



Sustaining Quality and Warranty

Module 7D Financing Growth

Motivation

Why is this module important?



- Many hardware-based start-ups excel at early-stage funding to help launch the business and develop prototypes, but they struggle with the next stage of development, which requires a heavy capital lift and a creative approach to financing growth
- A new perspective on financing strategies for hardware-based companies can help entrepreneurs avoid delays in time-to-market and pitfalls such as losing the interest of existing investors and key stakeholders

Motivation

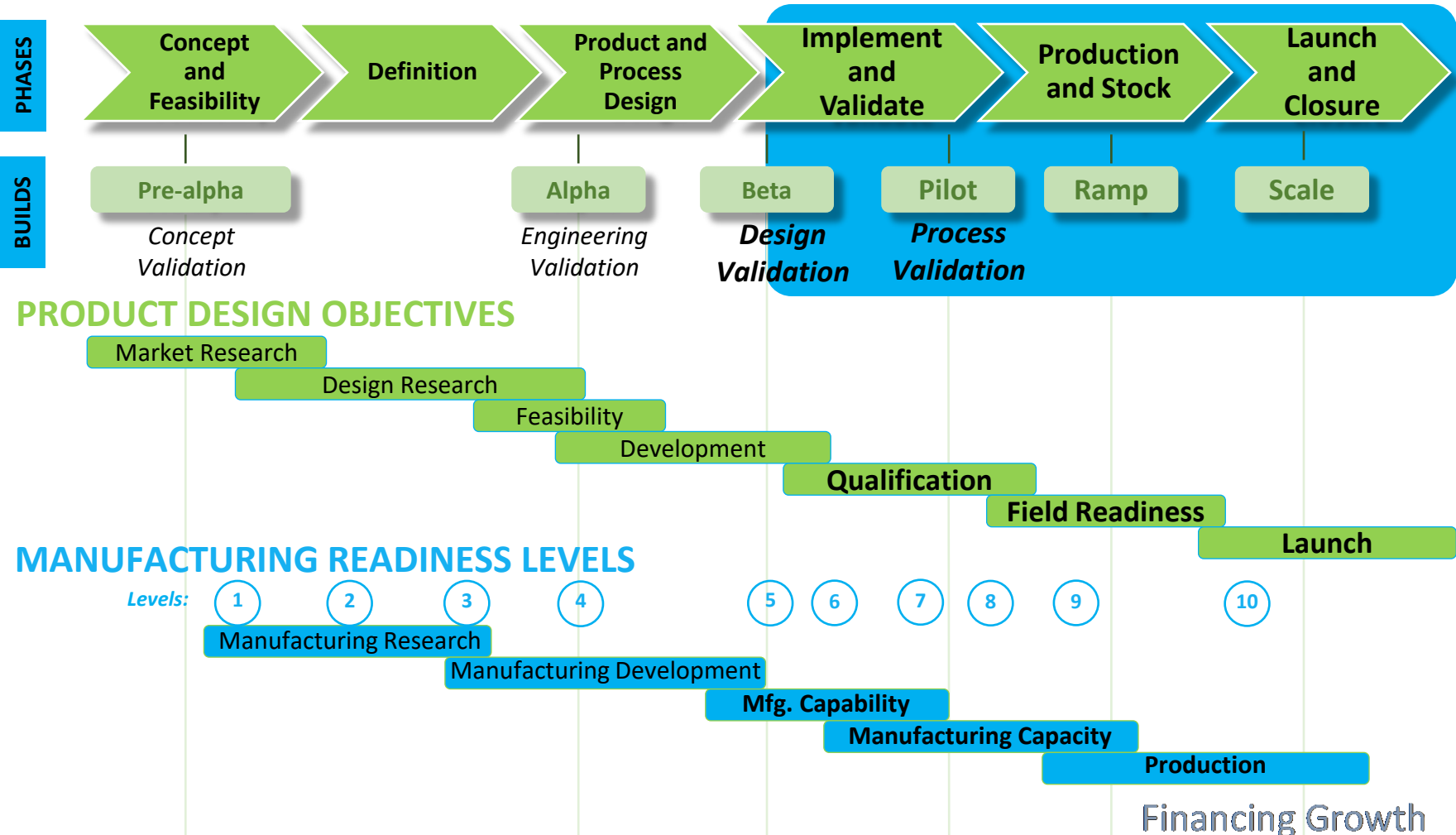
Common mistakes and misconceptions



- ❑ Limiting growth-related financing options to venture capital
- ❑ Spending too much time attempting to finance continuous technology development and not financing growth of currently viable products
- ❑ Underestimating the magnitude of investment needed for scaling up a manufacturing operation
- ❑ Aligning financing needs inconsistently with the commercialization timeline

Financing Growth

Where does this fit into the development cycle?



Manufacturing Readiness Levels

(MRL)



Material Solutions Analysis				Technology Development		Engineering and Manufacturing Development		Production and Deployment	Operations and Support
Basic manufacturing implications identified	Manufacturing concepts identified	Manufacturing proof of concept developed	Capability to produce the technology in a laboratory environment	Capability to produce prototype components in a production-relevant environment	Capability to produce a prototype system or subsystem in a production-relevant environment	Capability to produce systems, subsystems, or components in a production-relevant environment	Pilot line capability demonstrated. Ready to begin low-rate production	Low-rate production demonstrated. Capability in place to begin full-rate production	Full-rate production demonstrated and lean production practices in place
1	2	3	4	5	6	7	8	9	10

This module's content is relevant at these MRLs



Learning Objectives



- LO1. How to define current cost centers
- LO2. The role cost centers play in future growth and manufacturing
- LO3. The options for financing research and development (R&D), growth, and manufacturing

What This Module Addresses



- ☐ What does it take to finance a hardware product?
- ☐ Why is it different from financing a software or service company?
- ☐ What am I financing now?
- ☐ What are my existing and expected future cost centers?
- ☐ What is working capital and why is it so important?
- ☐ How do I assess my growth-financing options?

Financing Products

Hardware vs. software

Hardware

- ☐ Heavy capital expense
- ☐ Many years to **return on investment** (ROI)
- ☐ Lower margins
- ☐ Harder to scale
- ☐ Higher risk

Software

- ☐ Low capital expense
- ☐ Few years to ROI
- ☐ Large margins
- ☐ Easier to scale
- ☐ Lower risk



Financial Considerations

Hardware product production



Basic terminology:

- ❑ **Retail price:** the target price of sale to the ultimate user of the product
- ❑ **Wholesale price:** the price at which your company sells the product
- ❑ **Cost of goods sold (COGS):** expenses directly attributed to production (i.e., raw materials, processing, assembly, factory facility, and equipment)
- ❑ **Operating expenses (OpEx):** expenses not directly related to the product (i.e., administrative payroll and office space)
- ❑ **Interest and taxes (I&T):** federal, state, local, and payroll taxes; plus business loan interest expenses

Financial Considerations

Hardware product production (cont.)



Basic terminology: (cont.)

- **Revenue:** total income received through sale of products and services
- **Net profit:** revenue minus COGS, OpEx, and I&T (this is your bottom line)
- **Net profit margin:** revenue divided by net profit
- **Working capital:** product-related assets and liabilities
- **Working capital cycle:** time it takes to turn product assets and liabilities into cash

Financial Considerations

Hardware product production (cont.)



