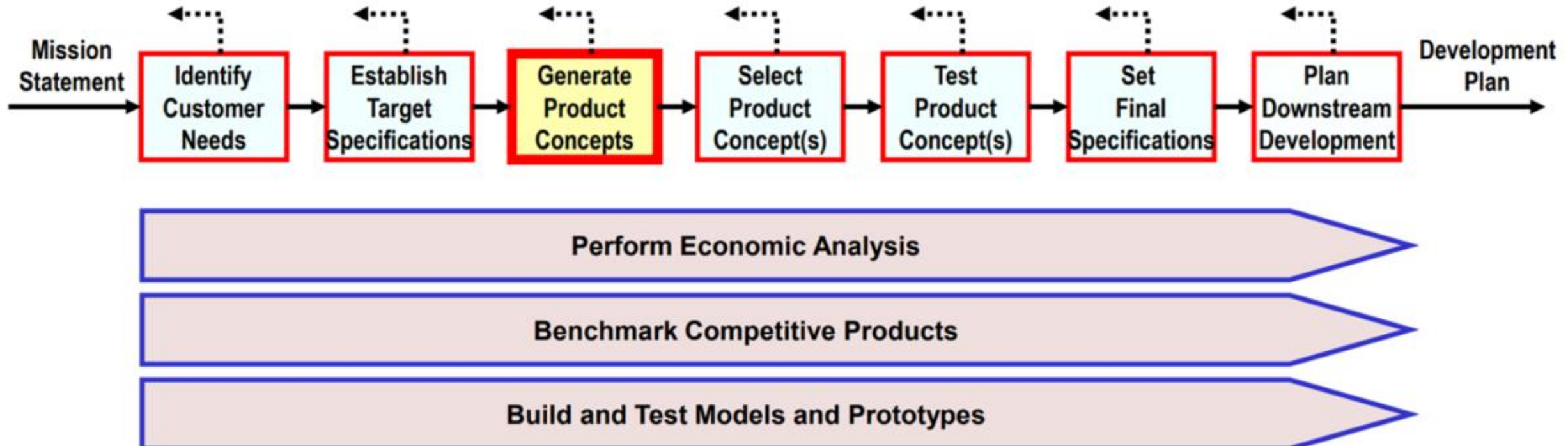


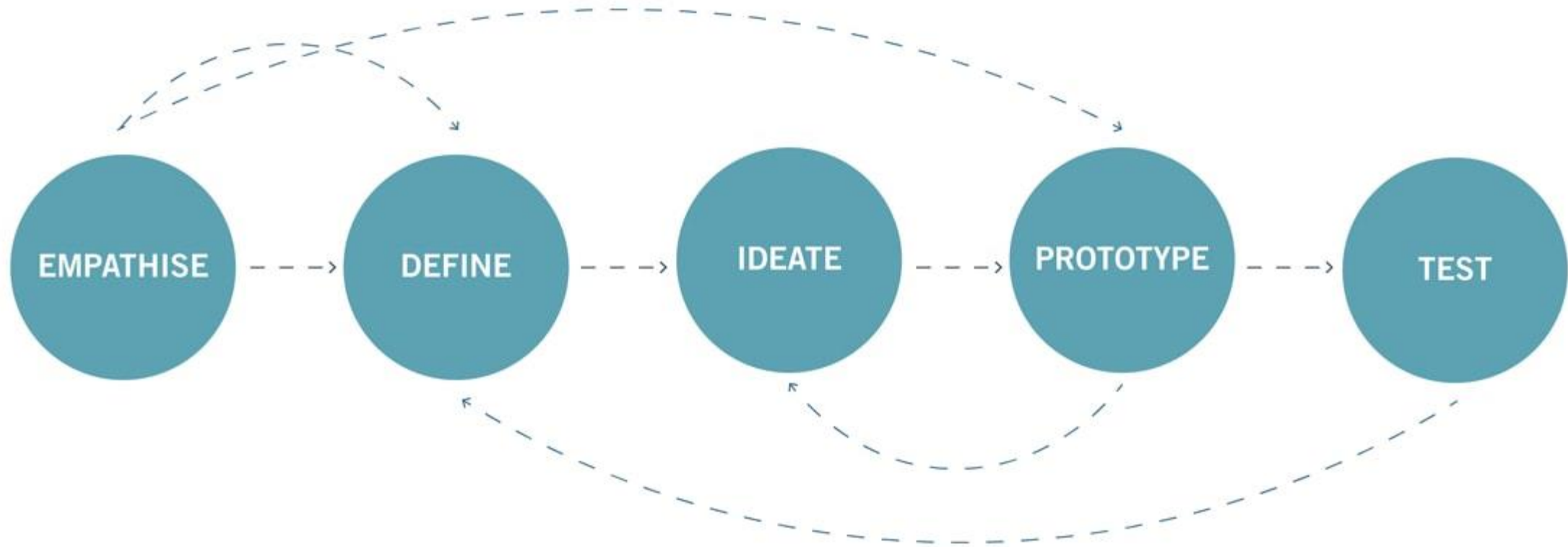
Test & Iterate & Financial Analysis



Concept Development Process



5 STEPS OF THE DESIGN THINKING PROCESS



Test your Prototype

- Early and often
- Adopt a Beginners mind is valuable at every step of the design process.
- Each step along the way affords an opportunity to rethink, relearn, and reboot as needed.
- Design process is rarely linear.

Expert View

“In the beginner’s mind there are many possibilities, in the expert’s mind there are few.” Zen teacher Shunryu Suzuki

Expert View

The beginner's mind is the mind of compassion. When our mind is compassionate, it is boundless.

Zen teacher Shunryu Suzuki

