line of search statistics on the right top indicated that 18 pages contained the term "product OR application".

3.3.4 Analyze data

The SPSS software was used to analyze the data.

To obtain a measure of frequency that was independent of the size of each company's website, the number of pages mentioning the keywords was normalized by the size of the website (Hicks et al., 2006). For example, for the startup Coupa Software, the hit count of

the keyword "product OR application" was transformed as follows: 18/42=0.43. The hit count of the keyword was 18, and the total number of pages of the website was 42. The raw firm-by-term matrix was transformed into a matrix of firm-by-keyword frequency by dividing the number of hits of a keyword by the total number of pages on the company's website.

Factor Analysis was used to analyze the data. Factor Analysis was chosen over Principal Components Analysis (PCA) because this research seeks to uncover what the underlying factor structure is. PCA is often used for the purposes of scale reduction, not factor exploration (Reise, Waller, and Comrey, 2000; Costello and Osborne, 2005). PCA became common decades ago when computers were slow and expensive to use, and it was a quicker, cheaper alternative to Factor Analysis (Gorsuch, 1990). It is computed without regard to any underlying structure caused by latent variables. In PCA, components are calculated using all of the variance of the manifest variables, and all of that variance appears in the solution (Ford, MacCallum, and Tait, 1986). Factor Analysis was used to extract as many latent factors as necessary to explain the correlations among the keywords. These factors are assumed to be the underlying causes for the inter-correlation between items (Draper, Jennings, and Barón, 2003).

If the data violates conditions of normality, Alpha Extraction was used. Alpha Factor Analysis considers relations in a population of individuals and does not consider the sampling of individuals' problem (Tucker and MacCallum, 1997). Among the choices available for extraction using non-normal variables, Alpha Extraction considers the

variables in the analysis (keywords in this case) to be a sample from the universe of potential variables (Hicks et al., 2006). The default Varimax Rotation was used to produce an orthogonal set of interpretable dimensions and uncorrelated factors. Factors with eigenvalues greater than 1.0 were retained. Coefficients over 0.40 were displayed and retained.

Keywords were dropped if they had zero variance. Keywords were dropped if they were used infrequently and the value of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy was less than 0.60 (the minimum acceptable value). Keywords were dropped if the value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy increased after they were dropped.

4 RESULTS

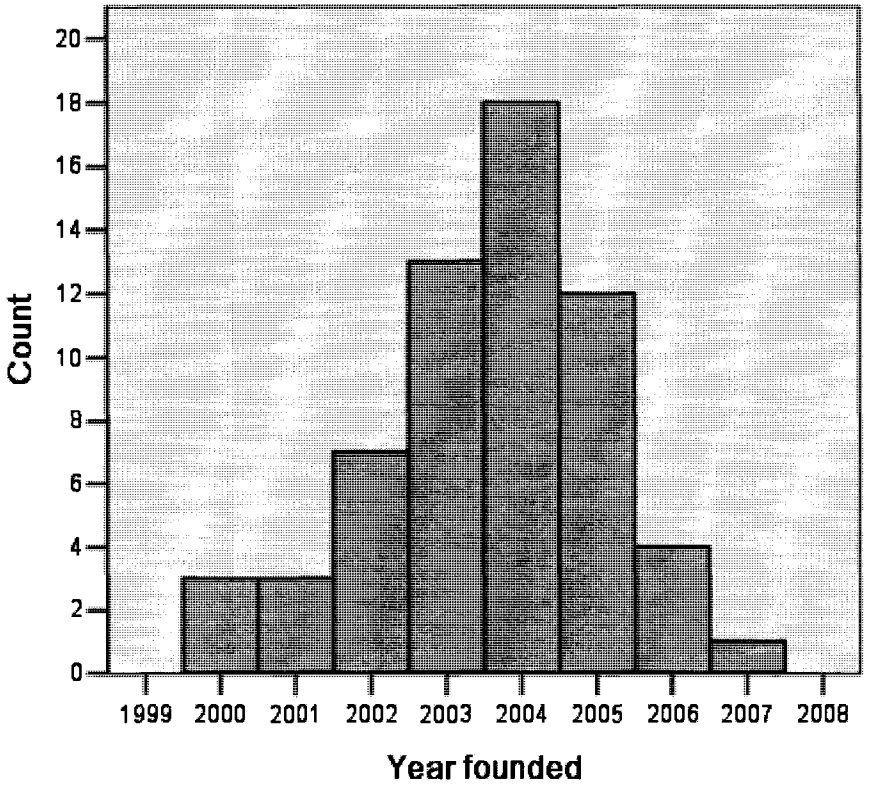
This chapter has four sections. The first section describes the sample used in this research. The second presents the descriptive statistics. The third section provides the results of the Factor Analysis. Finally, the fourth section summarizes the results.

4.1 Sample

The sample is comprised of 61 VC funded OSS startups. Appendix A provides a list of the companies in the sample. For each company, Appendix A shows the year and the place of founding, and the website address.

Figure 4 provides a bar graph of the VC funded OSS startups in the sample by the year they were founded. Figure 4 shows that more than half of the companies in the sample (n=43; 70.5%) were established in 2003, 2004 and 2005. All companies in the sample were founded in the United States.

Figure 4: VC funded OSS startups in the sample categorized by year founded



4.2 Keywords

To develop the set of keywords, the websites of six OSS startups (Krugle, Palamida, Scalix, Univa UD, Xandros and Zenoss) as well as the literature on market offers and business activities that rely on OSS (Alam, 2006; Chesbrough and Appleyard, 2007; Hicks et al., 2006; Wallace, 2006) were examined.

A total of 45 keywords were identified.

4.3 Descriptive statistics

Table 15 provides the descriptive statistics for the 45 variables that represented the keywords used in this research.

Table 15: Descriptive statistics for the variables representing keywords (sample size = 61)

	Variable	Min	Max	Mean	Std. deviation	Skewness	Kurtosis
1	product OR application	7	120,000	2,615.18	15,471.838	7.534	57.888
2	solution	0	36,400	1,056.85	5,114.282	6.243	40.778
3	product AND performance	0	7,310	190.93	943.784	7.411	56.498
4	service AND support	1	4,210	163.74	588.512	5.978	38.955
5	package OR packaging	0	82,300	1,593.82	10,548.679	7.716	59.959
6	accessory OR accessories	0	1,380	47.30	218.682	5.063	26.595
7	"open source" AND project	0	1,720,000	28,747.72	220,176.957	7.807	60.971
8	project	0	2,190,000	36,811.08	280,318.423	7.807	60.967
9	consult OR consulting	0	8,560	220.23	1,119.356	7.194	53.730
10	support	4	2,060,000	34,799.89	263,654.021	7.807	60.969
11	testing OR training	0	8,690	457.77	1,602.462	4.381	18.458
12	host OR hosting	0	6,610	315.80	1,226.922	4.538	20.103
13	subscription	0	10,400	208.44	1,330.282	7.746	60.302
14	"commercial license" OR "proprietary software"	0	1,950	37.41	249.135	7.794	60.824
15	content	0	377,000	7,598.07	48,832.671	7.486	57.201
16	"complemen-tary content"	0	0	0.00	0.000	.	.
17	incorporate OR incorpora-tion	0	4,340	80.08	555.592	7.765	60.505

18	module OR modular	0	840,000	14,654.87	107,639.291	7.766	60.517
19	integration OR integrate	0	24,700	699.75	3,341.066	6.577	46.283
20	component	0	183,000	3,076.33	23,422.425	7.809	60.982
21	hardware	1	66,400	1,221.51	8,495.769	7.779	60.656
22	Interoperability AND hardware	0	273	6.98	34.881	7.641	59.157
23	software	3	2,380,000	39,752.64	304,641.911	7.809	60.992
24	input	0	478,000	8,003.52	61,185.250	7.808	60.977
25	platform	0	148,000	2,768.36	18,964.918	7.737	60.193
26	peripheral equipment	0	5	0.18	0.695	5.889	39.560
27	network infrastructure	0	143	22.34	33.370	1.928	2.962
28	community	0	1,720,000	29,943.18	220,143.353	7.794	60.829
29	partner	1	10,100	368.00	1,458.345	5.682	34.989
30	discussion OR forum	0	49,400	1,825.84	7,455.735	5.429	31.214
31	blog	0	1,720,000	29,320.69	220,207.996	7.796	60.848
32	wiki	0	41,700	1,610.02	7,159.059	4.868	23.591
33	eco OR ecosystem	0	604	19.00	82.258	6.511	44.861
34	"user groups" OR "user group"	0	5,700	168.25	913.215	5.526	30.058
35	"mailing list"	0	15,200	347.33	2,052.737	6.778	48.002
36	"tracking tool"	0	179	3.07	22.911	7.800	60.890
37	org OR organization	1	1,720,000	28,785.21	220,159.408	7.809	60.985
38	delivery	0	24,500	489.05	3,141.243	7.695	59.727
39	download	0	1,560,000	29,201.23	200,888.536	7.632	58.961
40	channel	0	87,700	1,557.20	11,231.981	7.771	60.574
41	upgrade OR update	0	504,000	8,750.51	64,523.822	7.790	60.775
42	account AND register	0	26,100	726.67	3,835.569	5.890	35.754
43	"shopping cart"	0	2,420	43.26	309.896	7.771	60.576
44	buy OR purchase AND online	0	5,470	130.98	705.483	7.476	57.275
45	login OR "sign in"	0	1,760,000	29,271.54	225,296.995	7.810	60.992

Table 16 provides the descriptive statistics for the total number of pages on a firm's website.

