Engineering Entrepreneurship: The Startup Road Ahead

ENGR 4302/5302; EE 4302

WHAT EVERY ENGINEER SHOULD KNOW ABOUT

STARTING A HIGH-TECH BUSINESS VENTURE

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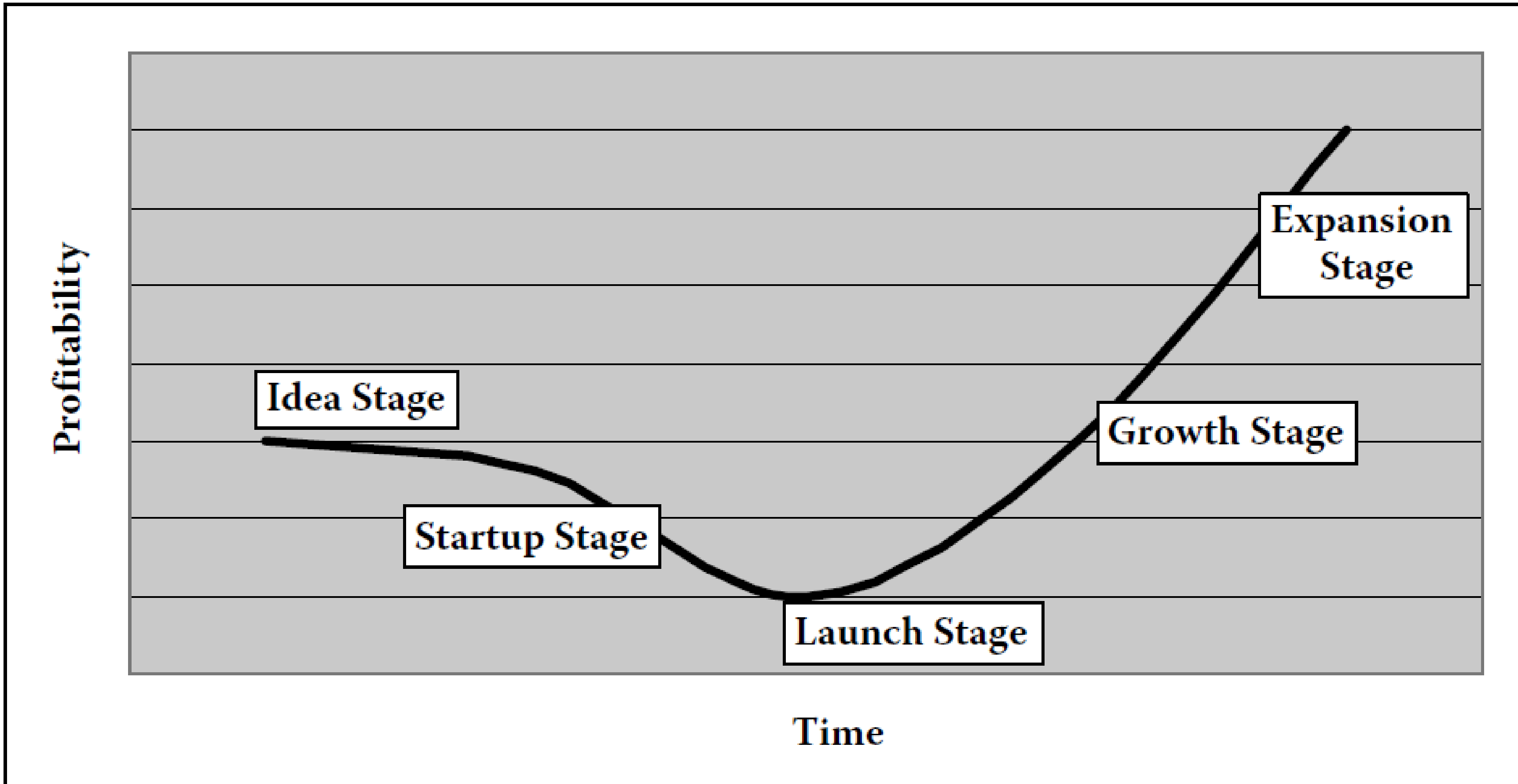
Outline