Test (1)

- Testing is where it can get a little scary
- Getting your product ideas in front of real users for feedback can be daunting
- But the whole basis for prototyping **early and often** is intended to keep us from forming attachments to ideas that may or may not be worthwhile.



Test (3)

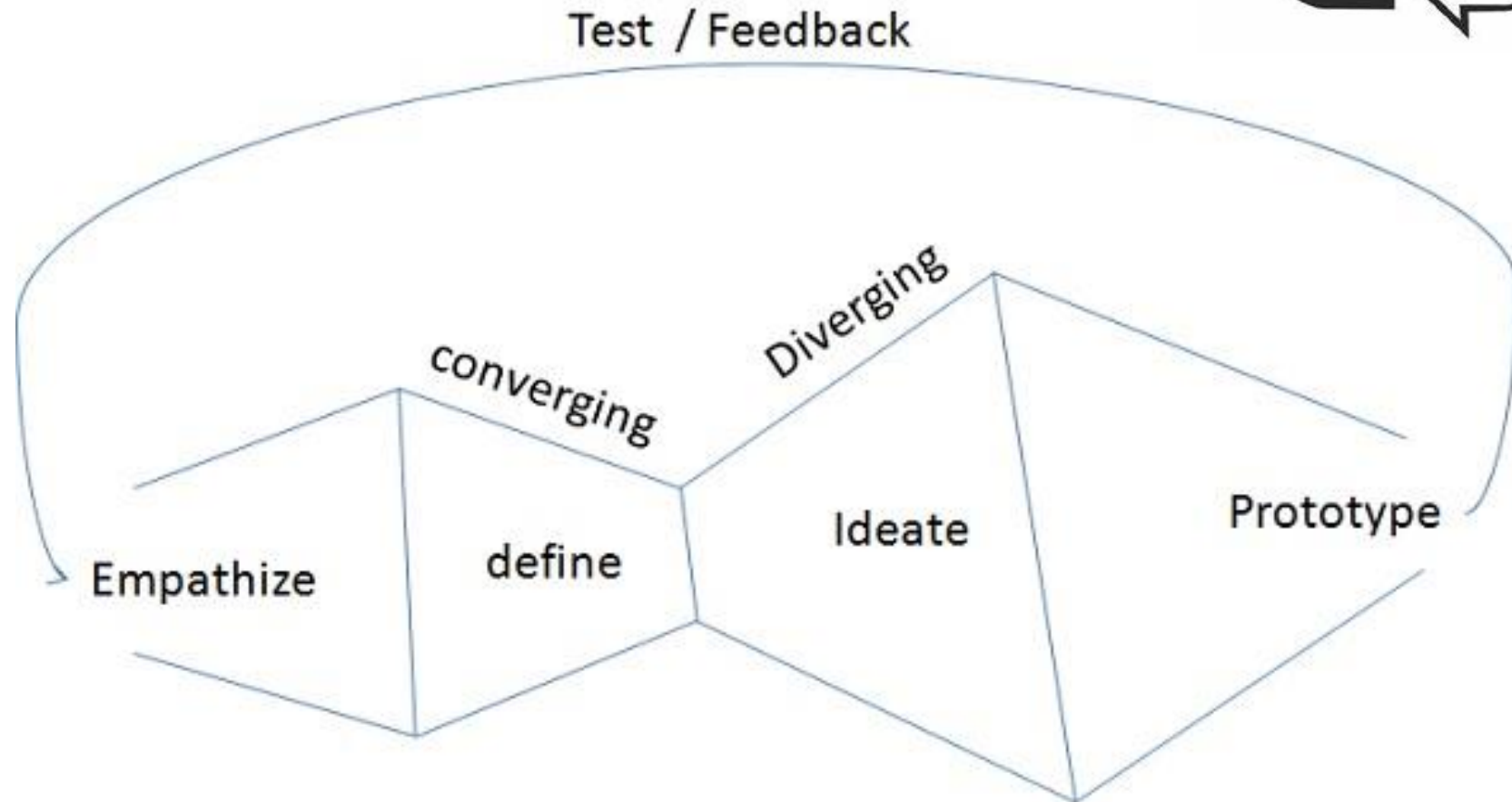
- By testing our prototypes with real users in context,
 - observing their reactions,
 - and getting feedback,
 - we can refine our POV,
 - learn more about our users,
 - and make the next iteration of the product that much better.
- It's important to test prototypes early in the design process so you can quickly correct course if your product hypotheses are incorrect.