Table 16: Descriptive statistics for the total number of pages on the firm's website (sample size = 61)

	Min	Max	Mean	Std. Deviation	Skewness	Kurtosis
Total pages on the firm's website	15	4,490,000	84,222.20	575,549.600	7.728	60.093

To obtain a measure of frequency independent of the size of each firm's website, variables for the keywords were transformed by the number of total pages of the firms' websites (Hicks et al., 2006). The names of these transformed variables were left unchanged.

Table 17 provides the descriptive statistics for the 45 transformed variables for the keywords.

Table 17: Descriptive statistics for the transformed variables representing keywords (sample size = 61)

	Transformed variable	Min	Max	Mean	Std. deviation	Skewness	Kurtosis
1	product OR application	0.00	0.82	0.3708	0.21415	0.021	-0.752
2	solution	0.00	0.83	0.2610	0.19107	0.722	0.242
3	product AND performance	0.00	0.37	0.0891	0.09537	1.589	1.866
4	service AND support	0.00	0.73	0.1269	0.13916	2.515	7.803
5	package OR packaging	0.00	0.66	0.0656	0.10969	4.308	20.184
6	accessory OR accessories	0.00	0.16	0.0033	0.02028	7.712	59.926
7	"open source" AND project	0.00	0.53	0.1213	0.13015	1.511	1.756
8	project	0.00	0.61	0.1690	0.14965	1.120	0.760
9	consult OR consulting	0.00	0.75	0.0935	0.14843	2.834	8.372
10	support	0.02	0.94	0.4614	0.21156	0.076	-0.159
11	testing OR training	0.00	0.83	0.1741	0.19032	1.646	2.518
12	host OR hosting	0.00	0.22	0.0432	0.04307	2.073	4.974
13	subscription	0.00	0.77	0.0549	0.10793	5.146	32.691
14	"commercial license" OR "proprietary software"	0.00	0.10	0.0140	0.02172	2.133	4.703
15	content	0.00	0.94	0.1757	0.24010	2.005	3.121
16	"complementary content"	0.00	0.00	0.0000	0.00000	.	.
17	incorporate OR incorporation	0.00	0.07	0.0102	0.01547	2.371	5.748
18	module OR modular	0.00	0.29	0.0358	0.05429	2.760	8.540
19	integration OR integrate	0.00	0.94	0.1840	0.21496	2.030	3.861
20	component	0.00	0.44	0.0512	0.07510	3.660	15.754
21	hardware	0.00	0.56	0.1154	0.11923	1.667	3.245
22	Interoperability AND hardware	0.00	0.05	0.0071	0.01118	2.174	4.733
23	software	0.04	0.99	0.4595	0.25708	0.228	-0.739
24	input	0.00	0.40	0.0349	0.05738	4.623	26.416
25	platform	0.00	0.69	0.1947	0.16419	1.063	0.741
26	peripheral equipment	0.00	0.02	0.0007	0.00325	5.478	30.372

27	network infrastructure	0.00	0.50	0.0466	0.07945	3.829	18.648
28	community	0.00	0.98	0.3690	0.30706	0.694	-0.878
29	partner	0.00	0.73	0.1487	0.13412	1.855	5.282
30	discussion OR forum	0.00	0.91	0.1295	0.21365	2.653	6.618
31	blog	0.00	0.94	0.1748	0.27769	1.623	1.423
32	wiki	0.00	0.98	0.0528	0.14876	4.933	27.311
33	eco OR ecosystem	0.00	0.07	0.0131	0.01617	1.730	2.580
34	"user groups" OR "user group"	0.00	0.02	0.0042	0.00603	1.533	1.618
35	"mailing list"	0.00	0.11	0.0059	0.01557	5.978	40.935
36	"tracking tool"	0.00	0.00	0.0001	0.00045	7.230	54.109
37	org OR organization	0.01	0.86	0.1693	0.17489	2.008	4.318
38	delivery	0.00	0.55	0.0513	0.07771	4.645	27.541
39	download	0.00	0.83	0.2429	0.22178	1.192	0.398
40	channel	0.00	0.18	0.0345	0.03838	1.829	3.578
41	upgrade OR update	0.00	0.25	0.0813	0.05698	0.887	0.241
42	account AND register	0.00	0.13	0.0130	0.02480	3.093	10.503
43	"shopping cart"	0.00	0.11	0.0040	0.01625	5.406	30.171
44	buy OR purchase AND online	0.00	0.50	0.0355	0.07347	4.714	27.325
45	login OR "sign in"	0.00	0.55	0.0958	0.13605	1.968	3.238

Alpha Extraction was used in the Factor Analysis because the data violated conditions of normality.

4.4 Factor Analysis

One transformed variable, "complementary content", was dropped because SPSS could not perform the Factor Analysis while it was included.

Six transformed variables were dropped because they were very infrequently used and made the value of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy less than

0.60. These were: accessory OR accessories, peripheral equipment, "user groups" OR "user group", "mailing list", "tracking tool", and "shopping cart".

Nineteen transformed variables were dropped because they did not effectively distinguish business operations. The value of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy increased after they were dropped. These variables were related to the following keywords: product AND performance, package OR packaging, project, support, host OR hosting, subscription, incorporate OR incorporation, module OR modular, component, input, network infrastructure, eco OR ecosystem, delivery, channel, upgrade OR update, account AND register, download, buy OR purchase AND online, and login OR "sign in".

Of the original 45 variables, 19 were used in the Factor Analysis. In this case, the subject (firm) to item (keyword) ratio (61/19) was more than 3. The minimum acceptable value is 2 (Stanek, 1993).

Table 18 presents the commonalities for the 19 variables used in the Factor Analysis. The "initial" commonalities present the percent of variance in a given variable explained by all 19 factors (one per variable). The "extracted" commonalities present the percent of variance in a given variable explained by the factors that are extracted.

Table 18: Commonalities for the variables used in the Factor Analysis with Alpha Factoring as the extraction method (sample size = 61)

NO.	Transformed variable	Initial	Extraction
1	product OR application	0.715	0.703
2	solution	0.523	0.342
3	service AND support	0.460	0.458
4	"open source" AND project	0.433	0.397
5	consult OR consulting	0.669	0.562
6	testing OR training	0.735	0.863
7	"commercial license" OR "proprietary software"	0.456	0.350
8	integration OR integrate	0.638	0.579
9	hardware	0.464	0.514
10	software	0.649	0.667
11	platform	0.612	0.611
12	community	0.503	0.685
13	partner	0.537	0.435
14	blog	0.399	0.412
15	wiki	0.343	0.381
16	discussion OR forum	0.378	0.358
17	org OR organization	0.301	0.394
18	content	0.376	0.407
19	interoperability AND hardware	0.537	0.527

Table 19 presents the results of the Kaiser-Meyer-Olkin and Bartlett's Test. The data passed the default Kaiser-Meyer-Olkin Measure of Sampling Adequacy, with a value of 0.686. The minimum acceptable value is 0.60 (Hicks et al., 2006).

Table 19: Kaiser-Meyer-Olkin and Bartlett's test (sample size = 61)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.686
Bartlett's Test of Sphericity	Approx. Chi-Square	432.120
	df	171
	Sig.	.000

Figure 5 shows that there were five factors with eigenvalues greater than 1.0.

