The Abdus Salam
International Centre for Theoretical Physics

United Nations
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Workshop on Entrepreneurship for Physicists and Engineers from Developing Countries

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Technical Entrepreneurship & Management

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CENTER *for* ENTREPRENEURSHIP

Technical Entrepreneurship & Management

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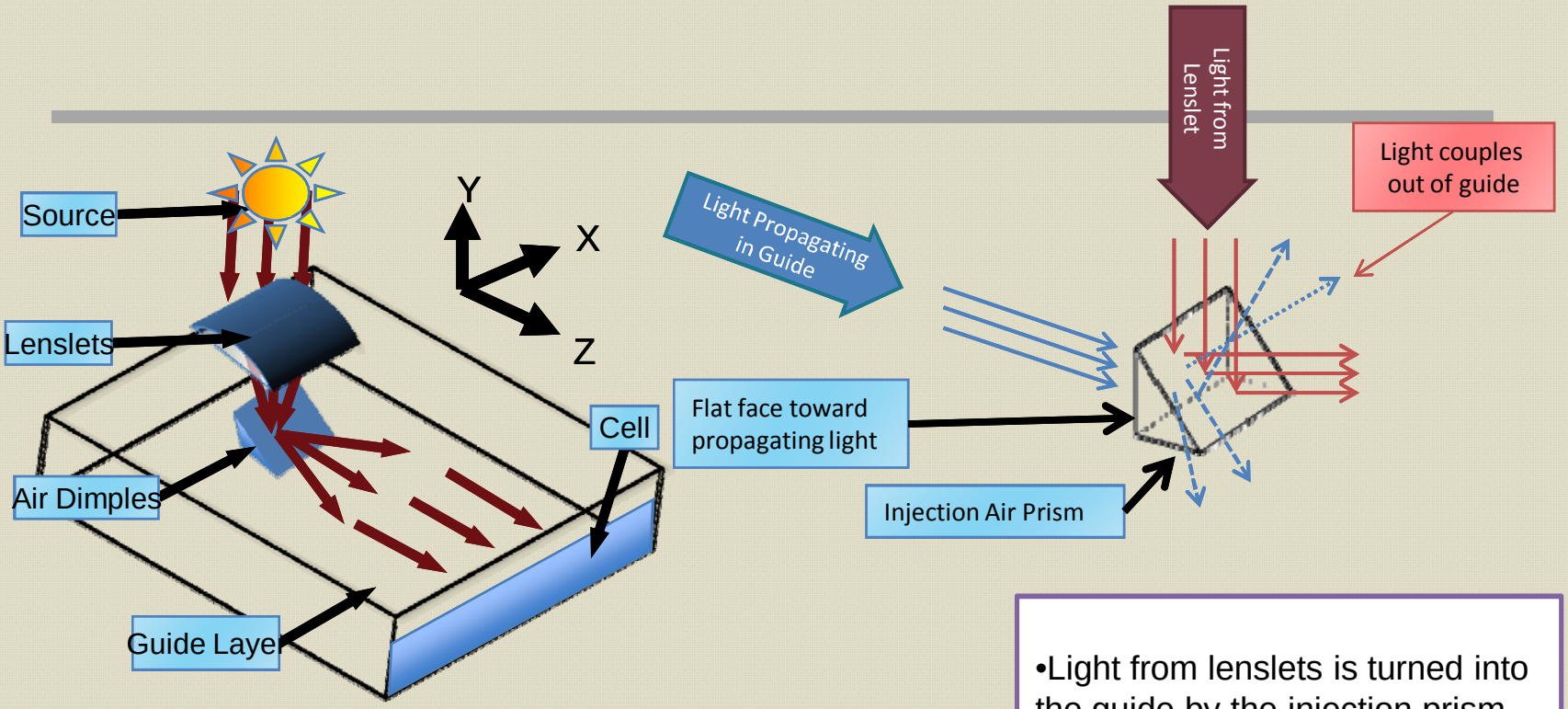
UNIVERSITY *of* ROCHESTER