Test (4)

“Prototype as if you know you’re right, but test as if you know you’re wrong.” Stanford’s d.school

Iterate



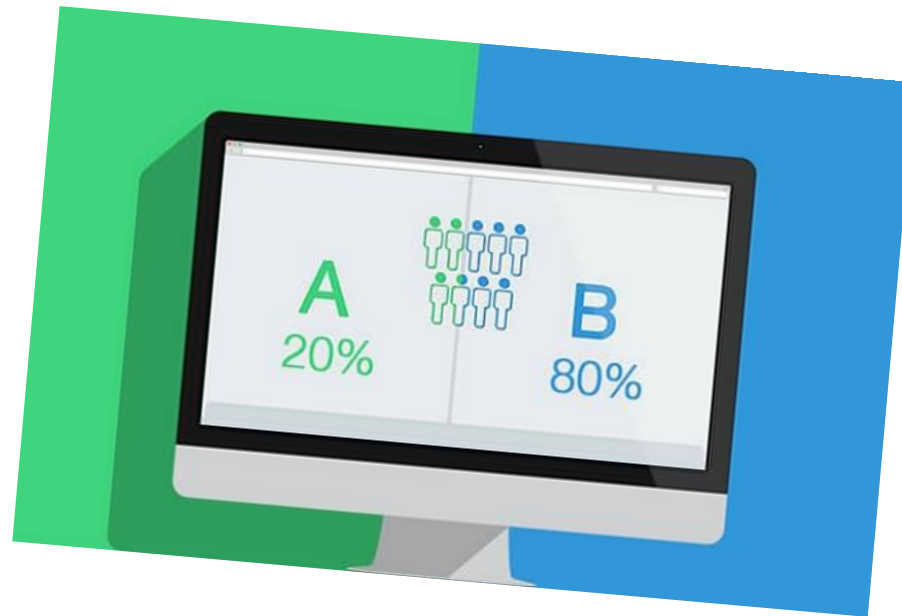
Test & Iterate

- <https://www.youtube.com/watch?v=OrYYdVyyc8s>

Test & Iterate

A/B Testing

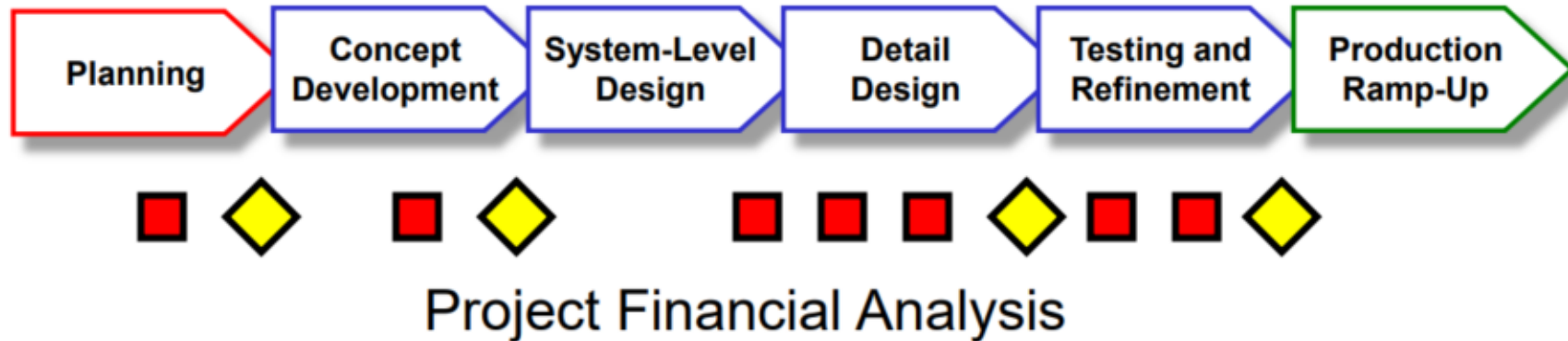
- <https://www.youtube.com/watch?v=R1jAoOvWRN0>