Figure 5: Scree plot for the VC funded OSS startups (sample size = 61)

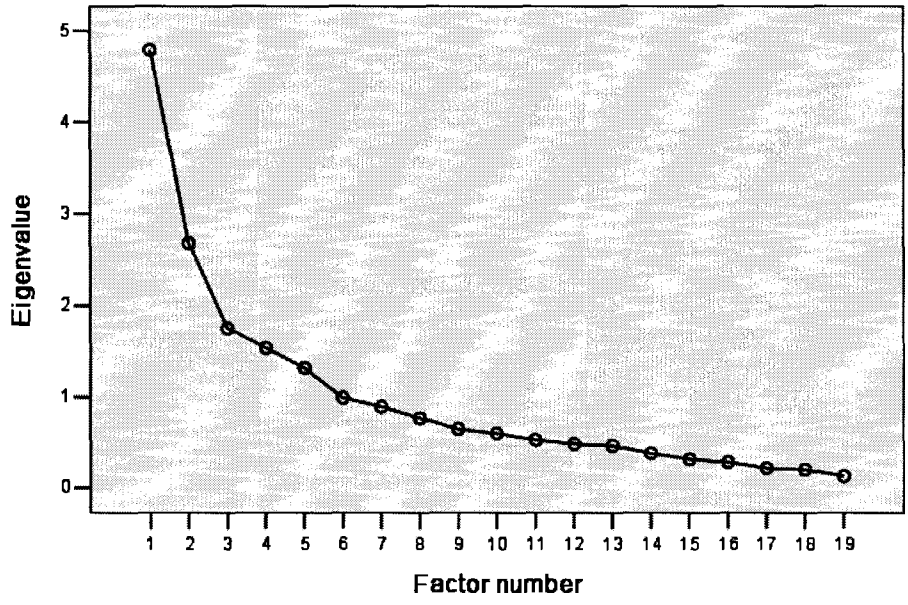


Table 20 shows that 50.7% of total variance was explained by the five factors with eigenvalue greater than 1.

Table 20: Total variance explained (sample size = 61)

Factor	Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %
1	2.920	15.3	15.3
2	2.835	14.9	30.2
3	1.419	7.5	37.7
4	1.286	6.8	44.5
5	1.184	6.2	50.7

Table 21 provides the results of the five factor solution. Table 21 shows the variables with factor loadings that were greater than 0.4.

Table 21: Results of Factor Analysis (sample size = 61)

Interpretation	Transformed variable	Factor				
		1	2	3	4	5
Factor 1 Sell products or applications that integrate OSS with proprietary software or hardware	10. software	.738				
	19. interoperability AND hardware	.704				
	11. platform	.659				
	9. hardware	.634				
	1. product OR application	.627	.419			
	2. solution	.492				
Factor 2 Provide consulting, training or testing services anchored around OSS	6. testing OR training		.922			
	5. consult OR consulting		.717			
	8. integration OR integrate		.640			
	13. partner		.524			
Factor 3 Provide support services and commercial licenses based on OSS projects	17. org OR organization			.603		
	4. "open source" AND project			.549		
	3. service AND support			.477		
	7. "commercial license" OR "proprietary software"			.413		
Factor 4 Community development through blog and wiki	14. blog				.633	
	15. wiki				.584	
Factor 5 Community development through forums	12. community					.721
	16. discussion OR forum					.572

Rotated Factor Matrix
Extraction Method: Alpha Factoring
Rotation Method: Varimax with Kaiser Normalization
Rotation converged in 7 iterations

The solution appears to be a good solution. There are three factors with more than three items loading strongly, i.e., 0.50 or greater. They are the markers of a solid factor (Costello and Osborne, 2005).

4.5 Summary of the results applied to the 61 VC funded OSS startups

For each company in the sample, Appendix B shows the company's market offers and ways it supports community development. The 61 VC funded OSS startups were organized and coded in Table 18 in terms of the results of the Factor Analysis. For example, Devicescape integrated OSS with hardware to create security applications for Wi-Fi devices (code denoted 1), and also had a community forum to enable developers to post questions and participate in discussions with other community members (code denoted 5). Thus, the company was coded as 15.

Table 22 provides the codes for each of the 61 companies in the sample. A Y in a cell included in the first three columns in Table 22 indicates that the researcher examined Appendix B and found that the company has a market offer related to Factors 1, 2 or 3. Similarly, a Y in a cell included in the last two columns in Table 22 indicates that the researcher examined Appendix B and found that the company supports community development using methods associated with Factors 4 or 5.

Table 22: Identification and classification of the 61 VC funded startups

	Company	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Code
1	ActiveGrid (WaveMaker)			Y		Y	35
2	Adaptive Planning		Y	Y		Y	235
3	Alfresco		Y	Y	Y	Y	2345
4	Appscio	Y					1
5	Astaro	Y					1
6	Automattic		Y		Y	Y	245
7	Barracuda Networks	Y				Y	15
8	BitTorrent	Y	Y				12
9	Black Duck Software		Y				2
10	Centeris			Y		Y	35
11	CIGNEX		Y			Y	25
12	Cleversafe	Y	Y			Y	125
13	Coupa Software			Y		Y	35
14	Collaborative Software Initiative		Y				2
15	Continuent		Y	Y		Y	235
16	db4objects	Y		Y		Y	135
17	Devicescape	Y				Y	15
18	EnterpriseDB			Y		Y	35
19	FiveRuns			Y			3
20	Fonality	Y					1
21	Funambol	Y		Y	Y	Y	1345
22	Greenplum		Y	Y		Y	235
23	GroundWork Open Source		Y	Y		Y	235
24	Hyperic		Y	Y		Y	235
25	JasperSoft		Y	Y		Y	235
26	Koders	Y	Y			Y	125
27	Krugle*	Y	Y				125
28	Laszlo Systems		Y	Y		Y	235
29	LucidEra			Y			3
30	MedSphere	Y		Y			13
31	MuleSource		Y	Y		Y	235
32	OpenClovis	Y	Y		Y	Y	1235
33	Open-Xchange		Y	Y	Y	Y	2345
34	Optaros		Y				2

35	Palamida*		Y				2
36	Pentaho		Y		Y	Y	245
37	PostPath	Y		Y			13
38	Qlusters	Y		Y			13
39	rPath		Y		Y	Y	245
40	Scalix*		Y	Y	Y	Y	2345
41	SiCortex	Y					1
42	SIPphone	Y					1
43	Socialtext	Y		Y	Y		134
44	SourceLabs		Y	Y		Y	235
45	SpikeSource		Y	Y		Y	235
46	Splunk		Y	Y		Y	235
47	SugarCRM		Y	Y	Y	Y	2345
48	Talend		Y	Y	Y	Y	2345
49	Terracotta		Y	Y	Y	Y	2345
50	Terascala	Y					1
51	Transera Communications	Y					1
52	Univa UD*		Y	Y	Y	Y	2345
53	Untangle	Y		Y	Y	Y	1345
54	VirtualLogix	Y	Y				12
55	VirtualIron			Y			3
56	Vyatta	Y	Y			Y	125
57	Wikia		Y		Y	Y	245
58	WS02		Y		Y	Y	245
59	Xandros*			Y			3
60	Zenoss*		Y	Y	Y	Y	2345
61	Zmanda		Y	Y	Y	Y	2345

Table 23 provides the count of the companies that have the same code. For example, there were 11 companies with code 235. This means that 11 companies had market offers that relate to Factors 2 and 3, and a way to support the community that relates to Factor 5.

Table 23: Number of companies by code

Code	Description of the code	Number of companies	Percent
1	Sell products or applications that integrate OSS with proprietary software or hardware	7	11.5%
2	Provide consulting, training or testing services anchored around OSS	4	6.6%
3	Provide support services and commercial licenses based on OSS projects	4	6.6%
4	Community development through blog and wiki	0	0
5	Community development through forums	0	0
12	Sell products or applications that integrate OSS with proprietary software or hardware; provide consulting, training or testing services anchored around OSS	2	3.3%
13	Sell products or applications that integrate OSS with proprietary software or hardware; provide support services and commercial licenses based on OSS projects	3	4.9%
15	Sell products or applications that integrate OSS with proprietary software or hardware; community development through forums	2	3.3%
25	Provide consulting, training or testing services anchored around OSS; community development through forums	1	1.6%
35	Provide support services and commercial licenses based on OSS projects; community development through forums	4	6.6%
125	Sell products or applications that integrate OSS with proprietary software or hardware; provide consulting, training or testing services anchored around OSS; community development through forums	4	6.6%

134	Sell products or applications that integrate OSS with proprietary software or hardware; provide support services and commercial licenses based on OSS projects; community development through blog and wiki	1	1.6%
135	Sell products or applications that integrate OSS with proprietary software or hardware; provide support services and commercial licenses based on OSS projects; community development through forums	1	1.6%
235	Provide consulting, training or testing services anchored around OSS; provide support services and commercial licenses based on OSS projects; community development through forums	11	18%
245	Provide consulting, training or testing services anchored around OSS; community development through blog and wiki; community development through forums	5	8.2%
1235	Sell products or applications that integrate OSS with proprietary software or hardware; provide consulting, training or testing services anchored around OSS; provide support services and commercial licenses based on OSS projects; community development through forums	1	1.6%
1345	Sell products or applications that integrate OSS with proprietary software or hardware; provide support services and commercial licenses based on OSS projects; community development through blog, wiki, and forums	2	3.3%
2345	Provide consulting, training or testing services anchored around OSS; provide support services and commercial licenses based on OSS projects; community development through blog, wiki, and forums	9	14.7%
Total		61	100%

5 DISCUSSION OF RESULTS

This chapter has four sections. The first section interprets the factors that emerged from the Factor Analysis. The second section uses a diagram that shows company clusters determined by the codes shown in Table 23. The third section compares the results from this research with those in the literature. The fourth section discusses the importance of wiki, blog and forums to community development.

