SMARTORG®
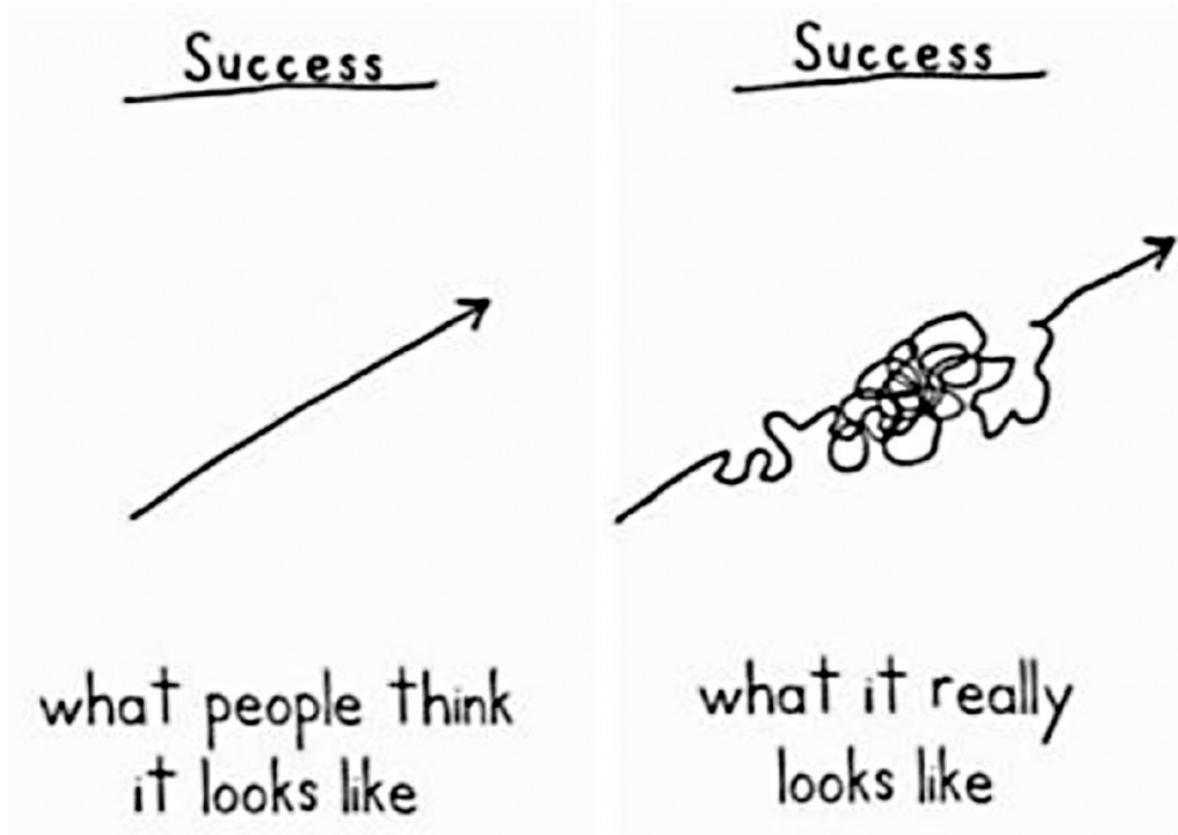R&D Decision Analysis
SDP Annual Conference Arlington, 2024

David Matheson, President and CEO

SmartOrg, Inc.

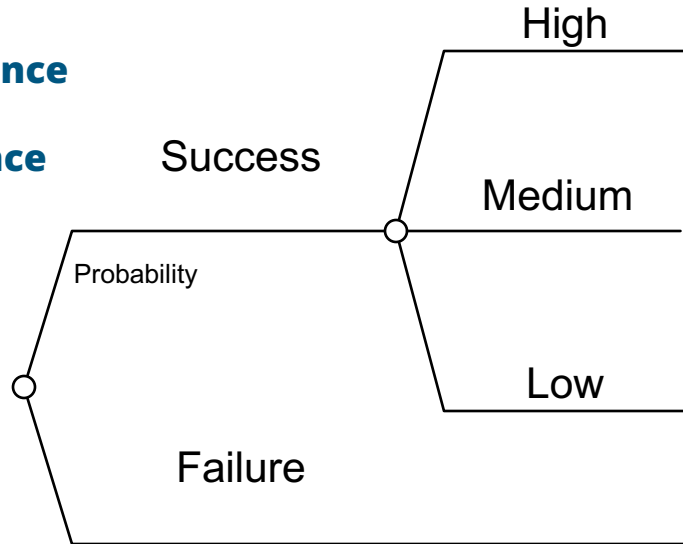# Innovation

Success — what people think it looks like

Success — what it really looks like

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Role of Decision Analysis changes