Financial Analysis

Product Development Process and Project Financial Analysis

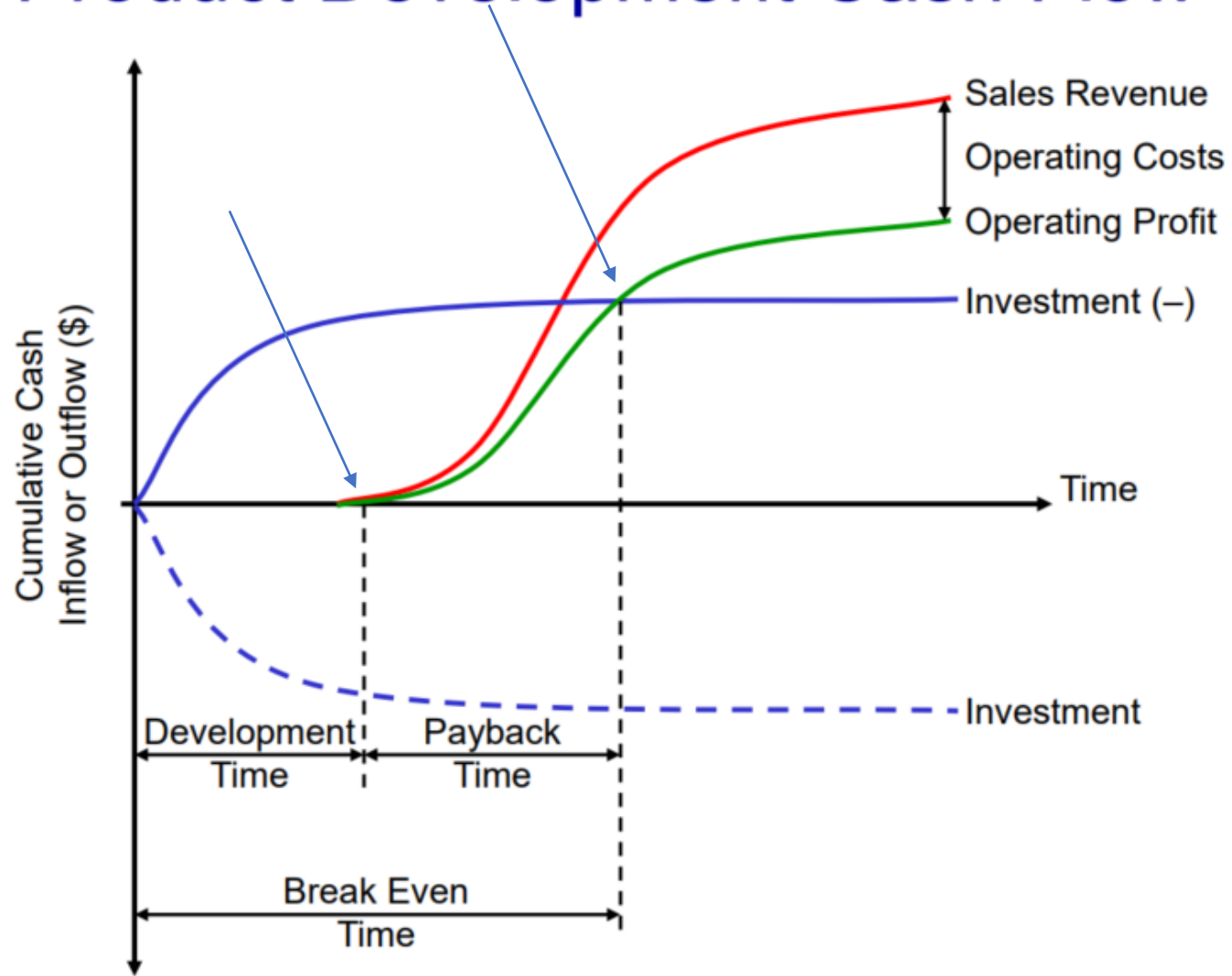
Product Development Process



◆ Go/No-Go Decision Gates

■ Sensitivity and Trade-off Analysis

Product Development Cash Flow



Questions to Answer with PD Project Financial Modeling

- Will the project be profitable enough to pay back the initial investment?
- What if our financial projections are wrong?
- What is the worst case for breakeven?
- Is it worth it to invest in more expensive [tooling, design, packaging, recycling]?
- Can we sell machines at a loss in order to get a stream of ongoing revenue from sales of [consumables, renewables, service]?
- What is the cost (value) of recycling?
- What if a new competitor joins the market?

Net Present Value

$$\text{NPV} = \sum_{\text{periods}} \frac{\text{period cash flow}}{(1 + \text{discount rate})^{\text{period}}}$$

$$\text{NPV} = \sum_{i=1}^N \frac{C_i}{(1+r)^i}$$

Net Present Value Formula

Net Present Value Formula

$$NPV = -C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \dots + \frac{C_T}{(1+r)^T}$$

$-C_0$ = Initial Investment

C = Cash Flow

r = Discount Rate

T = Time

Typical Inputs for NPV Analysis

Typical Inputs for NPV Analysis

- Development and testing cost (+ timing)
- Tooling investment (+ timing)
- Ramp-up cost and timing
- Marketing and support (+ timing)
- Sales volume (+ lifetime)
- Unit production cost
- Unit revenue
- Recycling cost or revenue
- Discount rate

Negative NPV

Reasons why firms may choose to pursue a product or service even if the financial analysis reveals a negative NPV