What to Watch For

SOME STATISTICS ON SUCCESS AND FAILURE

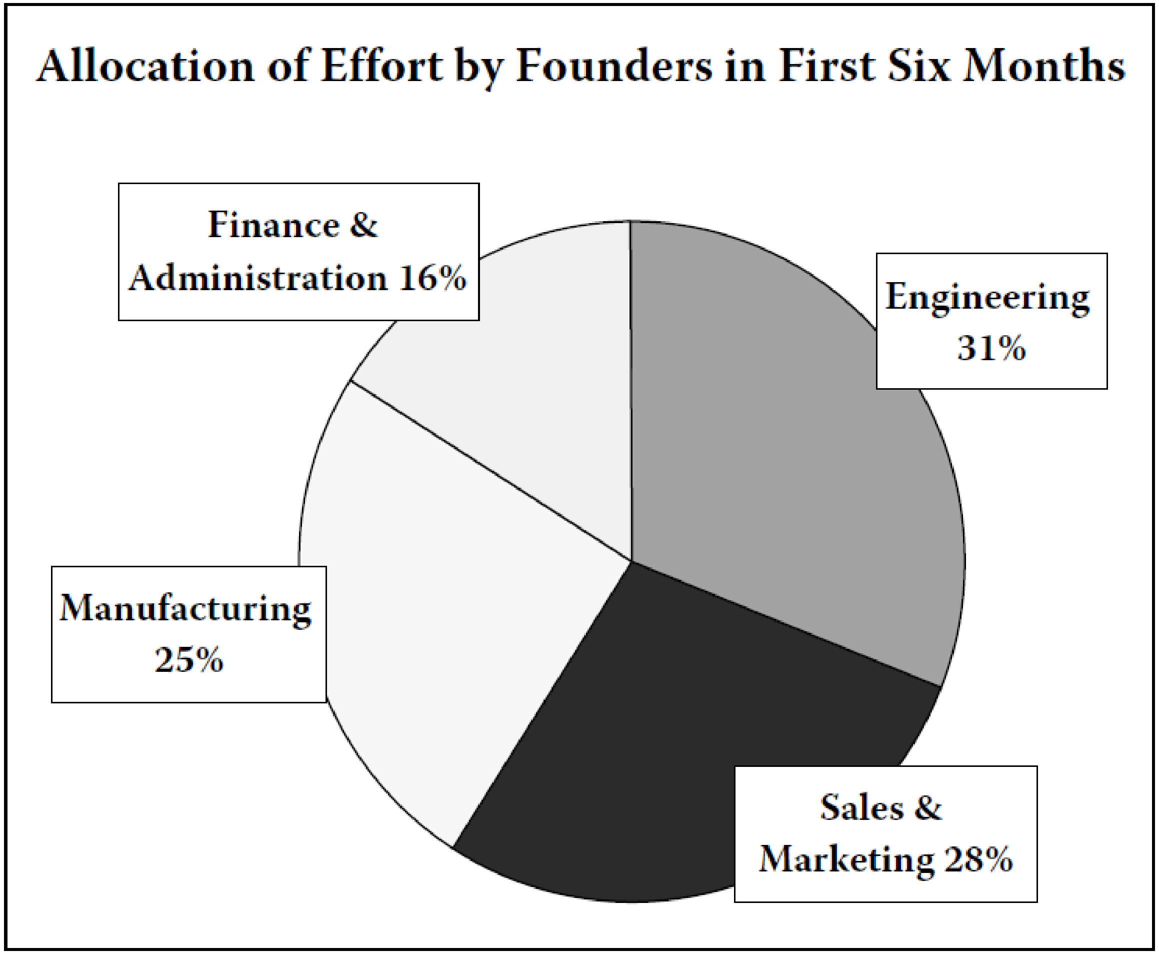
In 2000, venture capitalists funded 2,639 companies. At the end of 2005 (approximately five years later), 1,044 of those companies were still private (40%), 35 had gone public (1.3%), and the remainder had either been acquired or gone out of business.

Source: VentureOne.