Typical values:

- The **retail price** must be four times the COGS in order to support all other expenses to deliver and sell the product. This can be even higher [10x] for manufacturing companies. It is critical to confirm cost structures in the specific case of your company. This must include the effect of your distribution network on your pricing structure.
- **Net profit margin** can vary from more than 20% for large drug manufacturers to 1.7% for printed circuit boards

Net Profit Margins

- Net profit margins vary by industry sector, as shown below:

Drug manufacturers (major)	21.4%
Beverages (brewers)	18.0%
Electronic equipment	16.3%
Network/communication	12.3%
Beverages (soft drinks)	11.2%
Residential construction	8.6%
Toys and games	7.8%
Industrial electronic equipment	7.6%
Wholesale auto parts	5.3%
Auto manufacturer (major)	5.0%
Electronic wholesale	2.3%
Printed circuit boards	1.7%

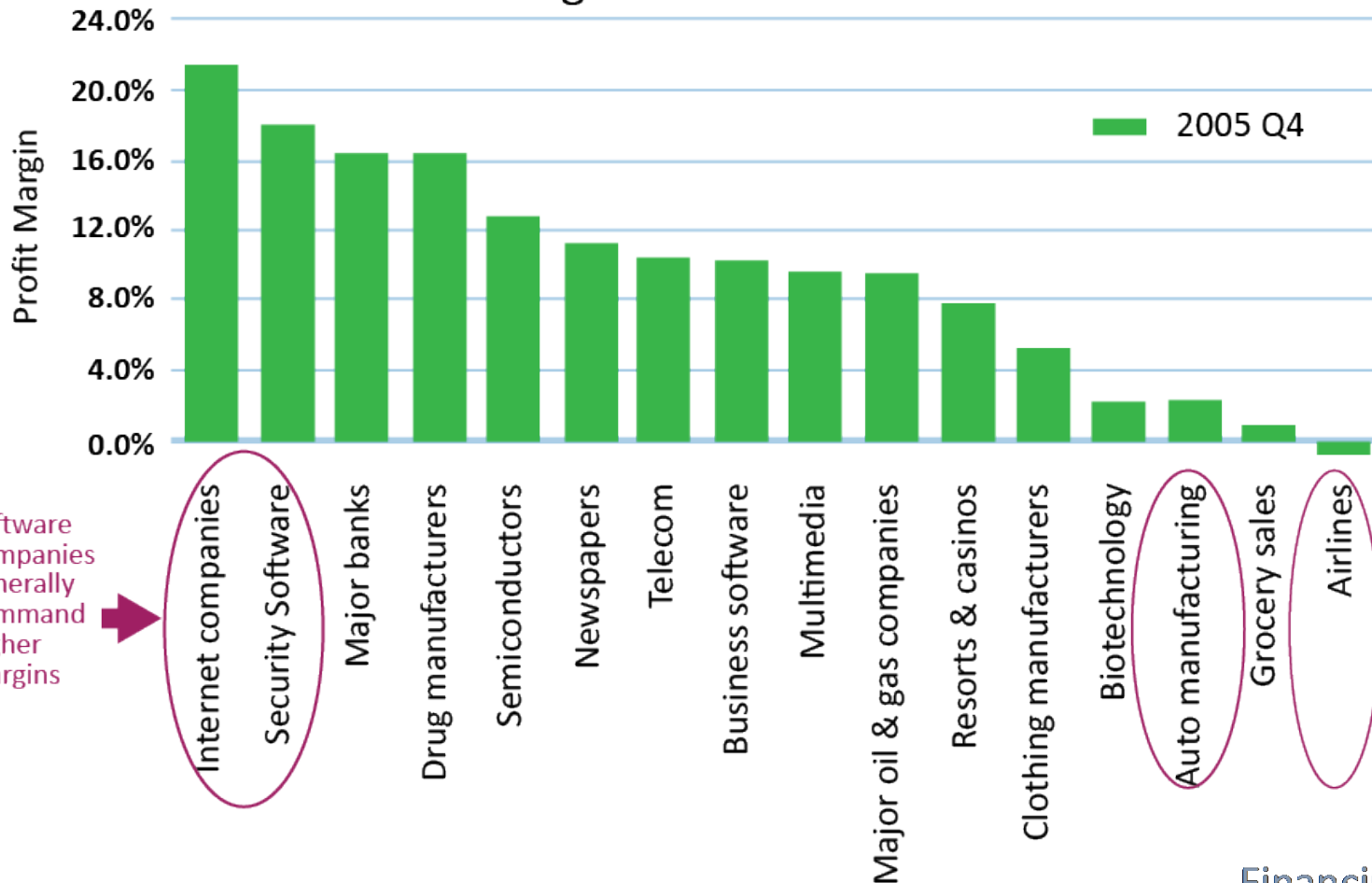
Hardware manufacturers do manage to survive and thrive on low profit margins

Profit Margins

Hardware vs. software



Profit Margins of Selected Industries



Software companies generally command higher margins

Hardware companies generally survive on lower margins

Financing Growth

Business Margins

Hardware



Hardware companies can survive and thrive on low margins (but what does this mean for hardware start-ups?)

- Production operations must be lean; eliminate or reduce waste in materials, time, and scrap product
- Growth must be managed meticulously to ensure scaling investments are in line with product-demand projections
- Overborrowing and underselling the product must be avoided
- Capital investment in facilities, equipment, and tooling need to be timely
- Business planning is a daily exercise to ensure growth investments are staged to reduce the cost of securing money (i.e., loan interest)

What Am I Financing Now?

Checklist – Existing costs

- ☐ Facilities
- ☐ Capital equipment
- ☐ Tooling
- ☐ Materials
- ☐ Design and engineering
- ☐ Testing
- ☐ Validation
- ☐ Product inventory
- ☐ Distribution
- ☐ Logistics
- ☐ Labor and human capital



What Are My Cost Centers?

Checklist – Existing and projected future costs

- ☐ Facilities
- ☐ Product
- ☐ R&D
- ☐ Operations
- ☐ Channel/sales
- ☐ Customer relationships
- ☐ Labor headcount
- ☐ **Intellectual property (IP)**



Calculating Cost Centers

Exercise – Existing and expected



Financing Growth	Year 1				Year 2				Year 3			
Where is investment expected based on project scaling activities?	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Facilities												
Product												
R&D												
Operations												
Channel/sales												
Customer relationships												
Labor headcount												
IP												

Working Capital

Why it's important for manufacturers



$$\text{Working Capital} = \text{Inventory} + \text{Accounts Receivable} - \text{Accounts Payable}$$

- Working capital is needed by all businesses to fund the necessary investment in inventory and accounts receivable to allow normal day-to-day trading to continue
- While this formula applies to any business, for a manufacturer inventory is more complicated and is made up of three components:
 - Raw materials
 - Work in progress (WIP)**
 - Finished goods

Working Capital

Why it's important for manufacturers (cont.)



- The manufacturer has to purchase and hold an inventory of raw materials, issue the materials into WIP, and apply direct labor and overhead to convert the raw materials into finished goods
- The working capital requirements equation can be adapted for a manufacturer and be written as follows:

$$\text{Working Capital} = \text{Raw Materials} + \text{WIP} + \text{Finished Goods} + \text{Accounts Receivable} - \text{Accounts Payable}$$

Working Capital Requirements

Example – Toy manufacturing start-up



Financial and production time assumptions:

□ Per unit

- COGS: \$5
- Retail price: \$20
- Wholesale price: \$15
- Net profit margin: 8%
- Net profit: \$1.20

□ Production

- Time in production: 2 months
- Delivery time to point of sale: 1 month
- Retailer payment period: 3 months
- Working capital cycle: 6 months
- Initial demand: 250,000 units/quarter
- Demand growth: 25%/quarter



Financing Growth

Working Capital Worksheet

Example – Toy manufacturing start-up (cont.)