5.1 Interpreting the factors

Five significant factors (i.e., eigenvalues > 1.0) emerged from the Factor Analysis performed on the publicly available data on 61 VC funded startups. Table 24 provides the researcher's interpretation of what the five factors mean and the rationales for them. The results suggest that: (i) Factors 1, 2 and 3 refer to market offers of VC funded OSS startups; and (ii) Factors 4 and 5 refer to community development.

Table 24: Interpretation of the five factors

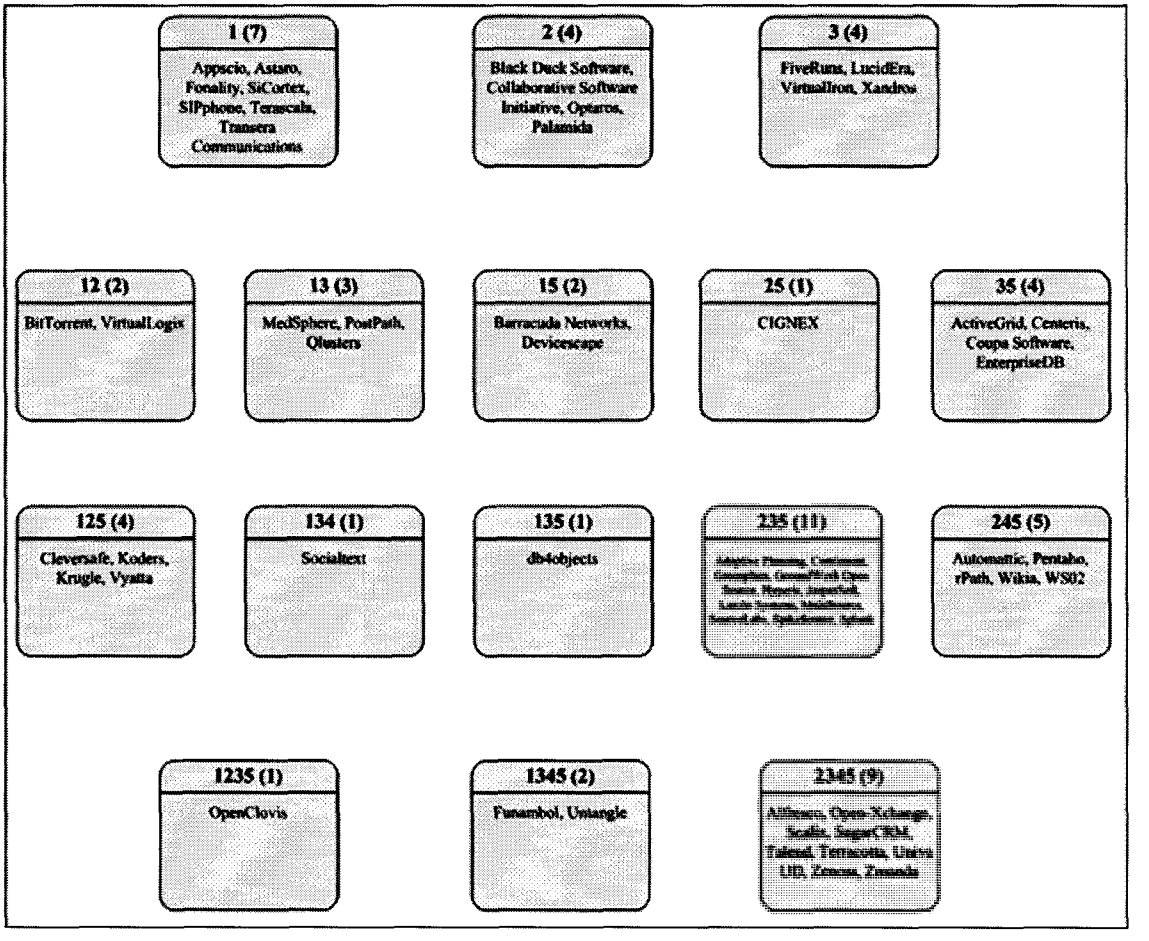
Factor	Factor represents	Rationale
1	Products or applications that integrate OSS with proprietary software or hardware.	Companies use OSS to provide lower cost solutions to customers and prototype market offers to attain a fit between their products and customer needs. OSS enables customers to switch platforms reducing vendor lock-in.
2	Consulting, training or testing services anchored around OSS. Consulting services include design, installation, configuration, deployment, maintenance, systems integration and enhancement, migration, tutorials, and documentation.	Partners help companies prototype market offers and access new markets.
3	Support services and commercial licenses based on OSS projects. Support services include fixes to the software, advice and suggestions for deploying the software in customers' environment, and customized development.	Companies create a software stack to integrate OSS or add advanced functionalities in order to develop commercial licenses.
4	Community development through content exchange.	Companies provide content in blogs and wikis to support products and applications as well as communication facilities for users to exchange ideas about product features, functionalities, benefits, documentation, questions, and incident reports. Blogs and wikis are used to provide information on products or applications.
5	Community development through communication.	Companies use forums to encourage registered users to contribute to the OSS projects upon which their products rely. Forum registration gives users access to additional features not available to guest users such as definable avatar images, private messaging, and ability to communicate via email.

5.2 Company clusters

Figure 6 shows the companies in the sample organized in clusters using the codes shown in Table 23. The first number on the top of the box refers to the code in Table 23. The

number in brackets to the right shows the number of companies in the cluster. The names of the companies in a cluster are included in the bottom part of the box.

Figure 6: VC funded OSS startups grouped using the codes in Table 23 (sample size = 61)



Twenty of the 61 companies in the sample (33%) (i) sell consulting, training and testing services; (ii) support services and commercial licenses; and (iii) provide community support. These 20 companies are included in the two clusters denoted 235 and 2345.

Twenty three of the 61 companies in the sample (38%) sell products and applications. Only seven of these companies (11% of the sample) do not sell services or develop communities while 16 do (27% of the sample). The seven companies that solely sell products and applications are included in the cluster denoted 1. Companies that sell products and applications also include those that: (i) sell services (five companies in clusters denoted 12 and 13); (ii) provide communication support (two companies in cluster denoted 15); (iii) sell consulting, training or testing services and develop communities through communications (four companies in cluster denoted 125); (iv) sell support services and commercial licenses as well as develop communities through content exchange (one company in cluster denoted 134); (v) sell support services and commercial licenses as well as develop communities with communication utilities (one company in cluster denoted 135); (vi) sell consulting, training or testing services, and services and commercial licenses as well as develop communities with communication utilities (one company in cluster denoted 1235); and (vii) sell support services and commercial licenses as well as develop communities through content exchange and communication (two companies in cluster denoted 1345).

Figure 6 indicates that clusters 4 and 5 do not exist. This means that VCs do not fund startups that solely provide community development.

Of the 61 companies in the sample, 52 sell services (85%). These companies are included in the clusters denoted 2, 3, 12, 13, 25, 35, 125, 134, 135, 235, 245, 1235, 1345, and 2345 in Figure 6.

Of the 52 companies that sell services, 41 also provide community development (79%). These companies include those in clusters denoted 15, 25, 35, 125, 134, 135, 235, 245, 1235, 1345, and 2345.

5.3 Comparison with Alam's results

Alam (2006) examined a sample of 24 OSS market offers and organized them into six types: (i) hosting and content services; (ii) training and testing services; (iii) support services; (iv) subscription services; (v) commercial licenses; and (vi) products/applications.

