River Cities SaaS Operating Metrics & Valuation Benchmarking Study

Rob Heimann, Managing Director, rheimann@rccf.com

Parag Rathi, Vice President, prathi@rccf.com

River Cities Overview

River Cities first encountered the SaaS model with its EVault investment in 2001. The concept of delivering software as a hosted, subscription service introduced new possibilities for entrepreneurs, customers and investors. The first wave of SaaS was typified by horizontal solutions and applications. River Cities benefited from recognizing the value of this model early and gained a competitive advantage by developing a track record of success and thought leadership at the onset. We have invested roughly $100M across 16 SaaS portfolio companies and have had six successful liquidity events, including two IPOs. Today, the Firm is focused on what we consider to be the second wave of the SaaS and tech-enabled business services model, which is characterized by vertical solutions for niche markets with a services approach.

As a firm, River Cities invests in world-class management teams – backing progressive, proven leaders in the markets of information technology and healthcare. A consistent, cohesive team has honed its strategy over six funds with compelling performance. River Cities seeks to be a business partner first and a capital provider second, investing significant human capital to leverage its domain expertise and a network of thought leaders assembled over the last 23 years. With more than $600M of capital raised and a consistent track record of success, River Cities has established itself as a preferred source of growth capital. We are actively seeking new investments in the $5 million - $30 million range, River Cities offers entrepreneurs the flexibility to raise an appropriate amount of growth capital for the company's respective stage of development.

River Cities SaaS Successes

TRAX	EVAULT	mxLOGIC	iSqFt	sciQuest	SPS commerce
Acquired by Strattam Capital $90M	Acquired by Seagate $185M	Acquired by McAfee, Inc. $170M	Acquired by GenStar Capital $150	IPO $215M	IPO $89
STRATTAM CAPITAL	Seagate	McAfee	GENSTAR CAPITAL, LLC	NASDAQ SQI	NASDAQ SPSC

Active River Cities SaaS Investments

canvas	Mobile platform for collecting/sharing information via mobile forms	Building Engines	Commercial property management software
Continuity CONTROL	Compliance management system for community banks and credit unions	netsertive	Cloud-based digital marketing engine that automates localized digital advertising
SIM Partners	Multi-location entreprise brand management	Lattice	AI predictive marketing analytics solutions for generating and prioritizing sales opportunities
KnowledgeTree	Sales team document management	perfectserve	Clinical communications service for hospitals and physician practices
dialogtech	Voice-based marketing automation		

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Study Overview

This study considers operating metrics from 92 public SaaS companies during their developmental period (pre-$100 million in revenue). Key operating metrics for the subject companies were collected through year-end 2016. Data was collected from public companies' S-1 filings in an effort to assess relative operating metrics at formative stages of development that are comparable to those of our portfolio companies. For example, we analyzed Salesforce's performance from 2001 to 2003, when the company had less than $100 million of revenue.

From the collected data, we have identified target operating benchmarks for best-of-breed SaaS companies. Operating benchmarks include capital efficiency, revenue growth, gross margin, operating expense investment, capital expenditures, and EBITDA margin. This report is meant to offer entrepreneurs insight into River Cities' perspective on building a metrics-driven SaaS organization.

Company Profiles

The number of public SaaS companies (92) included in this report has more than tripled since 2011. This increase in sample size reflects the rapid adoption of SaaS applications by both enterprise and small and medium business (SMB) users. With more than $8 billion in FY17 revenue, Salesforce is the largest company included in the study; most of the public SaaS companies we evaluated generated less than $500 million in TTM revenue. The following tables provide an overview of the companies included in this study. Of note, 72 of the 92 companies offer horizontal solutions. The other 20 companies are vertically-focused software vendors.

Exhibit 1A: Vertically-Focused Public SaaS Companies

Public Comps.	Ticker	Application
2U	TWOU	Provider of online higher education services.
AppFolio	APPF	Provider of software-as-a-service business solutions for property managers.
athenahealth	ATHN	Developer of web-based medical practice management software.
Blackbaud	BLKB	Provider of software and related services for nonprofit organizations.
Blackboard	BBBB	Provider of education technology services.
Convio^	CNVO	Provider of on-demand customer relationship management (CRM) software and services for non-profits.
Dealertrack^	TRAK	Provider of web-based digital marketing services.
Ebix	EBIX	Supplier of software and e-commerce services to the insurance industry.
Ellie Mae	ELLI	Provider of software used by mortgage lenders to make home loans.
Fleetmatics Group	FLTX	Provider of mobile workforce services for service-based businesses.
Guidewire Software	GWRE	Provider of software products for Property and Casualty insurers.
HealthStream	HSTM	Provider of internet-based learning and research services to the healthcare industry.
Medidata Solutions	MDSO	Provider of cloud-based technology for the life sciences industry.
MindBody	MB	Developer of business management software for fitness studios, spas, salons, and other retail clients.
OpenTable^	OPEN	Provider of online restaurant-reservation services.
Opower^	OPWR	Provider of customer engagement and energy efficiency cloud services to utilities.
Q2 Holdings	QTWO	Provider of an electronic banking software for banks and credit unions.
RealPage	RP	Provider of property management software services.
SPS Commerce*	SPSC	Provider of on-demand supply chain management solutions.
Textura	TXTR	Provider of on-demand business collaboration software to the commercial construction industry.
Veeva Systems	VEEV	Provider of cloud-based software for the global life-sciences industry.

Exhibit 1B: Horizontally-Focused Public SaaS Companies

Public Comps.	Ticker	Application
Amber Road	AMBR	Provider of global trade management software for importers, exporters and logistics service providers.
Apigee	APIC	Developer of an application programming interface (API) platform for digital business acceleration.
Apptio	APTI	Provider of on-demand Technology Business Management (TBM) services.
Atlassian	TEAM	Provider of collaboration software for product teams.
BazaarVoice	BV	Provider of outsourced technology, community management, analytics and syndication services.
Benefitfocus	BNFT	Provider of cloud-based software for managing employee benefits.
BlackLine Systems	BL	Developer of financial and accounting software.
Box	BOX	Provider of enterprise content-sharing and management platform.
Brightcove	BCOV	Provider of a video hosting and publishing solution.
Callidus Software	CALD	Provider of cloud-based sales, marketing and learning software.
Carbonite	CARB	Provider of online backup services to mainstream computer users.

**River Cities Previous Portfolio Company*
^Acquired

Exhibit 1B: Horizontally-Focused Public SaaS Companies (cont.)

Public Comps.	Ticker	Application
Castlight Health	CSLT	Provider of employee healthcare-engagement platform for enterprises.
ChannelAdvisor	ECOM	Developer of ecommerce channel management software for retailers.
Concur Technologies^	CNQR	Developer of software for managing business expenses.
Constant Contact^	CTCT	Provider of on-demand email marketing, online survey and event marketing services.
Cornerstone OnDemand	CSOD	Provider of cloud-based talent management software.
Coupa Software	COUP	Provider of savings-as-a-service procurement software.
Covisint^	COVS	Provider of cloud platform for building Identity and Internet of Things (IoT) applications.
CVENT^	CVT	Operator of an event management technology company.
Demandtec^	DMAN	Provider of consumer demand management software.
Demandware	DWRE	Provider of enterprise cloud commerce services.
E2open^	EOPN	Developer of cloud-based software for supply-chain management.
Eloqua^	ELOQ	Provider of marketing automation software.
ExactTarget^	ET	Provider of on demand e-mail marketing software services.
FireEye	FEYE	Provider of security services for enterprises and service providers, among others.
Five9	FIVN	Provider of an on-demand call center software for inbound, outbound and blended call centers.
Hortonworks	HDP	Provider of platform for storing, managing and analyzing data.
HubSpot	HUBS	Provider of an all-in-one marketing software platform.
inContact^	SAAS	Provider of cloud contact handling software services.
Instructure	INST	Provider of a cloud-based learning management system.
IntraLinks Holdings	IL	Provider of an online workspace for document exchange.
Jive Software	JIVE	Provides communication and collaboration solutions
Kenexa^	KNXA	Provider of recruiting and employee retention software.
LifeLock^	LOCK	Provider of identity-theft protection services.
LivePerson	LPSN	Provider of customer-engagement software.
LogMeIn	LOGM	Provider of remote access / support services.
Marin Software	MRIN	Provider of an online advertising management system.
Marketo	MKTO	Provider of marketing automation software.
Mimecast	MIME	Provider of cloud-based unified email management (UEM) software.
Netsuite	N	Provider of cloud-based financials software suites.
New Relic	NEWR	Provider of software as a service based cloud application for performance management.
Omniture^	OMTR	Provider of online business optimization software.
Paycom Software	PAYC	Provider of internet payroll and human resource services.
Paylocity	PCTY	Provider of online payroll services and human resource software solutions.
Proofpoint	PFPT	Provider of software-as-a-service based email security and compliance software.
Qlik Technologies	QLIK	Developer of business intelligence software.
Qualys	QLYS	Provider of information technology security and compliance services.
Rally Software	RALY	Provider of software development tools.
Responsys^	MKTG	Provider of marketing software to design, execute and manage email campaigns.
RightNow Technologies^	RNOW	Provider of Web-based customer service software for the Internet and intranet environments.
RingCentral	RNG	Provider of cloud-based communication technology.
Salary.com	XWA	Provider of on-demand compensation and performance management solutions.
Salesforce.com^	CRM	Provider of customer relationship management (CRM) software.
SciQuest*^	SQI	Developer of web-based e-procurement, supply and materials management software.
ServiceNow	NOW	Provider of cloud-computing based services.
Shopify	SHOP	Developer of e-commerce software.
SuccessFactors^	SFSF	Provider of human resources performance and talent management software.
Synchronoss Tech	SNCR	Provider of personal cloud services and software-based activation for connected devices.
Tableau Software	DATA	Developer of an analytics and visualization software.
Taleo^	TLEO	Provider of on-demand unified talent management software service.
Tangoe^	TNGO	Provider of IT and Telecom Expense Management (TEM) software and services.
Twilio	TWLO	Provider of an application programming interface (API) for voice communications.
Ultimate Software Group	ULTI	Provides unified human capital management software.
Upland Software	UPLD	Provider of an enterprise work-management software.
Vocus^	VOCS	Provider of on-demand software for corporate communications and public relations.
WageWorks	WAGE	Provider of consumer directed health plans.
Workday	WDAY	Provider of human capital management, financial management and payroll software.
Workiva	WK	Provider of a cloud based software for external financial reporting.
Xactly	XTLY	Provider of on-demand software to manage sales performance and incentive compensation.
Zendesk	ZEN	Provider of a cloud-based customer service software.
Zix	ZIXI	Provides email encryption services.

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^Acquired

Introduction

Summary of Key Findings

Below is a summary of key findings from the report:

- SaaS adoption continues to increase at a rapid pace; Gartner estimates that the SaaS market will grow at a 19.7% CAGR through 2019.
- 92 pure-play SaaS vendors have gone public, 27 of which happened in the last three years; 68 remain in the public market. Of the 92 companies, 72 provide horizontal solutions; 20 are vertically focused.
- Public SaaS companies are maturing: Five companies achieved revenue in excess of $1B. This is an increase of four companies from our last report in 2014 in which only Salesforce had passed the $1B mark.
- Investors continue to prioritize revenue growth over free cash flow in an effort to drive shareholder value. Only seven of the 39 companies that have gone public since 2013 had positive EBITDA at the time of IPO. For comparison, 32 out of 53 companies that went public prior to 2013 had positive EBITDA.
- Revenue multiples remain the primary valuation metric for SaaS investments. The average public SaaS company is valued at 6.0 times revenue as of June 30, 2017.
- While revenue growth continues to be the primary driver of valuation, it appears that the market is starting to price and reward the ability to generate healthy EBITDA margins while sustaining growth. Over the past few years, the industry has come up with the "Rule of 40" as a way to measure and compare growth. The 40% rule is that your growth rate + your profit should add up to 40%. So if you add your revenue growth percentage to your EBITDA margins percentage, ideally you want to be greater than 40% or close to 40% as possible.
    - 10 companies that scored 40% or greater averaged revenue multiples of 6.4x TTM revenue;
    - 26 companies that scored between 20% - 40% averaged revenue multiples of 5.3x TTM revenue;
    - 19 companies that scored between 0% - 20% averaged revenue multiples of 3.8x TTM revenue;
    - 8 companies that scored less than 0% averaged revenue multiples of 1.9x TTM revenue.
- Compelling SaaS market momentum coupled with solid returns from early SaaS investors continues to draw more private institutional capital to the sector. In 2003 (two years after River Cities' first SaaS investment in EVault), 548 investment firms invested $1.7B of private equity in 200 rounds of funding in SaaS companies. That number climbed to more than $18.5 billion across nearly 2,000 financing rounds in 2016. Approximately 2,100 investment firms participated in those rounds, a 4x increase in the number of active SaaS investors as compared to 2003. Today, nearly every venture/growth equity investor focused on Information Technology is targeting SaaS companies.