Operating Assumptions

*See next
page for
explanation*

COGS Unit Cost	5
Retail Price	20
Wholesale Price	15
Net Profit Margin	8%
Production time	2 mo
Delivery Time	1 mo
Payment time	3 mo
Growth Target per period	25%
Initial Order Qty	250,000

Production and Sales Period

	Year 1			Year 2		
	Q1	Q2	Q3	Q4	Q1	Q2
Period Growth						
COGS/order	\$ 1,250,000	\$ 1,562,500	\$ 1,953,125	\$ 2,441,406	\$ 3,051,758	\$ 3,814,697
Net Profit			\$ 300,000	\$ 375,000	\$ 468,750	\$ 585,938
Working Capital Required	\$ 1,250,000	\$ 2,812,500	\$ 3,515,625	\$ 4,394,531	\$ 5,493,164	\$ 6,866,455
Order (units)	250,000	312,500	390,625	488,281	610,352	762,939
COGS/unit	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00
Revenue			\$ 3,750,000	\$ 4,687,500	\$ 5,859,375	\$ 7,324,219

Financing Growth

Working Capital Worksheet

Example – Toy manufacturing start-up (cont.)

Operating Assumptions

COGS Unit Cost	5
Retail Price	20
Wholesale Price	15
Net Profit Margin	8%
Production time	2 mo
Delivery time	1 mo
Payment time	3 mo
Growth Target per period	25%
Initial Order Qty	250,000

Production and Sales Period

	Year 1				Year 2				Year 3			
Period Growth	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
COGS/order	\$ 1,250,000	\$ 1,562,500	\$ 1,953,125	\$ 2,441,406	\$ 3,051,758	\$ 3,814,697	\$ 4,768,372	\$ 5,960,464	\$ 7,450,581	\$ 9,313,226	\$ 11,641,533	\$ 14,551,916
Net Profit			\$ 300,000	\$ 375,000	\$ 468,750	\$ 585,938	\$ 732,422	\$ 915,527	\$ 1,144,409	\$ 1,430,511	\$ 1,788,139	\$ 2,235,237
Working Capital Required	\$ 1,250,000	\$ 2,812,500	\$ 3,515,625	\$ 4,394,531	\$ 5,493,164	\$ 6,866,455	\$ 8,583,069	\$ 10,728,836	\$ 13,411,045	\$ 16,743,715	\$ 20,863,402	\$ 25,787,153
Order (units)	250,000	312,500	390,625	488,281	610,352	762,939	953,674	1,192,093	1,490,116	1,862,645	2,328,306	2,910,383
COGS/unit	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00
Revenue			\$ 3,750,000	\$ 4,687,500	\$ 5,859,375	\$ 7,324,219	\$ 9,155,273	\$ 11,444,092	\$ 14,305,115	\$ 17,826,394	\$ 22,353,991	\$ 28,227,391

*See prior
page for
enlarged
image*

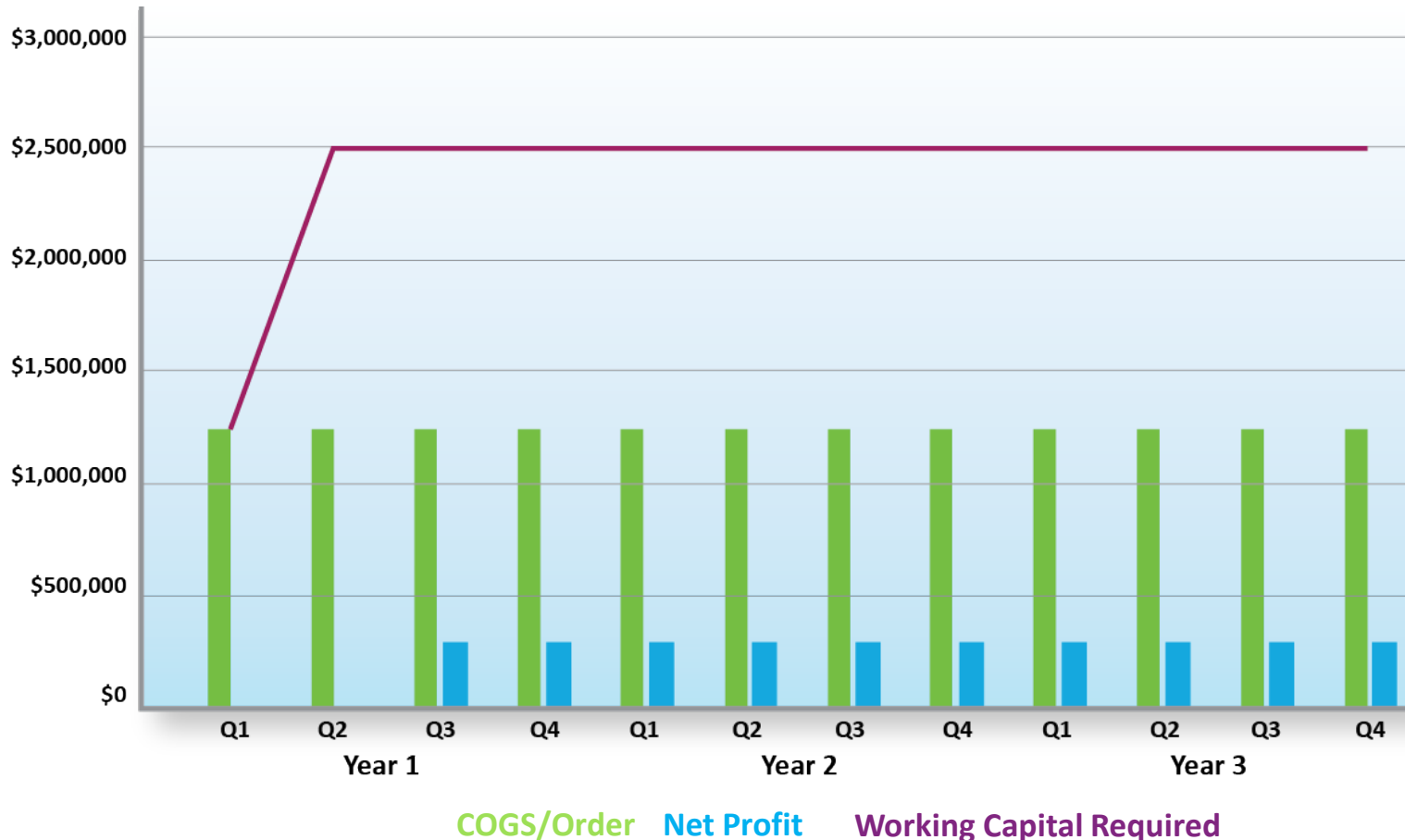
- The **COGS Unit Cost example** above shows a consistent price over time. Typically, COGS decreases with volume; companies usually plan for a 5%–10% COGS reduction year-on-year. COGS Unit Cost depends on volume, price of commodities over time, and supply versus demand dynamics. It is also driven by the requirement of additional capital investments to scale-up, which is baked into the COGS. Companies should perform COGS assessments regularly to ensure accuracy of working capital.

Financing Growth

Working Capital Requirements

Example – Toy manufacturing start-up (cont.)