Factors 1, 2 and 3 shown in Table 21 refer to four types of market offers identified by Alam (2006): (i) products/applications; (ii) training and testing services; (iii) support services; and (iv) commercial licenses. Support services are often sold simultaneously with commercial licenses. These two types of market offers load on Factor 3.

Companies in Alam's sample provided hosting and content services, as well as subscription services. The results of the Factor Analysis did not identify these two types of market offers. This suggests that both of them are not mainstream market offers for VC funded OSS startups.

Table 25 identifies the types of market offers identified by Alam (2006) were obviously found in this research and what types were not obviously found.

Table 25: Comparing the results of the Factor Analysis with the market offers identified by Alam (2006)

Identified by both Alam (2006) and results of the Factor Analysis	Identified by Alam (2006) and not by the results of the Factor Analysis
▪ Factor 1: Products or applications ▪ Factor 2: Consulting, training and testing services ▪ Factor 3: Support services and commercial licenses	▪ Hosting and content services ▪ Subscription services

Alam (2006) grouped the ways OSS is integrated into market offers into four cells: Minimal-No, Minimal-Yes, Comprehensive-No, and Comprehensive-No. The results of this research suggest that Factor 1 falls into the Comprehensive-Yes cell. This means that OSS is tightly integrated with proprietary assets to create the market offers, and OSS contributes significantly to the firm's market offers.

Factors 2 and 3 fall into the Minimal-Yes cell, where OSS is minimally integrated with the proprietary assets of the firm and OSS contributes significantly to the value of the market offers.

Table 26 identifies the links between the results of the Factor Analysis and the results identified by Alam (2006).

Table 26: Comparing the results of the Factor Analysis with the ways to integrate OSS identified by Alam (2006)

Identified by both Alam (2006) and results of the Factor Analysis	**Identified by Alam (2006) and not by the results of the Factor Analysis**
Factor 1: ▪ Comprehensive-Yes (vii) OSS is integrated with proprietary software and/or hardware to create a product or application, e.g., Astaro, Barracuda Networks, Cleversafe, Fonality (ix) The company uses OSS to seed demand for the company's proprietary application, e.g., Appscio, BitTorrent	▪ Minimal-No (i) OSS is used as one of the components to the network that delivers the hosting and content services ▪ Comprehensive-No (vi) OSS is integrated with proprietary software or hardware into an interface module that is a small part of the product ▪ Comprehensive-Yes (viii) The company integrates OSS with network infrastructure to provide subscription services (x) The company integrates OSS with other complementary products to work together as a system; OSS community develops complementary content that is required by the software
Factor 2: ▪ Minimal-Yes (ii) OSS is used to anchor training or testing services, e.g., Alfresco, CIGNEX, Talend	
Factor 3: ▪ Minimal-Yes (iii) The company uses OSS projects it established to create attractive market offers, e.g., VirtualIron, GroundWork Open Source (iv) The company integrates software from OSS projects established by others and proprietary software from other companies into a stack, adds advanced functionalities such as management capabilities to the software, perform tests, and certify the integrated software, e.g., Continuent, EnterpriseDB, FiveRuns (v) The company incorporates OSS from partner companies, and uses commercial and trademark licenses as its market offer, e.g., db4objects, LucidEra	

The results of this research suggest that no matter how extensive OSS was integrated with the proprietary assets (comprehensive or minimal) OSS contributed significantly to the market offers of the VC funded startups.

The results of this research also suggest that VC funded OSS startups rarely sold content services, and did not tend to integrate OSS with proprietary software or hardware into an

interface module, create infrastructures that provide extra added services and functionalities, or integrates OSS with other complementary products to work together as a system.

5.4 Importance of wiki, blog and forums to community development

This research finds that Factors 4 and 5 refer to community development through content exchange and communication. By using wikis, blogs and forums the OSS companies can create and transfer community values (Fitzgerald, 2006) to themselves and their customers.

Wikis, blogs and forums are important for five reasons. First, they lower the cost of software development. Wikis, blogs and forums enable the close-to-costless information flow within the community (Bitzer, Schrettl, and Schröder, 2007). This is a key characteristic of the open source development process. Information about new or ongoing OSS projects, feature requests, functionalities, benefits, documentation, questions, incident reports, bug reports and bug fixes is compiled on wikis, blogs and forums to support the distribution of code, and facilitate technology transfer within the community.

Second, wikis, blogs, and forums reduce the cost and risk for customers. Wikis, blogs and forums help customers reduce deployment, maintenance and support costs by simplifying application access to seek and utilize diverse internal and external information sources. They also reduce transaction risks by providing transparent information about the

contracts for buyers and sellers, and making customers feel secure when adopting open source products.

Third, wikis, blogs and forums help companies build their brands. Wikis, blogs and forums enable companies to increase customers' loyalty for their products.

Fourth, wikis, blogs and forums help companies increase their market share. They help companies create marketplaces for add-ons, support, and other related products and services. They also contribute to making it more difficult for competitors to enter the market.

Fifth, web analytics tools attached to wikis, blogs and forums can help indentify trends relevant to the company. Web analytics on wikis, blogs and forums can help indentify trends in the activities of users, customers, and developers.

5.5 Firm age

Figure 4 shows that 70.5% of the VC funded OSS companies in the sample are three to five years old. This suggests that VCs are not as interested in funding OSS companies that are lees than three years old and over five years old.

Sample selection criteria used in this research required firms to be not older than eight years. This is consistent with the literature. Sauermann and Cohen (2008) indicated that firm age used to define startups is less than six years. Taymaz and Köksal (2006) took

seven years as the acceptable age for startups. Ghobros (2006) used eight years as the acceptable age for software startups.

5.6 Why more services than products

The results of this research find that a greater number of VC funded OSS startups sell services than products and applications. Two reasons may explain this finding. First, when the product or technology becomes a commodity the value to the customer moves up the value chain. Thus, for many VC funded companies to compete effectively they must sell high quality services.

The second reason that OSS companies that sell services may be attractive to VCs is the fact that they do not have to fund expensive R&D programs. The rate of return on the investment in these companies is higher and the time-to-cash is decreased.

6 CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

This chapter has three sections. The first section describes the conclusions drawn from this research. The second section identifies the limitations of this research. Finally, the third section provides suggestions for future research.

6.1 Conclusions

This research uses a data mining process to classify 61 VC funded OSS startups using the information about their market offers and business activities published on their websites.

The main conclusions that can be drawn from this research are:

1. VC funded OSS startups seek to concurrently add value to their customers as well as the communities anchored around the OSS projects and customers on which their market offers rely.
2. The market offers of VC funded OSS startups can be categorized into three groups: (i) products and applications; (ii) consulting, training and testing services; and (iii) commercial licenses and support.
3. A greater number of VC funded OSS startups sell services than products and applications. Most startups that sell products or applications, also sell services. VCs are funding OSS startups for reasons other than their R&D capability.
4. Community growth is important to the market offers of VC funded OSS startups. VC funded OSS startups depend on the support of the developer community.

5. Factors 1, 2 and 3 refer to four of the six types of market offers identified by Alam (2006): (i) products and applications; (ii) training and testing services; (iii) support services; and (iv) commercial licenses.
6. This research also supports Alam's (2006) classification of the ways companies integrate OSS into market offers. Factor 1 falls into the cell of Comprehensive-Yes, and includes two ways in which OSS is integrated into market offers: (i) OSS is integrated with proprietary software and hardware to create a product or application; and (ii) the company uses OSS to seed demand for the company's proprietary application. This research finds that Factors 2 and 3 fall into the cell of Minimal-Yes, and include four ways in which OSS is integrated into market offers: (i) OSS is used to anchor training or testing services; (ii) the company uses OSS projects it established to create attractive market offers; (iii) the company integrates software from OSS projects established by others and proprietary software from other companies to add advanced functionalities; and (iv) the company incorporates OSS from partner companies, and uses commercial and trademark licenses as its market offer.

6.2 Limitations

The first limitation is that this research relies on secondary sources of data, e.g., information on companies' websites. This approach is limited because it can not be used to assess topics such as executives' motivations.

The second limitation is that the results of this research depend on the predefined keywords. A different set of keywords may lead to different results.

The third limitation is that this research only included VC funded OSS startups established in the United States. It is difficult to generalize the results reported in the thesis to VC funded OSS startups in regions outside of the United States.

6.3 Suggestions for future research

There are five suggestions for future research. First, future studies can examine the relationship between the market offers of VC funded OSS startups and the size of the developer community by testing hypotheses. These hypotheses may examine the relationship between the number of developers that contribute to an OSS project and the number of companies that sell products and services that rely on the OSS.