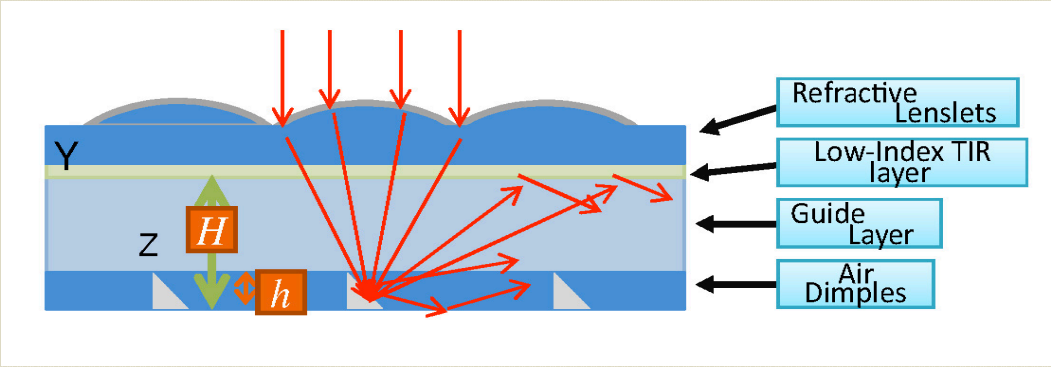
Center for Entrepreneurship

Short Subject

Solar Concentrating Photovoltaics Systems

Concept - Lightguide



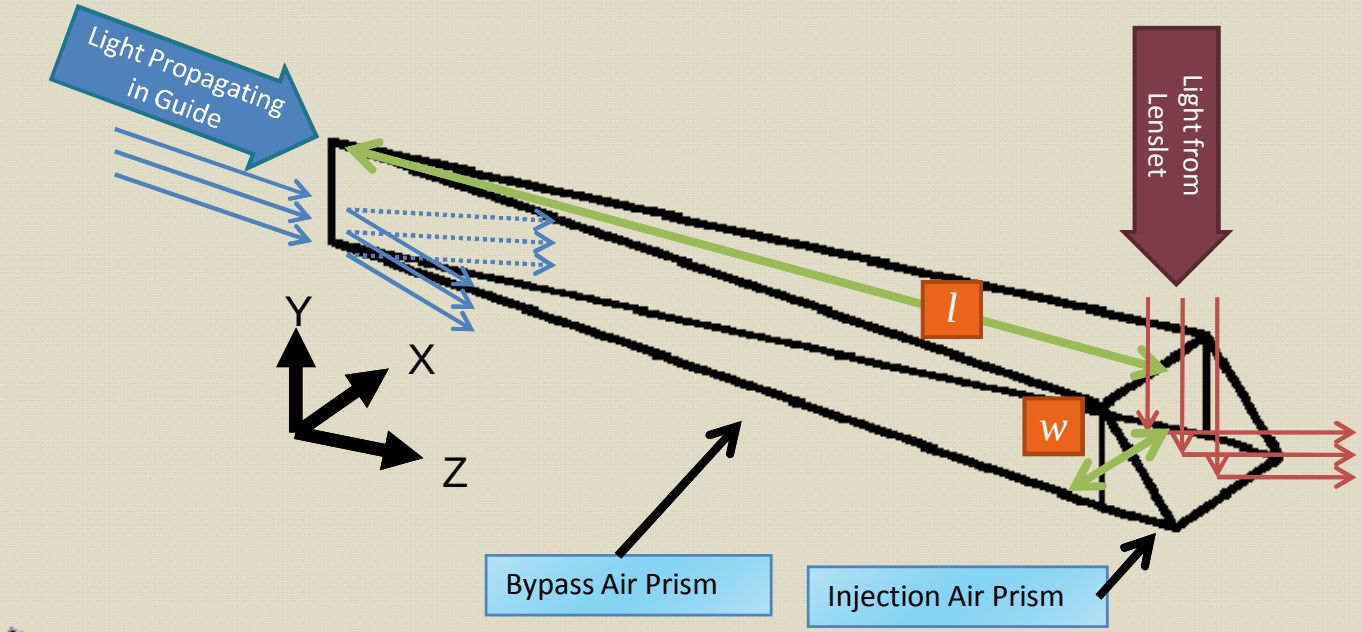


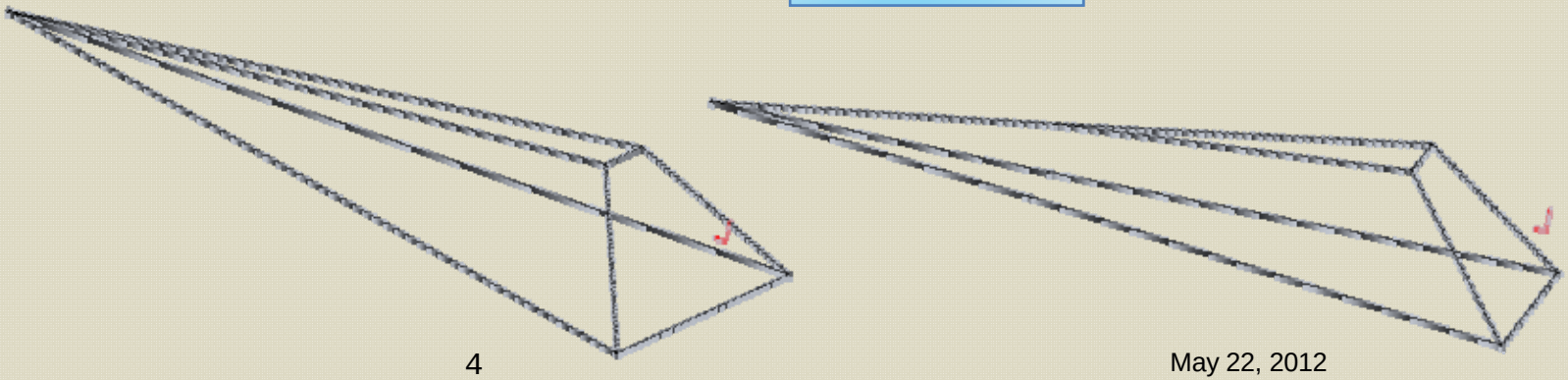
- Light from lenslets is turned into the guide by the injection prism.
- Light propagating in the guide interacts with the back face of the injection prism and escapes the guide layer.

May 22, 2012

Concept - Dimples

- Light from lenslets is turned into the guide by the injection prism.
- Light propagating in the guide is diverted by the bypass prism instead of being lost.
- The diverted light has increased angular extent in the X direction.





Gen 1Prototype Design Specifications

- Dimensions
  - Length, Width Height : 60mm by 50mm by 3mm
  - Lenslet Size: 1.0mm diameter
  - Dimple Size: 1.0mm by 0.1mm by 0.13mm
- Concentration:
  - Cx = 53x
  - Input aperture: 50mm by 60mm
  - Output aperture: 50mm by 1.13mm
- Acceptance Angle
  - ±1.2˚ , nominal
- Optical Efficiency:
  - 92%, nominal (Fresnel losses, absorption, ray loss)

May 22, 2012

What does it take to get financing

- A good business plan
  - Market Opportunity
  - Management Team
  - Product
  - Realistic Financial projections

- Successful business changes the playing field by one of the following
  - Product is 10X better
  - Convince the customer they have a new need
  - Make product accessible to a new set of customers

Canon

– 10x and a new set of customers

Bottled Water

Convince customers they have a new need. It is not about the price