Introduction

Summary of Key Findings Continued

- Companies that went public prior to 2011 raised an average of $41.6M before going public while SaaS companies that went public post-2011 raised an average of $90.4M. Furthermore, the companies that went public after 2011 are raising capital at later stages (the majority of capital being raised post $50M in revenue), the proceeds of which are increasingly used to provide liquidity for shareholders in addition to funding growth.
- Despite that post-2011 companies have raised more than twice that of pre-2011 companies, their growth rates are lower than the pre-2011 cohort at IPO by 14%. More and more, proceeds from these financings are being utilized less efficiently and/or going to fund liquidity for shareholders instead of growth initiatives. We suspect that the big discrepancy in funding between pre-and post-2011 companies is also tied to the prevalence of large pre-IPO rounds, which have become increasingly common as private markets have supported secondary liquidity needs.
- Sales and marketing expense as a percentage of revenue tends to be significantly lower for vertical SaaS companies than for horizontal companies. Horizontal companies tend to spend 15% - 20% more on sales and marketing as a percentage of revenue than vertically focused companies until about $30 million in revenue is achieved. At scale, the gap narrows as vertical solutions seem to increase their sales and marketing spend in comparison to the horizontal solutions. A likely reason for this dynamic is that vertical solutions greater than $30 million in revenue start looking at adjacent markets and/or new geographies as means to expand their total addressable markets.
- Well-performing SaaS companies achieve payback on sales and marketing investments in less than 24 months, with better companies reaching payback in under 12 months.
- Vertically-focused companies tend to see more efficient results than horizontally-focused companies. Horizontal players spend more, on average, to acquire $1 million of revenue or gross profit. Vertically-focused companies in the $15-$30 million revenue range see payback periods nearly 12 months shorter than their horizontal counterparts. Horizontal companies, however, do see an improvement in sales and marketing payback as they grow, with the gap between the payback periods shrinking as revenue scales.
- To better understand the unit economics of a SaaS business, two important metrics come into play: Lifetime value of a typical customer (LTV) and the cost to acquire a typical customer (CAC). The best SaaS businesses have an LTV to CAC ratio higher than 3x.
- In many regards, it's never been easier to launch a SaaS company, though interestingly, there has been an uptick in R&D spend in recent years. Companies that went public since 2011 spent roughly 10% more of revenue on R&D than companies that went public prior to 2011. We attribute this trend to an increase in competition and the over funding of certain sectors like sales and marketing.

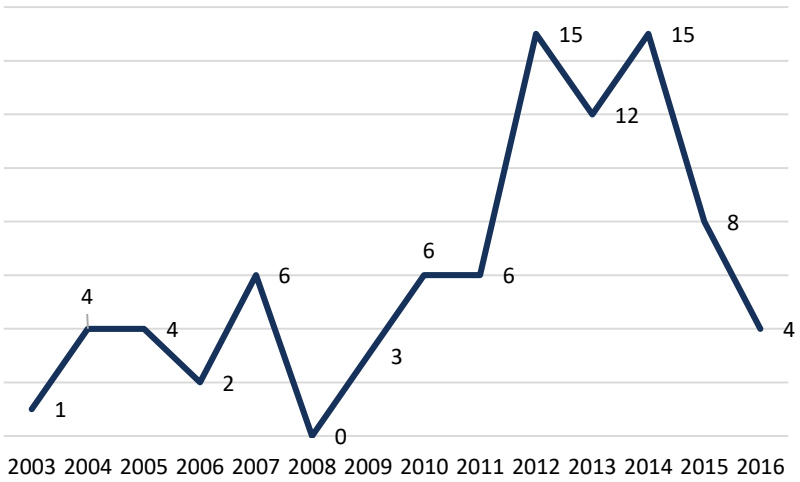
SaaS Funding Environment

SaaS IPO Statistics & Funding

The SaaS industry has grown rapidly over the last decade and this growth has translated into a growing universe of publicly traded SaaS companies. When we published our first study in 2009, there were only 17 companies included in our data set. We added 49 more companies in 2014, and today we include 92 SaaS businesses.

Of the 92 companies included in this data set, 24 have been acquired, and 68 SaaS providers continue to trade as public companies. As seen in Exhibit 2A, the number of SaaS IPOs spiked in the 2012-2014 timeframe but slowed in 2015 and again in 2016.

Exhibit 2A. Number of IPOs



Note: Does not include six IPOs that occurred pre-2003.

The robust SaaS IPO market from 2012 – 2014 was reflective of the overall favorable market during that time with total IPOs increasing from 125 in 2011 to 275 in 2014. The spike in IPOs can also be attributed to the wave of SaaS companies that were founded in the early to mid-2000's (post dot-com era), which created for a nice backlog. Note that the average company takes anywhere from 9 – 12 years to go from founding to IPO. The last two years have seen slow-down in the IPO market given macro trends and the total number of IPOs dropping to a dismal 105 in 2016. We also believe that several private companies are choosing to delay their IPO by raising large pre-IPO rounds.

Exhibit 2B highlights trends in scale at the time of IPO. Out of the 39 companies that raised public equity since our last report, all but three had TTM revenues of at least $50 million at IPO. Between 2015-2016, the median revenue at IPO climbed to $111 million . Of those 39 companies, Textura was the smallest with $36 million in TTM revenue, and Atlassian was the largest with $320 million.

Interestingly, only seven of the 39 companies had positive EBITDA at the time of IPO. For comparison, 32 out of 53 companies that went public prior to 2013 had positive EBITDA. Public equity investors have recognized the SaaS market opportunity and accepted the belief that fast-growing market leaders will be rewarded with premium valuations, even at the expense of near-term profitability.

Exhibit 2B. Median Rev & EBITDA at IPO ($m)

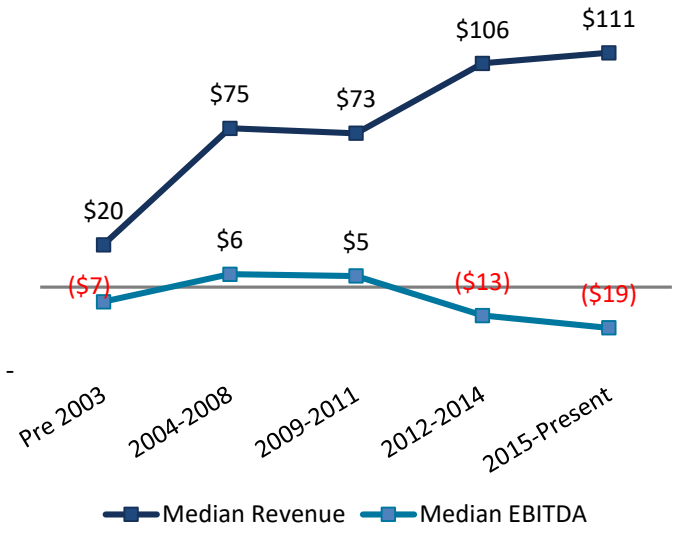
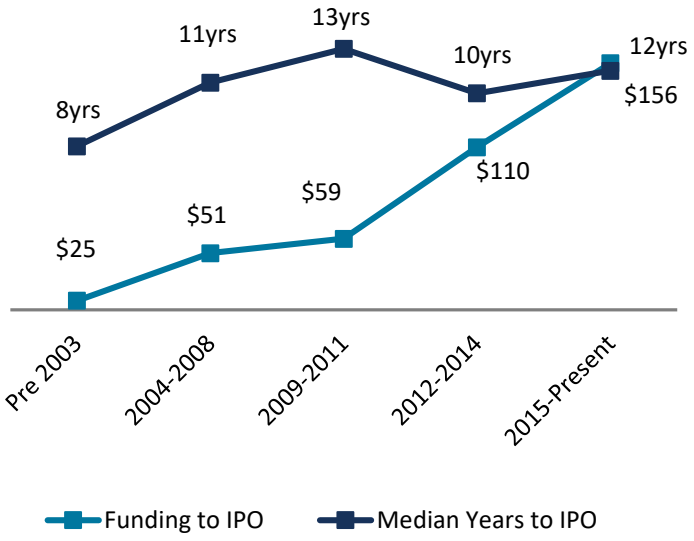


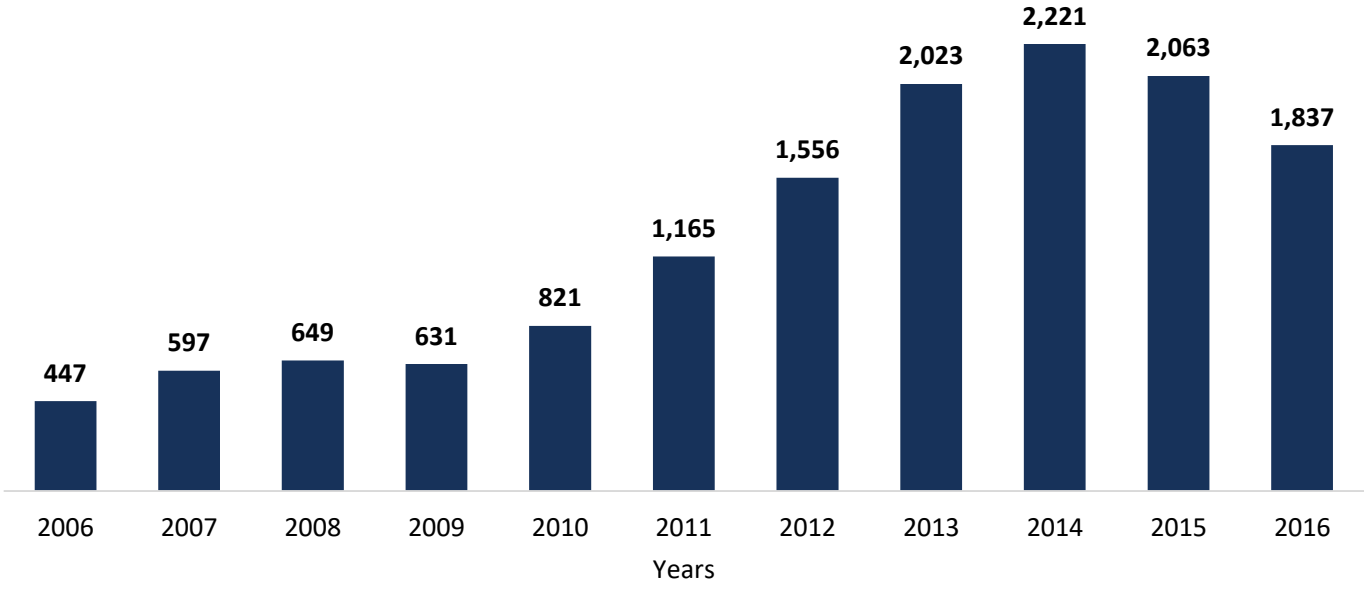
Exhibit 2C. Median Funding & Years to IPO ($m)



As seen in Exhibit 2C, the best performing SaaS companies typically go public approximately 12 years after they are founded. While time to IPO has remained fairly consistent, the amount of funding required to get to IPO has significantly increased since 2011. This data point is consistent with the uptick in revenue at time of IPO and reflects the prevailing tendency for companies to stay private longer. Interestingly, horizontally-focused SaaS companies typically obtain 15% more funding prior to IPO than their vertically-focused counterparts, although that margin has narrowed to 7% over the past five years.

There are several factors influencing the average increase in funding required pre-IPO. In general, the availability of capital for SaaS companies has skyrocketed over the last decade, given attractive sector returns. For example, in 2003 (two years after River Cities' first SaaS investment and when analysts began tracking SaaS as a sector), 548 PE/VC firms invested a total of $1.7 billion in the SaaS sector across 200 rounds of funding. As seen in Exhibit 2D, that number climbed to more than $19 billion across 2,200 financing rounds in 2014. Approximately 2,100 investment firms participated in those rounds, a 4x increase. Today, nearly every venture/growth equity investor focused on Information Technology is targeting SaaS companies.