Typical innovation process

Discovery · Incubation · Acceleration

Problems/ opportunities

Actionable ideas

De-risked projects

Implemented innovations

What issues matter most?

How do I prioritize resources?

How do I improve confidence in the business case?

How do I justify funding my experiments?

In Incubation, DA provides a roadmap to the future:
How to navigate uncertainty and contingency?
What does it take to make this opportunity a winner?

In Acceleration, DA evaluates a proposa
Should we invest / not?

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Basic Treatment of an R&D problem

Development Success

Value if Successful aka Commercial Value

Black & White success or failure, including:
- **Technical Performance**
- **Manufacturability**
- **Customer Acceptance**
- **Etc.**

Success

Probability

Failure

High

Medium

Low

Business case scenarios with figure of merit of NPV or future margin, from optimistic to pessimistic

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Roadmap to Creating an Investment-Grade Proposal

Strategy Table

	Brand	Business Model	Market Scope	HP Contribution	HP's Role in Optical Drive Industry	Consumer Strategy	Consumer Software
HP Branded	HP	HP Branded drives and discs	Optical Drive PC's Only	Optical drive design, disc coating material and consumer software application	HP works with select partners to build HP specific solution	HP drives demand as a proprietary feature	HP exclusive software feature
Harvest IP	White Label	License on Drives and Discs	All MS and Apple PC's	IP Only	HP provides licenses to all industry participants – HP does not develop solution	Disc Brands drive consumer demand	Open development platform for all optical drive software
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Align on multiple strategies
- Think boldly
- Clarify plan A
- Understand contingencies

Learning Plan

	Probability	Duration (Yr)	Investment ($M)
Phase 1	**10%**	**0.5**	**$1**
IP Complete	50%		
Sign up Critical Partners	20%		
Phase 2	**72%**	**1.5**	**$20**
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Drive Market Adoption	80%		
Totals	**6%**	**3**	**$31**
development-adjusted			$3.72

Plan your pivots
- Understand proof points
- Derisk cheaply and quickly
- Create and exercise options

Tornado Diagram

NPV given launch success

Loss | Small | OK | Good | Great

- Annuity Units per Base Unit
- Price per Base Unit
- Annuity Lifetime
- Revenue per Annuity Unit
- Peak Share
- Lifetime of Business
- TAM Peak Year
- Penetration
- Ramp Up Duration
- Ongoing Investment Rate
- Annuity Gross Margin
- Cost Per Base Unit
- Launch Cost
- Launch Cost Duration
- TAM, Base Year
- Conversion Rate
- Fixed Annual Revenue
- Fixed Annual Cost
- Combined Uncertainty

5/8/2009 2:20 PM
Lightscribe 2

Drive Upside
- Focus on uncertainties that matter
- Build a winning business case

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From Pioneer to Inventor (circa 2001)

- Daryl Anderson, a project manager in Corvallis Oregon, gets very frustrated as he produces a photo history of his family, true Oregon pioneers.

- The peel off labels for the Photo CD's constantly get stuck in his CD Writer making a huge mess.

- He has an idea, why not use the same laser that writes the data to write a label on the other side (yes, it was in the shower).

- He files a patent disclosure and HP decides to file the patent.

- By pure luck, HP owns the foundational patent that was sitting under the nose of the Optical Disc Drive industry.

hit **P R I N T**

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Drive Upside
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LightScribe Development Plan
"It will work (quick, more smoke and mirrors)"

Media

- Develop thermo-chromic coatings that meet the speed, contrast, cost, imaging and durability needs of customers.

Hardware

- Develop labeling in the existing writer hardware architecture with minimal modifications and additional cost.

Imaging

- Develop a label imaging system based on the existing optical drives that handles rectangular to curved raster interpolation, curved raster half-toning and new laser and drive mechanism controls.

