Suranga Chandratillake
Video Search
blinkx
two narratives
two narratives

the journey of the inventor
two narratives

the journey of the inventor

the journey of the entrepreneur
the Journey of the Inventor

challenged world
unappreciated protagonist
(basement; cold and damp)
flash of inspiration
victory
happy new world
the Journey of the Entrepreneur

ideas are not enough
dwindling resources
frantic iteration
fake bravado
maiden profit
a life of its own
educate & nurture technologists
educate & nurture technologists

the journey of the inventor
educate & nurture technologists

the journey of the inventor

the journey of the entrepreneur
left on the shelf
exploited by others
never reach their potential
this matters

1) Innovation is at the heart of Western governments’ plans for growth

1) In Computing, academia and industry have always been tightly coupled
educating & nurturing technologists

the journey of the inventor | the journey of the entrepreneur
educating & nurturing technologists

the journey of the inventor

the journey of the entrepreneur
educating & nurturing technologists

the journey of the inventor

the journey of the entrepreneur
selling innovation short
What they didn’t teach me:
What they didn’t teach me: Lessons learned building a technology company and taking it to market.
Part IA of the Computer Science Tripos
  Introduction to Part IA
  Entry to the Computer Science Tripos
  Computer Science Tripos Part IA
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  Politics, Psychology and Sociology Part I students
  The curriculum

Michaelmas Term 2012: Part IA lectures
  Paper 1: Computer Fundamentals
  Paper 1: Foundations of Computer Science
  Paper 1: Discrete Mathematics I
  Paper 2: Digital Electronics
  Paper 2: Operating Systems

Lent Term 2013: Part IA lectures
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  Paper 1: Object-Oriented Programming
  Paper 1: Floating-Point Computation
  Paper 1: Algorithms I
  Paper 2: Probability
  Paper 2: Discrete Mathematics II
  Paper 2: Regular Languages and Finite Automata

Easter Term 2013: Part IA lectures
  Paper 2: Software and Interface Design
  Further Java Briefing

Preparing to Study Computer Science

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  Algorithms II
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  ECAD and Architecture Practical Classes
  Concurrent and Distributed Systems
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  Group Project
  Logic and Proof
  Mathematical Methods for Computer Science
  Programming in C and C++
  Prolog
  Software Engineering
  Unix Tools
  Computer Graphics and Image Processing

Lent Term 2013: Part IB lectures
  Semantics of Programming Languages
  Compiler Construction
  Computation Theory
  Security I
  Computer Networking
  Databases

Easter Term 2013: Part IB lectures
  Artificial Intelligence I
  Concepts in Programming Languages
  Complexity Theory
  Economics and Law

Part II of the Computer Science Tripos
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  Optimising Compilers
  Principles of Communications
  Quantum Computing
  Types

Lent Term 2013: Part II lectures
  Artificial Intelligence II
  Business Studies
  Comparative Architectures
  Computer Vision
  Denotational Semantics
  Topics in Concurrency
  Information Retrieval
  Natural Language Processing
  Security II
  Human-Computer Interaction

Easter Term 2013: Part II lectures
  Advanced Graphics
  Business Studies Seminars
  E-Commerce
  Mobile and Sensor Systems
  System-on-Chip Design
  Topical Issues
But first...
when I was a boy...
BUT...
then the satellite TV got good...
BUT...
then the internet came along...
déjà vu...
a brief history of web search
1) Search is an excellent tool for navigating large volumes of fragmented, unstructured content

2) But to search the content effectively, you have to understand everything you can about it.
1) Search may be an excellent tool for navigating a large volumes of fragmented online video

2) But to search that online video effectively, you have to understand everything you can about it.
Generation One: Television
• Low number of channels, limited choice
• High-value content
• Manually created Schedules, Guides
  >> Schedules do not scale in an on-demand environment; editorial approach does not scale in a user-generated environment

Generation Two
• On-demand, massive volumes of user-generated content
• Search based on incidental meta-data (filename, geo-id data, etc) and user-provided meta-data (tags, names, titles, descriptions)
  >> Judging a book by its cover and prone to spamming
1) Search *may be* an excellent tool for navigating a large volumes of fragmented online video

2) But to search that *online video* effectively, you have to understand everything you can about it.
blinkx understands its elephant

content relationships to access archives

visual indexing to find video

text analysis to extract information from meta-data

speech recognition to listen to video

visual analysis to watch videos
A simple way to discover and share great videos.