No growth projection:

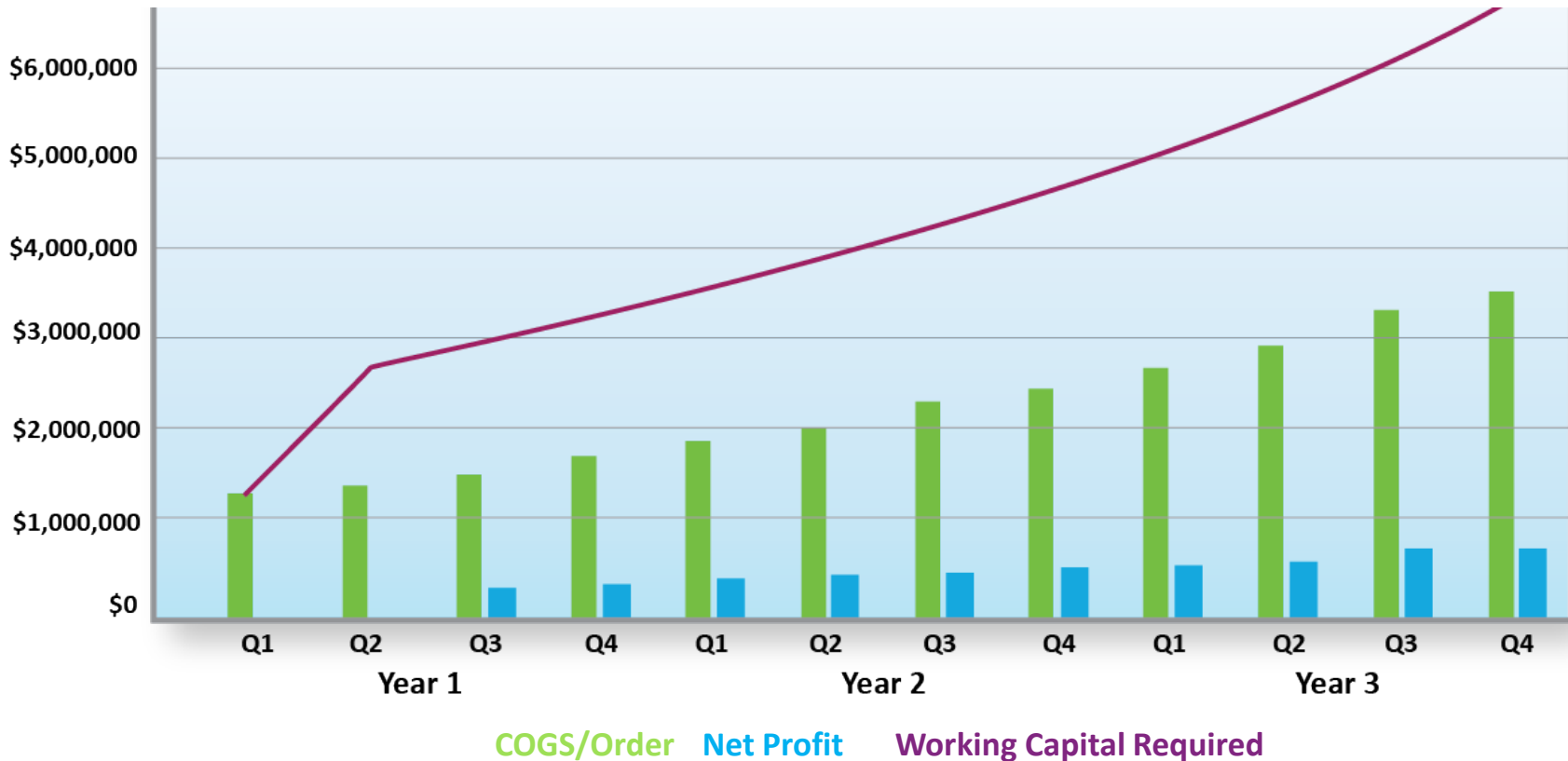


Financing Growth

Working Capital Requirements

Example – Toy manufacturing start-up (cont.)

10% quarterly growth projection:



Working Capital Requirements

Example – Toy manufacturing start-up (cont.)

25% quarterly growth projection:



COGS/Order Net Profit Working Capital Required

Financing Growth

Working Capital Requirements

Techniques for minimization



- ☐ Reduce working capital cycle time
- ☐ Reduce delivery time
- ☐ Reduce customer payment time
- ☐ Reduce production time
- ☐ Reduce inventory carrying cost
- ☐ Arrange for longer-term contracts with suppliers
- ☐ Build cost-of-supplier tooling into the long-term piece price of raw materials with contracted supply partners
- ☐ Spread out payments to suppliers over longer periods of time

Financing Growth

Assess alternative growth-financing options



First ask:

- Am I financing R&D? Options include the following:
 - Grants, loans
 - Accelerators, business plan competitions
 - Angel investors, venture capital
 - Strategic partners (equity share, debt or exclusivity in exchange for resources)
 - Corporate ventures

Financing Growth

Assess alternative growth-financing options (cont.)

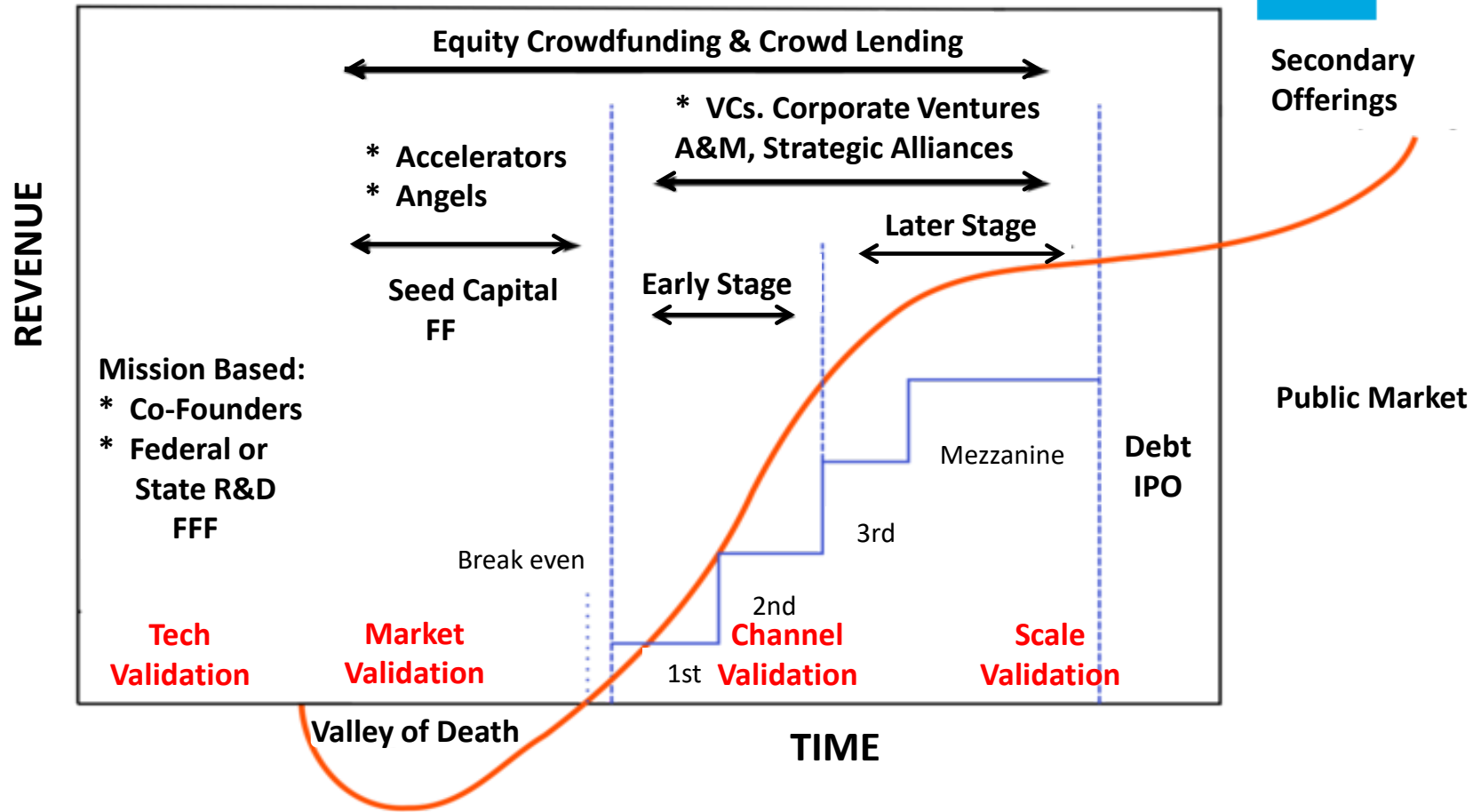


Or:

- Am I financing product manufacturing? Options include the following:
 - Sales – Should be your first option, if possible!
 - Debt financing
 - Venture capital and corporate ventures
 - Private equity
 - Strategic partners
 - Licensing, royalties
 - Preorders, conditional orders
 - Crowd funding
 - Go public using an **initial public offering (IPO)**

Financing Timeline

Appropriate financing method for product stage



Product scaling can be financed in many ways!

Financing Growth

Investor Interest

By technology readiness level (TRL)



Basic Tech Research	Feasibility Research		Tech Development	Tech Demonstration		System Commissioning	System Operation	
Basic principles observed and reported	Technology concept and/or application formulated	Proof of concept analyzed and experimented on	Component or system validation in lab environment	System validation, testing in operating environment	Prototype/ pilot system verification in operating environment	Full-scale prototype verified in operating environment	Actual system complete and functioning in operating environ.	Actual system tested and data collected over lifetime of system
TRL 1	2	3	4	5	6	7	8	9

ARPA-E

Corporate Strategic

DOE SBIR/STTR

Venture Capital

Angel Investors and Pre-Seed

State and Mission Entrepreneurial Support Funding

DOE Program R&D

Financing Growth

Scale Financing

Options

- Basic investment instruments
- Mission-based organizations
 - Federal funding
 - State and local funding
 - Accelerators
 - Philanthropic organizations
- Crowdfunding
- Angel investors
- Venture Capital
- Corporate strategic investment
- Banks, investment banking firms



Investment Instruments

Basics



There are many equity investment “instruments.” Here’s a quick summary of the most frequently used:

- **Common stock:** investors buy the same stock as founders and get no special privileges (usually for friends and family and very early angels)
- **Convertible note:** frequently used by angel investors; think of it as “debt wanting to be equity.” It forestalls the valuation discussion until the next round of financing. It sits on the balance sheet as debt, has a modest interest rate, and converts into equity according to certain terms and conditions and at a discount.

Investment Instruments

Basics (cont.)



- **SAFE:** an invention of the accelerator Y Combinator, a SAFE is a "**simple agreement for future equity**" that is a right to convert into a future round of equity (it has a similar function to a convertible note, but it is equity in the form of a special convertible security and not in the form of debt)
- **Convertible preferred stock:** upon a liquidation event—like the sale of a company—the stock converts into common stock unless the liquidation value of its proportional share in the conversion to common is less than the value of the investment (in that case, it gets principal and dividends [typically 8%] before common stock)
- **Participating preferred stock:** favored by venture capital firms, this stock “double dips” upon liquidation. Holders both get their principal out and participate in the returns as if they held common stock. The stock also accumulates dividends.

Scale Financing

Options



☐ Grants

- Don't be fooled by grants posing as “free money”
- No payback necessary, but strings are attached: program review requirements, audit requirements, reporting requirements, and the need to align with mission

☐ Loans

- Need to payback principal and interest
- No equity dilution
- Need to prove cash flow and/or pathway to customer orders

Scale Financing

Options (cont.)

☐ **Equity**

- Exchange for ownership stake
- Need to demonstrate growth opportunity

☐ **Factoring Receivables**

- Payment is at a discount



Scale Financing

Mission-based organizations



Federal Government:

- Mission: support advanced technology to ensure nation has leading technology
- Grants and loans

Examples: DOE EERE, DOE VTO, ARPA-E

State and Local Government:

- Mission: regional economic development; create jobs and invest in region
- Grants and loans

Examples: state economic development corporations (EDCs), county/city EDCs, incubators

Scale Financing

Mission-based organizations (cont.)



Philanthropic Organizations:

- Mission: solve a problem (e.g., climate change) or help a specific region
- Grants

Examples: Kresge, New Economy Initiative, Wells Fargo, PRIME Coalition

Accelerators and Business Plan Competitions:

- Mission varies, usually economic development driven
- Grants, sometimes convertible notes

Examples: Cleantech Open, TechStars, Make in LA, Accelerate Michigan

Investor Interest

By technology readiness level (TRL)



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ARPA-E

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DOE Program R&D

Financing Growth

Scale Financing

Federal R&D funding



Department of Energy (DOE) <https://energy.gov/>



Energy Efficiency & Renewable Energy (EERE)
<https://www.energy.gov/eere/office-energy-efficiency-renewable-energy>



Advanced Research Projects Agency-Energy (ARPA-E)
<https://arpa-e.energy.gov/>



Department of Defense (DoD) <https://www.defense.gov/>



National Science Foundation (NSF) <https://www.nsf.gov/>



Department of Transportation (DOT)
<https://www.transportation.gov/>

Financing Growth

How DOE Works

Energy Efficiency and Renewable Energy (EERE)



Objective: broad industry adoption

- Goal is domestic IP, jobs
- Year-round solicitation schedule
- Funding varies (≤ \$1M to \$10M)
- Funding opportunity announcements differ between each technology office
- Each office is focused on R&D, with some prototyping, manufacturing, demonstration, and deployment
- Become familiar with R&D roadmaps



Financing Growth

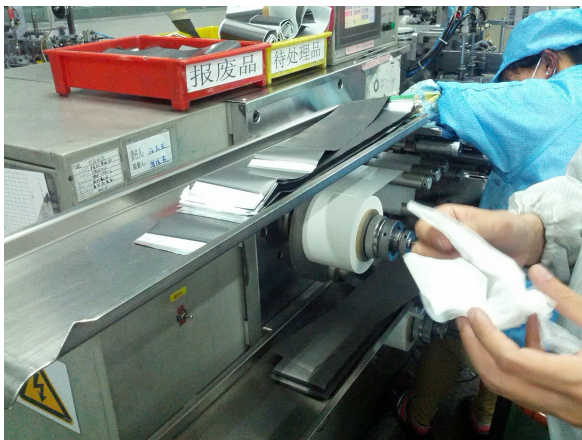
Scaling Your Business

Case Study 1



Using federal projects to secure a customer partner

- ❑ Developer of battery weld inspection systems pursuing DOE/EERE Vehicles Technologies Office (VTO) grant
- ❑ Secured customer partner to validate claims in their production operations by including customer in project in a validation role of their commercial demonstration