Software

- Develop a software solution that is simple, easy, intuitive, and is integrated in the consumers preferred application.

hit **P R I N T**

LightScribe Development Plan
"Let's develop a full system prototype"

Phase 3
Drive
Market
Adoption

Phase 2
Sign up
Critical
Suppliers

Phase 1
Develop
System to
Meet Specs

Enter Market with
Compelling Solution
and Industry Standard

$10

Fail = -$31

$1

Fail = -$21M

$20

Fail = -$20M

LightScribe information has been modified and is intended for illustrative purposes

hit **P R I N T**
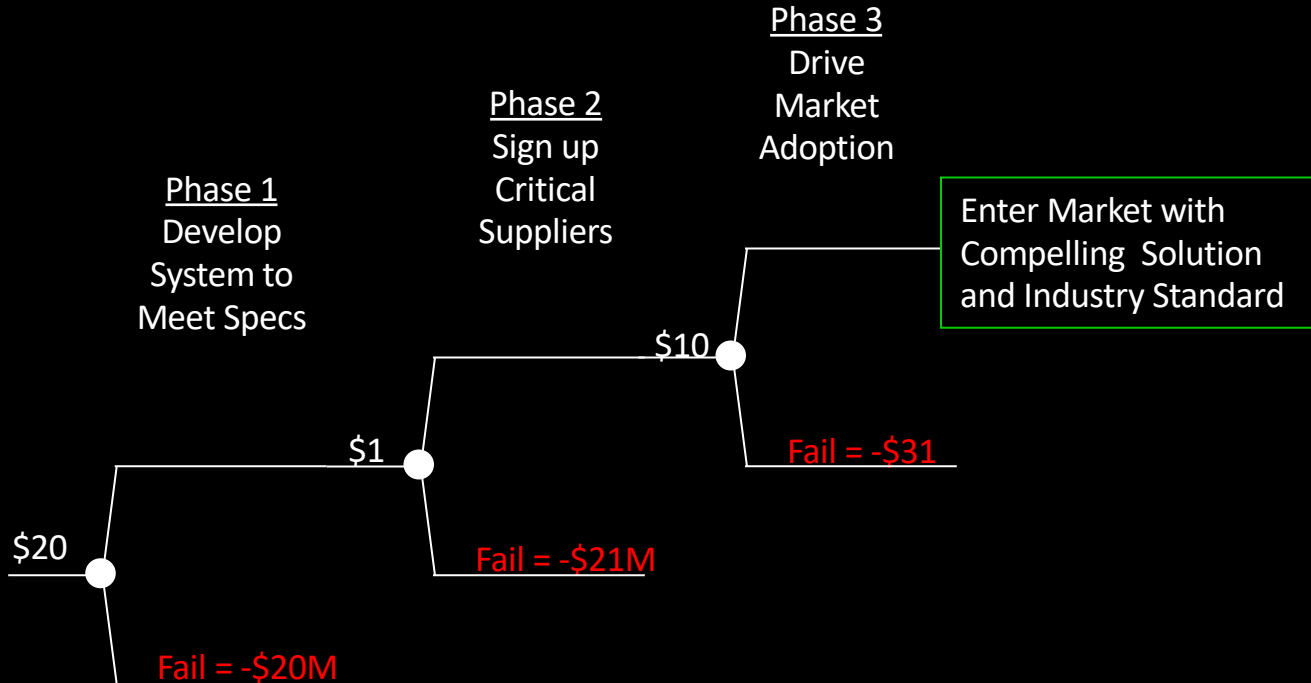
LightScribe Proof Points

Lock-in Business Model

- Validate IP portfolio and complete filing critical IP

Demonstrate end-user enthusiasm

- Small and large scale trials show high intent to use and willingness to pay

Sign up Development Partners

- Select, propose and close JDA with optical drive, coating and disc leaders to co-develop and drive industry standard labeling solution

Design System to Meet Specs

- Develop media, hardware, imaging system and software with partners

Trademark and Certification for Consumer Experience

- Develop a compelling trademark for WW consumers and certification process for to ensure excellent consumer experience and quality

Achieve Industry Standard

- Agreed on launch windows for all parties to build market momentum for LightScribe and early wins for HP and partners

hit **PRINT**

LightScribe Development Plan
"High probability of failing slowly and expensively"

Phase 3
Drive
Market
Adoption

Phase 2
Sign up
Critical
Suppliers

Phase 1
Develop
System to
Meet Specs

Enter Market with
Compelling Solution
and Industry Standard

80%

20% Fail = -$31

$10

10%

$1

90%
Fail = -$21M

$20

70%

30%
Fail = $20M

"We need $20M for a 6%
chance of success."