Dell

New set of customers

Kia

10x and solve customer risk

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Financing the New Venture

Types of Financing

- Debt – individual or institutional loans
- Lease Financing
- Government Assistance – Grants, Loans (SBA, NYSS&TF, SBICs)
- Equity – sale of stock or ownership interests

Debt v. Equity Financing

Advantages of Debt Financing

- Interest is deductible to borrower
- No dilution of control (except for loan covenants)
- No dilution of ownership
- Greater leverage to shareholders (if growth in earnings can outpace the cost of funds – greater return on investment)

Financing the New Venture

(continued)

Advantages of Equity

- Often no alternative – debt financing not available
- No fixed obligation to repay
- No negative impact on cash flow
- No danger of thin capitalization
- Little downside protection – but share in upside benefits

Financing of the New Venture

(Continued)

Availability and Sources for Financing

- Conservative Financial Institutions(like banks) are unwilling to take the risk of lending to start-ups
- Combine some debt (probably guaranteed) with some equity
- Individual investors (friends, family and angels)
- Venture Capital Funds
  - Remains a small segment of the financial marketplace
  - Goal – above average returns through equity ownership
  - Requirements – capable management; proprietary or innovative products or services; rapidly growing and large marketplace

Financing of the New Venture

(Continued)

Availability and Sources for Financing (continued)