Exhibit 2D. Number of VC Funding Rounds in SaaS Companies

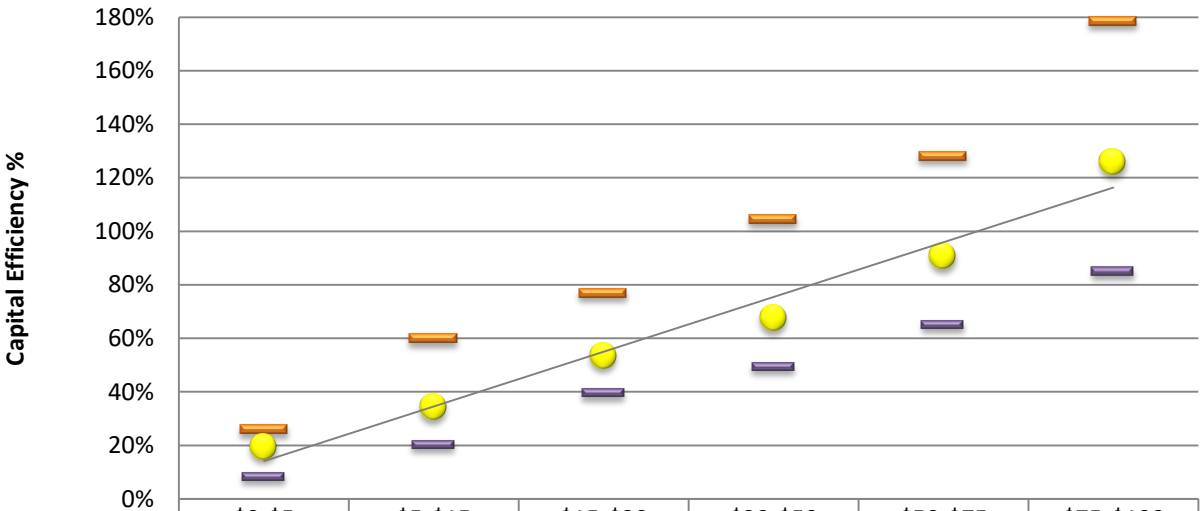


Source: PitchBook Data, Inc.

Capital Efficiency

Exhibit 3A shows a simple ratio that demonstrates the capital efficiency of a business. The ratio is calculated by dividing TTM revenue into the cumulative debt and equity that the company has raised. For example, if a company has raised $10 million of capital to get to $20 million of revenue, its efficiency ratio would be 200%.

Exhibit 3A. Cumulative Capital Efficiency (%)



	$0-$5	$5-$15	$15-$30	$30-$50	$50-$75	$75-$100
High	959%	331%	728%	374%	470%	667%
3rd Quartile	26%	60%	77%	104%	128%	179%
Median	19%	34%	53%	68%	91%	126%
1st Quartile	9%	20%	40%	50%	65%	85%
Low	2%	7%	7%	16%	15%	17%

Note: If more than one data point was available, a range is used. TTM revenue in Ms.

In general, capital efficiency increases as SaaS companies scale. Companies with less than $5 million in revenue stayed within the 9% - 26% capital efficiency range. By the time these companies reached $30-$50 million in revenue, capital efficiency increased to the 50% - 100% range, proving that, as companies scale, they are able to fund their own growth through organic means. Capital efficiency further improves to 85% - 180% as these companies surpass $75 million in revenue.

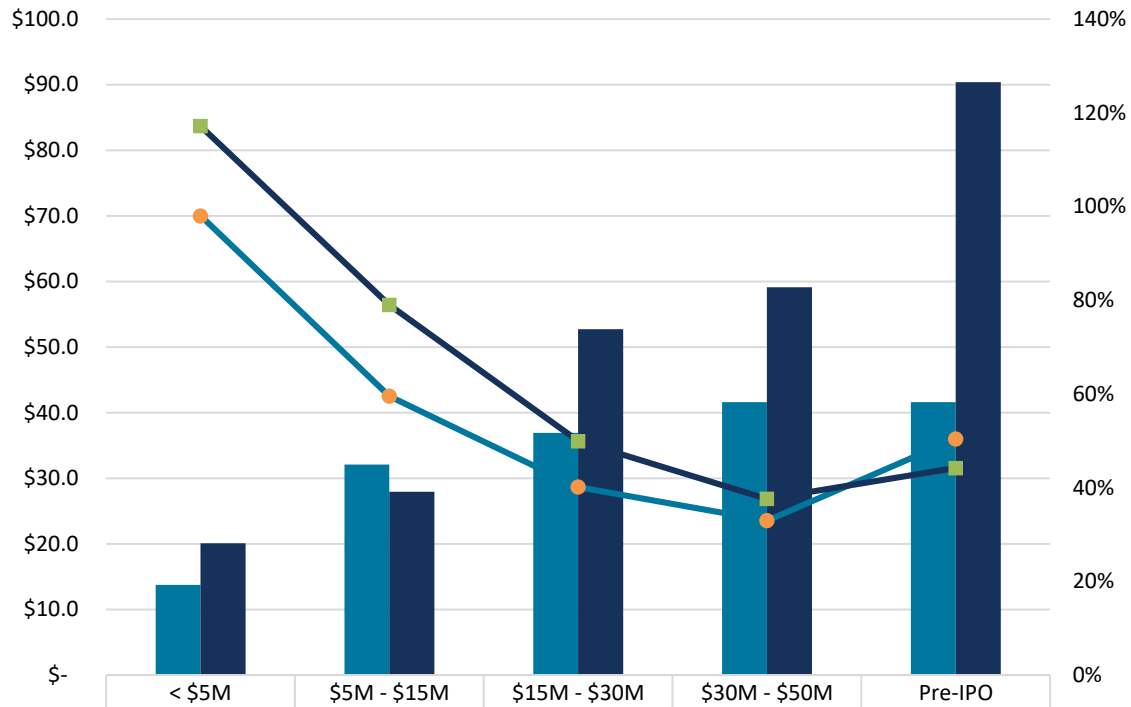
Best-of-breed SaaS companies achieve significant leverage on invested capital by the time they IPO. The median capital efficiency at the time of IPO was 193% for the companies we analyzed. Impressively, 63% of these companies achieved capital efficiency in excess of 100% at the time of IPO.

We also segmented our data set between horizontally- and vertically-focused SaaS companies to examine the impact of end market dynamics on capital efficiency. As we will discuss throughout this report, vertically-focused SaaS companies tend to grow more efficiently. The median ratio for vertically-focused SaaS companies was 287%, as compared to 168% for the horizontally-focused SaaS companies. Further, 75% of the vertical providers achieved greater than 100%, while only 59% of horizontal providers exceeded this benchmark.

Exhibit 3B compares the growth rates and funding characteristics of companies that went public prior to 2011 to those that went public after 2011. Post-2011 IPOs are raising more than 40% more capital to reach $15 million and again to reach $30 million in revenue. Despite raising significantly more capital capital, companies that went public after 2011 only demonstrated moderately higher growth rates through $50 million in revenue and actually 14% less growth directly prior to IPO.

However, even though post-2011 companies have raised more than twice that of pre-2011 companies, their growth rates are lower than the pre-2011 cohort at IPO by 14%. More and more, proceeds from these financings are being utilized less efficiently and/or going to fund liquidity for shareholders instead of growth initiatives. We suspect that the big discrepancy in funding between pre-and post-2011 companies is also tied to the prevalence of large pre-IPO rounds, which have become increasingly common as private markets have supported secondary liquidity needs.

3B. Growth Rates vs. Capital Raised



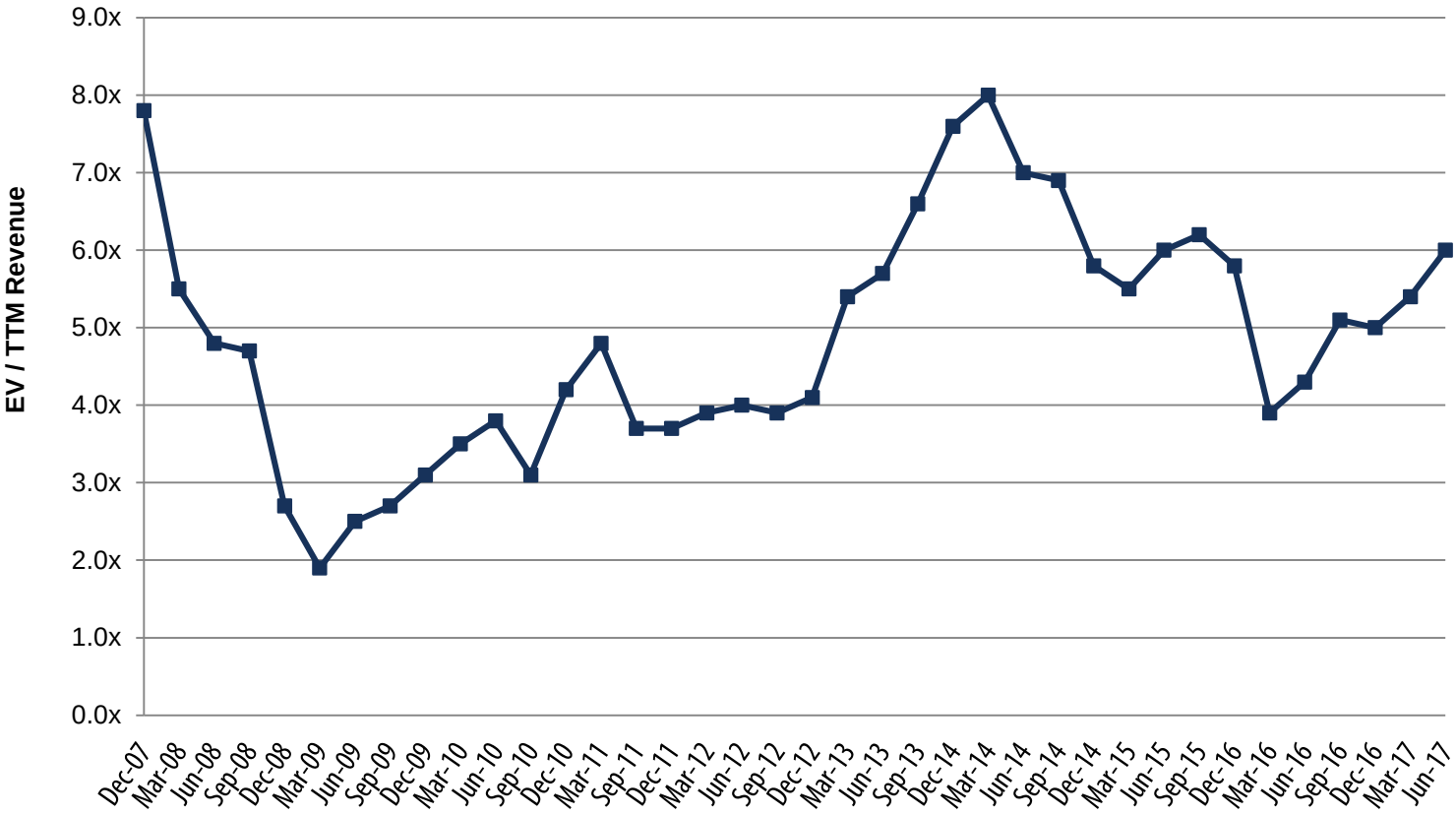
	< $5M	$5M - $15M	$15M - $30M	$30M - $50M	Pre-IPO
Pre-2011 Median Capital Raised	$13.7	$32.1	$36.9	$41.6	$41.6
Post-2011 Median Capital Raised	$20.1	$27.9	$52.7	$59.1	$90.4
Pre-2011 4-Year Growth Rates	98%	60%	40%	33%	50%
Post-2011 4-Year Growth Rates	117%	79%	50%	38%	44%

Large institutional fund investors are going down market to invest in earlier stage companies as evident in that post-2011 companies raise an average $6 million more before reaching $5 million in revenue. Given the relative size of these funds, their strategy typically entails funding companies with large initial investments (often greater than $30 million). However, these companies are often sub-$30 million in revenue and struggle to put invested equity to work efficiently. As a result, overfunding often leads to suboptimal unit economics and less attractive return on invested capital.

Although this dynamic has been prevalent over the past few years, we suspect that the artificial friction created by minimum check size requirements will lead to poor outcomes for funds and entrepreneurs. Long-term, if larger rounds are not translating into more rapid or more efficient growth (as seen in Exhibit 3B), we believe that market dynamics will change. In our 2014 report, we projected this same theory, though the trend of raising more money has continued, while growth rates have still yet to improve.

SaaS Public Company Valuation Metrics

Exhibit 4A: Median Public Company Revenue Multiples Since Q4'07



Source: Software Equity Group

Exhibit 4A demonstrates that public market SaaS valuations have cooled off since reaching a post-recession peak in 2014. Nonetheless, SaaS companies continue to trade at higher multiples than traditional on-premise software companies, which typically command valuations in the 2x-3x revenue range.