Second, researchers can compare market offers across different geographical areas.

Third, future research may use case studies to examine how VC funded companies create, appropriate, and expand value.

Fourth, researchers can classify VC firms that invest in OSS using the method used in this research.

Fifth, OSS companies can be classified using cluster analysis instead of the method used in this research and the results obtained can be compared.

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APPENDICES

Appendix A: List of the 61 VC funded OSS startups included in the sample

	Company name	Year founded	Place founded	Website
1	ActiveGrid (WaveMaker)	2003	San Francisco, CA 94105, USA	www.wavemaker.com
2	Adaptive Planning	2003	Mountain View, CA 94040, USA	www.adaptiveplanning.com
3	Alfresco	2005	Palo Alto, CA 94301, USA	www.alfresco.com
4	Appscio	2006	Sunnyvale, CA 94085, USA	appscio.com
5	Astaro	2000	Burlington, MA 01803, USA	www.astaro.com
6	Automattic	2005	San Francisco, CA 94105, USA	automattic.com
7	Barracuda Networks	2002	Campbell, CA 95008, USA	www.barracudanetworks.com
8	BitTorrent	2004	San Francisco, CA 94105, USA	www.bittorrent.com
9	Black Duck Software	2002	Waltham, MA 02451, USA	www.blackducksoftware.com
10	Centeris	2004	Bellevue, WA 98007, USA	www.centeris.com
11	CIGNEX	2000	Santa Clara, CA 95054, USA	www.cignex.com
12	Cleversafe	2004	Chicago, IL 60616	www.cleversafe.com
13	Coupa Software	2006	Foster City, CA 94404, USA	www.coupa.com
14	Collaborative Software Initiative	2007	Portland, OR 97239, USA	www.csinitiative.com
15	Continuent	2004	San Jose, CA 95128	www.continuent.com
16	db4objects	2004	San Mateo, CA 94403	www.db4o.com
17	Devicescape	2001	San Bruno, CA 94066	www.devicescape.com
18	EnterpriseDB	2004	Edison, NJ 08837-2210, USA	www.enterprisedb.com
19	FiveRuns	2005	Austin, TX 78730, USA	www.fiveruns.com
20	Fonality	2003	Los Angeles, CA 90230, USA	www.fonality.com
21	Funambol	2002	Redwood City, CA 94063, USA	www.funambol.com
22	Greenplum	2003	San Mateo, CA 94403, USA	www.greenplum.com
23	GroundWork Open Source	2004	San Francisco, CA 94107, USA	www.groundworkopensource.com
24	Hyperic	2004	San Francisco, CA 94105, USA	www.hyperic.com

25	JasperSoft	2004	San Francisco, CA 94107, USA	www.jaspersoft.com
26	Koders	2004	Santa Monica, CA 90403, USA	www.koders.com
27	Krugle*	2005	Menlo Park, CA 94025, USA	www.krugle.com
28	Laszlo Systems	2000	San Mateo, CA 94403, USA	www.laszlosystems.com
29	LucidEra	2005	San Mateo, CA 94404, USA	www.lucidera.com
30	MedSphere	2002	Aliso Viejo, CA 92656, USA	www.medsphere.com
31	MuleSource	2006	San Francisco, CA 94105, USA	www.mulesource.com
32	OpenClovis	2002	Petaluma, CA 94954, USA	www.openclovis.com
33	Open-Xchange	2005	Tarrytown, NY 10591, USA	www.open-xchange.com
34	Optaros	2004	Boston, MA 02108, USA	www.optaros.com
35	Palamida*	2003	San Francisco, CA 94105, USA	www.palamida.com
36	Pentaho	2004	Orlando, FL 32822, USA	www.pentaho.com
37	PostPath	2003	Mountain View, CA 94041-1106, USA	www.postpath.com
38	Qlusters	2001	Palo Alto, CA 94304, USA	www.qlusters.com
39	rPath	2005	Raleigh, NC 27607, USA	www.rpath.com
40	Scalix*	2002	New York, NY 10016, USA	www.scalix.com
41	SiCortex	2003	Maynard, MA 01754, USA	www.sicortex.com
42	SIPphone	2003	San Diego, CA 92121, USA	www.sipphone.com
43	Socialtext	2003	Palo Alto, CA 94301, USA	www.socialtext.com
44	SourceLabs	2004	Seattle, WA 98104, USA	www.sourcelabs.com
45	SpikeSource	2003	Redwood City, CA 94063, USA	www.spikesource.com
46	Splunk	2004	San Francisco, CA 94107, USA	www.splunk.com
47	SugarCRM	2004	Cupertino, CA 95014, USA	www.sugarcrm.com
48	Talend	2006	Los Altos, CA 94022, USA	www.talend.com
49	Terracotta	2003	San Francisco, CA 94103, USA	www.terracottatech.com
50	Terascala	2005	Avon, MA 02322, USA	www.terascala.com

51	Transera Communications	2004	Sunnyvale, CA 94087, USA	www.transerainc.com
52	Univa UD*	2004	Lisle, IL 60532, USA	www.univaud.com
53	Untangle	2003	San Mateo, CA 94403, USA	www.untangle.com
54	VirtualLogix	2002	Sunnyvale, CA 94089, USA	www.virtuallogix.com
55	VirtualIron	2003	Lowell, MA 01851, USA	www.virtualiron.com
56	Vyatta	2005	San Mateo, CA 94002, USA	www.vyatta.com
57	Wikia	2004	San Mateo, CA 94401, USA	www.wikia.com
58	WS02	2005	Mountain View, CA 94041, USA	wso2.com
59	Xandros*	2001	New York, NY 10016, USA	www.xandros.com
60	Zenoss*	2005	Annapolis, MD 21401, USA	www.zenoss.com
61	Zmanda	2005	Sunnyvale, CA 94086, USA	www.zmanda.com

Appendix B: List of companies' market offers and community development activities

	Company	Year	Place	Market offers	Community development
1	ActiveGrid (WaveMaker)	2003	CA, USA	▪ Products/Applications: OS license (AGPL v3), and commercial license ▪ Support: services and support that enterprises require	▪ Community, forum
2	Adaptive Planning	2003	CA, USA	▪ Products: express edition (OS/GPL), corporate edition, enterprise, Software as a service (SaaS) solution ▪ Services: implementation, training, and support ▪ Product support: community support, standard support, and premium support	▪ Community
3	Alfresco	2005	CA, USA	▪ Products: Alfresco enterprise, and Alfresco community (GPL) ▪ Services; a range of support options; a full range of training services; a full range of consulting and professional services offerings	▪ Community, forum ▪ Wiki, blog
4	Appscio	2006	CA, USA	▪ Products: a services platform to organize raw video streams, either live or recorded, into structured, coherent and actionable information	
5	Astaro	2000	MA, USA	▪ Products: Astaro Security Gateway, Astaro Command Center, Astaro Report Manager, Astaro VPN Clients	
6	Automattic	2005	CA, USA	▪ Support; services for WordPress and WordPress MU (Multi-User) through the Automattic Support Network (basic, premium) ▪ Advanced services: WordPress.com premium features, WordPress.com VIP hosting	▪ Codex community, forum ▪ Wiki, blog
7	Barracuda Networks	2002	CA, USA	▪ Products: Barracuda Spam Firewall, Barracuda Web Filter, Barracuda IM Firewall, Barracuda Load Balancer, Barracuda Message Archiver, Web Application Controllers	▪ Community, forum

8	BitTorrent	2004	CA, USA	▪ Products: BitTorrent SDK for devices ▪ Services: delivering high-quality files and an online destination for downloadable and ad-supported streaming entertainment content @ Torrent Entertainment Network; content delivery service through BitTorrent DNA ▪ Test service through BitTorrent Certified	▪ Client forum
9	Black Duck Software	2002	MA, USA	▪ Products: Code Center, protexIP, protexIP/sdk, exportIP, transactIP ▪ Professional services ▪ Training ▪ Customer support	
10	Centeris	2004	WA, USA	▪ Products (Solutions): Likewise Open (OS/ GPL), Likewise Enterprise ▪ Support offerings: pre-sales support, silver support, and gold support	▪ Community, bug tracking via Bugzilla
11	CIGNEX	2000	CA, USA	▪ Solutions: Web content management, Intranets and collaboration, document management, records management, portals, and content intelligence ▪ Services: consulting, design, migration, development, maintenance, integration, support, training	▪ Community, blog
12	Cleversafe	2004	IL, USA	▪ Products: three components that form a Dispersed Storage Network (dsNet) ▪ Solutions ▪ Support: customer support, training & education, and documentation	▪ Community, forum, blog
13	Coupa Software	2006	CA, USA	▪ Products: unlimited, premier, standard, basic, express (OS/GPL) ▪ Support: support center	▪ Community, forum
14	Collaborative Software Initiative	2007	OR, USA	▪ Services: collaboration & community building, project management, technical support & maintenance, OSS foundation development & management	