Search videos

Sign in. See what your friends are sharing.
Meanwhile...
Autonomy R&D

US CTO

Technology Applications
Autonomy for the consumer
Autonomy for the consumer

blinkx as a separate entity
Building a team
Building a team

The hunt for a CEO
Finance
Finance
Marketing
Finance
Marketing
Sales
Finance
Marketing
Sales
Human Resources
…and many more
Finance
Marketing
Sales
Human Resources
…and many more

Masterclass
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i) Finance
the blinkx IPO
• Making no money, but needing it
• Making no money, but needing it
• (rent, food, stuff like that)
• Making no money, but needing it
• (rent, food, stuff like that)
• We needed $50M to hit profitability
• Making no money, but needing it
• (rent, food, stuff like that)
• We needed $50M to hit profitability
• The company was worth $250M at IPO
• Making no money, but needing it
• (rent, food, stuff like that)
• We needed $50M to hit profitability
• The company was worth $250M at IPO
• So we needed to sell 20% of the company
• Making no money, but needing it
• (rent, food, stuff like that)
• We needed $50M to hit profitability
• The company was worth $250M at IPO
• So we needed to sell 20% of the company
• We already had 221M shares
• Making no money, but needing it
• (rent, food, stuff like that)
• We needed $50M to hit profitability
• The company was worth $250M at IPO
• So we needed to sell 20% of the company
• We already had 221M shares
• So we issued 56M new shares, for a new total of 277M shares
• Making no money, but needing it
• (rent, food, stuff like that)
• We needed $50M to hit profitability
• The company was worth $250M at IPO
• So we needed to sell 20% of the company
• We already had 221M shares
• So we issued 56M new shares, for a new total of 277M shares
• Our shareprice was $250M / 277M = $0.90
• Making no money, but needing it
• (rent, food, stuff like that)
• We needed $50M to hit profitability
• The company was worth $250M at IPO
• So we needed to sell 20% of the company
• We already had 221M shares
• So we issued 56M new shares, for a new total of 277M shares
• Our shareprice was $250M / 277M = $0.90
• So selling the 56M new shares to new shareholders…
• Making no money, but needing it
• (rent, food, stuff like that)
• We needed $50M to hit profitability
• The company was worth $250M at IPO
• So we needed to sell 20% of the company
• We already had 221M shares
• So we issued 56M new shares, for a new total of 277M shares
• Our shareprice was $250M / 277M = $0.90
• So selling the 56M new shares to new shareholders…
• …raised $50M!
Valuation
Estimating blinkx’s cash flows

- At the time we were doing 30,000,000 searches a month
- On average $0.015 per search in advertising sales
- Forecast dynamics in pricing and value per search

- Historically, our searches had grown by 94% a month
- Google’s text searches had grown by an average of 280% a year
- Video views for content were growing by up to 400% a year
- Forecast a search growth rate

- Annualized revenue was around $5.4M
- Generate a revenue Forecast
- Take away cost-base
- Now we know that, in years 0 to N, blinkx will generate cash of:

\[ x_0, x_1, x_2, x_3, \ldots, x_N \text{ dollars} \]
Calculating Fair Value

• How much are you willing to pay for this company? Precisely the same amount that it will return to me

• Sum future cash flows from the company:
  \[ x_0 + x_1 + x_2 + x_3 + \ldots + x_N \]  

• But future value isn’t the same as present value!

• Consider $100 in a year’s time and a 5% interest rate:
  Today’s Value (PV) = $100 / 1.05 = $95

• Generally:
  \[ PV = FV \cdot \left[ 1 / (1 + i)^t \right] \]
  
  Where
  \( PV \) is Present Value
  \( FV \) is Future Value
  \( i \) is the annual discount rate
  \( t \) is the number of years in the future
Calculating Fair Value

• Sum future cash flows from the company:
  \[ x_1 + x_2 + x_3 + x_4 + \ldots x_N \]  
  \[ (a) \]

• Present value of a Future value:
  \[ PV = FV \cdot \left[ 1 / (1 + i)^t \right] \]  
  \[ (b) \]

• Apply (b) to (a):

\[
DPV = \sum_{t=0}^{N} \frac{FV_t}{(1 + i)^t}
\]
Bottom-up Forecast
Infer DCF-based Valuation
Calculate Offer Size and Pricing

...basic algebra?!
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- Paper 1: Discrete Mathematics 1
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- Paper 2: Probability
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- Paper 2: Regular Languages and Finite Automata

Easter Term 2013: Part IA lectures
- Paper 2: Software and Interface Design
- Further Java Briefing
- Preparing to Study Computer Science