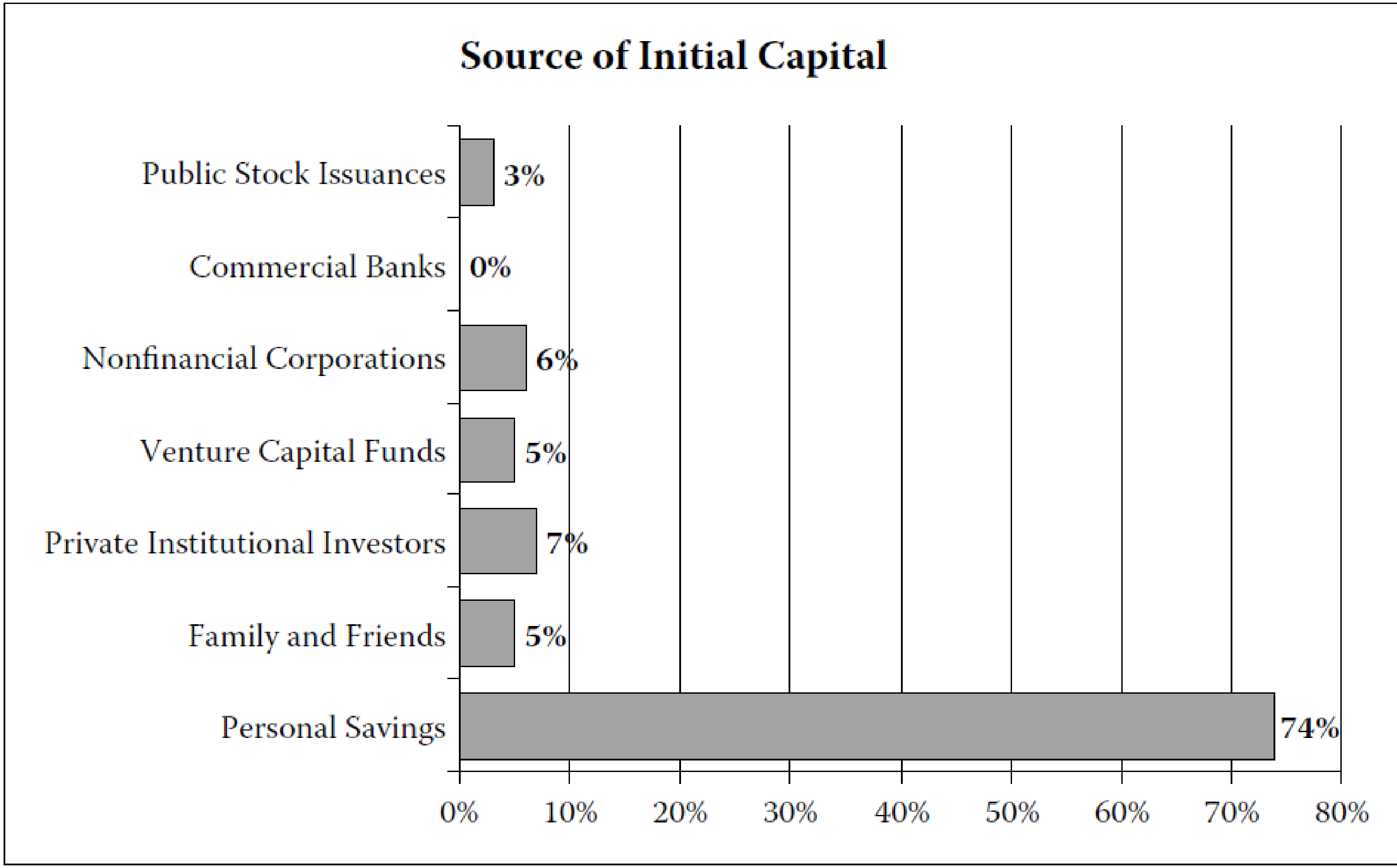


Five Challenges in a High-Technology Startup Company

- Funding challenges ("How do we pay for this?")
- Talent challenges ("How should we recruit and retain the right people?")
- Technology challenges ("How can we develop and protect our innovation?")
- Marketing and sales challenges ("How do we get people to buy?")
- Operational challenges ("How do we build the company for success?")



Reference: E. Roberts, Entrepreneurs in High-Technology: Lessons from MIT and Beyond (Oxford University Press, 1991)



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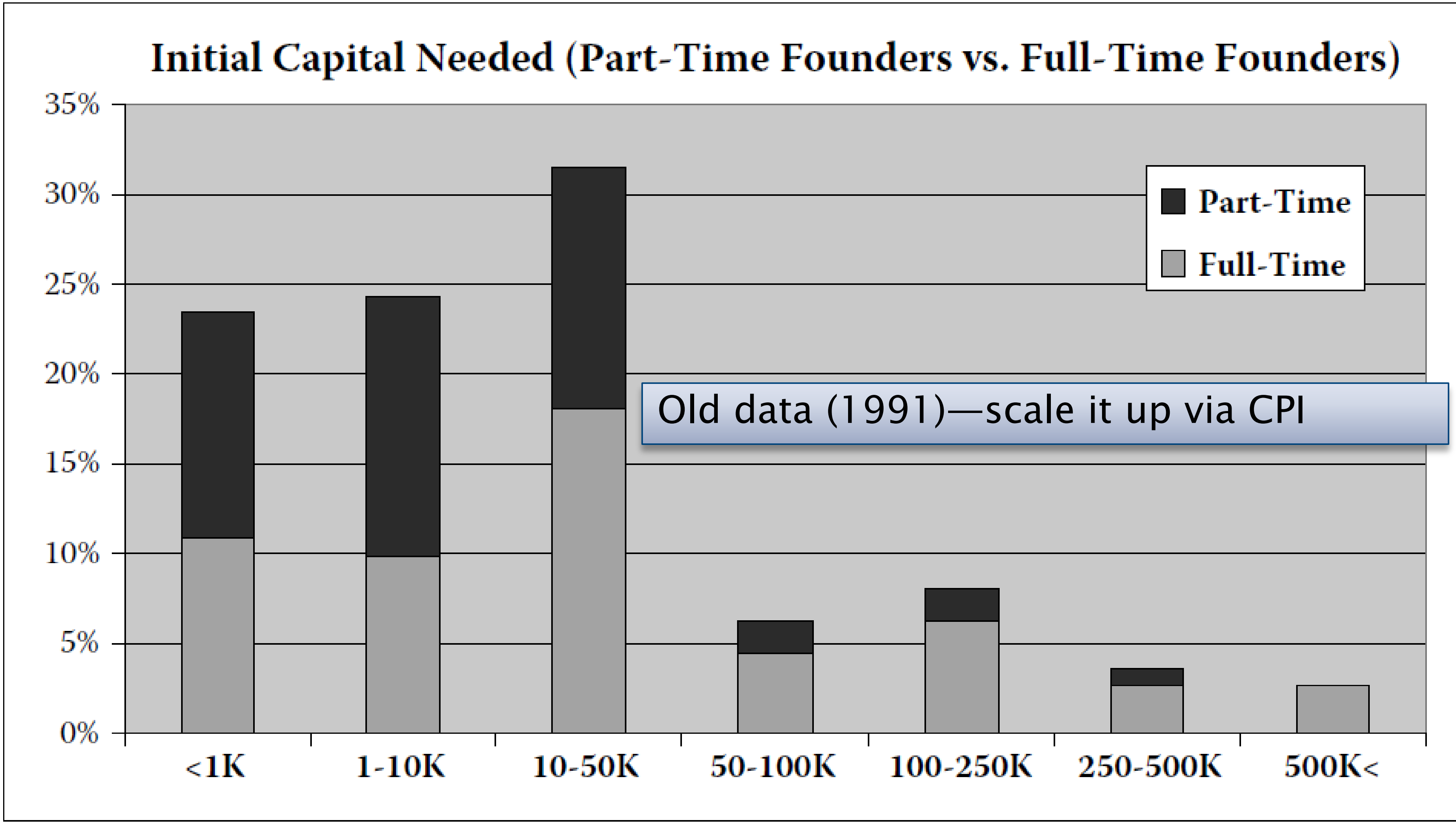