1. Development of core competencies
 2. Positive externality with related products
 3. Development of products for lead users (undeveloped markets)
 4. Environmental policies
 5. Competitive response
 6. Development of goodwill
 7. Dynamic pricing
- Above situations can be considered as "spending" rather than investment.
 - Consider some of these effects in the NPV analysis. The difficulty is to quantify the beneficial effects.





Typical Inputs for NPV Analysis

- Development and testing cost (+ timing)
- Tooling investment (+ timing)
- Ramp-up cost and timing
- Marketing and support (+ timing)
- Sales volume (+ lifetime)
- Unit production cost
- Unit revenue
- Recycling cost or revenue
- Discount rate

Base-Case Model Inputs

Model Inputs	Model Values
Sales Volume Growth, machines	15% per year
Initial Sales Volume, machines	200000 units/year
Initial Retail Price, machines	\$260 per unit
Distributor + Retail Margin	40%
Retail Price Growth, machines	-10% per year
Sales Volume, capsules	400 capsules/machine each year
Initial Retail Price, capsules	\$0.60 per unit
Retail Price Growth, capsules	5% per year
Product Development	5.0 \$M over 1 year
Equipment and Tooling	4.0 \$M over 1/2 year
Production Ramp-up	2.0 \$M over 1/2 year
Market Launch	10.0 \$M over 1/2 year
Marketing and Support	5.0 \$M/year
Production Cost, machines	\$55 per unit
Production Overhead	1.0 \$M/year
Production Cost, capsules	\$0.050 per unit
Recycling Rate, capsules	20%
Recycling Overhead	0.50 \$M/year
Recycling Cost, capsules	\$0.010 per unit
Recycling Recovery Value	\$0.0010 per unit (1g Al @ \$1/kg)
Discount Rate	7%