Part IB of the Computer Science Tripos
- Introduction to Part IB
- Michaelmas Term 2012: Part IB lectures
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- Computer Design
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- Prolog
- Software Engineering
- Unix Tools
- Computer Graphics and Image Processing

Lent Term 2013: Part IB lectures
- Semantics of Programming Languages
- Compiler Construction
- Computation Theory
- Security I
- Computer Networking
- Databases

Easter Term 2013: Part IB lectures
- Artificial Intelligence I
- Concepts in Programming Languages
- Complexity Theory
- Economics and Law

Part II of the Computer Science Tripos
- Introduction to Part II
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- Bioinformatics
- Computer Systems Modelling
- Digital Signal Processing
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- Information Theory and Coding
- Optimising Compilers
- Principles of Communications
- Quantum Computing
- Types

Lent Term 2013: Part II lectures
- Artificial Intelligence II
- Business Studies
- Comparative Architectures
- Computer Vision
- Denotational Semantics
- Topics in Concurrency
- Information Retrieval
- Natural Language Processing
- Security II
- Human-Computer Interaction

Easter Term 2013: Part II lectures
- Advanced Graphics
- Business Studies Seminars
- E-Commerce
- Mobile and Sensor Systems
- System-on-Chip Design
- Topical Issues
BLWX E
BLXX
BLX
ii) Marketing
Marketing?

“Advertising may be described as the science of arresting human intelligence long enough to get money from it”

- Stephen Leacock
Marketing!

“Doing business without marketing is like winking at a girl in the dark. You know what you’re doing, but no one else does.”

- Steuart Henderson Britt
The user goes to a web page. They can go to any page. And they can use any browser. The page loads and blinkx appears at the top of the page. About a second later, blinkx changes colour and the icons light up. blinkx has read the page and found other, relevant content. The user can now click on blinkx to link to other content. It's automatic, it's fast and it's easy. The content can come from websites, news sites, be ads ... and even video.
Marketing blinkx Pico

Communicating with your potential market about your product.

Why? Because you’re hoping they’ll buy the product.

Given this:

\[(\text{Marketing Spend}) < (\text{Total Sales})\]
Pico Sales

Targeted in-line Ads
- 4 Ads shown per day
- 0.5% of Ads clicked on
- Average 10c per Ad
- Average 3 month lifetime
- Lifetime Revenue Per User (LRPU) = $1.80

Sponsorship
- LRPU = $0.40

Total LRPU = $2.20
Marketing Tactics

Public Relations

Banner Ads

Search/Keyword Ads
Pico Marketing Progress

Public Relations
- $25,000 a month for two agencies
- $20,000 in one-off campaign costs (planes, trains, Starbucks)
- Total 2-month campaign = $70,000
- Delivered 80 articles and about 1,125,000 circulation
- We got 50,000 clicks to the site
- Site conversion ratio = 25%
- Number of downloads/users = 12,500
- Cost per User = $5.60
- Very unprofitable
Pico Marketing Progress

Banner
- $2.50 CPM (Cost Per Mille)
- 0.5% CTR (Click Through Rate)
- Site Conversion Ratio = 25%
- Eg: $1000 minimum campaign
  - $1000/$2.50 = 400,000 impressions
  - Visits = 2,000
  - Users = 500
  - Cost per User = $2

- But ...
- Site Conversion = 10%
- Actual Cost Per User = $5
- Horribly unprofitable!
Pico Marketing Progress

Search
- Cost Per Click = $0.45
- Site Conversion Ratio = 55%
- Cost per user = $0.81
- Massively Profitable!
Marketing Results

Public Relations
- Unprofitable distribution method
- Additional value provided through partnerships

Banner Ads
- Just very unprofitable

Search/Keyword Ads
- Profitable, scalable option
Complexities I

• The medium you use affects the user you get. The user you get affects:
  – Conversion rate
  – Revenue per click per user
  – Lifetime of the user

• Build large, statistically viable cohorts with all key properties
  – Analyze performance over time
  – Probabilistic methods to predict future behaviour
Cohort Analysis
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The curriculum
Michaelmas Term 2012: Part IA lectures
Paper 1: Computer Fundamentals
Paper 1: Foundations of Computer Science
Paper 1: Discrete Mathematics I
Paper 2: Digital Electronics
Paper 2: Operating Systems
Lent Term 2013: Part IA lectures
Paper 1: Programming in Java
Paper 1: Object-Oriented Programming
Paper 1: Floating-Point Computation
Paper 1: Algorithms I
Paper 2: Probability
Paper 2: Discrete Mathematics II
Paper 2: Regular Languages and Finite Automata
Easter Term 2013: Part IA lectures
Paper 2: Software and Interface Design
Further Java Briefing
Preparing to Study Computer Science

