

Back of the Envelope

You wake up one morning with a brilliant idea for a software product and service business, for which you're sure there is demand in the marketplace. How would you describe your business idea to a friend and discuss its economic soundness? Can you fit it on the back of an envelope?

- 1) Startup costs and initial investment are difficult to measure at first, so do a fast-forward to the first stable point (say, two years out). (If it's not a good economic idea once it gets going, it doesn't matter what its startup costs are).
- 2) Assume one primary product line at the first stable point where you begin to look at your business model: **Product A**. Like all your products, it includes a license fee and implementation services, and you believe you can bundle with it an annual fee for maintenance services as well. Typical implementation services cost you 300 labor hours, and typical maintenance services cost 100 labor hours.

You think you can sell 20 of them in a year for an average of \$50,000 each (total fee for the 1st year) with maintenance services every year (including the first year) of an average of \$10,000, for an average of 5 years. (Year 1, you charge \$60,000, and year 2, you charge \$10,000).

This is your bread-and-butter business, your flagship product.

- 3) You might also be able to sell add-on consulting & customization services to some of your customers, but we'll think of that as a separate product that has its own economic justifications, and we'll omit it from our look at Product A, which has its own base level of consulting & customization services.

So, what might this look like as a model?

Product A					
	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue					
License	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000
Implementation	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000
Maintenance	\$ 200,000	\$ 400,000	\$ 566,667	\$ 733,333	\$ 900,000
Non-Labor (ignore for now)	\$ -	\$ -	\$ -	\$ -	\$ -
Total Revenue	\$ 1,200,000	\$ 1,400,000	\$ 1,566,667	\$ 1,733,333	\$ 1,900,000
Direct Cost					
License (ignore for now)					
Implementation	\$ 185,127	\$ 185,127	\$ 185,127	\$ 185,127	\$ 185,127
Maintenance	\$ 61,709	\$ 123,418	\$ 185,127	\$ 246,835	\$ 308,544
Non-Labor (ignore for now)	\$ -	\$ -	\$ -	\$ -	\$ -
Total Direct Cost	\$ 246,835	\$ 308,544	\$ 370,253	\$ 431,962	\$ 493,671
Gross Profit	\$ 953,165	\$ 1,091,456	\$ 1,196,414	\$ 1,301,371	\$ 1,406,329
Profit as % of Revenue	79%	78%	76%	75%	74%
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Parameters/Assumptions					
Units sold	20	20	20	20	20
Impl labor hours/unit	300				
Maint labor hours/unit	100				
Avg. direct labor annual salary	\$ 45,000				
Fully-loaded labor cost as %	30%				
License fee	\$ 25,000				
1st year price	\$ 50,000				
Annual maintenance price	\$ 10,000				
			Derived		
			Fully loaded labor cost/hr	\$	31
			Effective labor price (impl)	\$	83
			Effective labor price (maint)	\$	100

3) But what about the license cost? It's not really kosher to assume no cost because it happened in years 1 and 2 before you start getting revenue. In addition, you're going to have to keep developing improvements to your product.

Let's think about dividing our investment in building software like this:

- A) The first release of a product costs X. We estimate what that is, primarily in labor hours. Each time we think about a new release, we estimate what that will take in labor hours. In addition, every year we need to invest a certain amount in just keeping the software clean and bug free, minor fixes, and so forth. We should tie these costs to the particular product.
- B) We need to do some R&D in software that may not be oriented to a particular product. A certain amount of our budget should be put aside for that, out of the general R&D amount.

This means that we can look at the "debt" we've incurred getting started as having 3 components:

- A) Deliberate investment in software Product A
- B) Additional investment in software not specific to a Product (general R&D)
- C) Everything else involved in launching a company

It's clear that (B) and (C) are part of the general burden of the company (we'll see them again later), but we should think of (A) as the underlying license cost for Product A. Each time we choose to work on a new release, we should assign that cost as well to Product A.

However, we don't expect to pay back the total investment in building Product A in the first sale, or even in the first year. Instead we expect to spread it out over some number of sales which will take some number of years. One way to think about it is "this is worth doing, if we can earn it back over 3 years". Since we expect to sell 20 units per year, what we'd be saying is we expect to earn it back over 60 units. So let's spread the cost out that way, and each time we investigate whether we should do an upgrade, we can do the same analysis. Let's estimate 12000 hours for the initial product creation.

Let's also assume there's likely to be a major upgrade requirement every two years, and see if Product A can pay for itself after the initial investment. Call that 7500 hours/2 yrs.

We also need to account for the amount of minor product maintenance (bug fixes, etc.) that needs to happen every year between upgrades. Call that 1000 hours/year.

What does this do to the gross margins for Product A?