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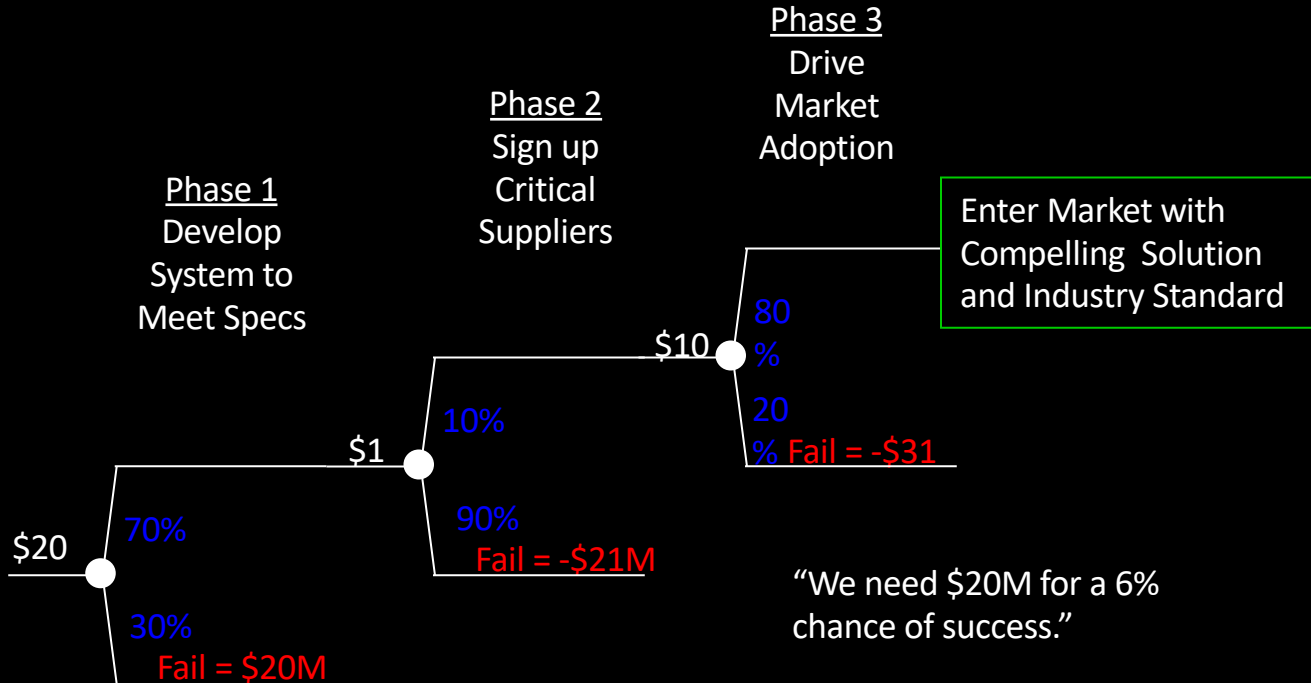
hit **P R I N T**