Part IB of the Computer Science Tripos
Introduction to Part IB
Michaelmas Term 2012: Part IB lectures
Algorithms II
Computer Design
ECAD and Architecture Practical Classes
Concurrent and Distributed Systems
Further Java
Group Project
Logic and Proof
Mathematical Methods for Computer Science
Programming in C and C++
Prolog
Software Engineering
Unix Tools
Computer Graphics and Image Processing
Lent Term 2013: Part IB lectures
Semantics of Programming Languages
Compiler Construction
Computation Theory
Security I
Computer Networking
Databases
Easter Term 2013: Part IB lectures
Artificial Intelligence I
Concepts in Programming Languages
Complexity Theory
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Part II of the Computer Science Tripos
Introduction to Part II
Michaelmas Term 2012: Part II lectures
Bioinformatics
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Optimising Compilers
Principles of Communications
Quantum Computing
Types
Lent Term 2013: Part II lectures
Artificial Intelligence II
Business Studies
Comparative Architectures
Computer Vision
Denotational Semantics
Topics in Concurrency
Information Retrieval
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Business Studies Seminars
E-Commerce
Mobile and Sensor Systems
System-on-Chip Design
Topical Issues
Complexities II

- The download site design massively affects the conversion rate
  - An 80% swing on the Pico Website
  - User path
  - Page elements
  - Copy and other creative elements

- Build dynamic website
  - Random site design choices
  - Collect statistical data to analyze the compounding effect of these decisions
Decision Tree Analysis
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    • System-on-Chip Design
    • Topical Issues
iii) HR
Building an Organization

- HQ
- Culture & Organizational Memory
- Shared Hub (Mission, Philosophy, Portal, Comms)
- German Office
- Finance Shared Services
- External Partners

Diagram shows the relationships between the components of the organization.
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    - Natural Language Processing
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    - Topical Issues
iv) Sales
Sales

• Hire a salesforce
• Have them do meetings
• Build a pipeline
• Receive RFPs
• Respond with Proposals
• Follow-ups, demos, bake-offs
• Closing

➢ Analyze the data as a multi-actor pipeline
Entry to the Computer Science Tripos

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The skills that I needed to be an inventor were the skills I needed to be an entrepreneur.
Quantitative

Rigorous

Analytical
What does this mean?
(That you’ve just wasted 40 minutes of your life?)

No, of course not...
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  - Preparing to Study Computer Science

Part IB of the Computer Science Tripos
- Introduction to Part IB
- Michaelmas Term 2012: Part IB lectures
  - Algorithmics I
  - Computer Design
  - ECEAD and Architecture Practical Classes
- Concurrent and Distributed Systems
- Further Java
- Group Project
- Logic and Proof
- Mathematical Methods for Computer Science Programming in C and C++
- Prolog
- Software Engineering
- Unix Tools
- Computer Graphics and Image Processing
- Lent Term 2013: Part IB lectures
  - Semantics of Programming Languages
  - Compiler Construction
  - Computation Theory
  - Security I
  - Computer Networking
  - Databases
- Easter Term 2013: Part IB lectures
  - Artificial Intelligence I
  - Concepts in Programming Languages
  - Complexity Theory
  - Economics and Law

Part II of the Computer Science Tripos
- Introduction to Part II
- Michaelmas Term 2012: Part II lectures
  - Bioinformatics
  - Computer Systems Modelling
  - Clinical Signal Processing
  - Hoare Logic
  - Information Theory and Coding
  - Optimising Compilers
  - Principles of Communications
  - Quantum Computing
  - Types
- Lent Term 2013: Part II lectures
  - Artificial Intelligence II
  - Business Studies
  - Comparative Architectures
  - Computer Vision
  - Denotational Semantics
  - Topics in Concurrency
  - Information Retrieval
  - Natural Language Processing
  - Security II
  - Human-Computer Interaction
- Easter Term 2013: Part II lectures
  - Advanced Graphics
  - Business Studies Seminars
  - E-Commerce
  - Mobile and Sensor Systems
  - System-on-Chip Design
  - Topical Issues
I said no.

For six months.