Financing Growth

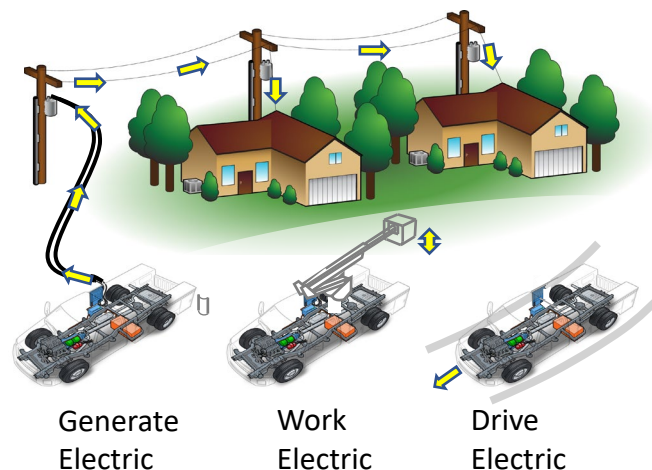
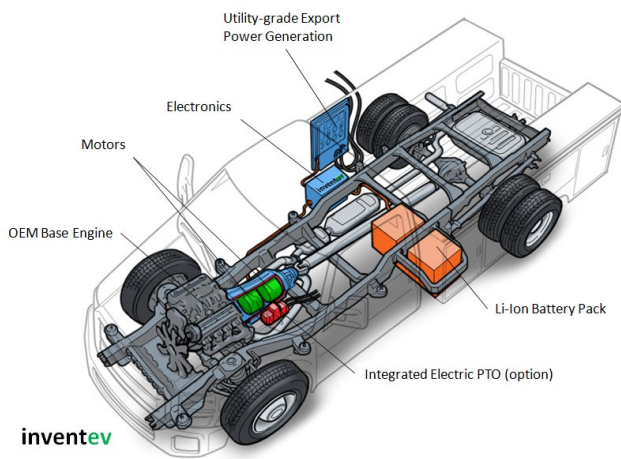
Scaling Your Business

Case Study 2



Using federal projects to secure a supply chain partner

- Hybrid vehicle component developer with export power
- Secured battery, power electronics, and vehicle integration suppliers as project partners to support the development of their technology at scale



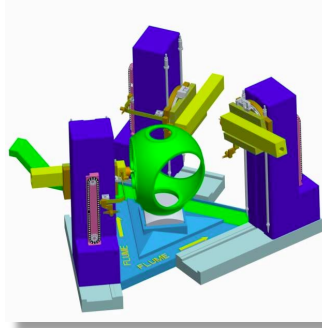
Scaling Your Business

Case Study 3



Using federal projects to secure a downstream strategic market channel partner

- Custom manufacturing equipment developing unique machining process for high-volume production of wind turbine hubs and blades
- Secured contract manufacturing as project partner cost share in high-volume scale demonstration in exchange for including exclusive license to equipment with royalties back to the equipment company on a per-machined-unit basis



Scale Financing

State government options

□ **EDC**

- Jobs created
- Investment attracted
- IP developed
- New companies formed

□ **State offices: Energy**

- Energy office
- Reducing energy waste
- Reducing electricity costs

□ **State offices: DOT**

- Reducing emissions from vehicles
- Reducing fuel use, congestion



State Government Financing

Examples



☐ **Market Research Grants**

—Grants that offset cost for market research

☐ **First Customer Assistance Programs**

—Grants that offset cost for customer research, identification, and acquisition

☐ **Expert in Residence Programs**

—Funding that offsets cost for contracting management team and consultants

State Government Financing

Examples (cont.)



☐ **Microloans and Seed Funding**

—Low-interest loans and small-stake equity investments that support technical- and business-scaling milestones

☐ **SBIR and Other Federal R&D Funding Matching Funds**

—Funding put up as a match to support federal project proposals

☐ **Venture Match Programs**

—Equity investments that provide match money to help attract venture capital investments

Investor Interest

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ARPA-E

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Angel Investors and Pre-Seed

State and Mission Entrepreneurial Support Funding

Family and Friends, Loans, Crowdfunding

Financing Growth

Scale Financing

Incubators



- Typically provide business support services
- Usually dedicated to support start-ups and early-stage companies
- Often provide physical office or lab space, shared services for companies
- Often connected to a university or national lab to support spinoff companies
- Usually do not provide direct financial investment but may carry equity in companies they support

Scale Financing

Accelerators



- Goal is to grow early-stage businesses
- Typically technology specific and supported by industry
- Companies typically required to successfully complete coaching or training curriculum
- Funds are usually equity stake or convertible note
- Typical investment: \$20k–\$100k for up to 10% of company

Incubators And Accelerators

Examples



accelerate>>MICHIGAN
INNOVATION COMPETITION



Scale Financing

Business plan competitions

- Goal is to award most promising companies
- Region or network specific
- Colleges, states/cities, etc.
- Grants, usually \$5k–\$50k (AMIC \$25k–\$500k)



Selected Incubators

Cleantech and hardware



- ❑ ACTION (New England) <http://www.actionnewengland.org/>
- ❑ ACRE/Urban Future Lab/Powerbridge (NY) <http://ufl.nyc/>
- ❑ Austin Technology Incubator (TX) <http://ati.utexas.edu/>
- ❑ Clean Energy Trust (Chicago, IL) <http://cleanenergytrust.org/>
- ❑ Cleantech San Diego (CA) <http://cleantechsandiego.org/>
- ❑ CLT Joules (Charlotte, SC) <http://cltjoules.com/>
- ❑ Colorado Renewable Energy Collaboratory
<http://www.coloradocollaboratory.org/>
- ❑ Greentown Labs (Boston, MA) <http://greentownlabs.com/>
- ❑ GreenTech Endeavors (Miami, FL)
<http://www.greentechendeavors.com/>
- ❑ Hawaii Energy Exelerator <http://energyexcelerator.com/>

Selected Incubators

Cleantech and hardware (cont.)



- ❑ Los Angeles Cleantech Incubator <http://laincubator.org/>
- ❑ Michigan Alternative and Renewable Energy Center <http://www.gvsu.edu/mihub/>
- ❑ Midwest Energy Research Consortium (WI) <http://m-werc.org/>
- ❑ New England Clean Energy Council <http://www.necec.org/>
- ❑ NextEnergy (MI) <http://www.nextenergy.org/>
- ❑ Northeast Ohio Economic Development Council (Cleveland, OH) <http://www.teamneo.org/>
- ❑ Oregon BEST <http://oregonbest.org/>
- ❑ Pecan Street Project (Austin, TX) <http://www.pecanstreet.org/>
- ❑ Prospect Silicon Valley (San Jose, CA) <http://prospectsv.org/>

Selected Incubator Resources

Cleantech and hardware



- Incubatenergy Network <https://incubatenergy.org/>

The Incubatenergy Network is accelerating the transition to a sustainable economy through national coordination of incubator resources supporting entrepreneurs focused on clean energy innovation and deployment. The network has supported more than 500 companies to date and has a significant pipeline.

- Energy Nexus <https://www.energynexus.co/accelerators/>

New Energy Nexus supports clean, smart, and distributed energy start-ups worldwide, facilitating collaboration and innovation among the accelerators, start-ups, companies, and investors

Selected Accelerators

Cleantech and hardware



North America

- ❑ Alphalab Gear (Pittsburgh, PA) <http://www.alphalabgear.org/>
- ❑ Bolt (Boston, MA) <https://www.bolt.io/>
- ❑ First Batch <http://www.firstbatch.org/>
- ❑ Greentown Labs <http://greentownlabs.com/>
- ❑ Hax <https://hax.co/about/>
- ❑ Highway1 powered by PCH (San Francisco, CA) <http://highway1.io/>
- ❑ IncubatEnergy Network <https://incubatenergy.org/>
- ❑ Invent@NMU (MI) <http://www.nmu.edu/invent/home>
- ❑ LabiX powered by Flextronics (San Jose, CA) <http://www.labix.io/>

Selected Accelerators

Cleantech and hardware (cont.)