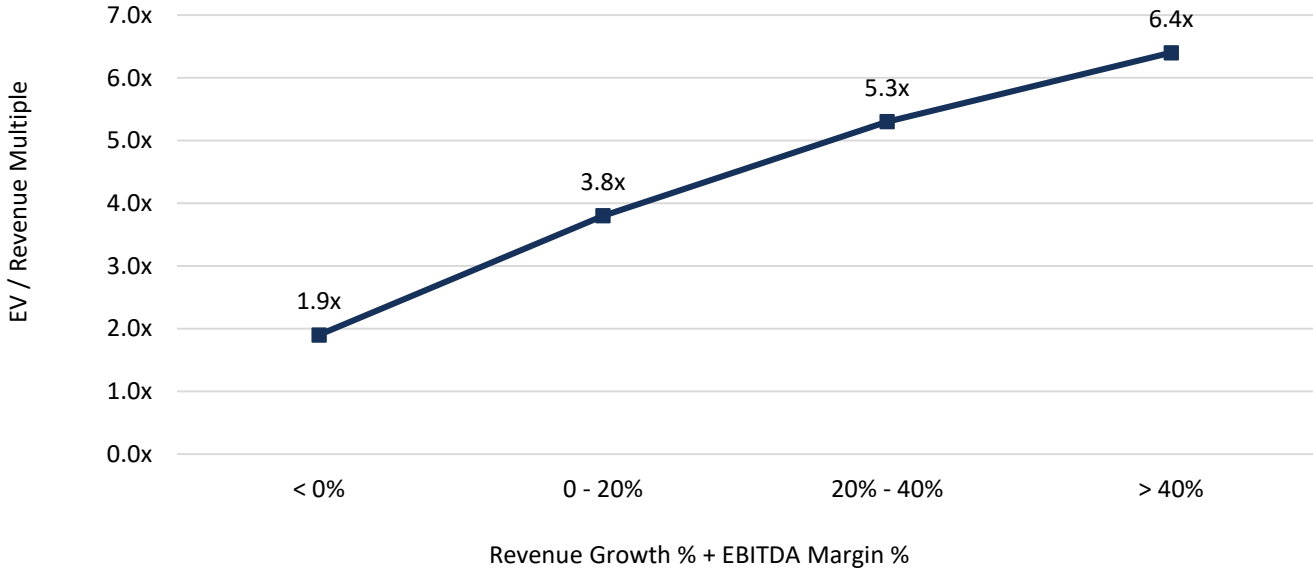
The decrease in SaaS valuation multiples is partially attributable to stock market cyclicality. We are also seeing more public SaaS companies generate positive EBITDA, reflecting the market's desire for SaaS companies to demonstrate profitability.

SaaS Public Company Valuation Metrics Continued

While revenue growth continues to be the primary driver of valuation, it appears that the market is starting to price and reward efficient growth and not growth at all costs. Over the past few years, the industry has come up with the "Rule of 40" as a way to measure and compare growth. The rule of 40 is simple to calculate: Add revenue growth percentage to your EBITDA margins percentage. Ideally you want to be greater than 40% or close to 40% as possible. As an example, a company with topline growth of 60% and 20% negative EBITDA losses is growing more efficiently than a company with 70% revenue growth and 50% EBITDA losses. We applied the rule of 40 to the 63 active public SaaS companies and saw meaningful correlation as follows:

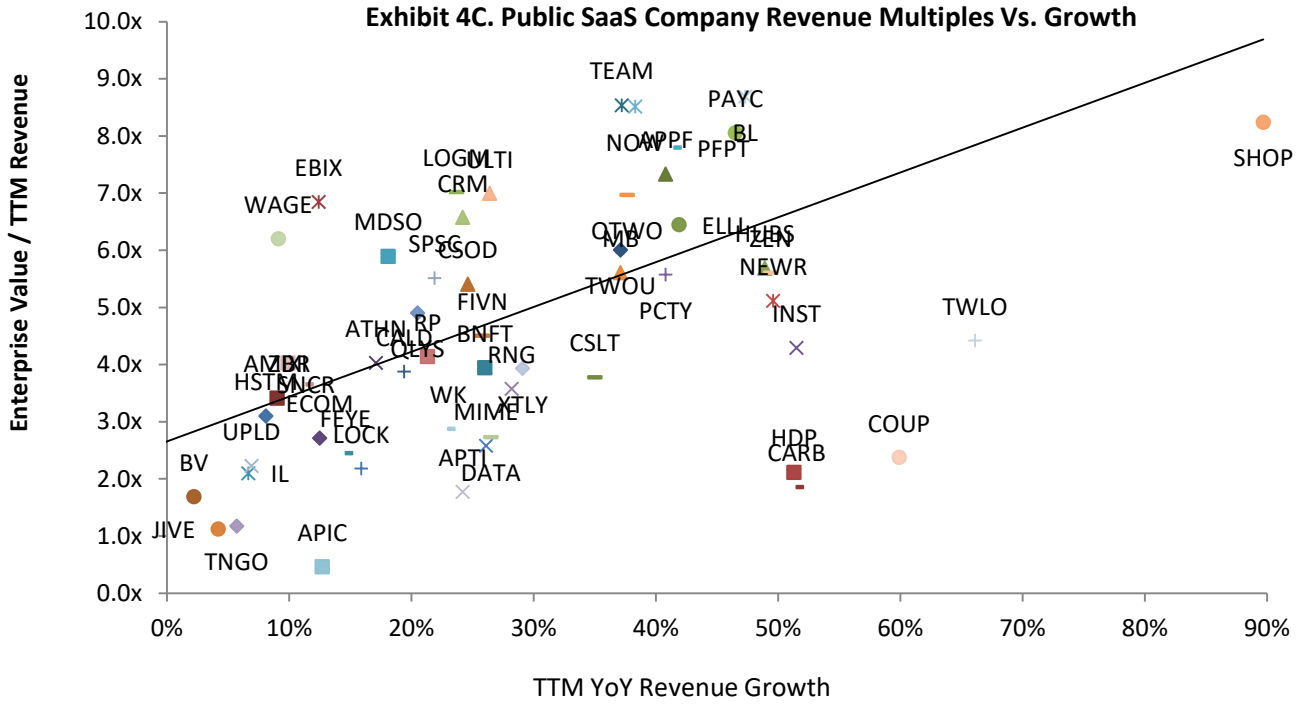
- 10 companies that scored 40% or greater averaged revenue multiples of 6.4x TTM revenue;
- 26 companies that scored between 20% - 40% averaged revenue multiples of 5.3x TTM revenue;
- 19 companies that scored between 0% - 20% averaged revenue multiples of 3.8x TTM revenue;
- 8 companies that scored less than 0% averaged revenue multiples of 1.9x TTM revenue.

4B. Revenue growth % + EBITDA % vs. Valuation Multiple



Valuation Drivers

Exhibit 4C. Public SaaS Company Revenue Multiples Vs. Growth

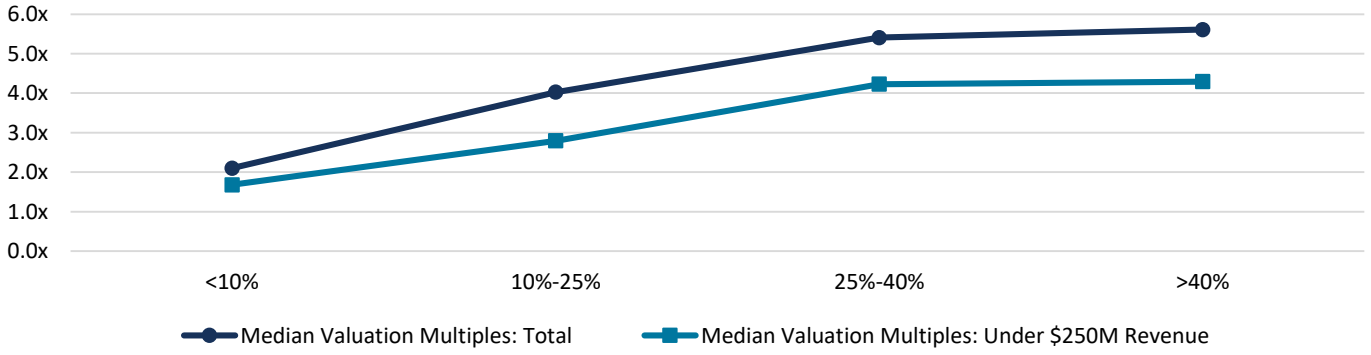


Source: Pitchbook Data as of Q4 2016
Note: Excludes WDAY and VEEV with EV / revenue multiples greater than 10.0x.

As mentioned earlier, revenue growth is one of the primary valuation drivers for SaaS companies. Other valuation drivers for SaaS companies include scale, leadership position, gross margins, customer acquisition costs, retention rates, pricing power (e.g., switching costs and ability to upsell), and free cash flow margin potential.

Exhibits 4C and 4D demonstrate the correlation between revenue growth and revenue multiples. Exhibits 4C and 4D show that the valuation premium for higher growth is significant; companies with 10% growth trade at 2x revenue, while companies with 25%-40% growth trade around 4x - 6x revenue. As growth rates exceed 40%, revenue multiples begin to flatten out, partially due to the discount at which earlier stage companies trade relative to their more mature peers. In our data set, companies with 40%+ growth had average revenue of $246 million, less than half the average for the rest of the sample ($523 million).

Exhibit 4D: YOY Growth vs. Valuation Multiples

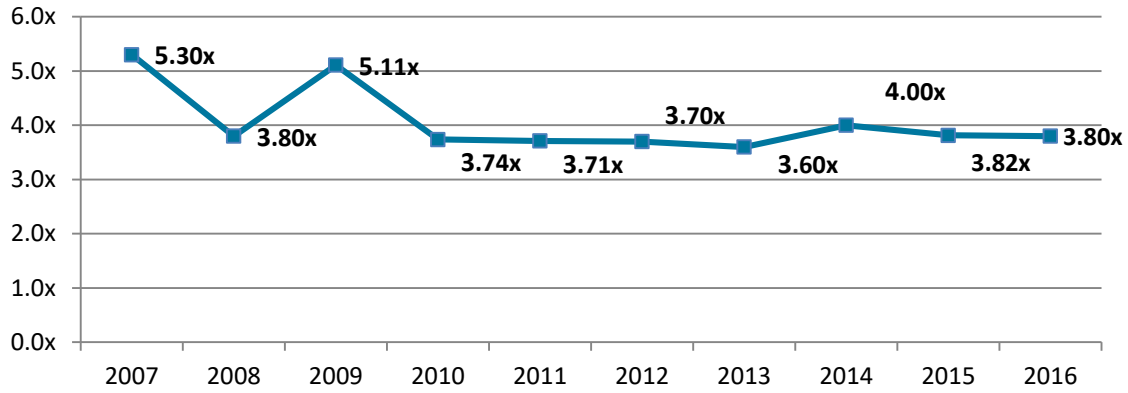


Source: Pitchbook Data as of Q4 2016

SaaS M&A Valuation Metrics

Public company SaaS multiples are not necessarily reflective of private market valuation dynamics due to differences in market liquidity, profit measurement, capital structure, risk profile, etc. To better gauge more realistic valuation expectations for private companies, we turn our attention to SaaS M&A trends.