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WHY SMALL BUSINESSES FAIL

General Business Factors

Lack of a well-developed business plan, including insufficient research on the business before starting it — 78%

Being overly optimistic about achievable sales, money required, and about what needs to be done to be successful — 73%

Not recognizing, or ignoring, what they don't do well and not seeking help from those who do — 70%

Insufficient relevant and applicable business experience — 63%

Financial Factors

Poor cash flow management skills/poor understanding of cash flow — 82%

Starting out with too little money — 79%

Not pricing properly or failure to include all necessary items when setting prices — 77%

Marketing Factors

Minimizing the importance of promoting the business properly — 64%

Not understanding who your competition is or ignoring competition — 55%

Too much focus and reliance on one customer/client — 47%

Human Resource Factors

Inability to delegate properly or micromanaging work given to others or over-delegating and abdicating important management responsibilities — 58%

Hiring the wrong people or clones of themselves and not people with complementary skills or hiring friends and relatives — 56%

Source: Jessie Hagen of U.S. Bank cited on the SCORE/Counselors to America's Small Business website (http://www.score.org).

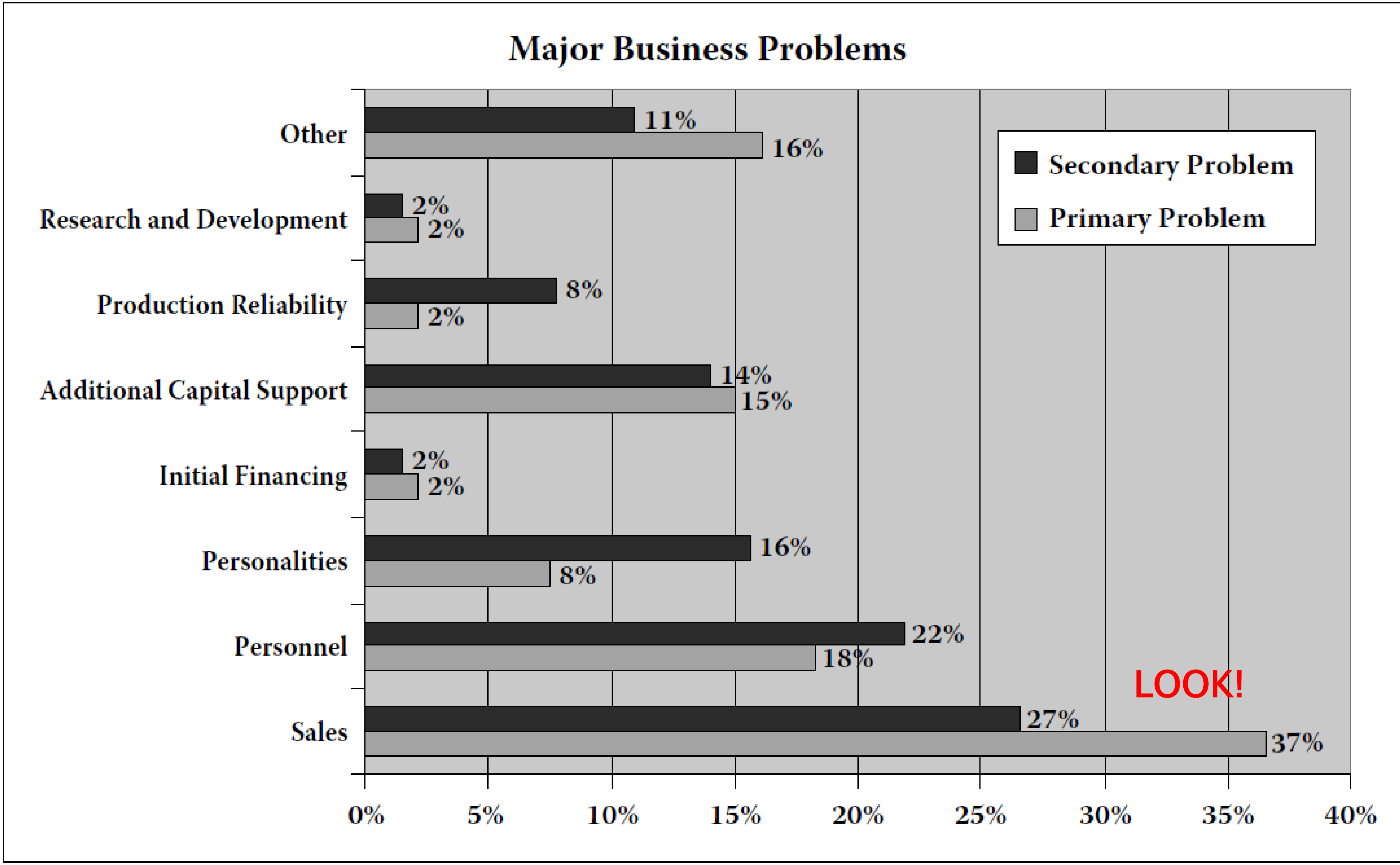
Reasons for bankruptcy

WHY SMALL BUSINESSES FAIL

According to a report by the U.S. Bureau of Labor Statistics,[1] approximately one-third of new businesses fail within two years and more than half go out of business within four years. But why do firms fail? In 1999, the U.S. Small Business Administration released a report studying the reasons small firms had been forced to declare bankruptcy.