Product A	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue					
License	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000
Implementation	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000
Maintenance	\$ 200,000	\$ 400,000	\$ 566,667	\$ 733,333	\$ 900,000
Non-Labor (ignore for now)	\$ -	\$ -	\$ -	\$ -	\$ -
Total Revenue	\$ 1,200,000	\$ 1,400,000	\$ 1,566,667	\$ 1,733,333	\$ 1,900,000
Direct Cost					
License	\$ 154,272	\$ 154,272	\$ 231,408	\$ 107,991	\$ 185,127
Implementation	\$ 185,127	\$ 185,127	\$ 185,127	\$ 185,127	\$ 185,127
Maintenance	\$ 61,709	\$ 123,418	\$ 185,127	\$ 246,835	\$ 308,544
Non-Labor (ignore for now)	\$ -	\$ -	\$ -	\$ -	\$ -
Total Direct Cost	\$ 401,108	\$ 462,816	\$ 601,661	\$ 539,953	\$ 678,797
Gross Profit	\$ 798,892	\$ 937,184	\$ 965,005	\$ 1,193,381	\$ 1,221,203
Profit as % of Revenue	67%	67%	62%	69%	64%
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Parameters/Assumptions					
Units sold		20	20	20	20
Impl labor hours/unit	300				
Maint labor hours/unit	100				
Avg. direct labor annual salary	\$45,000				
Fully-loaded labor cost as %	30%				
License fee	\$25,000				
1st year price	\$50,000				
Annual maintenance price	\$10,000				
Dev't labor hours for initial product	12000				
Recoup dev't hours after units	60				
Dev't labor hours for each upgrade	7500				
Annual labor hours for routine maint	1000				
			Derived		
			Fully loaded labor cost/hr	\$	31
			Effective labor price (impl)	\$	83
			Effective labor price (maint)	\$	100
			License cost/unit (until recouped)	\$	6,171
			License cost/unit (for upgrades)	\$	3,857

4) You also think it's likely there will be a special product for high-end customers:
Product B. This is an add-on that you can charge a lot for, which is quite profitable for you. You won't sell very many of them, but they're mostly all gravy. It might be, for example, an add-on to your primary product that was simple to develop (little license cost) and is easy to set up but for which you can charge a significant maintenance fee.

You think you can sell 4 of them in a year for an average of \$35,000 each, with a basic license fee of \$15,000, with maintenance of \$7,500/year. Typical installation hours are 100, and typical maintenance hours are 200/year. It only cost 1500 hours to develop initially, and upgrades every 2 years cost 800 hours. Routine maintenance is 200 hours/year.

Product B		Year 1	Year 2	Year 3	Year 4	Year 5
Revenue						
License		\$ 60,000	\$ 60,000	\$ 60,000	\$ 60,000	\$ 60,000
Implementation		\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000
Maintenance		\$ 30,000	\$ 60,000	\$ 220,000	\$ 380,000	\$ 540,000
Non-Labor (ignore for now)		\$ -	\$ -	\$ -	\$ -	\$ -
Total Revenue		\$ 170,000	\$ 200,000	\$ 360,000	\$ 520,000	\$ 680,000
Direct Cost						
License		\$ 21,598	\$ 21,598	\$ 29,826	\$ 14,399	\$ 22,627
Implementation		\$ 6,171	\$ 6,171	\$ 6,171	\$ 6,171	\$ 6,171
Maintenance		\$ 12,342	\$ 24,684	\$ 37,025	\$ 49,367	\$ 61,709
Non-Labor (ignore for now)		\$ -	\$ -	\$ -	\$ -	\$ -
Total Direct Cost		\$ 40,111	\$ 52,453	\$ 73,022	\$ 69,937	\$ 90,506
Gross Profit		\$ 129,889	\$ 147,547	\$ 286,978	\$ 450,063	\$ 589,494
Profit as % of Revenue		76%	74%	80%	87%	87%
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Parameters/Assumptions						
Units sold		4	4	4	4	4
Impl labor hours/unit	50					
Maint labor hours/unit	100					
Avg. direct labor annual salary	\$ 45,000					
Fully-loaded labor cost as %	30%					
License fee	\$ 15,000					
1st year price	\$ 35,000					
Annual maintenance price	\$ 7,500					
Dev't labor hours for initial product	1500					
Recoup dev't hours after units	12					
Dev't labor hours for each upgrade	800					
Annual labor hours for routine maint	200					
		Derived				
		Fully loaded labor cost/hr		\$	31	
		Effective labor price (impl)		\$	400	
		Effective labor price (maint)		\$	75	
		License cost/unit (until recouped)		\$	3,857	
		License cost/unit (for upgrades)		\$	2,057	

5) There's also likely to be a product (**Product C**) which is not very profitable, but which you need to offer in order to have a fully-rounded suite. This may be needed to counter your competition, or to help lead the client in a more profitable direction for later sale. It might be, for example, an integration product that requires customization but which allows you to sell your flagship product more effectively once in place.