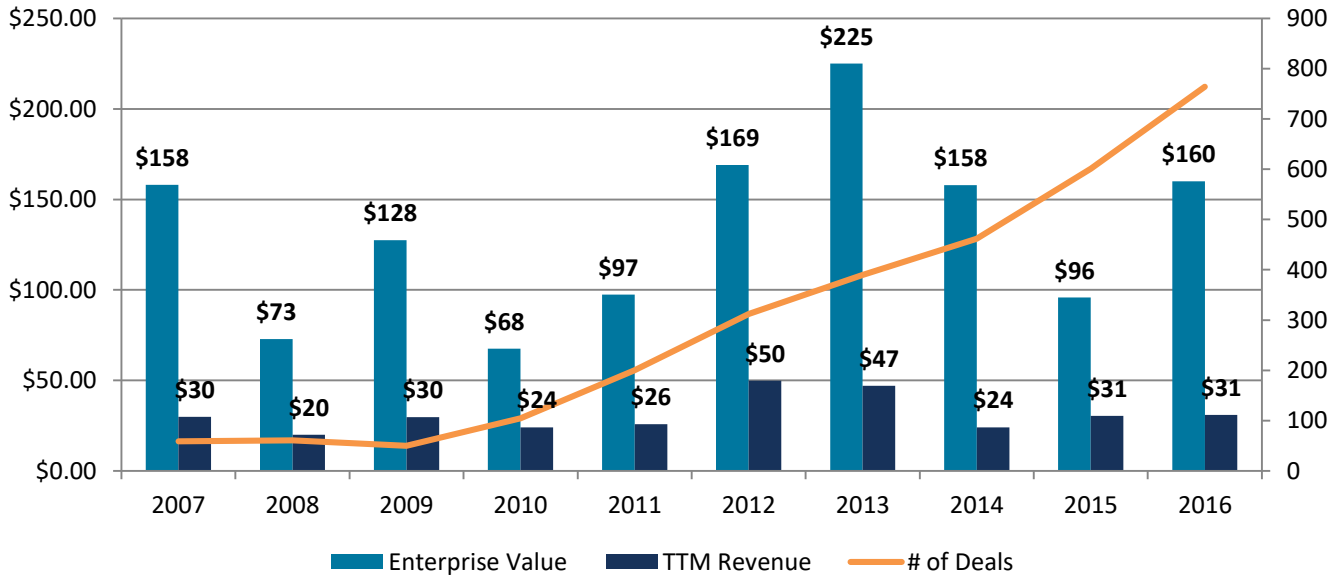
5A. Median EV/TTM Revenue Multiple



Source: Software Equity Group Software Industry Financial Report

As shown in Exhibit 5A, M&A valuation multiples peaked in 2007 at 5.3x and declined to 3.6x in 2013. Multiples have plateaued with the median 2016 revenue multiple being 3.8x. Note, however, that Exhibits 5A and 5B represent only a self-reported universe of transactions (likely the most successful) and that a majority of smaller, less-successful outcomes do not report deal statistics, suggesting the true median revenue multiples are likely lower.

5B. Median Enterprise Value & TTM Revenue



Source: Software Equity Group Software Industry Financial Report

When looking at the above universe of transactions, while on the rise, it is clear that the median enterprise value at exit is still well below $250M. As noted by the orange line, the rate of M&A transactions has also been on the rise since 2009. Finally, inherent in the above data is that most successful exits are happening when companies achieve scale, though revenue at exit has decreased from about $50M in 2012 to only $31M in 2016.

Key Operating Metrics

This section of the report is designed to assist management teams in thinking through operating metrics and corporate initiatives as they scale their companies. In particular, we have highlighted benchmarks for revenue growth, gross margins, sales & marketing investments, research & development funding, general & administrative expenses, capital expenditures and EBITDA margins. These benchmarks are based on an analysis of the 92 public SaaS vendors and reflect their performance when they were generating less than $100 million in revenue.

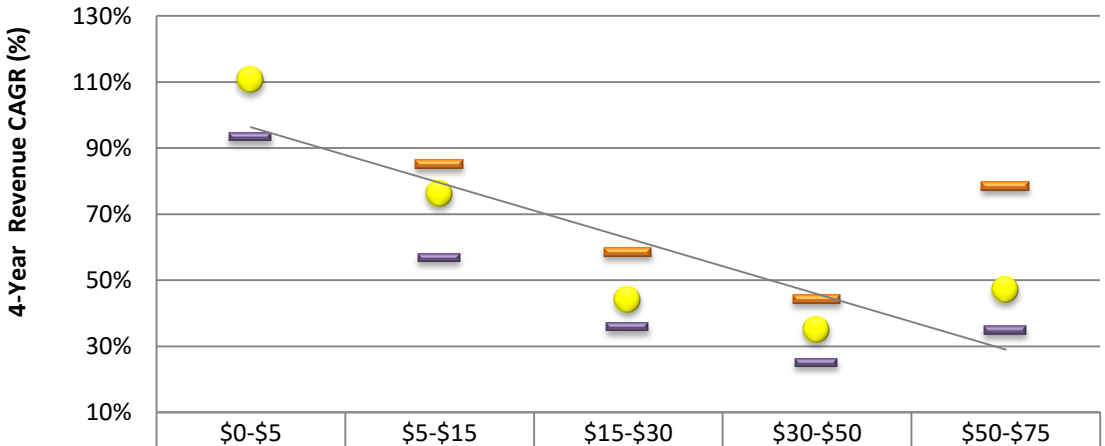
Revenue Growth

Revenue growth is one of the most important considerations when valuing SaaS companies. Because RCCF's investment strategy focuses on investing in growth-stage companies, we analyzed the revenue CAGR (compound annual growth rate) for a four-year period starting from the year in which the companies (now public) were generating sub-$5 million, $5-$15 million, $15- $30 million, $30-$50 million, $50-$70 million, and $75-$100 million in revenue. As an example, we looked at Workday for the four years following the year the company posted $6.4 million in TTM revenue. Workday generated an impressive 156% CAGR to achieve TTM revenue of $273.7 million four years later.

Exhibit 6 reveals that more than half of the 25 SaaS companies included in the sub-$5 million data range achieved greater than 100% CAGR over the four years immediately following the year in which they posted sub-$5 million in TTM revenue. Of course, the law of small numbers is in effect at this stage of development, and it is obviously much harder to sustain these growth rates as companies scale. The median four-year CAGR drops to 76% when considering the four years immediately following the year in which these companies achieved greater than $5 million but less than $15 million in TTM revenue. The median drops further to 44% when considering the four-year period immediately following the year in which these companies achieved greater than $15 million but less than $30 million in TTM revenue. Between $30 and $50 million in revenue, companies demonstrate the lowest level of growth, a median of 35%.

From the year in which they posted sub-$5 million in TTM revenue, public SaaS companies took an average of six years to achieve greater than $100 million in sales. Salesforce and DealerTrack were the top performers, taking only four years to exceed $100 million in TTM revenue. Meanwhile, Concur, Ultimate Software and Vocus each took 11 years to reach the $100 million revenue mark.

Exhibit 6: Four-Year Revenue CAGR (%)



	$0-$5	$5-$15	$15-$30	$30-$50	$50-$75
High	208%	156%	117%	107%	208%
Top Quartile	130%	85%	59%	44%	78%
Median	111%	76%	44%	35%	47%
Lower Quartile	93%	57%	36%	25%	35%
Low	44%	20%	16%	6%	12%
Count	25	46	54	50	50

Renewal & Churn Rates

Renewal rates measure retention of customers and revenue. Retention metrics are critical for SaaS companies, as churn directly impacts growth rates. Additionally, the impact of churn becomes more profound as SaaS companies scale. For example, a $50 million SaaS company with 20% churn can add an impressive $20 million of new business and still achieve only 20% growth. If churn were only 5%, the company would have grown 35% with the same bookings.

Better performing private SaaS companies typically achieve customer renewal rates north of 85% and revenue renewal rates close to 100%, depending on the business model. As a general rule, SaaS providers selling into the enterprise market typically experience less churn than those selling into the SMB market. Enterprise SaaS solutions inherently have more tentacles into the IT infrastructure than SMB solutions. SMB customers manage a less sophisticated tech infrastructure, tend to switch suppliers more frequently, are more focused on cost vs. breadth of platform and tend to go out of business more frequently.

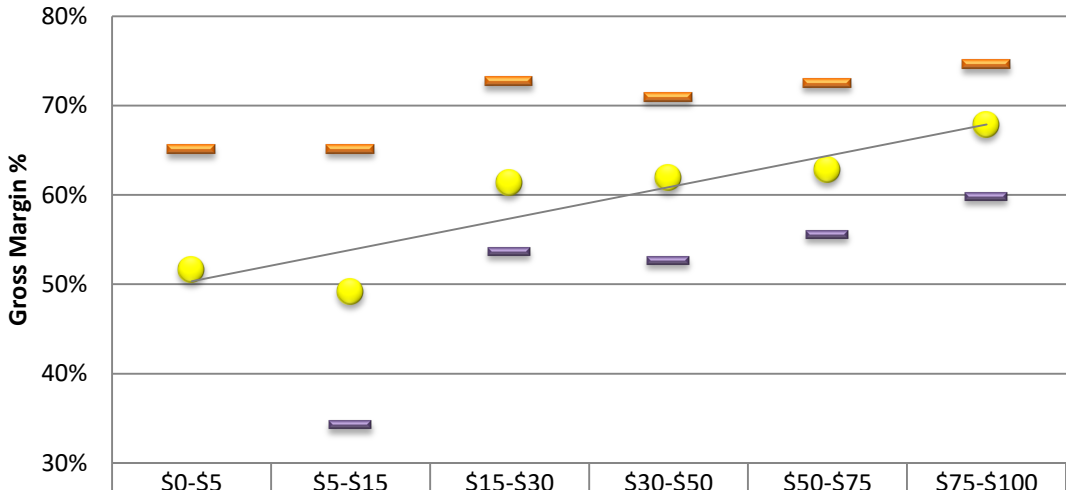
For enterprise-focused providers, it is worth noting that IT departments are increasingly consolidating relationships with third-party vendors, so a provider's ability to expand its service offerings and act as a unified platform for multiple services will significantly improve renewal rates.

We provide a detailed example of measuring churn, a cohort analysis and other sales and marketing metrics in the appendix of this report.

Gross Margins

SaaS vendors get the most operating leverage by deploying a single-instance, multi-tenant architecture, which means they manage one codebase across an entire installed customer base. Cost savings include shared hardware, software and maintenance costs, which are significantly lower for SaaS businesses due to ease of deployment. Software upgrades and bug fixes are deployed against one instance for thousands of customers as opposed to supporting thousands of instances.

Exhibit 7: Gross Margins



	$0-$5	$5-$15	$15-$30	$30-$50	$50-$75	$75-$100
High	99%	85%	94%	96%	95%	88%
3rd Quartile	65%	65%	73%	71%	73%	75%
Median	52%	49%	61%	62%	63%	68%
1st Quartile	20%	34%	54%	53%	56%	60%
Low	-91%	-77%	-18%	-76%	27%	36%

Note: If more than one data point was available, a range is used.

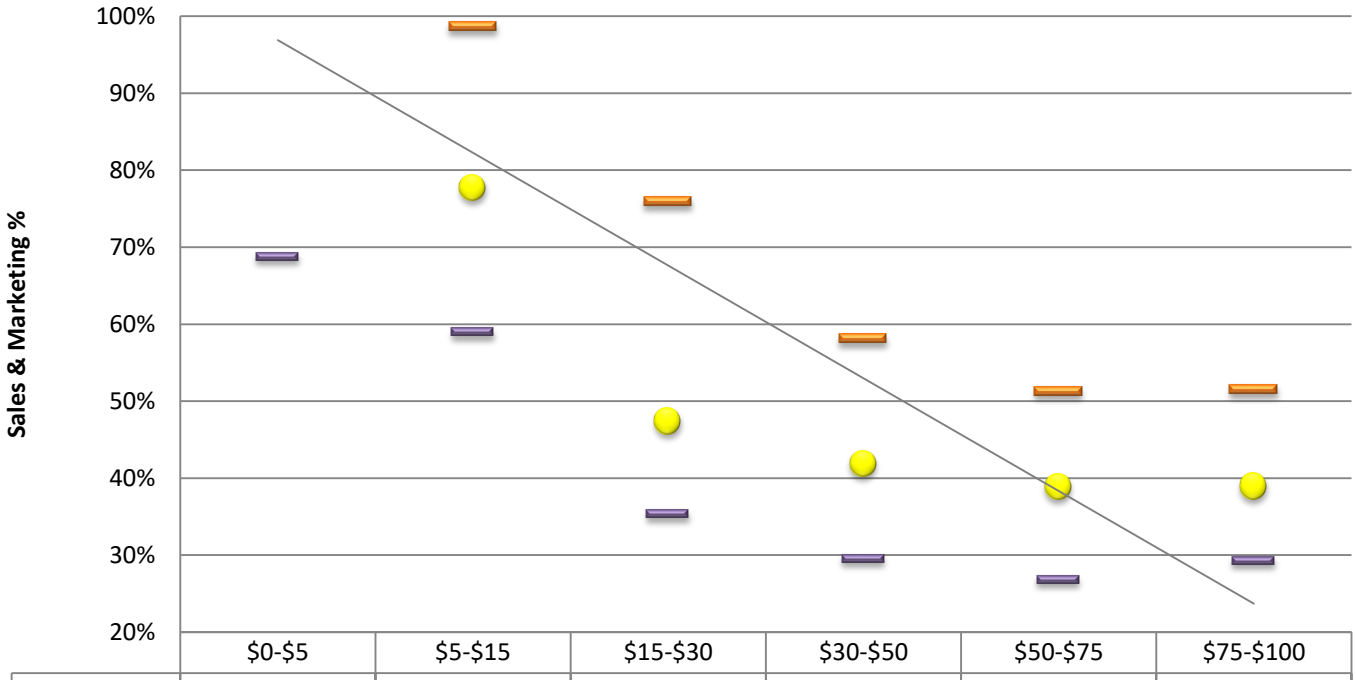
Cost of revenue for a SaaS company typically includes hosting cost, third-party software cost, data fee, implementation and on-boarding / personnel cost related to customer support or maintaining the production environment. The treatment of other personnel cost involved in account management or customer success roles varies across companies as there are no specific GAAP rules defining cost of revenue. We guide companies to not include the cost of account reps or customer success if they carry an up-sell / cross-sell quota, suggesting instead that they should be included in sales and marketing. On the other hand if they don't carry any sales quota, we recommend that the cost of account management reps and customer success be included in cost of revenue. Public companies tend to allocate a portion of their overhead to cost of revenue based on headcount.