The reasons for filing were broken down into the following categories: (1) outside business conditions (mentioned by 39% of filers), (2) financing problems (28%), (3) inside business conditions (27%), (4) tax-related reasons (20%), (5) dispute with a particular creditor (19%), (6) personal problems (17%), and (7) calamities (10%). Outside business conditions included such factors as new competition, increases in rent, insurance costs, or declining real estate values. Inside business conditions included a bad location, inability to manage people, the loss of major clients, or inability to collect accounts receivable. Personal problems often included divorce and health problems. One-third of the bankrupt businesses had less than $100,000 in debts, and 79% had less than $500,000 in debts. Mean assets were $841,000, with median assets of $94,700.

[1] Knaup, Amy E. "Survival and Longevity in the Business Employment Dynamics Data," *Monthly Labor Review*. May 2005.


Major Business Problems
Other
11%
16%
Research and Development
2%
2%
Production Reliability
8%
2%
Additional Capital Support
14%
15%
Initial Financing
2%
2%
Personalities
16%
8%
Personnel
22%
18%
Sales
27%
37%
Secondary Problem
Primary Problem
LOOK!
0%
5%
10%
15%
20%
25%
30%
35%
40%

ACCORDING TO ENTREPRENEURS

What are the key challenges you are focusing on for your business?

Entrepreneur magazine and PricewaterhouseCoopers, in their "2006 Entrepreneurial Challenges Survey," asked CEOs of privately held, high-technology businesses about their most pressing challenges they are focusing on for their businesses:

- Retaining key employees — 74%
- Developing new products/services — 47%
- Creating business alliances — 27%
- Expansion to markets outside of the United States — 21%
- Finding new financing — 15%

Engineers Allege Hiring Collusion in Silicon Valley--Retention

From left, Sergey Brin and Eric Schmidt, of Google, and Steve Jobs, of Apple, in 2008.

By DAVID STREITFELD
FEB. 28, 2014

Just how far Silicon Valley will go to remove such risks is at the heart of a class-action lawsuit that accuses industry executives of agreeing between 2005 and 2009 **not to poach** one another's employees.

Headed to trial in San Jose this spring, the case involves 64,000 programmers and seeks billions of dollars in damages. Its mastermind, court papers say, was the executive who was the most successful, most innovative and most concerned about competition of all — Steve Jobs.

How did it end?

Judge approves $415M settlement in Apple, Google wage case
September 3, 2015 by Michael Liedtke

A federal judge has approved a **$415 million** settlement that ends a lengthy legal saga revolving around allegations that Apple, Google and several other Silicon Valley companies illegally **conspired to prevent their workers from getting better job offers**.

The **settlement** of a class-action lawsuit will pay more than 64,000 technology workers about $5,800 apiece. The complaint, filed in 2011, originally sought $3 billion in damages that could have been tripled under U.S. antitrust law. Based on that figure, the workers could have received more than $100,000 apiece if they prevailed at trial.

Nearly **$41 million** of the settlement will be **paid to lawyers** representing the technology workers. That's less than half of the roughly $85 million in fees that the attorneys had sought.

Types of High-Tech Companies

- Firms that undertake radical innovation
- Firms that rely on incremental improvements in existing innovations
- Firms that use technology to facilitate their business processes