15	Continuent	2004	CA, USA	▪ Products: Continuent™ uni/cluster - middleware ▪ Support: self-service portal, support levels (basic support, extended support, enterprise support, custom support), consulting services	▪ Community, issue tracking via JIRA
16	db4objects	2004	CA, USA	▪ Solutions: mobile carriers, navigation and telematic systems, network and transportation control systems, devices and equipment, mobile enterprise ▪ Products: db4o database runtime engine, db4o Replication System (dRS), ObjectManager, XtremeConnect (commercial packages: dDN Enterprise, Commercial db4o Runtime Licenses) ▪ Support and software maintenance: db4o Developer Network (dDN)	▪ Community, forum
17	Devicescape	2001	CA, USA	▪ Products: Devicescape Security for home Wi-Fi, Devicescape Security for enterprise Wi-Fi, and Devicescape Connect for commercial and free/open (GPL) hotspots ▪ Services: professional services to help device manufacturers get their products to market, and assist in porting and integrating our Devicescape technology into the device design ▪ Support: assistance that includes telephone and email consultation, web forums, and training, updates with additional features, patches, and technical notes are available to customers with active maintenance agreements, and technical support web portal for licensed customers	▪ Community, forum, blog

18	EnterpriseDB	2004	NJ, USA	▪ Products: Postgres Plus (basic/premium), Postgres Plus Advanced Server (Postgres Plus Advanced Server (developer-free/subscription) ▪ Support: learning center ▪ Services: support services, professional services (daily DBA, fast track deployment, Postgres health check, Postgres Plus performance tuning replication set-up, high-availability set-up, custom services) ▪ Training: training courses to developers and DBAs on a wide variety of topics: database administration, database troubleshooting, database replication, database design, and server-side programming	▪ Community, forum, blog
19	FiveRuns	2005	TX, USA	▪ Products: RM-Manage (hosted product-a web-based), and RM-Install (OS/Apache License 2.0) ▪ Support	
20	Fonality	2003	CA, USA	▪ Products: PBXtra (standard, professional, and call centers), HUD (personal-free, team, and agent) ▪ Solutions: call centers, business communication solutions for SMBs ▪ Support: free installation support, 24x7 emergency support, free software updates, paid support, and annual software maintenance and support pricing	

21	Funambol	2002	CA, USA	▪ Products: community edition (OS/ GPL), and the commercial carrier edition ▪ Industry solutions: push email for the mass market, mobile backup & PIM sync, device management and an open source platform to mobilize applications and data for several types of organizations, including service providers, OEMs, ISVs, and ODMs and enterprises ▪ Services: consulting services, training (KickStart package), support options (annual software maintenance and technical support & community support)	▪ Community, forum ▪ Wiki, blog
22	Greenplum	2003	CA, USA	▪ Products: Greenplum database (commercial), Bizgres (OS/BSD) ▪ Support: Free support for 30 days, standard and enterprise support ▪ Services: accessible via Greenplum Network (GPN) -- Resource Center ▪ Education ▪ Consulting ▪ Industry solutions: financial services, communications & media, retail, manufacturing, government, transportation, Web analytics	▪ Community, forum
23	GroundWork Open Source	2004	CA, USA	▪ Solutions: GroundWork Monitor (proprietary products like HP OpenView Operations or BMC Patrol ▪ Products: enterprise, professional, and community (OS/GPL v2) ▪ Services & support: standard, premier (24x7), web-based GroundWork connect, professional services ▪ Training: full schedule, getting started with GroundWork, hosting monthly live webcast sessions	▪ Community, forum

24	Hyperic	2004	CA, USA	▪ Products: Hyperic HQ (OS/GPL-silver), Hyperic HQ Enterprise (gold/diamond), SIGAR (System Information Gatherer and Reporter/OS/GPL), Plugin Reference Library (HyperFORGE) ▪ Support: community support, subscription support (silver/gold /diamond), enterprise updates, onsite support & training ▪ Training: Hyperic 101, Hyperic custom training	▪ Community, forum
25	JasperSoft	2004	CA, USA	▪ Products: JasperServer professional, JasperSoft BI suite, JasperServer community edition and JasperReports community edition (OS/GPL) ▪ Technical support: per-incident and annual subscriptions ▪ Professional services: consultance, JasperSoft BI suite jumpstart, workshop ▪ Training: convenient online or on-site education, JasperSoft BI suite training, JasperServer training, course	▪ Community, forum, bug tracker
26	Koders	2004	CA, USA	▪ Products: Koders.com (free/Open Source Code search), Koders Pro, Koders enterprise edition, and plug-in for the IDE Eclipse and an add-in for Microsoft Visual Studio ▪ Support: Koders forums, FAQs, online help (major and minor updates, documentation), feedback	▪ Community, forum, blog
27	Krugle*	2005	CA, USA	▪ Products: Krugle enterprise, Krugle DevNetwork, Krugle public (OS/AGPL v3) ▪ Support: online support, telephone support, support packages (evaluations/basic/premium), support priority (P1/P2/P3/P4)	▪ Community, forum, blog

28	Laszlo Systems	2000	CA, USA	▪ Products/applications: Laszlo Webtop (service providers/enterprises/developers), OpenLaszlo (GPL), Laszlo Mail (commercial applications) ▪ Services: professional services (laszlo studios/consulting packages), OpenLaszlo training (online workshop/OpenLaszlo fundamentals/building OpenLaszlo applications/onsite training), support programs (Laszlo developer network: standard developer, premium developer, enterprise developer), developer incident support	▪ Community, forum
29	LucidEra	2005	CA, USA	▪ Products/applications: LucidEra enterprise, LucidEra for Salesforce.com (integration into Salesforce.com), LucidEra for Oracle order management, on-demand analytics platform ▪ Solutions: sales (CRM systems/sales questions), sales operations (sales operations questions), finance (financial systems, finance questions), IT ▪ Services: Service Level Agreement (application availability and uptime guarantee/maintenance/upgrade schedule), phone support, security, privacy	
30	MedSphere	2002	CA, USA	▪ Products: OpenVista™ for the enterprise, OpenVista™ for the clinic, OpenVista Clinical Information System (CIS) (MSPL), OpenVista Server (GPL) ▪ Services: implementation, training, support, development	
31	MuleSource	2006	CA, USA	▪ Products: Mule Enterprise Service Bus (ESB, silver/gold/platinum), Mule community edition (OS/GPL v2), Mule Galaxy SOA governance platform, Mule Saturn Data monitoring platform, MULE HQ, Mule IDE ▪ Services: subscriptions, education, consulting, support tiers, Quickstart program	▪ Community, forum

32	OpenClovis	2002	CA, USA	▪ Products: OpenClovis Application Service Platform, OpenClovis IDE ▪ Support & services: tech support (standard/professional/enterprise), training, consulting services	▪ Community
33	Open-Xchange	2005	NY, USA	▪ Products: Open-Xchange community edition (OS/GPL v2), Open-Xchange express edition, Open-Xchange server, Open-Xchange hosting edition, Open-Xchange mobility solutions ▪ Services: support offerings (maintenance subscription/installation support/advanced support), additional support (maintenance portal) ▪ Training: administration workshop, administration module, user workshop	▪ Community, forum ▪ Wiki
34	Optaros	2004	MA, USA	▪ Solutions: solutions by industry ▪ Approaches: designing enterprise applications, rapid design of customer-facing applications, benefits of user experience design ▪ Assembly methodology: blueprint assembly, solution assembly, support (a variety of support plans), integrated assembly environment (wiki-based content repository	
35	Palamida*	2003	CA, USA	▪ Products: IP amplifier, IP authorizer ▪ Services: vulnerability reporting audits (vulnerability reporting), M&A audits (M&A solution), enterprise audits, and QuickStart services ▪ Support; ramp and go support package, plus and premier corporate support packages (annual subscription)	
36	Pentaho	2004	FL, USA	▪ Products: Pentaho Open BI Suite (OS/MPL 1.1) ▪ Services: professional support (gold/platinum), training, consulting (business consulting/technical consulting), ISV/OEM support, services, WebEx event center	▪ Community, forum ▪ Wiki