You think you can sell 8 of these in a year for an average of \$20,000 each, with a basic license fee of \$10,000, with maintenance of \$3,500/year. Typical installation hours are 200, and typical maintenance hours are 200/year. It cost 4000 hours to develop initially, and upgrades every 2 years cost 2200 hours. Routine maintenance is 500 hours/year.

Product C		Year 1	Year 2	Year 3	Year 4	Year 5
Revenue						
License		\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000
Implementation		\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000
Maintenance		\$ 28,000	\$ 56,000	\$ 136,000	\$ 216,000	\$ 296,000
Non-Labor (ignore for now)		\$ -	\$ -	\$ -	\$ -	\$ -
Total Revenue		\$ 188,000	\$ 216,000	\$ 296,000	\$ 376,000	\$ 456,000
Direct Cost						
License		\$ 56,566	\$ 56,566	\$ 79,193	\$ 38,054	\$ 60,680
Implementation		\$ 49,367	\$ 49,367	\$ 49,367	\$ 49,367	\$ 49,367
Maintenance		\$ 49,367	\$ 98,734	\$ 148,101	\$ 197,468	\$ 246,835
Non-Labor (ignore for now)		\$ -	\$ -	\$ -	\$ -	\$ -
Total Direct Cost		\$ 155,301	\$ 204,668	\$ 276,661	\$ 284,889	\$ 356,883
Gross Profit		\$ 32,699	\$ 11,332	\$ 19,339	\$ 91,111	\$ 99,117
Profit as % of Revenue		17%	5%	7%	24%	22%
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Parameters/Assumptions						
Units sold		8	8	8	8	8
Impl labor hours/unit	200					
Maint labor hours/unit	200					
Avg. direct labor annual salary	\$ 45,000					
Fully-loaded labor cost as %	30%					
License fee	\$ 10,000					
1st year price	\$ 20,000					
Annual maintenance price	\$ 3,500					
Dev't labor hours for initial product	4000					
Recoup dev't hours after units	24					
Dev't labor hours for each upgrade	2200					
Annual labor hours for routine maint	500					
				Derived		
				Fully loaded labor cost/hr	\$	31
				Effective labor price (impl)	\$	50
				Effective labor price (maint)	\$	18
				License cost/unit (until recouped)	\$	5,142
				License cost/unit (for upgrades)	\$	2,828

6) So, what happened to the “Back of the Envelope”? If we combine the 3 products together, we’re halfway there.

Products A, B, C	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue					
License	\$ 640,000	\$ 640,000	\$ 640,000	\$ 640,000	\$ 640,000
Implementation	\$ 660,000	\$ 660,000	\$ 660,000	\$ 660,000	\$ 660,000
Maintenance	\$ 258,000	\$ 516,000	\$ 922,667	\$ 1,329,333	\$ 1,736,000
Non-Labor (ignore for now)	\$ -	\$ -	\$ -	\$ -	\$ -
Total Revenue	\$ 1,558,000	\$ 1,816,000	\$ 2,222,667	\$ 2,629,333	\$ 3,036,000
Direct Cost					
License	\$ 232,437	\$ 232,437	\$ 340,427	\$ 160,443	\$ 268,434
Implementation	\$ 240,665	\$ 240,665	\$ 240,665	\$ 240,665	\$ 240,665
Maintenance	\$ 123,418	\$ 246,835	\$ 370,253	\$ 493,671	\$ 617,089
Non-Labor (ignore for now)	\$ -	\$ -	\$ -	\$ -	\$ -
Total Direct Cost	\$ 596,519	\$ 719,937	\$ 951,345	\$ 894,778	\$ 1,126,187
Gross Profit	\$ 961,481	\$ 1,096,063	\$ 1,271,322	\$ 1,734,555	\$ 1,909,813
Profit as % of Revenue	62%	60%	57%	66%	63%

7) There’s one very important hidden assumption here. We’ve taken a pool of labor hours as though we had X people working full time on work that is charged to customers. In the real world, we know it can’t be that tidy. There are difficulties achieving 100% utilization even when everyone is working hard, and software & consulting businesses are always challenged to keep the work flowing smoothly so that everyone is utilized for the maximum amount of time.

Much of the above profit would evaporate if there were significant benchtime. In an idealized model like this, you can assume full utilization just to look at the basic feasibility, but a real business model needs to account for likely benchtime across the group of direct cost employees. An alternative is to increase the labor cost/hr to reflect likely benchtime.