Why?
The Boffin Fallacy
The Boffin Fallacy

Technologists do not understand business. It’s something they can’t do, something they won’t enjoy or something that is beneath them.
Is it just me?
Must it be so?
Does it matter?
Is it just me?

Must it be so?

Does it matter?
“A good many times I have been present at gatherings of people who, by the standards of the traditional culture, are thought highly educated and who have with considerable gusto been expressing their incredulity at the illiteracy of scientists. Once or twice I have been provoked and have asked the company how many of them could describe the Second Law of Thermodynamics. The response was cold: it was also negative. Yet I was asking something which is the scientific equivalent of: Have you read a work of Shakespeare's?

... 

So the great edifice of modern physics goes up, and the majority of the cleverest people in the western world have about as much insight into it as their neolithic ancestors would have had.”
“A good many times I have been present at gatherings of people who, by the standards of the scientific culture, are thought highly educated and who have with considerable gusto been expressing their incredulity at the illiteracy of businesspeople. Once or twice I have been provoked and have asked the company how many of them could describe the Discounted Cashflow Method. The response was cold: it was also negative. Yet I was asking something which is the business equivalent of: Do you understand the Second Law of Thermodynamics? ... 

So the great edifice of capitalist enterprise goes up, and the majority of the cleverest people in the western world have about as much insight into it as their neolithic ancestors would have had.”
Alan Sugar

"I've never met an engineer who can turn his hand to business"
Alan Sugar

"I've never met an engineer who can turn his hand to business"

- The UK’s “Enterprise Champion”
The Sugar Response I

”…Britain has a very misplaced view of engineers. They're … seen as eccentric boffins who speak in algebraic formula, or fixers, sorting faulty cookers, broken-down cars. All important but, at base, engineering is about problem-solving and inventing, making lives better through developing new technology … They are analytical problem solvers – it's why the City loves engineers.”

- James Dyson
The Sugar Response II

"Really? I don't think we've done too badly! ”
- Eric Schmidt, ex-CEO, Google
The Sugar Response II

"Really? I don't think we've done too badly! ”

- Eric Schmidt, ex-CEO, Google
  (Considerably wealthier than Lord Sugar)
Is it just me?

Must it be so?

Does it matter?
Contrast

Noyce, Moore, Grove (Intel)
Packard (HP)
Gates (Microsoft) *
Stan Shih (Acer)
Warnock (Adobe)
Bezos (Amazon)
Page/Brin/Schmidt (Google)
Khosla/McNealy (Sun)
Dell (Dell) *
Ellison (Oracle) *
Sanders (AMD)
Jobs (Apple) *
Olsen (DEC)
Zuckerberg (Facebook) *

* Failed to complete University, but all were technologists
Is it just me?

Must it be so?

Does it matter?
In Tech Companies Founder CEOs:

- Require less overall investment
- Invest more in R&D
- ‘Exit’ quicker from their first investment
- Exit at a higher valuation
- Deliver significantly higher ROI

Why Founder CEOs have an edge:

- Maximizing vs Finding Product Cycles
- Comprehensive Knowledge
- Sense of Ownership
- Moral Authority
- The Product of Technology is Innovation

Founders vs Professional CEOs: University of Pennsylvania, 2010
Innovation, growth and the Economy

• Silicon Valley and San Francisco lead the jobs recovery in the US in 2012 (3x national average)

• There are 39,000 active companies founded by Stanford alumni since the 1930s:
  – $2.7TN in annual worldwide sales
  – 5.4M jobs created
  – 39% of companies founded within 60 miles of the University campus
  – Largest group were ‘technical innovators’
Innovation, growth and the Economy

“We are firmly on the side of the high-growth, highly innovative companies of the future. Don’t doubt our ambition.”

“It was British scientists who unravelled the genome......who helped design the i-pod... ...who invented the world wide web ... ”

“Well, everything. I The spark of initiative. The courage to make your dream happen. The hard work to see it through.”

- David Cameron

Recent Government activity includes:

- £200M in equity ‘innovation’ financing
- £200M for new Technology and Innovation Centre
- £110M start-up loans
A question of duty
In summary…
two narratives
two narratives

the journey of the inventor
two narratives

the journey of the inventor

the journey of the entrepreneur
two narratives

the journey of the inventor  the journey of the entrepreneur
The Boffin Fallacy

Technologists do not understand business. It’s something they can’t do, something they won’t enjoy or something that is beneath them.
The Boffin Fallacy

A question of mentality, not skill.
this matters
left on the shelf
exploited by others
never reach their potential
this matters
The Boffin Fallacy
selling innovation short