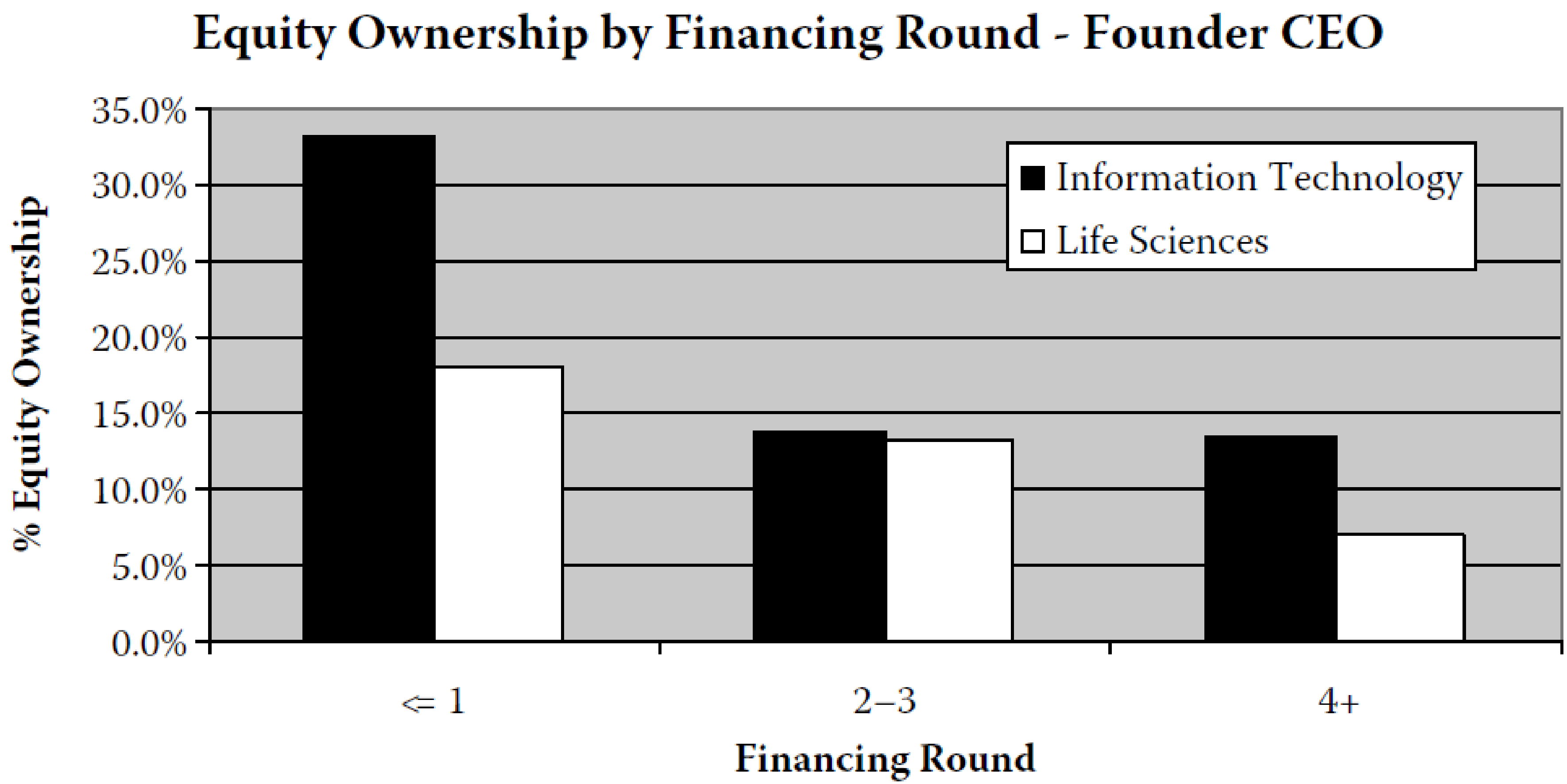
WHAT TYPE OF "HIGH TECH" ARE YOU?

Because there are so many different types of companies, Allen and Stearns decided to break down the high-tech sector by the three categories of high-tech companies:

- **First mover:** These companies are in search of disruptive technologies that make previously existing technologies obsolete. The difficulty for these companies yields substantial rewards to success but also brings with it a substantially higher risk of failure. Companies such as Apple, Microsoft, and Netscape would be classified as first movers.
- **Innovator strategy:** A company that relies on an innovator strategy is not structured around creating disruptive technologies. Rather, in many cases, the underlying technology will already exist and the company will combine, merge, or retool existing technologies for use in a new application, market, or area. Oftentimes these entrepreneurs will leverage experience gained at another company in the field to launch a new business, taking an innovative approach to problem solving. Some of these include companies such as Dell Computers, Lotus, and even Google, who initially tackled Internet search using an innovative algorithm.
- **Practitioner strategy:** Many companies that consider themselves to be "high tech" are not actively inventing and innovating. These companies use existing technology to gain competitive advantages, oftentimes using the disruptive technologies of first movers. A company such as Exxon, Wal-Mart, and Home Depot would adopt a practitioner strategy.

Business type: Startup versus small business

Startup	Small business
Wealth generation	Income substitution
Importance of technology and proprietary intellectual property	Broader range of businesses
Broad markets	Narrow markets (geographic or target audience)
Goals of $10 million to $100 million in annual sales	Goals of $500,000 to $10 million in annual sales
Seeks venture capital funding	Relies on bootstrapping and bank loans
Staff of 50 or more	Staff of 20 or less



Source: 2006 Compensation & Entrepreneurship Report (www.compstudy.com).

WHAT AM I LEFT WITH?

Seven models are included at the end of this chapter that detail the amount of dilution depending on the capital needs of the company. For example, in the model for a company with very low capital needs, the founder who initially held 25% would be left with 12.4% of the company after raising $3.8 million dollars. Conversely, for a company with medium-to-high capital needs that raises $58.8 million in outside investments, the founder who initially held 25% of the company would be left with 4.9% of the company.

Personal Financial Summary
Sally Founder & Joe Founder (Spouse)

January 1, 2009

CLARIFY YOUR FINANCES!

SUMMARY

Assets			Liabilities		
Cash			Current Debt		
Checking	$ 8,000		Credit cards	$ 10,000	
Savings	15,000		Other current debt Accounts	2,500	
Total		**$ 23,000**	*Total*		**$ 12,500**
Investments			Other Debts		
Certificates of deposit			Taxes payable	$ 10,000	
Stocks, mutual funds, bonds	$ 10,000		Auto loan accounts	25,000	
Loans/notes due	2,500		Other	5,500	
Life insurance (surrender value)	7,500		*Total*		**$ 40,500**
Education savings	15,000				
Total		**$ 35,000**	Real Estate		
			Mortgages on real estate	$250,000	
Personal Property			Leases due for next 12 months	15,000	
Automobiles	$ 35,000		*Total*		**$265,000**
Real estate (market value)	300,000				
Other	15,000		Other installment accounts	$	
Total		**$350,000**	Other liabilities (specify)	$ 8,500	

Personal Financial Summary
Sally Founder & Joe Founder (Spouse)

January 1, 2009

SUMMARY (CONTINUED)