- Advantages and Disadvantages of equity
  - Advantages
    - Source of Capital – now and later
    - Sophisticated investor – less exposure to liability – securities laws
    - Credibility in future financings
    - Management and related Assistance
  - Disadvantages
    - Loss of control (affirmative and negative obligations)
    - Less leverage in valuation/pricing then in private placement
    - Requirement to meet 25-40% annual, compounded return ((3 to 5.4 X over 5 years)

Equity Financing

- Stages of financing

	Failure Rate
– Seed Stage	7 of 10
– Early Stage	5 of 10
– Growth Stage	3 of 10
– Late Stage	1 of 10

Equity Financing

- Stages of financing

	Maturity of Technology
– Seed Stage	Prototype built and tested
– Early Stage	Sales over $500K
– Growth Stage	Sales over millions
– Late Stage	Sales over 10's of millions

Equity Financing

- Stages of financing

	Annual Rate of Return (5 year multiplier)
– Seed Stage	40% to 50% (5.4 to 7.6)
Early Stage	20% to 40% (2.5 to 5.4)
– Growth Stage	15 % to 30%(2.0 to 3.7)
– Late Stage	10% to 20%(1.6 to 2.5)

All of these numbers assume that there is no inflation

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The Business Plan

- It is a story
- Explain it to your mother
- Raise money
- Like a novel, not a documentary

The Business Plan

- Which is better

- An A team technology with a B team management or
- a B team technology with an A team management

Business Plan – The Story

- The product
  - Not the technology
  - Not the idea

  But

  What are you putting in a box and shipping

  What problem are you solving for the customer

  Why is the customer willing to buy it?

Business Plan – The Story

The Market

- Not that there are 4 billion potential customers
- Not that there is no competition
- Not that you are the lowest price

But

- Who is your customer?
- Who are the first 5 people with whom you will meet?
- What are the market dynamics?
- What will the competition do?

Business Plan – The Story

The Team

- Not that you are smarter than everyone else
- Not your life story

But

- The team members with relevant experience
- Who is the "king"?
- What type of people do you need to recruit to make a complete team?

Business Plan – The Story

- The Financials
  - Not that you will be a $2B company in 5 years
  - Not that your gross margins are better than everyone else
  - Not that your sales/marketing/administrative are the lowest in the industry
- But
  - How fast can you really grow?
  - What are your real COGS(Cost of Goods Sold)?
  - Make it believable

Funding and Ownership

Two of you start a company-each owning 50%

You need to raise $100K

How much stock do you give for the $100K?

You convince the investor (Duncan) that what you have done to date is worth $500K (pre money value)

Funding and Ownership

After the investment, the company now has a value of

$600K ($500K plus the $100K) called the Post Money

So the $100K buys 16.7% of the company (100/600) Make it 16%

You own 42%, your partner owns 42% and the investor owns 16%

Source could be friends and family or seed funding

Funding and Ownership

You work very hard but use up the $100K

Now you need $500K (seed or growth stage)

You convince the VC that the company is worth $3M (pre money number for round 2)

For $500K, the VC gets 14% (500/(3000+500))

Funding and Ownership

Amount Raised		$100K	$500K
Pre $ Value	Day One	$500K	$3M
You	50%	42%	36%
Partner	50%	42%	36%
Duncan		16%	14%
VC			14%

Funding and Ownership

You and your team work very hard but spend all of the $500K and need $3M more and convince a second VC that the value of the company is $8M (pre $ value)

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Funding and Ownership

Raise		$100K	$500K	$3M
Pre $ Value	Day 1	$500K	$3M	$8M
You	50%	42%	36%	26%
Partner	50%	42%	36%	26%
Duncan		16%	14%	11%
VC1			14%	10%
VC2				27%

Funding and Ownership

Are we happy?

The company is valued at $11M

You and your partner's stock is valued at $2.86M

My investment of $100K is valued at $1.2M!

But it is paper gain only. I can not sell.

Funding and Ownership

Again the team works very hard but need to raise more money.

This time you need $7M and convince another VC that the company is now valued at $13M. So that purchases 35% (7/(13+7))

Funding and Ownership

Raise		$100K	$0.5K	$3M	$7M
Pre $ Value	Day 1	$500K	$3M	$8M	$13M
You	50%	42%	36%	26%	17%
Partner	50%	42%	36%	26%	17%
Duncan		16%	14%	11%	8%
VC1			14%	10%	7%
VC2				27%	18%
VC3					35%

Funding and Ownership

Apple wants to purchase your company for $45M.