A typical SaaS company has gross margins in the 50% - 70% range. As the installed base grows, these companies can share fixed infrastructure costs, such as hosting expenses, across more clients and achieve higher margins. The exhibit above demonstrates that sub-$5 million SaaS companies typically generate gross margins in the 20% - 65% range. Margins consistently grow to more than 60% once companies exceed $15 million in revenue, and top quartile companies achieve gross margins north of 70% once they achieve material scale (>$15 million in revenue).

Sales & Marketing Effectiveness

Particular attention in this study is given to identifying important sales and marketing operating metrics that help assess a company's efficiency and effectiveness. Sales and marketing is typically the largest and, as seen below, most widely variable expense component of a SaaS company's cost structure.

Exhibit 8: Sales and Marketing as a % of Revenue



	$0-$5	$5-$15	$15-$30	$30-$50	$50-$75	$75-$100
High	509%	260%	246%	154%	169%	90%
3rd Quartile	201%	99%	76%	58%	51%	51%
Median	117%	78%	47%	42%	39%	39%
1st Quartile	69%	59%	35%	30%	27%	29%
Low	38%	23%	12%	12%	12%	7%

Note: If more than one data point was available, a range is used.

Sales and marketing expenses range from just 12% of revenue to 154% of revenue for companies between $30 and $50 million in revenue. With scale, sales and marketing investment tends to represent a lower percentage of revenue. As shown above, companies with less than $5 million in revenue tend to spend 69% - 201% of those dollars on sales and marketing. By the time companies generate more than $50 million, the percentage of revenue dedicated to sales and marketing drops to 27% - 51%.

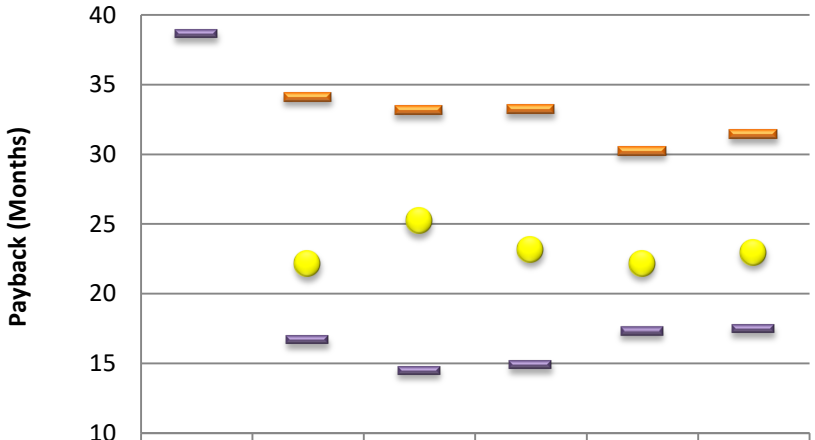
Worth noting, at the median level, horizontal companies tend to spend 15% - 20% more on sales and marketing as a percentage of revenue than vertically focused companies until about $30 million in revenue is achieved. At scale, the gap narrows as vertical solutions seem to increase their sales and marketing spend in comparison to the horizontal solutions. A likely reason for this dynamic is that vertical solutions greater than $30 million in revenue start looking at adjacent markets and/or new geographies as means to expand their total addressable markets.

Return on Sales & Marketing Investment

Best-of-breed SaaS companies achieve payback on sales and marketing investment in less than 24 months. Essentially, 24-month payback equates to a 50% ROI on invested capital; a 12-month payback represents 100% ROI. Payback is simply calculated by taking sales and marketing spend for a defined period and dividing it by the respective period's incremental gross margin. By measuring payback on gross margin (vs. revenue), this calculation takes into consideration the company's churn.

Believing that 12-24 month payback on sales and marketing is attractive, River Cities advises companies to accelerate their sales and marketing spend when they are achieving those results. If payback rises to more than two years, companies should consider alternate spend initiatives to drive more efficient growth.

Exhibit 9A: Payback on Sales and Marketing (Months)



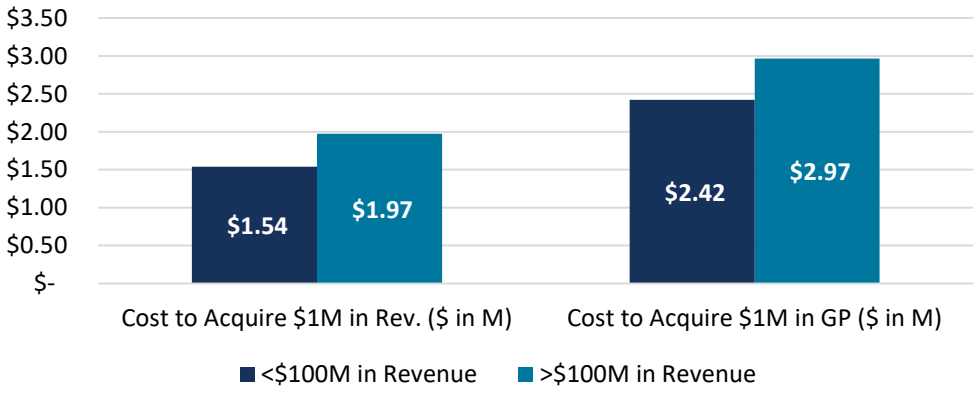
	$0-$5	$5-$15	$15-$30	$30-$50	$50-$75	$75-$100
High	74.2	79.7	275.1	81.2	92.7	141.7
3rd Quartile	62.4	34.1	33.2	33.2	30.2	31.4
Median	50.5	22.1	25.2	23.2	22.1	22.9
1st Quartile	38.6	16.7	14.5	14.9	17.3	17.5
Low	26.8	7.3	6.2	6.3	4.2	5.4

Note: If more than one data point was available, a range is used.

As evidenced in Exhibit 9A, in general, as SaaS companies scale their revenue, it becomes harder and harder to grow efficiently. Once SaaS companies achieve a critical mass of $100 million in TTM revenue, they often look to sustain top-line growth by expanding into adjacent markets or introducing new offerings. These activities tend to increase spending and the implied cost required to add $1 million of revenue.

Exhibit 9B highlights the cost to acquire $1 million in revenue and gross profit in 2016 by size, providing insight into the recent sales and marketing effectiveness of active SaaS companies. To account for revenue generated through acquisition, we have included the acquisition price in the cost of sales and marketing. In River Cities' 2014 SaaS Benchmarking, we reported that the median cost to acquire $1 million in gross profit was $2.7 million; this figure has decreased to $2.4 million in this year's study, suggesting that SaaS companies are becoming more effective in deploying sales and marketing resources.

Exhibit 9B: Cost to Acquire $1M in Revenue and GP by Size



Sales & Marketing for Horizontally- vs. Vertically-Focused SaaS Companies

Vertically-focused companies tend to see more efficient results on their sales and marketing spend than horizontally-focused companies. The efficiency of vertically-focused SaaS providers is evident in Exhibit 9C, which shows that horizontal players spend more, on average, to acquire $1 million of revenue or gross profit. Looking at Exhibits 9D and 9E below, this is clear for both the median and quartile statistics; for example, vertically-focused companies in the $15-$30 million revenue range see payback periods nearly 12 months shorter than their horizontal counterparts. Horizontal companies, however, do see an improvement in sales and marketing payback as they grow, with the gap between the payback periods shrinking as revenue scales.

Exhibit 9C. Cost to Acquire $1M in Revenue and GP by Type

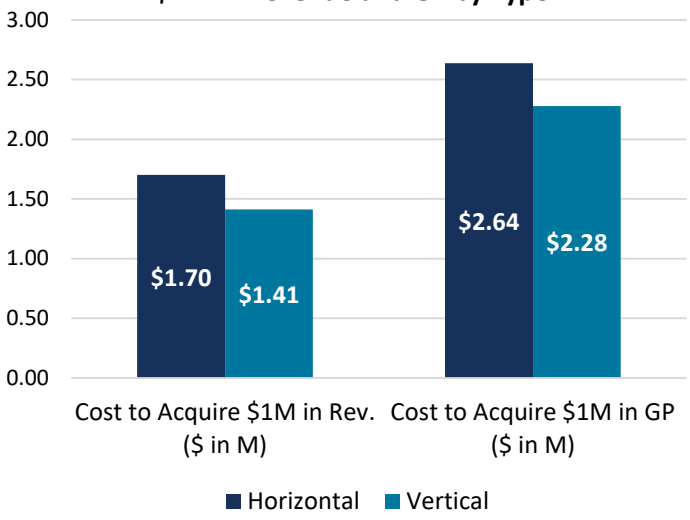
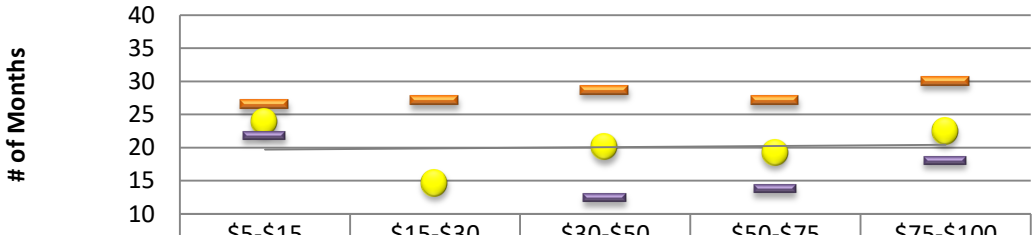
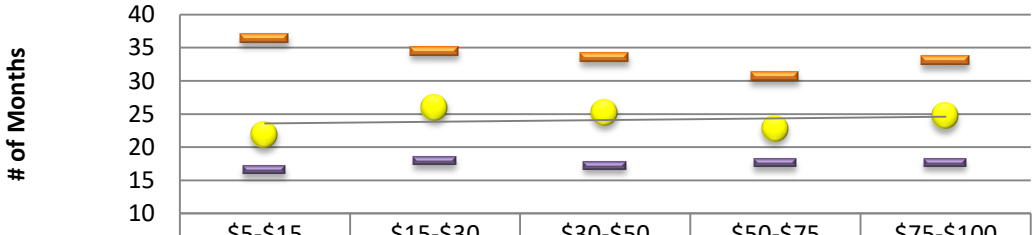


Exhibit 9D: S&M Payback (Vertical)



	$5-$15	$15-$30	$30-$50	$50-$75	$75-$100
High	45.5	35.9	79.1	57.1	75.1
3rd Quartile	26.5	27.2	28.7	27.1	30.0
Median	23.9	14.6	20.1	19.2	22.5
1st Quartile	21.8	7.6	12.4	13.8	18.0
Low	7.3	7.0	6.4	4.2	14.1

Exhibit 9E: S&M Payback (Horizontal)



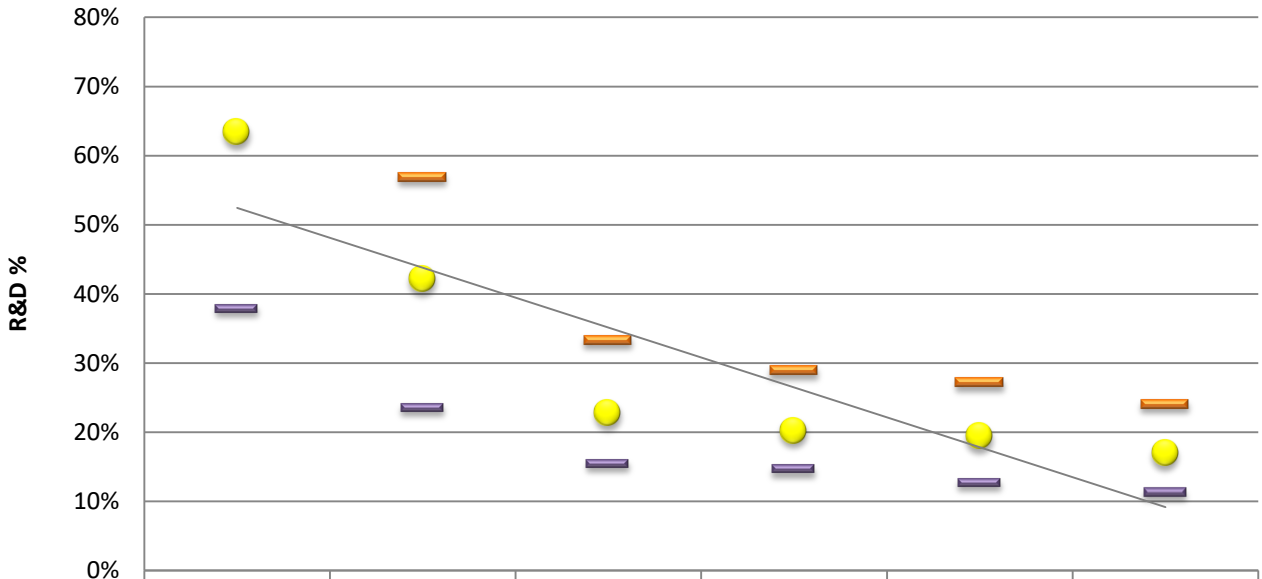
	$5-$15	$15-$30	$30-$50	$50-$75	$75-$100
High	50.6	75.9	79.1	92.7	141.7
3rd Quartile	36.4	34.5	33.5	30.7	33.0
Median	21.8	26.0	25.2	22.7	24.6
1st Quartile	16.6	17.9	17.2	17.7	17.7
Low	12.2	6.2	6.3	4.2	5.4

Note: If more than one data point was available, a range is used.

