

Emetrics Summit 2004

Front Line Internet Analytics at Amazon.com

Ronny Kohavi, Director of Data Mining and Personalization

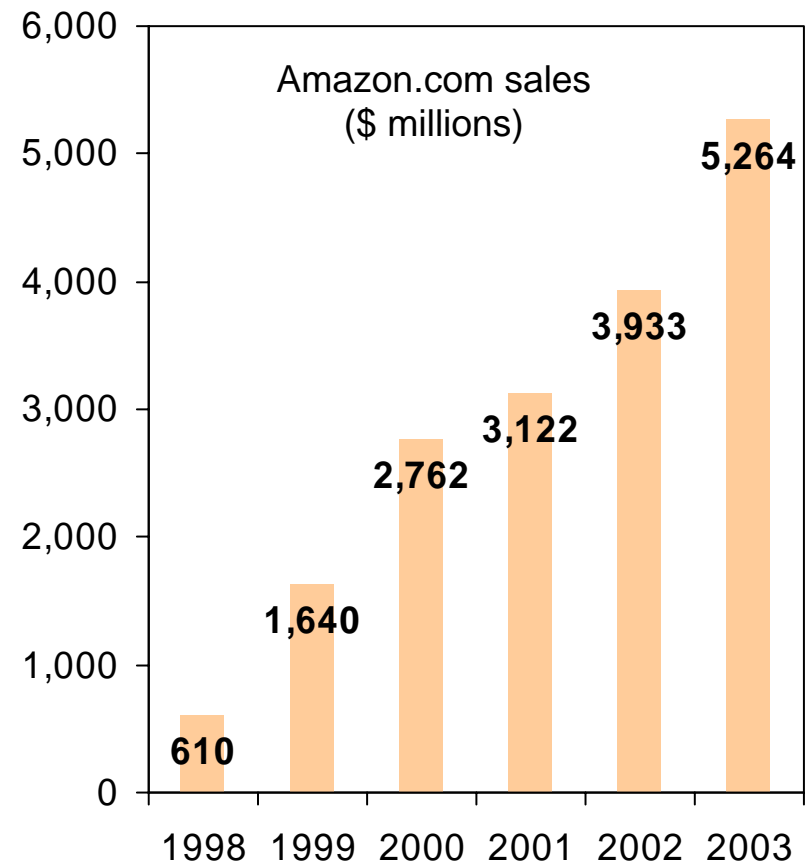
Matt Round, prior Director of Personalization

AMAZON.COM

- Fortune 500 company
- Over 41M active customers accounts
- Order Fulfillment to More than 200 Countries
- World's 74th most valuable brand ahead of Levi's, Motorola, Boeing, J&J, Starbucks, FedEx, Barbie(*)
- Vision
 - Offer Earth's Biggest Selection
 - Be Earth's most customer-centric company
- American Customer Satisfaction Index gave Amazon.com a score of 88—the highest customer satisfaction score ever recorded in any service industry, online or off

(*) BusinessWeek Aug 4, 2003
Copyright 2004, Amazon.com

amazon.com.



Business Strategy

- Low Prices
 - Leverage fixed-costs
 - Enable 3rd party sellers to offer products, alongside ours, and set prices
- Convenience
 - Feature-rich content: recommendations, wishlists, registries, Search Inside the Book™
 - Secure and trusted transaction environment
 - Fast, reliable fulfillment
- Wide Selection of Merchandise
 - Millions of unique products available
 - We want to be the destination of first resort

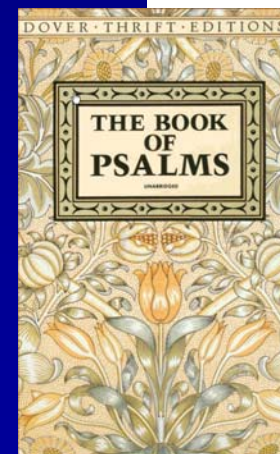
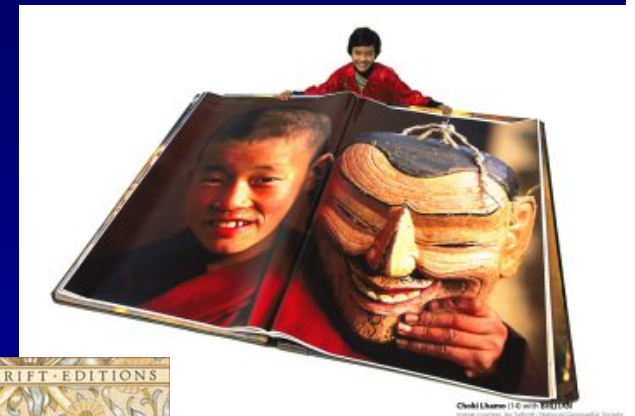
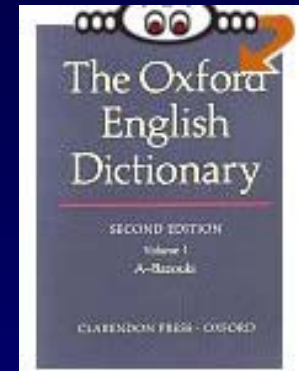
Earth's Biggest Selection

- Half a ton Jointer ships free with Super Saver Shipping
- Gold, Platinum, Opal, and Diamond "Nirvana" Necklace for \$390,000
(Please call credit card company first to pre-qualify purchase.)
- Caviar anyone?
- Yak cheese, highest altitude cheese, from Tibet