Your board of directors and stockholders approve the sale.

Funding and Ownership

You and your partner each receive $7.65M

I get $3.6 M for my $100k investment. (if the time was 5 years, I had better that a 100% annualized rate of return—I doubled my money each year)

My investment was the riskiest. So I received the best rate of return

The VC3 who invested in the final round received $15.8M- doubling their investment. VC3 had the lowest risk and received the lowest rate of return- but still very good

Funding and Ownership

Everyone is happy. You can retire and give some of your wealth to your university to support technical entrepreneurship!!

VC Business Model

Raise funds from rich people, pension funds, government entities who expect a rate of return that is higher than other investment options

Time is typically 10 years.

If they invest in your company, they want a plan to get their money back in 5 years.

It takes about 2 years to deploy the money and there is an assumption that if you have a plan for 5 years, it will take 7 or 8 years

Equity Financing

- Stages of financing

	Failure Rate
– Seed Stage	7 of 10
– Early Stage	5 of 10
– Growth Stage	3 of 10
– Late Stage	1 of 10

VC Business Model

Seed VCs look for an annualized rate of return of 40 to 50%

Over five years, 5.4 to 7.6X

From the Cash flow analysis, we need $600K from investors.

Assume 6X return over 5 years.

So the investment of $600K must be worth $3.6M in year 5

Valuation of your company

How do you value the company in year 5

A multiple of sales

Profit

Value to a buyer (strategic)

Bubble

Valuation of your company

Your business plan needs to be convincing enough for the investor to believe the sales numbers, the COGS(cost of goods sold), profit, etc in year 5.

Assume sales are $10M in year 5 and the value of the company based on industry comparisons is twice sales.

Valuation of your company

So the investment of $600k today will need to worth at $3.6M (6X) in year 5. The BP convinces the investor that the company is valued at $20M.

Therefore, the investor would get 18% of the stock.

This is where the negotiation begins.

Your Board of Directors/Advisers is very important

IT IS NOT AN EXACT SCIENCE!!!

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Thank You

Valuation of your company

Time to do Income statement, balance sheet, cash flow

This is where the negotiation begins.

Your Board of Directors/Advisers is very important

IT IS NOT AN EXACT SCIENCE!!!

Three financial forms

Income Statement

Balance Sheet

Cash flow analysis (DTM believes this is the most important)

Each serves a different purpose

Income Statement

Measures success of business over a period of time (year to date, month, over a fiscal year)

Sources of funds

Use of funds

Income Statement-Why

Profitability

Value for investment

Risk

Credit worthiness

Predicting future cah flows

Income Statement

Revenue by product

Cost of goods sold (COGS)

Expenses(rent,utility, sales, marketing development,etc)

Gains

Losses

Net income(loss) ties to balance sheet

Income Statement

Sales (revenue)

- Cost of goods sold

=Gross profit (Yen/dollars as a %)

-selling and marketing

-research and development

-general and administrative expenses

=Income from operations

+/- other gains(losses)

=Income before income taxes

-income tax

=Net income

Balance Sheet

Financial position at a certain point in time (compared to Income statement)

Three parts (A=L+SE)

Assets(A)-Resources and low liquid are they

Liabilities(L) --To whom do you owe money over what time

Stockholders' equity(SE)

Balance Sheet

Assets (in order of liquidity)

Cash, accounts receivable, inventory (two types), prepaids (cancellable)

+ property, equipment less deprecation

=Total assets

Liabilities (in order in which they need to be paid)

Accounts payable (less than 60 days), payments in next 12 months, payments more than 12 months)

+ Stockholders equity

=Total liabilities plus Equity

Cash Flow Statement

Determines how much money you need to raise

How negative is your business cash position?

Can make you business go bankrupt even if you have good sales

Business people do a top down approach

We will do a bottoms up approach

Cash Flow Statement

Lets go to an Excel Spreadsheat

Summary of Lecturers

Innovation = Invention X market opportunity

B Team Technology with A Team Management

Mentors/coaches/BoD

Network

Not an exact science

Summary of Lecturers

Cash is king

IP is important for a technology based company

Making decisions with incomplete data