Assets			Liabilities	
Retirement Funds				
IRA	$ 55,000			
401k	75,000			
Other	22,500			
Total		**$152,500**		
Other assets (specify)	$ 4,500			
Other assets (specify)	$			
TOTAL ASSETS		**$565,000**	**TOTAL ASSETS**	**$326,500**

NET WORTH

Assets	**$ 565,000**
Liabilities	**$(326,500)**
Net Worth	**$ 238,500**
Current Assets	**$ 23,000**
Current Liabilities	**$ (12,500)**
Net Current Funds	**$ 10,500**

Notes:

Personal Financial Summary
Sally Founder & Joe Founder (Spouse)

January 1, 2009

SUMMARY

You			Spouse		
Employer	Technology Firm Ltd.		Employer	Accounting Firm	
Position or profession	Chief Engineer		Position or profession	Accountant	
Partner, officer or owner in any other venture?	Yes	**No**	Partner, officer or owner in any other venture?	**Yes**	No
If Yes, please name			If Yes, please name	Joe's Accounting	
Average Monthly Sources of Income			**Average Monthly Sources of Income**		
Salary (Post-tax)	$ 5,500		Salary (Post-tax)	$ 4,500	
Bonus and commissions	2,000		Bonus and commissions	500	
Dividends			Dividends		
Other investment income			Other investment income		
Real estate income			Real estate income	800	
Other income (list)			Other income (list)		
			Part-time accounting work	350	
Total		$7,500	***Total***		$ 6,150

Personal Financial Summary
Sally Founder & Joe Founder (Spouse)

January 1, 2009

SUMMARY (CONTINUED)

Combined

Average Monthly Expenditures			
Mortgage/rent	$ 3,000		
Education	750		
Food	1,025		
Clothing	600		
Travel	500		
Work-related	200		
Discretionary	800		
Other expenses (list)			
Healthcare	600		
Total	$7,475	**Liquid Savings**	$10,500

#months=10500/1325
Based on **current** assets/liabilities

MONTHLY FINANCIAL PICTURE

Current		**Prospective**	
Income (You + Spouse)	$13,650	Income (Spouse)	$ 6,150
Expenditures	$ (7,475)	Expenditures	$(7,475)
Remaining/(Shortfall)	$ 6,175	**Remaining/(Shortfall)**	$(1,325)
		Months of Savings for Shortfall	7.92

Startup Expenses Planning High-Tech Startup Inc.

ESTIMATE YOUR INITIAL COSTS AND AVAILABLE $$

January 1, 2009

UMMARY: Year 1

Startup Expenses		
Real Estate, Office Location, Buildings		
Purchase	$	
Construction		
Remodeling		
Other		
Total		$
Building Improvements (Leased Property)		
(specify)	$	
(specify)		
Total		$
Capital Equipment List		
Equipment	$30,000	
Furniture	10,000	
Machinery		
Other		
Total		$ 40,000

Sources of Capital		
Owners' Investment		
Sally Founder – 50%	$75,000	
Mike Techie – 30%	45,000	
Jane Designer – 10%	15,000	
Mark Angel – 10%	15,000	
Total		$150,000
Loans		
Banks	$25,000	
SBA		
Other		
Total		$ 25,000
Other Capital		
(specify)	$	
(specify)		
Total		$
TOTAL SOURCES OF FUNDS		$175,000

Startup Expenses Planning High-Tech Startup Inc.

January 1, 2009

SUMMARY: Year 1 (CONTINUED)

Startup Expenses			Sources of Capital
Operating Expenses			
Rent (½ year at $10,000/month)	$60,000		
Deposits	10,000		
Outside legal/accounting	15,000		
Insurance	4,000		
Consulting	8,000		
Salaries	15,000		
Other			
Total		$112,000	
Beginning Inventory			
(specify)	$		
(specify)			
Total		$	

Startup Expenses Planning High-Tech Startup Inc.

January 1, 2009

SUMMARY: Year 1 (CONTINUED)

Startup Expenses			Sources of Capital
Marketing, Sales, Advertising			
Marketing	$ 2,500		
Advertising	5,500		
Selling expenses			
Travel/entertainment	10,000		
Other			
Total		$ 18,000	
Other Expenses			
(specify)	$		
(specify)			
Total		$	
Reserves	$15,000		
Working Capital	$		
TOTAL STARTUP EXPENSES		$185,000	

Startup Expenses Planning High-Tech Startup Inc.

January 1, 2009

SUMMARY: Year 1 (CONTINUED)

Summary Statement

Sources of Capital	
Owners' Investments	$150,000
Loans	25,000
Other Capital	
Total Source of Funds	**$175,000**
Startup Expenses	
Real Estate, Office Location, Buildings	$
Building Improvements (Leased Property)	
Capital Equipment List	40,000
Operating Expenses	112,000
Beginning Inventory	
Marketing, Sales, Advertising	18,000
Other Expenses	
Reserves	15,000
Working Capital	
Total Startup Expenses	**$185,000**
Funds Available / (Shortfall)	$ (10,000)

Estimated Time to Break-even	24 Months
Estimated Time to Additional Funding	12 Months

Hypothetical: Company with Low Capital Needs

		Amount of Funds Raised		Dilution*
Your Initial Ownership %	25.00%	Angels	$300,000	Series A – 42.9%
Expected Future Sale Price or IPO Value of Company	$30,000,000	Series A	$3,000,000	Series B – 37.1%
		Series B	$5,000,000	Series C – 25.2%
		Series C	$0	Later – 20.9%
		Total	$8,300,000	*Estimated averages

COMMENTS: This hypothetical represents a company that will require $8.3 million in outside investments. If the company is able to grow to a company valued at $30 million, the founder who initially owned 25.0% would own 7.8% at sale time (excluding additional stock awards as the company grew) worth approximately $2.3 million. Investors would own approximately 69% of the company; founders and employees 31%.