37	PostPath	2003	CA, USA	▪ Products: PostPath Server (a commercial product), PostPath WebMail, PostPath Server VMware Edition (free) ▪ Solutions: exchange replacement solutions, archiving and anti-virus, storage, lean infrastructure ▪ Support: support options (free support/standard support/enhanced support)	
38	Qlusters	2001	CA, USA	▪ Products: openQRM OS license (modified MPL), and commercial license ▪ Support: hotline, on-line customer support system	
39	rPath	2005	NC, USA	▪ Products: rBuilder (GPL), rPath appliance platform (GPL) ▪ Services: consulting services ▪ Support: standard and premium, online issue tracking system, documentation wiki, hardware support ▪ Training: application packaging and appliance building methodology	▪ Community, forum ▪ Wiki
40	Scalix*	2002	NY, USA	▪ Products: enterprise edition, small business edition, community edition (OS/SPL), hosted edition, univention edition ▪ Support: technical training, on-site employment services, and 24x7 Premium Support plan (Post-development)	▪ Community, forum ▪ Wiki
41	SiCortex	2003	MA, USA	▪ Products: SC5832 (The SiCortex SC5832 is the first computer architecture to recognize that high sustained performance and low power are synergistic, not antagonistic.), SC1458, SC648, SC072 ▪ Support: login	
42	SIPphone	2003	CA, USA	▪ Products: VoIP hardware ▪ Support: knowledgebase, forum	
43	Socialtext	2003	CA, USA	▪ Products: Socialtext wiki enterprise, professional, personal, OS (CPAL/Artistic License 2.0) ▪ Support: customer login	▪ Wiki, blog

44	SourceLabs	2004	WA, USA	▪ Products: SourceLabs self-support suite, Sash 2.0 developer (commercial), Sash 2.0 (OS/GPL) ▪ Support: SourceLabs self support suite for Linux and Open Source Java (intro offer/fully supported: annual subscription), SourceLabs continuous support system (CS2), Open Source Management System (OSMS), Sash 2 - Java development stack ▪ Solutions: SourceLabs continuous support solution for java middleware	▪ Community
45	SpikeSource	2003	CA, USA	▪ Applications/solutions: Intel® Certified solutions program, SpikeSource solutions factory, Open Source Apps for Windows Server 2008 (Free), SuiteTwo - Powered by Intel (From $2495/hosted or from $990/software only), Drupal SpikeIgnited, SpikeSource solutions for email, calendaring and collaboration, Centric CRM SpikeIgnited solution, JasperSoft SpikeIgnited BI suite ▪ Support is incorporated in the solutions	▪ Community, forum
46	Splunk	2004	CA, USA	▪ Products: Splunk free/enterprise ▪ Applications: availability, security, compliance, BI ▪ Support: community support, enterprise support, global support (priority levels: P1-P4) ▪ Education programs: self-guided, instructor-led, certification tracks ▪ Professional services: installation and configuration services (e.g., $2,000 per day), customization services, design services, integration services	▪ Community, forum

47	SugarCRM	2004	CA, USA	▪ Products: Sugar community (OS/GPL v3), Sugar enterprise (on-site), Sugar professional (on-site), Sugar on-demand (host/enterprise/professional) ▪ Customer support: case management, inbound email, knowledgebase, bug tracking, self-service portal ▪ Services: support services (standard support/extended support/premium support), implementation services, professional services, sugar network ▪ Training: online library, learning, sessions, classroom, sugar university offerings	▪ Community, forum ▪ Wiki
48	Talend	2006	CA, USA	▪ Products: Talend open studio (OS/GPL v2), Talend integration suite, Talend on demand (SaaS: silver support/gold support/silver support) ▪ Solutions: operational data integration, data migration, data synchronization, ETL for BI and data warehousing ▪ Support: technical support (silver support/gold support/silver support) ▪ Training: Talend foundation class, Talend advanced class ▪ Services: Talend POC program, Talend quick start program, Talend expert program, Talend project program, Talend deployment program, Talend quality insurance program	▪ Community, forum, bug tracker ▪ Wiki, blog
49	Terracotta	2003	CA, USA	▪ Products: subscription (OS version (TPL)/commercial version), ▪ Services: a service level (silver/gold), training (standard training/custom courses and onsite courses/certification program), developer support (jump start/enterprise project/enterprise unlimited), consulting (quick start/prime time/enterprise analysis)	▪ Community, forum ▪ Wiki, blog

50	Terascala	2005	MA, USA	▪ Products: The Terascala RTS 1000 run time storage appliance + service and support (one year service and support contract) ▪ Support: online support, superior technical support	
51	Transera Communications	2004	CA, USA	▪ Products: Seratel™ - on-demand virtual call center software (enterprises/outsourcers/service providers) ▪ Services: customer support (gold/standard), support login, deployment, consulting, training	
52	Univa UD*	2004	IL, USA	▪ Products: UniCluster express (free, community-enabled OS cluster management product), UniCluster Pro packs, Grid MP (OS), Insight ▪ Solutions: clusters, desktops, grids, reporting & analytics ▪ Services & support: service offerings (grid assessment/grid and cluster implementation/grid and cluster application adaptation), support offerings (gold/platinum/customer portal) ▪ Training: cluster and grid overview, tools and administration, developer academy, installation training, system administration training, application enablement training, support services training, workshop	▪ Community, forum ▪ Wiki, blog
53	Untangle	2003	CA, USA	▪ Products: the Untangle gateway platform (OS/GPL v2), Untangle professional package, Kaspersky Virus Blocker, Pre-Installed Untangle Servers, applications (OS/commercial add-on) ▪ Support: documentation, Untangle forums, user mailing list or IRC channel	▪ Community, forum, mailing list, IRC (Internet Relay Chat) ▪ Wiki, blog
54	VirtualLogix	2002	CA, USA	▪ Products: VirtualLogix™ VLX, VLX for Network Infrastructure, VLX for Mobile Handsets, VLX Embedded, VLX Developer ▪ Services: customer project, consulting, training; ▪ Support: standard support, platinum support	

55	VirtualIron	2003	MA, USA	▪ Solutions: server consolidation, rapid provisioning, business continuity, capacity management, virtual infrastructure management, development and test, virtual hosted desktop infrastructure ▪ Products: enterprise-class software for server virtualization & virtual infrastructure management, [The Virtual Iron platform consists of three components: Virtualization Manager, Virtualization Services, Open Source Virtualization (GPL)] ▪ Services & support: support lifecycle (general support/extended support/technical guidance), professional services	
56	Vyatta	2005	CA, USA	▪ Products: software combines enterprise-class router, firewall and VPN with OS (GPL) solutions, community edition, professional subscription, enterprise subscription, hardware appliances (professional subscription/enterprise subscription) ▪ Professional services: remote consulting services, community support ▪ Training: Vyatta university, course catalog, delivery options (on-site/online)	▪ Community, forum, blog, secret society
57	Wikia	2004	CA, USA	▪ Services: basic wiki editing, advanced wiki editing, wiki-based search	▪ Community, forum, IRC ▪ Wiki, blog
58	WS02	2005	CA, USA	▪ Products: SOA platform (OS/Apache License/consisting of an application server, an enterprise service bus, a mashup server, a registry & repository and more) ▪ Support: development support, production support (silver/gold/platinum) ▪ Training: live online training, onsite training ▪ Services: consulting, OS development sponsorship	▪ Community, forum ▪ Wiki, blog

59	Xandros*	2001	NY, USA	▪ Products: Xandros server, Xandros home edition, Xandros networks, Versora progression desktop, Xandros desktop operation system (home edition/home edition/premium professional) ▪ Support: forums, technical support, web-based support, migration strategies and tools	
60	Zenoss*	2005	MD, USA	▪ Products: Zenoss Core OS edition (GPL v2), enterprise edition, subscriptions (community, core support, enterprise silver, enterprise gold) ▪ Consulting: plan and architecture, deployment, customization, integration, instrumentation ▪ Training: specific topics (modeling your environment/availability monitoring/performance monitoring/event management and log monitoring/alerting rules and methods/templates and plugins/system tuning and maintenance)	▪ Community, forum, IRC ▪ Wiki, blog
61	Zmanda	2005	CA, USA	▪ Products: Amanda community edition (GPL), Amanda enterprise edition (basic/standard/premium), Zmanda recovery manager for MySQL community edition (GPL), Zmanda recovery manager for MySQL enterprise edition (annual subscription) ▪ Services: QuickStart, implementation services, solution services, continuity and compliance consulting ▪ Support: Zmanda network (free subscription/basic/standard/premium)	▪ Community, forum ▪ Wiki, blog