- ❑ Lemnos Labs (San Francisco, CA) <http://lemnoslabs.com/>
- ❑ Make in LA (Los Angeles, CA) <http://makeinla.com/>
- ❑ NextEnergy <http://www.nextenergy.org/>
- ❑ RGA powered by Techstars (New York, NY)
<http://rgaaccelerator.com/connecteddevices/>
- ❑ Qualcomm Robotics powered by Techstars (San Diego, CA)
<http://qualcommaccelerator.com/>
- ❑ Tandem Capital (Burlingame, CA) <http://tandemcap.com/>

Selected Business Plan Contests

Cleantech and hardware



- Zahn Innovation Center Kylie Hardware Awards (NY)
<http://www.zahncenternyc.com/>
- TechCrunch Hardware Battlefield (Las Vegas, NV)
<https://techcrunch.com/events/hardware-battlefield-2015/event-home/>

Scale Financing

Philanthropic foundation funding



□ PRIME Foundation Funding Opportunity

- Utilizing program-related investments
- Technology companies considered for investment must target social cause of climate change mitigation

<https://docs.google.com/a/nextenergy.org/forms/d/1R7cil0n3JwgMet6lHlpe6PwCGyTJmmNhaPyWc9UUC8w/viewform>

Scale Financing

Philanthropic foundation funding (cont.)



□ Wells Fargo Cleantech Innovation Incubator

- \$10 million grant for clean technology start-up technology validation
- Co-administered by the National Renewable Energy Laboratory (NREL)
- Up to \$250,000 research and testing support at NREL's world-class facility in Golden, CO
- Technology focus: lighting, sensors and controls, space heating and cooling, windows, energy modeling, plug loads, and building envelope

https://www.wellsfargo.com/about/press/2014/cleantech-innovation-incubator_1028

Investor Interest

By technology readiness level (TRL)



Basic Tech Research	Feasibility Research		Tech Development	Tech Demonstration		System Commissioning	System Operation	
Basic principles observed and reported	Technology concept and/or application formulated	Proof of concept analyzed and experimented on	Component or system validation in lab environment	System validation, testing in operating environment	Prototype/pilot system verification in operating environment	Full-scale prototype verified in operating environment	Actual system complete and functioning in operating environ.	Actual system tested and data collected over lifetime of system
TRL 1	2	3	4	5	6	7	8	9

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Corporate Strategic

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Venture Capital

Angel Investors and Pre-Seed

State and Mission Entrepreneurial Support Funding

Family and Friends, Loans, Crowdfunding

Financing Growth

Growth Financing Options

Debt finance



- ❑ Short-term bank loans and overdrafts are suitable only for short-term planning
- ❑ Long-term bank loans from high-street banks are an option to consider; however, they are an expensive way of acquiring funding
- ❑ You must budget for the regular repayments you have to make
- ❑ Debt financing usually requires multiple years of balance sheets and positive revenue and confirmation of projected sales

Growth Financing Options

Debt finance (cont.)



- A less known form of debt finance is “factoring,” which is a loan against receivables (for a company that has consistent sales and needs working capital from sales before customers are willing to pay, this may provide short-term financing, but beware of the costs)
- You may also hear about “revenue-share” or “royalty” financing in which you pay out a share of your revenues until the lender receives 2–3x their money (this is a bit in-between debt and equity, but it is treated as debt)

Growth Financing Options

Debt finance pros and cons



- ❑ Interest paid on debt is tax-deductible, so you're not spending as much as you think
- ❑ It allows you to retain equity in exchange for borrowing money and the cost of loan interest over time
- ❑ Debt finance is subject to rising interest rates
- ❑ It can be difficult to secure, particularly if your business is pre-revenue, R&D heavy
- ❑ You may be required to offer personal guarantees (e.g., collateral)

Growth Financing Options

Equity finance



- Investors will get involved if they believe you are a business with the potential for significant growth
- Business angels are wealthy individuals who invest their own funds in your business for equity. They also offer mentoring and advice. They tend to invest smaller sums and take less time to complete a deal than venture capitalist firms.

Growth Financing Options

Equity finance (cont.)



- ❑ Venture capitalist firms look to buy a minority stake in your business. They offer unsecured finance, management expertise, increased credibility, and business contacts. You have to give up part of your business, and the firm will expect to place a member on your board.
- ❑ Banks also offer direct equity investments with the promise of noninterference with day-to-day operations
- ❑ Private equity firms are another option but are more likely to want a change in management and operational control

Growth Financing Options

Equity finance pros and cons



- ❑ Not every business will attract equity finance; only high-growth businesses with attractive prospects can secure this kind of investment
- ❑ You will have to give up a portion of the business and you must grow and operate to a fixed schedule
- ❑ Equity is better respected than debt and can confer a certain credibility and prestige on your company
- ❑ Equity investors can often advance business through industry knowledge and strategic connections
- ❑ Securing private equity is time-consuming; it can take 12–18 months to pitch and secure investment

Crowdfunding

Basics



Many entrepreneurs see crowdfunding as an option to formal angel or venture capital funding

There are two types of crowdfunding:

- ❑ **Pre-sales funding** (like Kickstarter): this is for consumer products companies and not industrial product offerings
- ❑ **Equity crowdfunding**: to date, this has been of limited value to high-growth potential start-ups (the 2012 “JOBS Act” opened the door to a wider range of equity funding options from individual investors, not just “accredited” [wealthy] individuals)

Crowdfunding

U.S. Securities and Exchange Commission (SEC) rules



- Historically, companies raising equity financing relied on a rule called “506” that is an exemption from the rules around public stock offerings under which most angel and venture funding exists
- This is now modified as SEC Rule 506b, which requires you to keep your equity offering strictly private, only disclosable to accredited investors

Example: no need to reference the fact that you’re raising money when pitching at a public business plan competition!

Crowdfunding

SEC rules (cont.)



- As directed by the JOBS Act, the SEC created several new pathways to funding
- The following two are of note:
 - SEC Rule 506c allows you to more broadly speak about your investment offering, but still, you can only take in money from accredited investors. In exchange for allowing you to publicize your offering, there are more reporting requirements. Platforms like AngelList rely on this rule.
 - Crowdfunding via approved Internet platforms allows you to raise up to \$1,000,000 in a 12-month period from unaccredited investors. Challenge: lots of small investors to distract you!

Make sure you consult a lawyer who has a lot of experience with SEC regulation!

Investor Interest

By technology readiness level (TRL)



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Financing Growth

Angel Investors

Basics



☐ **How do they work?**

- High-net-worth individuals or groups investing personal money to get returns
- Looking to get 2–10x return from their investments
- Typically invest \$50k–\$250k for 10%–20% of company
- Oftentimes former entrepreneurs who have successfully grown and sold companies

☐ **What do they care about?**

- Better returns than typical conservative investments they make
- Usually first money in
- Tend to focus on local entrepreneurs and local economic development
- Invest in areas of personal expertise and interest

Angel Investors

Basics (cont.)



□ Points to consider

- Can be smart money if angels bring more than money (e.g., connections, strategy)
- Due diligence on angel groups: check background on angels (is there a fit with your technology, industry?)
- Investment terms are critical and can often attract or scare away future investors

□ Methods of approach

- Warm introductions always best: use networks/incubators/accelerators/mentors to identify, recommend ,and connect
- Regionally focused angels and groups usually have websites and post investment pitch days
- Resources: AngeList (amgel.co), SeedInvest.com, Angel Capital Association (<http://www.angelcapitalassociation.org/>), National Angel Summit

Angel Investors

Examples



**Capital
Community
Angels**



Investor Interest

By technology readiness level (TRL)



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Financing Growth

Venture Capitalists

Basics



□ **How do they work?**

- Money managers managing investor stakeholders' money
- Invest in the \$500k–\$10M range for Series A–C
- Typically require majority stake in company

□ **What do they care about?**

- Looking for significant market potential (\$1B+)
- Need to get 10x portfolio return to their stakeholders in about 7 years
- Risk mitigation (ability to pivot, multiple market applications)
- Need to prove that there is significantly more demand for your product or service than what your current resources can fill
- Scalability and time to market

Venture Capitalists

Basics (cont.)