Coffee Machines Only

Values in \$M (except where noted)	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Sales, machines					6.24	7.80	7.80	9.36	6.46	8.07	8.07	9.69	6.68	8.36	8.36	10.03
<i>Sales Volume, machines (units/qtr)</i>					40,000	50,000	50,000	60,000	46,000	57,500	57,500	69,000	52,900	66,125	66,125	79,350
<i>Unit Wholesale Revenue, machines (\$/unit)</i>					156	156	156	156	140	140	140	140	126	126	126	126
Total Revenue					6.24	7.80	7.80	9.36	6.46	8.07	8.07	9.69	6.68	8.36	8.36	10.03
Product Development	1.25	1.25	1.25	1.25												
Equipment and Tooling			2.00	2.00												
Production Ramp-up				1.00	1.00											
Marketing and Support				6.25	6.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Production, machines					2.45	3.00	3.00	3.55	2.78	3.41	3.41	4.05	3.16	3.89	3.89	4.61
Total Costs	1.25	1.25	3.25	10.50	9.70	4.25	4.25	4.80	4.03	4.66	4.66	5.30	4.41	5.14	5.14	5.86
Period Cash Flow	-1.25	-1.25	-3.25	-10.50	-3.46	3.55	3.55	4.56	2.43	3.41	3.41	4.39	2.27	3.22	3.22	4.16
Period Present Value	-1.23	-1.21	-3.09	-9.80	-3.17	3.20	3.14	3.97	2.08	2.87	2.82	3.57	1.82	2.52	2.48	3.15
Net Present Value	13.1															

Coffee Machines and Capsules

Values in \$M (except where noted)	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Sales, machines					6.24	7.80	7.80	9.36	6.46	8.07	8.07	9.69	6.68	8.36	8.36	10.03
<i>Sales Volume, machines (units/qtr)</i>					40,000	50,000	50,000	60,000	46,000	57,500	57,500	69,000	52,900	66,125	66,125	79,350
<i>Unit Wholesale Revenue, machines (\$/unit)</i>					156	156	156	156	140	140	140	140	126	126	126	126
Sales, capsules					1.44	3.24	5.04	7.20	9.30	11.47	13.65	16.25	19.17	21.79	24.42	27.56
<i>Sales Volume, capsules (units/qtr)</i>					4,000,000	9,000,000	14,000,000	20,000,000	24,600,000	30,350,000	36,100,000	43,000,000	48,290,000	54,902,500	61,515,000	69,450,000
<i>Unit Wholesale Revenue, capsules (\$/unit)</i>					0.36	0.36	0.36	0.36	0.38	0.38	0.38	0.38	0.40	0.40	0.40	0.40
Total Revenue					7.68	11.04	12.84	16.56	15.76	19.55	21.72	25.94	25.85	30.15	32.77	37.59
Product Development	1.25	1.25	1.25	1.25												
Equipment and Tooling			2.00	2.00												
Production Ramp-up				1.00	1.00											
Marketing and Support				6.25	6.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Production, machines					2.45	3.00	3.00	3.55	2.78	3.41	3.41	4.05	3.16	3.89	3.89	4.61
Production, capsules					0.20	0.45	0.70	1.00	1.23	1.52	1.81	2.15	2.41	2.75	3.08	3.47
Total Costs	1.25	1.25	3.25	10.50	9.90	4.70	4.95	5.80	5.26	6.18	6.47	7.45	6.82	7.88	8.21	9.34
Period Cash Flow	-1.25	-1.25	-3.25	-10.50	-2.22	6.34	7.89	10.76	10.50	13.37	15.25	18.50	19.03	22.26	24.56	28.25
Period Present Value	-1.23	-1.21	-3.09	-9.80	-2.04	5.71	6.99	9.37	8.98	11.24	12.60	15.02	15.19	17.46	18.93	21.41
Net Present Value	125.5															

Model Uncertainty

Model Inputs	Model Values
Sales Volume Growth, machines	15% per year
Initial Sales Volume, machines	200000 units/year
Initial Retail Price, machines	\$260 per unit
Distributor + Retail Margin	40%
Retail Price Growth, machines	-10% per year
Sales Volume, capsules	400 capsules/machine each year
Initial Retail Price, capsules	\$0.60 per unit
Retail Price Growth, capsules	5% per year
Product Development	5.0 \$M over 1 year
Equipment and Tooling	4.0 \$M over 1/2 year
Production Ramp-up	2.0 \$M over 1/2 year
Market Launch	10.0 \$M over 1/2 year
Marketing and Support	5.0 \$M/year
Production Cost, machines	\$55 per unit
Production Overhead	1.0 \$M/year
Production Cost, capsules	\$0.050 per unit