	Year 0 2010		Year 1 2011		Year 2 2012		Year 3 2013		Year 4 2014		Year 5 2015	
Pre-Money Valuation	$1,700,000		$3,993,007		$8,477,089							
Outside Investment	$300,000		$3,000,000		$5,000,000							
Post-Money Valuation	$2,000,000	$0.40	$6,993,007	$0.69	$13,477,089	$0.84	$13,477,089	$0.84	$13,477,089	$0.84	$13,477,089	$0.84
Total Shares	5,000,000		10,080,645		16,026,463		16,026,463		16,026,463		16,026,463	
FUNDRAISING ROUND			A		B							
	Shares	%	Shares	%	Shares	%	Shares	%	Shares	%	Shares	%
Your Ownership	1,250,000	25.0%	1,250,000	12.4%	1,250,000	7.8%	1,250,000	7.8%	1,250,000	7.8%	1,250,000	7.8%
Other Founders	2,250,000	45.0%	2,250,000	22.3%	2,250,000	14.0%	2,250,000	14.0%	2,250,000	14.0%	2,250,000	14.0%
Stock Options	750,000	15.0%	750,000	7.4%	1,506,048	9.4%	1,506,048	9.4%	1,506,048	9.4%	1,506,048	9.4%
Additional Stock Options			756,048	7.5%		0.0%		0.0%		0.0%		0.0%
Angel Investors	750,000	15.0%	750,000	7.4%	750,000	4.7%	750,000	4.7%	750,000	4.7%	750,000	4.7%
Investors, Series A			4,324,597	42.9%	4,324,597	27.0%	4,324,597	27.0%	4,324,597	27.0%	4,324,597	27.0%
Investors, Series B					5,945,818	37.1%	5,945,818	37.1%	5,945,818	37.1%	5,945,818	37.1%
Investors, Series C						0.0%		0.0%		0.0%		0.0%
TOTAL	5,000,000	100.0%	10,080,645	100.0%	16,026,463	100.0%	16,026,463	100.0%	16,026,463	100.0%	16,026,463	100.0%
Dilution Effect			42.90%		37.10%		0.00%		0.00%		0.00%	

	Year 0		Year 1		Year 2		Year 3	Year 4	Year 5
Owned by Founders/ Employees	85.00%		49.66%	=12.4+22.3+7.4+7.5	31.24%		31.24%	31.24%	31.24%
Owned by Investors	15.00%		50.34%	=7.4+42.9	68.76%		68.76%	68.76%	68.76%
Your Payout (if sold shares today @ Sale Price/IPO Value)	$7,500,000	=0.25*30M	$3,720,000		$2,339,880		$2,339,880	$2,339,880	$2,339,880
Your Payout (if sold shares today @ Valuation Price)	$500,000	=0.25*2M	$867,133	=0.124*6.99M	$1,051,159	=0.078*13.5M	$1,051,159	$1,051,159	$1,051,159

Note: Dilution model incomplete (author's website not responsive)

NOTES

Year 0

Angels=investment/post-money valuation
=300/2000=15%

Year 1

VC=3000/6993=42.9%
share price=6993/10080=$0.69

How did post-money valuation in year 0 of 2M reach pre-money valuation in year 1 of $3.99M?

This is likely the result of negotiations with the new investors. If the company had sales increase and/or new markets identified, investors would be more likely to accept a higher valuation.

And how did the #shares go from 5M to ~10M?

The dilution model is missing. Let's assume they decided to just scale up the number of shares in relation to the new investment and company value. Number of shares owned by original investors does not change. Assume we keep the stock option ratio the same at 15%.

Then:

1250+2250+**0.15**S+750+**0.429**S=S=number of shares after series A.

Solve for S=10,095,000

This is close to the 10,080,645 in the text example.

This difference has negligible effect on your and founders percentage ownership; stock option fractions should both be at ~7.5%.

Note that "Year" here could be "Period" as investments can come in at any time. Good to grow company value to reduce effect of dilution as much as possible.

Employee stock options

From Wikipedia

- An **employee stock option** (ESO) is a call option on the common stock of a company, granted by the company to an employee as part of the employee's remuneration package. The objective is to give employees an incentive to behave in ways that will boost the company's stock price.

- If the company's stock market price rises above the call price, the employee could exercise the option, pay the exercise price and would be issued with ordinary shares in the company. The employee would experience a direct financial benefit of the difference between the market and the exercise prices.

- If the market price falls below the stock exercise price at the time near expiration, the employee is not obligated to exercise the option, in which case the option will lapse. **Restrictions** on the option, such as vesting and non-transferring, attempt to align the holder's interest with those of the business shareholders—an important point!

- Employee stock options are mostly offered to management as part of their executive compensation package. They may also be offered to non-executive level staff, especially by businesses that are not yet profitable, as they may have few other means of compensation. Alternatively, employee-type stock options can be offered to non-employees: suppliers, consultants, lawyers and promoters for services rendered.