LightScribe Development Plan
"How do we learn quickly and cheaply"
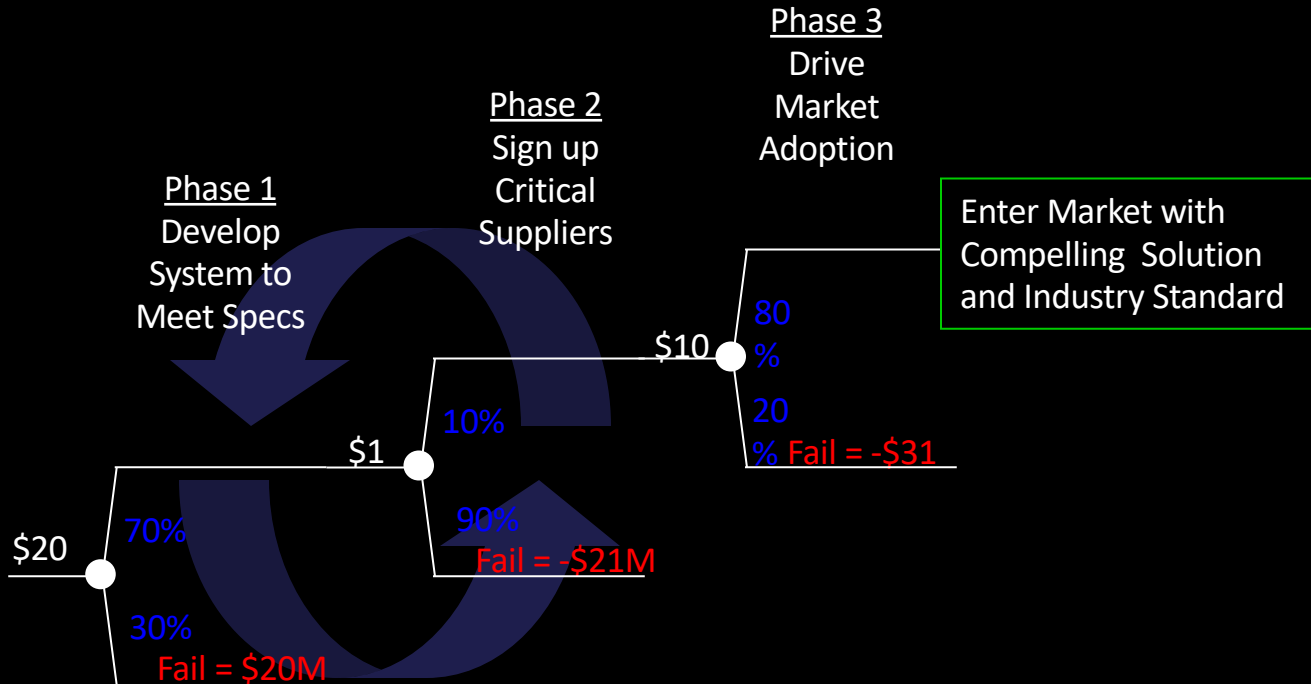
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$1

70%

30%
Fail = $20M

$20

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hit P R I N T

LightScribe Strategic Plan
"Getting the Proof Points in the right order"

Phase 3
- Drive Market Adoption

Phase 2
- Develop System to Meet Specs
- Trademark & Certification

Phase 1
- IP Complete
- Sign up Critical Partners

Enter Market with Compelling Solution and Industry Standard

$10
- 80%
- 20% Fail = -$31

$20
- 70%
- 30%
- Fail = -$21M

$1
- 10%
- 90%
- Fail = -$1M

"We need $1M for a 6% chance of success. If the next step works, then we will need $20M for a 56% chance."