Research & Development

In many regards, it has never been easier to launch a software company. With SaaS, there is no need to invest upfront capital to buy servers and other hardware components. Cloud hosting services and open source software have significantly reduced the upfront capital required to achieve early proof points and product-market fit.

Exhibit 10A: Research & Development as a % of Revenue

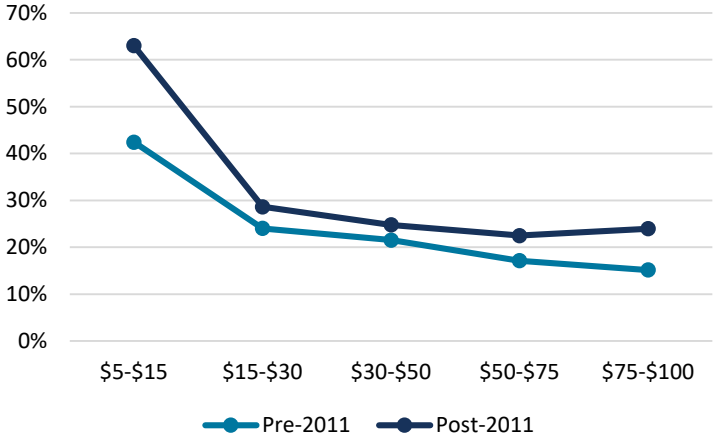


	$0-$5	$5-$15	$15-$30	$30-$50	$50-$75	$75-$100
High	448%	404%	119%	98%	58%	175%
3rd Quartile	163%	57%	33%	29%	27%	24%
Median	63%	42%	23%	20%	19%	17%
1st Quartile	38%	24%	15%	15%	13%	11%
Low	18%	4%	2%	2%	2%	2%

Note: If more than one data point was available, a range is used.

Highly-technical and highly-priced solutions with fewer customers require relatively higher R&D investment. As seen in Exhibit 10A, companies spend more on product development early in their life cycle (as a percentage of revenue). Companies with less than $5 million in revenue reinvest 63% of sales (median) into R&D; the percentage decreases to 17% (median) by the time companies reach $75-$100 million in revenue. Half of the companies in our data set spent less than 20% of revenue on R&D once they achieved scale ($30-$50 million in revenue).

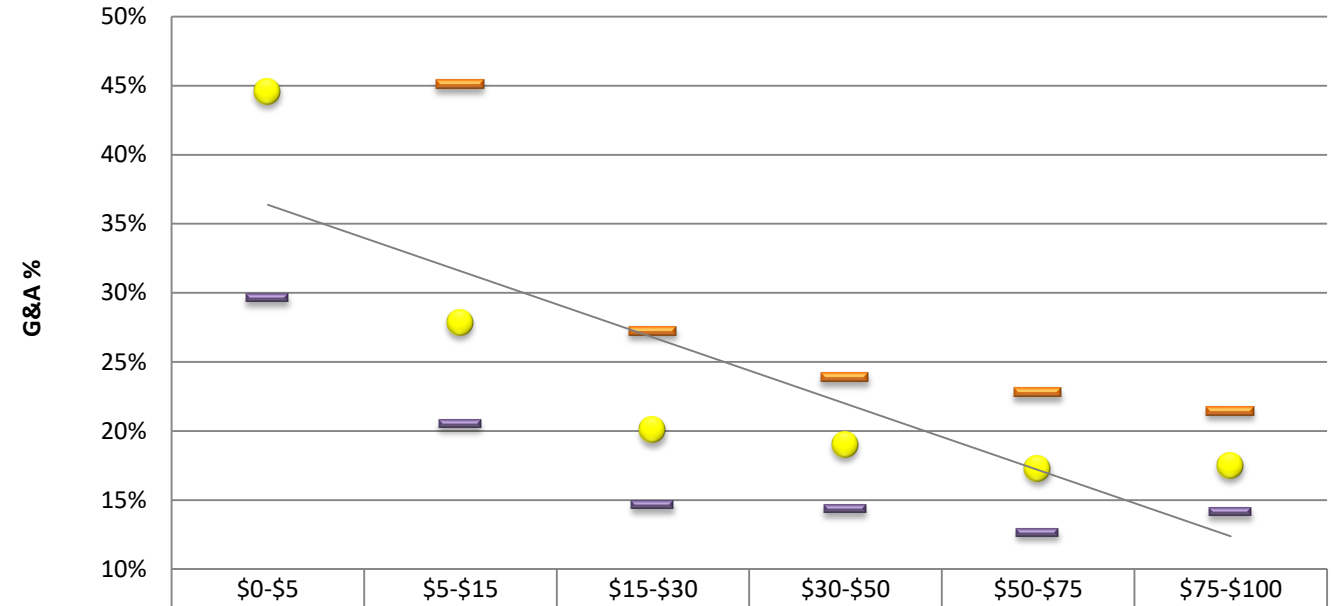
Exhibit 10B: R&D as a % of Revenue Across Time



As evidenced in Exhibit 10B, there has been an uptick in R&D spend in recent years. Companies that went public since 2011 spent roughly 10% more of revenue on R&D than companies that went public prior to 2011. We attribute this trend to an increase in competition and the over funding of certain sectors like sales and marketing.

General & Administrative

Exhibit 11: G&A Expense as a % of Revenue



	$0-$5	$5-$15	$15-$30	$30-$50	$50-$75	$75-$100
High	268%	126%	51%	66%	43%	42%
3rd Quartile	80%	45%	27%	24%	23%	21%
Median	45%	28%	20%	19%	17%	17%
1st Quartile	30%	21%	15%	14%	13%	14%
Low	14%	5%	7%	7%	3%	7%

Note: If more than one data point was available, a range is used.

As expected, a company's relative investment in G&A expense declines with scale. For companies with less than $5 million in revenue, the median investment in overhead is 45% of sales, and a quarter of public SaaS companies spent more than 80% of revenue on G&A expense in their early stages of development. Typically, as companies raise capital and go to market with new offerings, investment in high-quality executives outpaces revenue growth. During the early days, SaaS companies are establishing a foundation for growth with the anticipation that they will benefit from economies of scale.

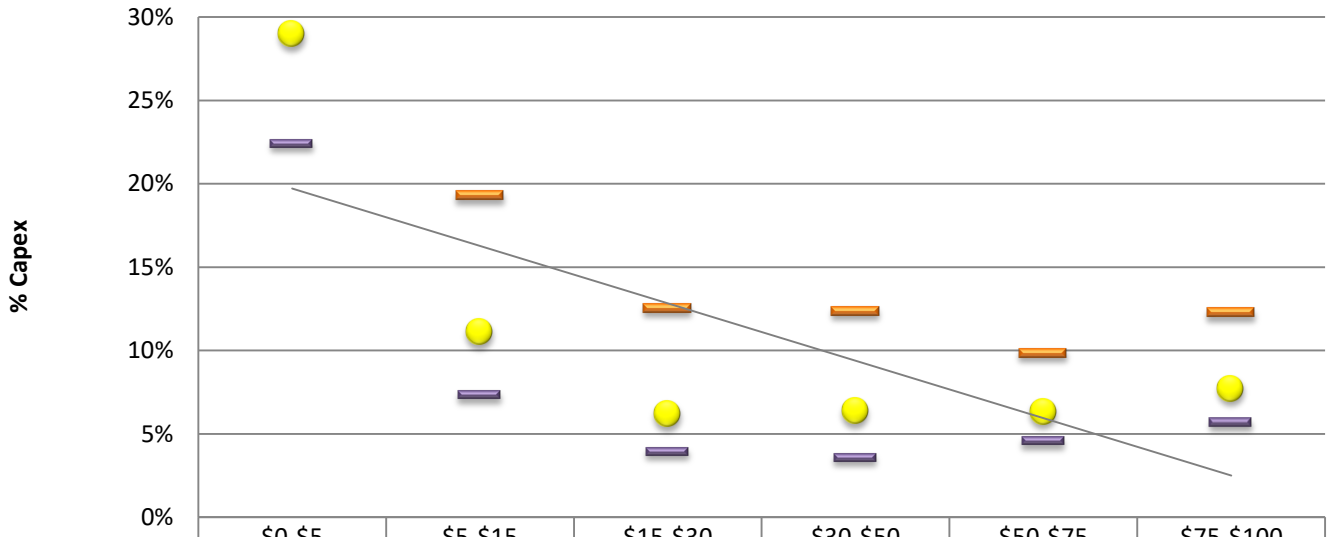
Not surprisingly, G&A expense as a percentage of revenue levels off as SaaS companies approach $30 million in sales. From there, the median investment in G&A is relatively stable and hovers in the 17% to 20% range, with +/-5% deviations in the second and third quartiles.

Capital Expenditure

With fewer and fewer SaaS companies delivering applications via self-managed servers, capital expenses are becoming a much less burdensome line item on the cash flow statement. In Pacific Crest's 2016 SaaS survey, 67% of private company participants surveyed leveraged third-party hosting (mostly Amazon Web Services), and an additional 12% expected to migrate off of self-managed servers within the next three years.

Not only are capital expenses declining as a result of Infrastructure-as-a-Service, but SaaS companies also have relatively fixed annual capital investment requirements. For companies with $5 million to $50 million of revenue, annual capital expenses tend to be in the $1 million to $2 million range. As a result, capital expenditure as a percentage of revenue decreases significantly with scale. Once SaaS companies grow beyond $30 million of revenue, most invest less than 8% of sales back into capital purchases.

Exhibit 12: Capex as % of Revenue



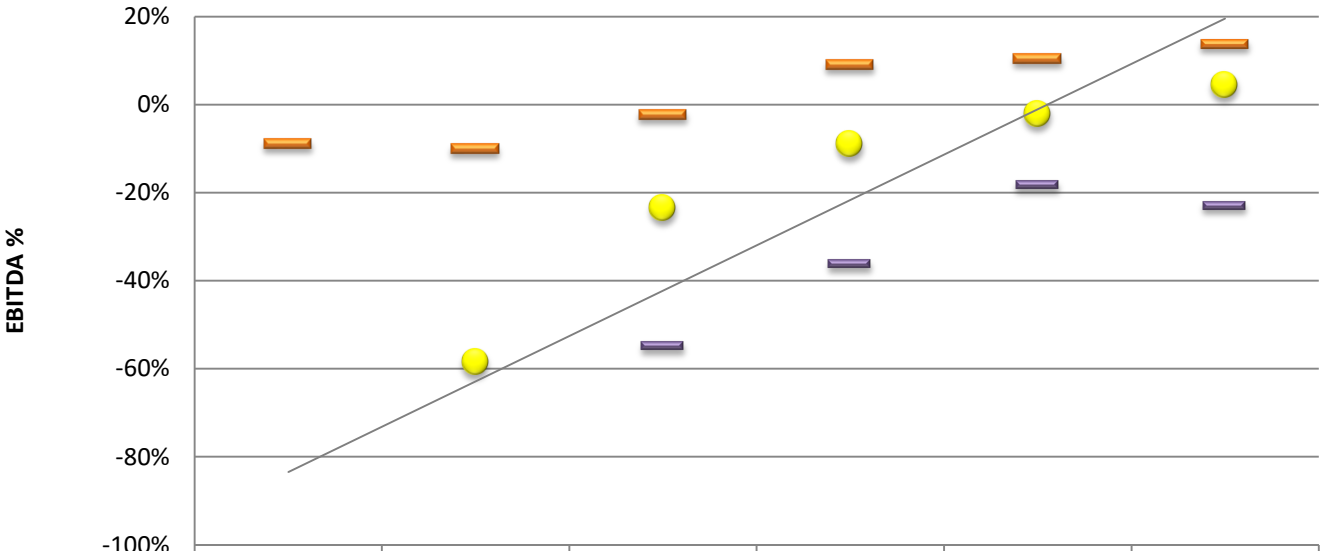
	$0-$5	$5-$15	$15-$30	$30-$50	$50-$75	$75-$100
High	118%	108%	72%	44%	39%	46%
3rd Quartile	53%	19%	13%	12%	10%	12%
Median	29%	11%	6%	6%	6%	8%
1st Quartile	22%	7%	4%	4%	5%	6%
Low	10%	1%	1%	1%	1%	1%

Profitability

Most high growth SaaS companies aggressively reinvest cash flow into research and development and sales and marketing. Revenue growth is typically more accretive than cash flow generation, particularly early in the development cycle. Today, SaaS unit economics are well understood and easily digested. As a result, the investor community has embraced cash burn when market dynamics and unit economics (sales and marketing efficiency, retention, etc.) support increased investment.