Uncertainty of Model Values		
Base	Worst	Best
15%	-5%	25%
200000	100000	250000
\$260	\$225	\$295
40%	50%	35%
-10%	-15%	5%
400	250	600
\$0.60	\$0.55	\$0.70
5%	0%	5%
5.0	7.0	4.0
4.0	5.0	3.0
2.0	2.5	1.5
10.0	15.0	8.0
5.0	6.0	4.0
\$55	\$60	\$50
1.0	1.2	0.8
\$0.050	\$0.055	\$0.045

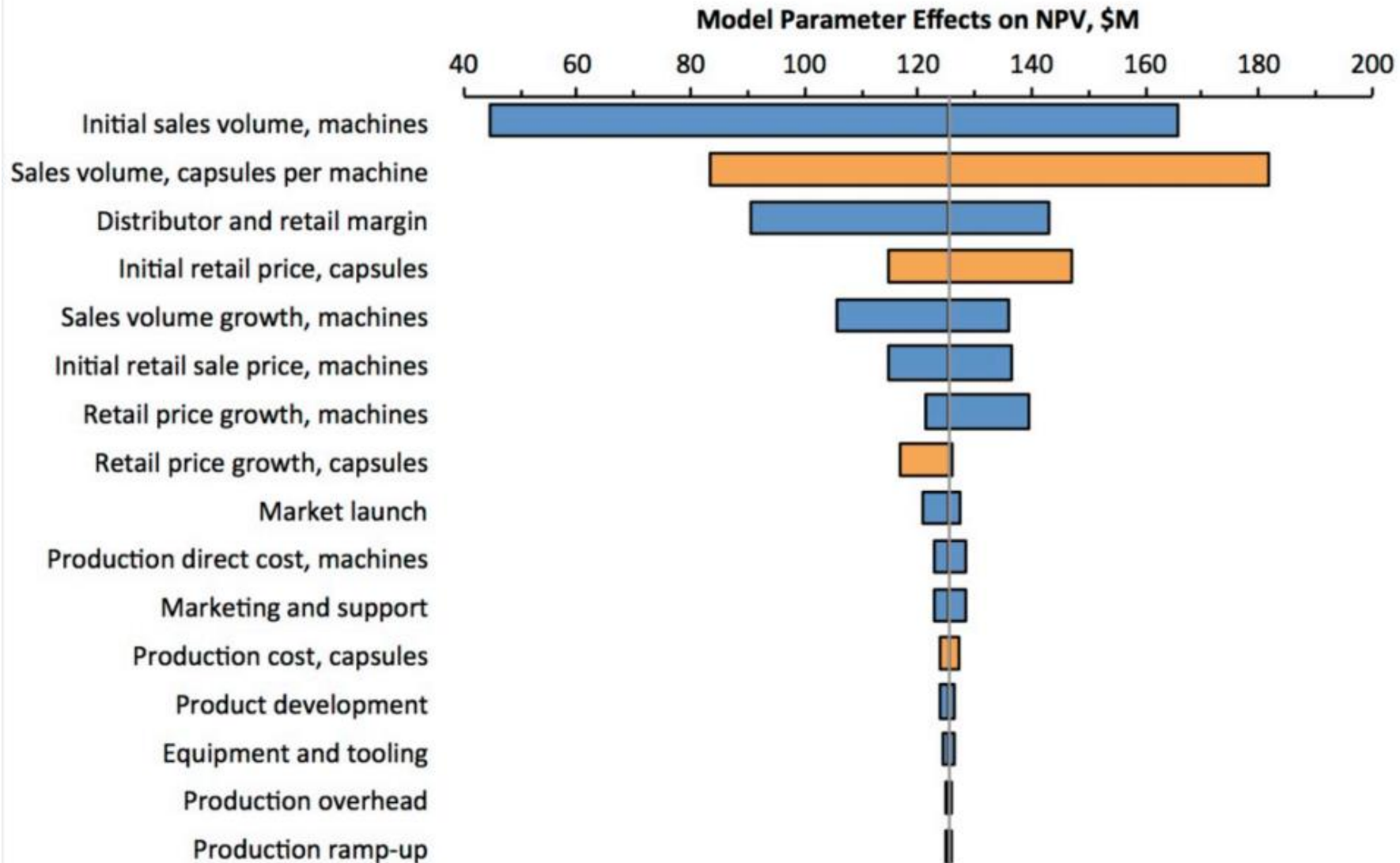
Sensitivity Analysis – with capsules

Model Inputs	Model Values	Uncertainty of Model Values			with Capsules	
		Base	Worst	Best	Worst	Best
Sales Volume Growth, machines	15% per year	15%	-5%	25%	105.9	136.1
Initial Sales Volume, machines	200000 units/year	200000	100000	250000	44.8	165.9
Initial Retail Price, machines	\$260 per unit	\$260	\$225	\$295	114.7	136.4
Distributor + Retail Margin	40%	40%	50%	35%	90.6	143.0
Retail Price Growth, machines	-10% per year	-10%	-15%	5%	121.2	139.4
Sales Volume, capsules	400 capsules/machine each year	400	250	600	83.4	181.7
Initial Retail Price, capsules	\$0.60 per unit	\$0.60	\$0.55	\$0.70	114.8	147.1
Retail Price Growth, capsules	5% per year	5%	0%	5%	116.8	125.5
Product Development	5.0 \$M over 1 year	5.0	7.0	4.0	123.6	126.5