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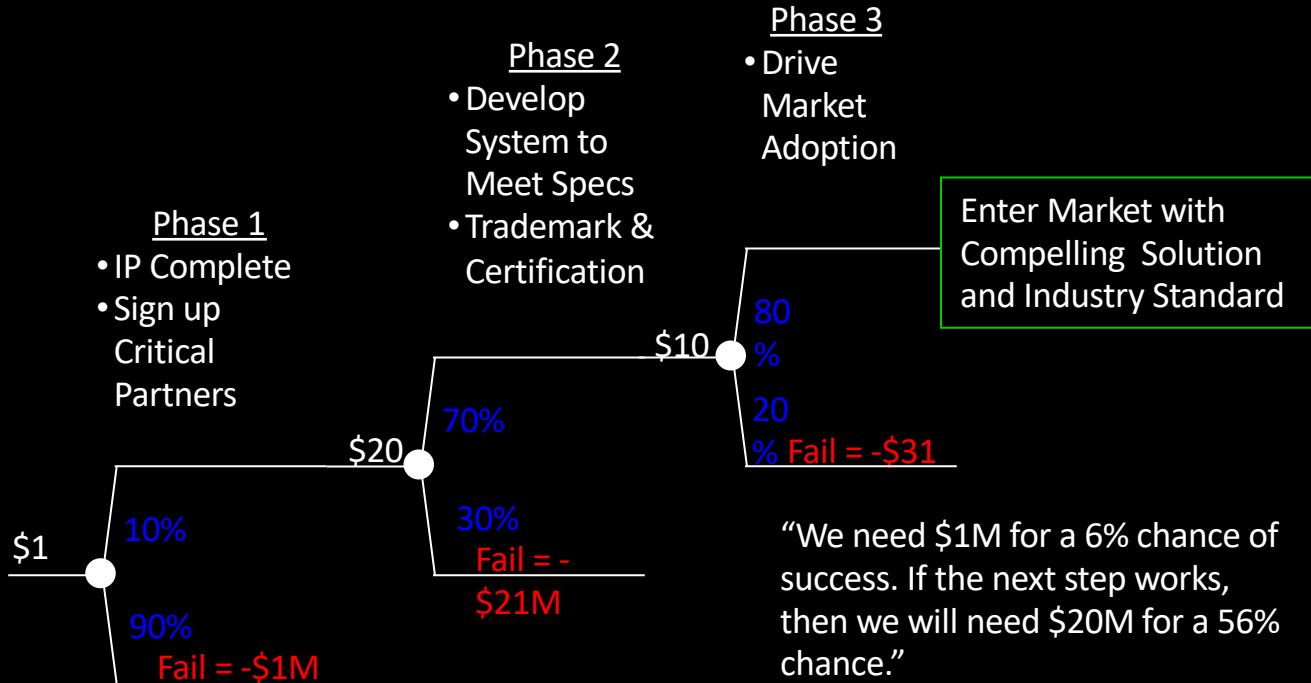
Learning Plan, based on proof points

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Fixed Annual Revenue
Fixed Annual Cost

Combined Uncertainty

Drive Upside

- Focus on uncertainties that matter
- Build a winning business case

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Seed Business Proposal
Program Name: LightScribe (from 2004)

Customer Value Statement

- **For** – Anyone who burns optical discs – CDs or DVDs
- **Who Need** – To label the contents
- **The Solution & Benefit** – Integrated into your optical disc burner the ability to label specially coated discs – low-cost, fast, high quality image, mobile, and durable. Allows you to express your personality – be it organized, creative, professional, or zany.

Market Size and Business Model

- 2008 Worldwide Market Size:
  - 130M drives sold, 20B discs
- 2008 HP Addressable Market Size: 50%
- Business Model – Licensing and Royalty
- Branding – Create Industry Standard Ingredient Brand with no linkage to HP

Market Trends and Competition (2004)

- > 15B discs are burned by consumers annually, this is growing with music and video download services and digital photography.
- 80% of discs are marked with the "Sharpie"
- Epson, Canon, and Sharp have disc printers or accessories that allow printing of discs
- Laptops are growing at faster rate than desk top PCs – need a mobile solution