Not surprisingly, most public SaaS companies were unprofitable as they scaled to $50 million in sales. Between $15 million and $30 million in revenue, only seven of the 57 companies included in this data set achieved positive EBITDA margins. At the time of their IPOs, only 43% of SaaS companies reported positive EBITDA margins.

Exhibit 13: EBITDA Margin



	$0-$5	$5-$15	$15-$30	$30-$50	$50-$75	$75-$100
High	899%	20%	29%	26%	72%	41%
3rd Quartile	-9%	-10%	-2%	9%	10%	14%
Median	-103%	-59%	-23%	-9%	-2%	4%
1st Quartile	-248%	-143%	-55%	-36%	-18%	-23%
Low	-951%	-539%	-285%	-355%	-158%	-80%

Looking Ahead

Room to Run: Verticalization of SaaS

SaaS adoption continues to increase at a rapid pace; Gartner estimates that the SaaS market will grow at 19.7% CAGR through 2019. Capital constraints and the need for organizations to maintain flexibility will continue to amplify the advantages of outsourced subscription models relative to traditional on-premise implementations. As a result, there is still significant upside for SaaS applications, especially for niche verticals that have historically been slower to adopt technology. River Cities considers this influx of technology adoption in vertical segments the next wave of SaaS – with the first phase being typified by functional solutions across many verticals.

From the customer point of view, the biggest measurable benefit of vertical SaaS is that an industry specific solution significantly reduces the need for customization. This not only saves money but more importantly accelerates time to value. As a result, customers are willing to pay a premium for solutions tailored to their industry needs. The vertical focus also provides a lower customer acquisition cost (CAC). Where horizontal solution providers can spend 1x - 3x the annual contract value acquiring a customer, vertical solution providers can acquire customers as low as $\frac{1}{4}$x the annual contract value. Given this dynamic, vertical SaaS providers have the ability to achieve profitability earlier in the lifecycle than does a horizontal provider, helping further mitigate risk.

Infrastructure-as-a-Service

Consistent with many other non-core business functions, outsourcing technology infrastructure has become standard practice. Amazon, Microsoft and Google cracked the code on cheaply and effectively moving core IT functions out of company datacenters and into the public "cloud" including basic computing, networking and storage.

With cloud computing, customers pay as they go for computing power, which translates into substantial benefits for businesses, including reduction in hosting and equipment costs, increased capacity and productivity all at a time when we have seen an exponential growth in corporate data. This dynamic has also fundamentally reduced the barriers to entry for new software as a service companies. Where early SaaS companies invested tens of millions upfront in data center hardware and other infrastructure, today that's mostly consumed on a pay as you go basis, eliminating hefty upfront costs. The consequence of this has been a proliferation of point solutions that reach a few million of revenue, but struggle to reach meaningful scale.

Next Phase of Data and Analytics

As businesses increasingly move their data into hosted environments, there will be opportunities for SaaS vendors to extend the application layer and deliver more value to the customer. Vendors who leverage data science and machine intelligence will become better partners, and integrating data from different departments (and thus different applications) will allow vendors to deliver more valuable insights.

In 2016, the progressive shift over the years from IT-led reporting to business-led self-service analytics passed the tipping point, empowering the business users with advanced, statistically sound business analytics for simple, actionable and relevant decision-making. Data will become a strategic asset to the enterprise and analytics will enable the organization to distinguish the signals from the noise and focus on the outcomes that matter, resulting in solid business ROI.

River Cities' thought leadership, portfolio company experience and SaaS investment success provide the firm with a unique perspective around strategic issues faced by SaaS companies. Continued focus on the firm's knowledgebase further supports River Cities' efforts to quickly assess prospective SaaS portfolio companies as well as make solid fact-based recommendations to existing portfolio companies.

For more information on our SaaS experience or investment strategy, please contact:
Rob Heimann, Managing Director, rheimann@rccf.com
Parag Rathi, Senior Associate, prathi@rccf.com

RIVER CITIES
CAPITAL FUNDS

Appendix

Renewal & Churn Rates

Measuring Churn

There are a variety of ways churn can be measured and analyzed. Below we detail a couple of approaches:

Rolling 12-Month Basis

The rolling 12-month basis calculates annual churn by annualizing each month's dollar churn. Monthly dollar churn is calculated by dividing the current monthly dollar churn as a % of the previous month's revenue. As an example, in Month 2, the business lost $4,261 of revenue, equating to 0.9% monthly churn.

Period	Billed Revenue	Monthly Churn $	Monthly Churn %	Annualized Churn	
Month 1	$500,000				
Month 2	$515,236	$4,261	0.9%	$51,132	
Month 3	$530,693	$4,531	0.9%	$49,841	
Month 4	$541,307	$4,185	0.8%	$41,850	
Month 5	$568,372	$4,956	0.9%	$44,604	
Month 6	$608,158	$5,687	1.0%	$45,496	
Month 7	$632,485	$3,256	0.5%	$22,792	
Month 8	$645,134	$4,778	0.8%	$28,668	
Month 9	$651,586	$6,850	1.1%	$34,250	
Month 10	$648,328	$4,489	0.7%	$17,956	
Month 11	$667,778	$5,458	0.8%	$16,374	
Month 12	$681,133	$4,158	0.6%	$8,316	
Month 13		$6,444	0.9%	$6,444	
	$7,190,210	**$59,053**	**0.8%**	**$367,723**	**5.1%**

To calculate annualized churn as of Month 13, we annualize the monthly dollar churn through Month 13 and divide it by total TTM revenue as of Month 13. For example, in Month 2 the business lost $4,261 in revenue or $51,132 ($4,261 X 12) of annualized revenue. In sum, the business churned $367,723 in annualized revenue, amounting to an annualized churn rate of 5.1%.

Cohort Analysis

Analyzing churn through a cohort analysis (with each cohort being the group of customers who launched in the same month) can provide a more granular look at retention. Often, SaaS companies lose a big portion of their churned customers in the first few months due to lack of adoption. Once customers reach a certain time-based milestone, churn might stabilize at a lower level. If this is the case, focusing on account management and support in the initial months of a customer's life may improve unit economics materially. The following is a sample cohort analysis:

		12-Month MRR Cohort Analysis											
Month	New MRR	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-13	Nov-17	Dec-17
Jan-17	$3,363	$3,296	$3,230	$3,165	$3,102	$3,040	$2,979	$2,919	$2,861	$2,804	$2,748	$2,693	$2,639
Feb-17	$2,880		$2,837	$2,795	$2,753	$2,711	$2,671	$2,631	$2,591	$2,552	$2,514	$2,476	$2,439
Mar-17	$3,946			$3,906	$3,867	$3,829	$3,790	$3,752	$3,715	$3,678	$3,641	$3,605	$3,568
Apr-17	$4,139				$4,119	$4,098	$4,078	$4,057	$4,037	$4,017	$3,997	$3,977	$3,957
May-17	$2,941					$2,956	$2,971	$2,985	$3,000	$3,015	$3,030	$3,046	$3,061
Jun-17	$2,891						$2,934	$2,978	$3,023	$3,068	$3,114	$3,161	$3,209
Jul-17	$3,832							$3,909	$3,987	$4,067	$4,148	$4,231	$4,316
Aug-17	$5,576								$5,716	$5,859	$6,005	$6,155	$6,309
Sep-17	$8,047									$8,289	$8,537	$8,793	$9,057
Oct-17	$3,871										$4,025	$4,186	$4,354
Nov-17	$4,142											$4,328	$4,523
Dec-17	$7,041												$7,393
		$3,296	**$6,067**	**$9,866**	**$13,841**	**$16,634**	**$19,423**	**$23,232**	**$28,930**	**$37,349**	**$41,760**	**$46,651**	**$54,824**

		% of Retained MRR in Lifetime Month											
		1	2	3	4	5	6	7	8	9	10	11	12
Jan-17	$3,363	98.00%	96.04%	94.12%	92.24%	90.39%	88.58%	86.81%	85.08%	83.37%	81.71%	80.07%	78.47%
Feb-17	$2,880	98.50%	97.02%	95.57%	94.13%	92.72%	91.33%	89.96%	88.61%	87.28%	85.97%	84.68%	
Mar-17	$3,946	99.00%	98.01%	97.03%	96.06%	95.10%	94.15%	93.21%	92.27%	91.35%	90.44%		
Apr-17	$4,139	99.50%	99.00%	98.51%	98.01%	97.52%	97.04%	96.55%	96.07%	95.59%			
May-17	$2,941	100.50%	101.00%	101.51%	102.02%	102.53%	103.04%	103.55%	104.07%				
Jun-17	$2,891	101.50%	103.02%	104.57%	106.14%	107.73%	109.34%	110.98%					
Jul-17	$3,832	102.00%	104.04%	106.12%	108.24%	110.41%	112.62%						
Aug-17	$5,576	102.50%	105.06%	107.69%	110.38%	113.14%							
Sep-17	$8,047	103.00%	106.09%	109.27%	112.55%								
Oct-17	$3,871	104.00%	108.16%	112.49%									
Nov-17	$4,142	104.50%	109.20%										
Dec-17	$7,041	105.00%											
		101.97%	103.07%	**103.77%**	**103.92%**	**102.03%**	**99.40%**	**96.42%**	**93.18%**	**89.89%**	**86.29%**	**82.20%**	**78.47%**

The above graph depicts cohort MRR and how it grows or churns over time. In this analysis, the business added $3,363 of new MRR in Month 1 and retained ~78% of it at the end of 12 months. In contrast, in Month 6, the business added $2,891 of new MRR, which grew to $3,209, representing 11% expansion within a six-month period. This kind of analysis can be helpful in analyzing how churn varies across time and how churn is changing with newer customers.

Other Sales and Marketing Metrics

Another way to understand the unit economics of a SaaS business is to look at the lifetime value of a typical customer (LTV) and the cost to acquire that customer (CAC). For illustrative purposes, let's say that a SaaS business has the following metrics:

Sales and marketing cost:	$200k a month
New customers added every month:	100
Average Revenue per Account:	$100
Monthly Churn:	1%

Formulas

Customer Acquisition Cost = Total sales and marketing cost / # of new customers acquired
LTV = Average recurring per account (ARPU) / Churn
LTV (adjusted for gross margin) = Average gross margin per account / Churn
CAC Ratio = LTV / CAC

In the above example, CAC equates to $2,000 ($200,000 / 100), Lifetime value (LTV) of a customer amounts to $10,000 ($100 / 0.01), and LTV adjusted for gross margin equates to $8,000 ($80 / 0.01). Finally, the CAC ratio is calculated by dividing LTV by CAC, or $8,000 divided by $2,000, resulting in a CAC ratio of 4x. The ratio between CAC and LTV helps us understand whether a company is making more profit from customers than it costs to acquire them. Solid performing SaaS businesses have an LTV to CAC ratio higher than 3x at scale.

The graphic below depicts the above example and the relationship between LTV and CAC. As you can see, immediately upon acquiring a customer, the business is in the red, having spent $2,000 to acquire that customer. As the customer starts generating $80 in gross margin each month, the business climbs toward breakeven and eventually crosses that threshold after 25 months. From there, the customer becomes profitable, and LTV increases until the customer churns.