In a living company you usually manage this by assuming a level of utilization, building the model to that, and then monitoring the assumption. The larger you are, the easier this is to predict and control.

8) Now we have to take into account the rest of the costs for your proposed company, the indirect costs. Someone has to sell your products, pay the taxes, run the payroll, track the competition, brainstorm about new products, check out the new telephone contract, and water the office plants.

Since you're just starting your business, it's hard to anticipate what typical indirect costs would be. You can start by thinking about what you need. The non-labor fixed costs are fairly easy (rent, telephone, etc.), but if you think of management roles like a large business (one of these and one of those, etc.), you'll find when you add all that up that it's way more people than you can afford. It's also difficult to think about a "normal" amount to set aside for R&D and other investment.

This is where industry statistics can be helpful. You do a survey of your industry, and you find that the average costs as a percent of revenues are:

- Direct costs 30%
- Sales 20%
- Marketing 15%
- R&D (indirect only) 15%
- G&A 10%
- Profit (Reserve) 10%

You know your business is small, and likely to be below scale for efficiency, so targets that are probably more reasonable for you (until you grow) might be:

- Direct costs 35%
- Sales 15%
- Marketing 10%
- R&D (indirect only) 10%
- G&A 25%
- Profit (Reserve) 5%

This profit is EBITDA (Earnings Before Interest, Taxes, Depreciation, & Amortization). If you have a large debt you're paying interest on, then your profit here could vanish and become a loss.

These percents, however, are just a general guide. To go with the specificity in your product model, you need to get specific with the indirect cost model. Some things have known costs (e.g., rent, phones, 2 sales reps), others can work as a percentage (e.g., R&D).

If you combine these costs with your Gross Profit picture, you have your basic business model. This is your theory about how your great idea ought to make a viable company.

Products A, B, C		This Year % of Revenue	
Revenue			
License	\$ 640,000		
Implementation	\$ 660,000		
Maintenance	\$ 258,000		
Non-Labor (ignore for now)	\$ -		
Total Revenue	\$ 1,558,000		
Direct Cost			
License	\$ 232,437		Direct FTEs 3.7
Implementation	\$ 240,665		3.9
Maintenance	\$ 123,418		2.0
Non-Labor (ignore for now)	\$ -		
Total Direct Cost	\$ 596,519	38%	9.5
Gross Profit	\$ 961,481		
Profit as % of Revenue	62%		
Indirect Cost			
Sales & Marketing	\$ 400,000	26%	4 people and other costs
R&D	\$ 155,800	10%	10% of Revenue
G&A			
Mngt & Admin	\$ 400,000		3 people
Non-labor fixed costs	\$ 200,000		Rent, utilities, etc.
Total G&A	\$ 600,000	39%	
Total Indirect Cost	\$ 1,155,800		
Net Profit (Loss)	\$ (194,319)	-12%	Loss

Oops! What happened? Well, it's hard to run a company without any management and admin, and that costs money. The industry averages reflect a different size of company.

Translating the labor hours (100% utilized, remember) into FTEs (Full Time Equivalents) yields about 10 people. With Sales, Marketing, and G&A, this is about a 17-person firm. If you were bigger, the burden of management and admin would be reduced as a proportion of the business, even though you'd have to grow them a little.

Say you doubled the revenue model while leaving all the direct costs proportionately unchanged.

Products A, B, C		This Year % of Revenue	
Revenue			
License	\$ 1,280,000		
Implementation	\$ 1,320,000		
Maintenance	\$ 516,000		
Non-Labor (ignore for now)	\$ -		
Total Revenue	\$ 3,116,000		
Direct Cost			
License	\$ 464,873		Direct FTEs 7.4
Implementation	\$ 481,329		7.7
Maintenance	\$ 246,835		3.9
Non-Labor (ignore for now)	\$ -		
Total Direct Cost	\$ 1,193,038	38%	19.1
Gross Profit	\$ 1,922,962		
Profit as % of Revenue	62%		
Indirect Cost			
Sales & Marketing	\$ 500,000	16%	5 people and other costs
R&D	\$ 311,600	10%	10% of Revenue
G&A			
Mngt & Admin	\$ 500,000		4 people
Non-labor fixed costs	\$ 300,000		Rent, utilities, etc.
Total G&A	\$ 800,000	26%	
Total Indirect Cost	\$ 1,611,600		
Net Profit (Loss)	\$ 311,362	10%	Gain

Well, that's a bit better, and the ratios are more in line with your small company's version of the industry averages. This is about a 28-person firm.

So now you know about how large you would have to be to have enough scale to be basically profitable. All (!) you have to do is work on all the cost drivers to try and do things more efficiently. (The devil's in the details...)

This is the "back of the envelope" you've been trying to create.