Leverage and Required Partnerships

- **IPG Leverage:** Chemistry development, image processing, supply chain, HP Legal
- **HP Partnerships:** HP Personal Systems Group
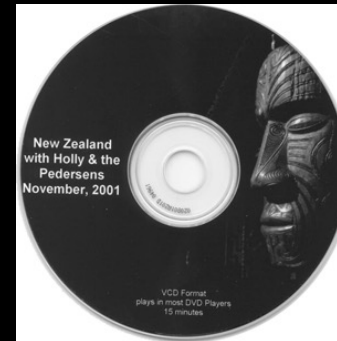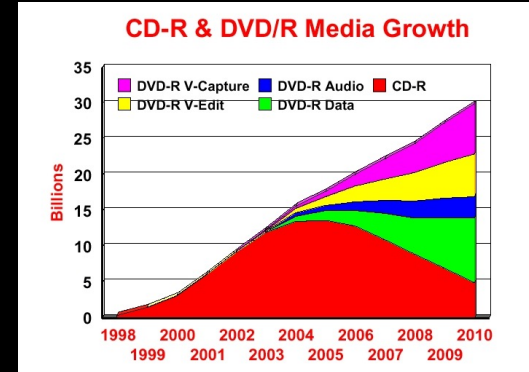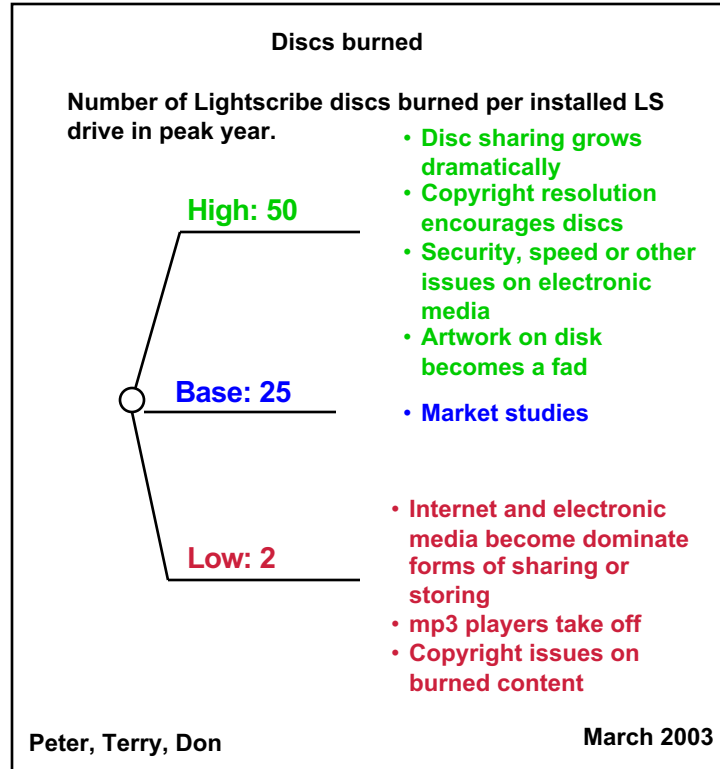- **External Partnerships:** Optical drive supplier, disc coating supplier and disc manufactures

LightScribe information has been modified and is intended for illustrative purposes

hit **PRINT**

Template Structure

Project Evolution through Phases
  Phase 1
  Phase 2
  Phase 3
  Phase 4

Probability of passing each phase
Cost
Duration

Launch Date

Develop-ment Investment

Probability of Success

Project Value

Market
  Total Available Market
  Penetration of new solution
  HP Market share
  Unit Conversion

Cash Flow
  P&L

Contribution if Successful

Unit Profits
  Unit Price
  Unit Cost

Annuity Profits
  Annuity Duration
  Annuity Units
  Annuity Revenue
  Annuity Cost

Fixed Profits
  Fixed Revenue
  Fixed Cost

Lifecycle
  Ongoing Investment Rate
  Launch Cost
  Ramp up time

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Uncertainty Assessment:
Number of labeled discs each year

- In 2004; 300M drives installed base, 15B total discs burned = 50 discs burned per drive

- Projected percentage of burned discs that will be labeled using LightScribe at projected cost and performance = 50%

- Projected discs labeled annually for users with a LightScribe drive = 25

- Error range of consumer research = +/- 20%

CD-R & DVD/R Media Growth

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Uncertainty discussion of disks burned per drive.

Discs burned

Number of Lightscribe discs burned per installed LS drive in peak year.

High: 50

- Disc sharing grows dramatically
- Copyright resolution encourages discs
- Security, speed or other issues on electronic media
- Artwork on disk becomes a fad

Base: 25

- Market studies

Low: 2

- Internet and electronic media become dominate forms of sharing or storing
- mp3 players take off
- Copyright issues on burned content

Peter, Terry, Don

March 2003

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Uncertainty Assessment:
Cost of modifying the CD and DVD drives

LightScribe is planned for drives that contain a 32X or greater capable laser, such that a maximum power at the disk surface of 48 mW is available. To achieve the larger spot size, some modifications to the range provided by the voicecoil in the OPU, along with control changes to minimize heating during focus may be required. A chip modification is also anticipated to enable the labeling commands or functionality. By working with an existing manufacturer to implement a reference chip, a smoother expansion into multiple drives will be ensured.

- Detailed engineering and supply chain estimate gives cost of drive at $3.40 ± 5%

- What would happen if the range was ± 10%?

- Wouldn't this kill the business?