Equipment and Tooling	4.0 \$M over 1/2 year	4.0	5.0	3.0	124.6	126.5
Production Ramp-up	2.0 \$M over 1/2 year	2.0	2.5	1.5	125.1	126.0
Market Launch	10.0 \$M over 1/2 year	10.0	15.0	8.0	120.9	127.4
Marketing and Support	5.0 \$M/year	5.0	6.0	4.0	122.8	128.3
Production Cost, machines	\$55 per unit	\$55	\$60	\$50	122.7	128.4
Production Overhead	1.0 \$M/year	1.0	1.2	0.8	125.0	126.0
Production Cost, capsules	\$0.050 per unit	\$0.050	\$0.055	\$0.045	123.9	127.2

Uncertainty Model

- Uncertainty is to increase the discount rate.
- Sales will have more uncertainty than manufacturing cost.
- A Tornado chart represents Uncertainty Analysis.

Tornado Chart Displays Uncertainty Analysis





Nespresso
Capsule
Recycling

NESPRESSO.

Recycling Decision

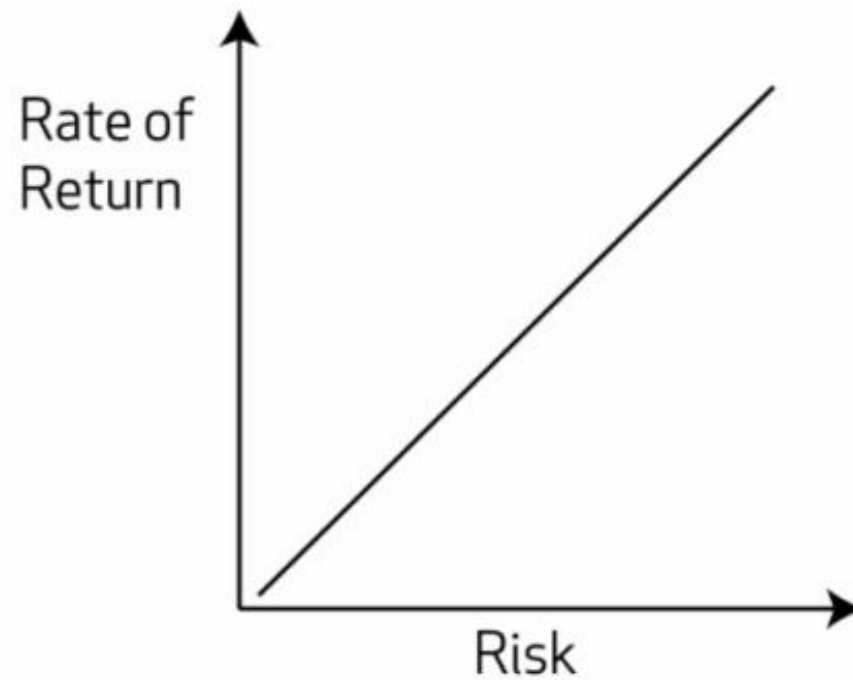
- Recycling costs
 - Infrastructure
 - Take-back program
 - Marketing activity
- Recycling benefits
 - Environmental impact
 - Materials recovery
 - Sales



Risk and Rewards

Risk and Rewards

Higher the Project Risk, Higher should be its Expected Return



Thank You :)
&
Good luck in the Final Exams