□ Points to consider

- Due diligence: evaluate existing portfolio and investor stakeholders
- Are there conflicts or synergies?
- Are there portfolio companies that could be customers, suppliers, channel partners?
- Would their investors potentially acquire my company?
- Typically require board presence and decision-making authority

□ You are on the clock!

- Methods of approach
- Cleantech investor forums: NREL, Clean Energy Trust, Cleantech Group

Venture Capitalists

Examples



Investor Interest

By technology readiness level (TRL)



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Financing Growth

Corporate Strategic Investment

Basics



□ How do they work?

- Tech-scouting unit of a large corporation interested in new technology that supports their product development and corporate strategy
- Use investment arm as a way to complement internal R&D
- Investments align with corporate objectives and buy into companies they will help grow
- Typically later stage (Series B+), typically less than majority share, and not always board seat

□ What do they care about?

- Improving internal processes and efficiencies
- Advancing internal product development timeline
- Advantage to sell more of their product
- Competitive technological advantage, product differentiation

Financing Growth

Corporate Strategic Investors

Basics (cont.)



□ Points to consider

- Can lead to sales and supply chain relationships in addition to investment
- Lengthy process; requires many levels of approval within big corporation
- Terms typically require industry exclusivity on IP

□ Methods of approach

- Warm introductions through partners (incubators)
- Corporate-start-up matchmaking: NextEnergy, Clean Energy Trust
- Open innovation platforms: Nine Sigma
<http://www.ninesigma.com/>; NextChallenge
- Corporate venture sites: <http://www.cleantech.com/>;
<http://www.cbinsights.com/CorporateVC>

Corporate Strategic Investors

Examples



Corporate Strategic Investors

Portfolios



Design and manufacture heavy-duty vehicles powered solely by clean domestic fuels



Develop solid-state rechargeable lithium ion battery technology



Self-learning monitoring technology that monitors fluctuations in power output of motors to predict mechanical issues months in advance



Harnesses and concentrates sunlight to produce steam for enhanced oil recovery

Financing Growth

Tips



- First priority...finance your growth through sales whenever possible
- Second priority...finance your growth through projected sales that will allow you to secure low-cost debt (e.g., loans)
- Only take the money you need...avoid racking up debt and be lean...force yourself to be smart with your finances
- Taking investment in the form of “equity” can prove to be either low risk or expensive for a company (see additional explanation on the next slide)

Financing Growth

Tips (cont.)



- Giving up equity at an early stage may mean you do not need to pay it back if you fail, but if you provide too much equity to others it can prohibit the loss of revenues forever if your venture proves successful
- When taking on equity partners, always attempt to attract “smart money”...investors that offer other ways to accelerate the commercialization and growth of the company (e.g., connections, industry knowledge, access to markets, management support)
- Reduce your cost of management when possible by providing equity to high-impact individuals who can serve as advisors to the company and directly influence growth (e.g., retired general who helps you secure business in defense industry)

List Of Terms

In glossary



- ❑ **Process Validation** is the analysis of data gathered throughout the design and manufacturing of a product in order to confirm that the process can reliably output products of a determined standard.
- ❑ **Hardware** is the collection of all the parts you can physically touch while software is a set of digital instructions to perform specific operations.
- ❑ **Return on Investment (ROI)** is the benefit to an investor resulting from an investment of some resource. A high ROI means the investment's gains compare favorably to its cost.
- ❑ **Software** is a part of a computer system that consists of data or computer instructions, in contrast to the physical hardware from which the system is built.
- ❑ **Retail Price** also referred to at times as list price or manufacturer's suggested retail price (MSRP), recommended retail price (RRP), or suggested retail price (SRP), of a product is the price at which the manufacturer sells to or recommends sale to the end user.
- ❑ **Wholesale Price** is the price charged for a product as sold in bulk to large trade or distributor groups as opposed to what is charged to consumers.
- ❑ **Work in Process (WIP)** is a company's partially finished goods waiting for completion and eventual sale or the value of these items. These items are either just being fabricated or waiting for further processing in a queue or a buffer storage. The term is used in production and supply chain management.
- ❑ **Factoring** is a financial transaction and a type of debtor finance in which a business *sells* its accounts receivable (i.e., invoices) to a third party (called a factor) at a discount.
- ❑ **Cost of Goods Sold (COGS)** are expenses directly attributed to production (i.e., raw materials, processing, assembly, factory facility, and equipment)
- ❑ **Operating Expenses (OpEx)** are expenses not directly related to the product (i.e., administrative payroll and office space)

List Of Terms

In glossary (cont.)



- ❑ **Interest and Taxes** (I&T) includes federal, state, local, and payroll taxes; plus business loan interest expenses. When you deduct the interest and taxes from Income from Operations, you get to the final number on the P&L, called Net Income.
- ❑ **Revenue** is the total income received through sale of products and services
- ❑ **Net Profit** is revenue minus COGS, OpEx, and I&T (This is your bottom line)
- ❑ **Net Profit Margin** is revenue divided by net profit
- ❑ **Working Capital** is product-related assets and liabilities
- ❑ **Working capital cycle** is the time it takes to turn product assets and liabilities into cash
- ❑ **Intellectual Property (IP)** refers to creations of the intellect for which a monopoly is assigned to designated owners by law.
- ❑ **COGS Unit Cost** is the total expenditure incurred by a company to produce, store and sell one unit of a particular product or service.
- ❑ **Initial Public Offering (IPO)** is a type of public offering in which shares of a company usually are sold to institutional investors that in turn, sell to the general public, on a securities exchange, for the first time.
- ❑ **Venture Capital (VC)** is a type of private equity financing that is provided by firms or funds to small, early-stage, emerging firms that are deemed to have high growth potential, or which have demonstrated high growth (in terms of number of employees, annual revenue, or both).
- ❑ **Common Stock** is stock offered to investors that is the same in all ways as the stock received by the founders. There are no special limitations of privileges (Usually for friends and family and very early angels)
- ❑ **Convertible Note** is frequently used by angel investors. Think of it as “debt wanting to be equity.” It forestalls the valuation discussion until the next round of financing. Sits on the balance sheet as debt, has a modest interest rate, and converts into equity according to certain terms and conditions and at a discount.

List Of Terms

In glossary (cont.)



- **SAFE** is an invention of the accelerator Y Combinator, a SAFE is a "simple agreement for future equity," that is a right to convert into a future round of equity (It has a similar function to a Convertible Note but it is equity in the form of a special convertible security not in the form of debt)
- **Convertible Preferred Stock**, upon a liquidation event like sale of the company, converts into common stock unless the liquidation value of its proportional share in the conversion to Common is less than the value of the investment (in that case it gets principal and dividends (typically 8%) before common stock)
- **Participating Preferred Stock** is favored by VCs, this stock "double dips" upon liquidation. Holders both get their principal out AND participate in the returns as if they held Common Stock. Also accumulates dividends
- **Simple Agreement for Future Equity** is an agreement between an investor and a company that provides rights to the investor for equity in the company similar to a warrant, except without determining a specific price per share.
- **Venture Capitalist (VC)** firms look to buy a minority stake in your business. They offer unsecured finance, management expertise, increased credibility and business contacts. You have to give up part of your business and the VCs will expect to place a member on your board.