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LightScribe Uncertainty Analysis

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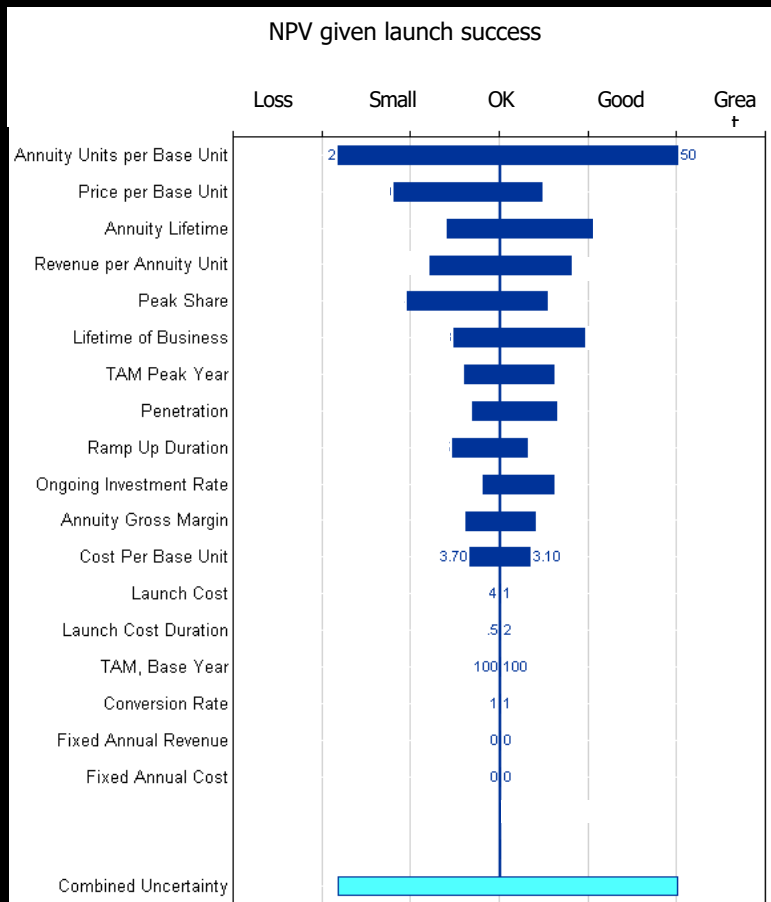
"The next wave is the real big wave"

- The worldwide portable flash player market exploded in 2003 and is expected to grow from 12.5 million units in 2003 to over 50 million units in 2008, fueled by falling flash memory costs and the availability of players at multiple storage capacities.

- … new competition in the portable jukebox player market during the forecast period from vendors offering devices based on 1.0in. and smaller hard drive form factors.

Source: "Worldwide Compressed Audio Player Forecast 2004-2008: MP3 Reaches Far and Wide" from technology consulting firm IDC.

MP3
"Carry all my music"

Music
Sharing
"My Album"

Digital
Music

hit **P R I N T**

An interesting hedging strategy

THE WALL STREET JOURNAL.

Desk Job
**Consumer Demand and Growth
In Laptops Leave Dell Behind**

By **CHRISTOPHER LAWTON**
August 30, 2006; Page A1

Dell has largely ignored the consumer boom although it says it still considers consumers an important market. For a while it had part-time workers with an annual turnover rate of 300% taking calls from customers who wanted to buy a PC. The company has poured money into corporate products such as printers, storage systems and computer servers. It nixed some overtures from retailers to sell its wares in stores. At a conference in 2004, Dell Chief Executive Kevin Rollins declared, "We have never focused on the consumer as a company."

At the same time, rivals such as H-P, Gateway and **Apple Computer** Inc., have charged ahead in the consumer PC market. In particular, H-P cut costs to become competitive with Dell, began working more closely with retailers and redoubled its marketing efforts. As **Dell cut prices,**
H-P invested in consumer-friendly features in its notebooks. H-P computers, using a laser, can write a label on a specially coated music CD with artist and title so users don't have to use a marker.

lightScribe
DIRECT DISC LABELING

Dell decided not to offer the LightScribe industry standard solution in their PC's.
- *Reduced LightScribe market*
- *HP Increased its leadership in the consumer PC market*

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hp

LightScribe Licensees (May 2009)

PC and Notebooks

Media Brands

System Integrator

CD/DVD Publishing Systems

LightScribe Aftermarket Drive Brands

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Roadmap of Portfolio and Innovation Frameworks

Key:

Portfolio Framework

Innovation Framework

Mixed

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