Selection in Books

- Oxford: 22,000 pages in 20 volumes
- Bhutan: A Visual Odyssey (Real-life kid shown) 60"x44" book for \$10,000 (1.5m x 1.1m)
- \$2 book to help with Super Saver Shipping



Not Just a Retailer

- Technology company building platform
- Merchant.com
 - Utilize platform to operate another business's website
 - Sometimes offer fulfillment services
 - Example: www.target.com



- Merchant@ and Marketplace
 - Allow other merchants to integrate their products into our website
 - Example: ToysRus.com

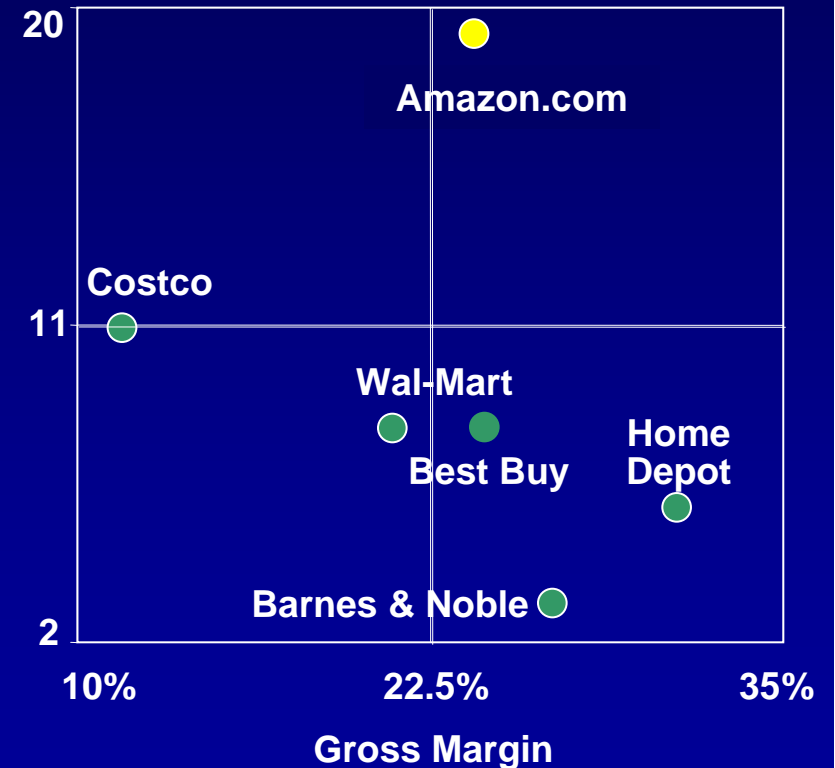


- In Q1 2004, 23% of world-wide units were sold by retailers other than Amazon.com

The Unique Advantage Inventory Turns (TTM)

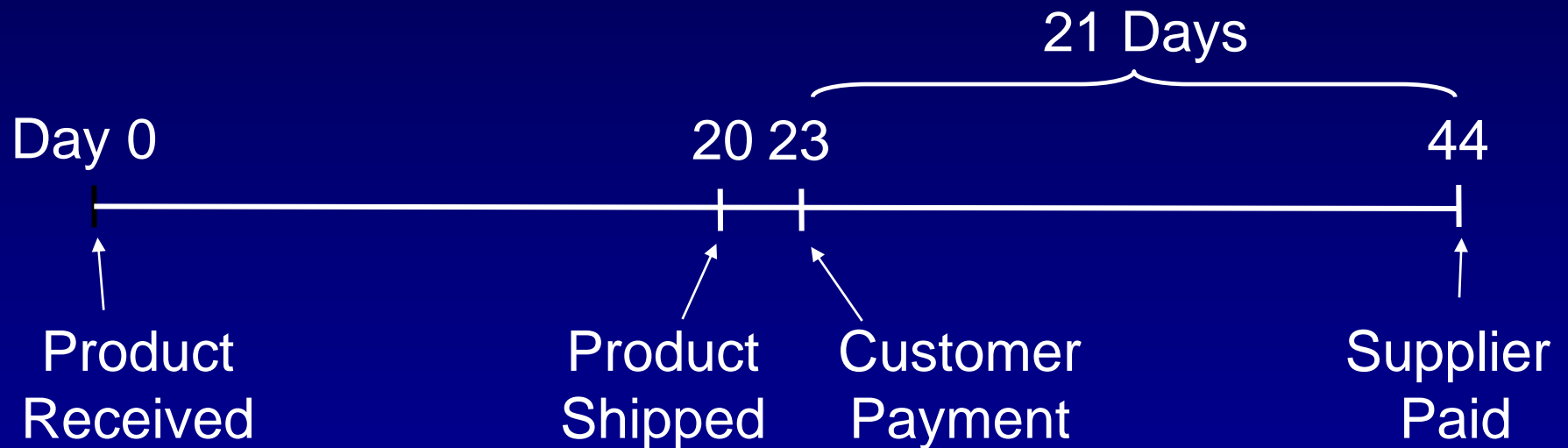
Inventory
Turns

	Gross Margin	Inventory Turns
Amazon.com	24%	19
Barnes & Noble	27%	3
Costco	12%	11
Home Depot	32%	5
Best Buy	25%	7
Wal-Mart	22%	7



Best of Both Worlds -- High Turns, High Margins

Capital Efficiency – Negative Operating Cycle*



Working Capital is a Source of Cash

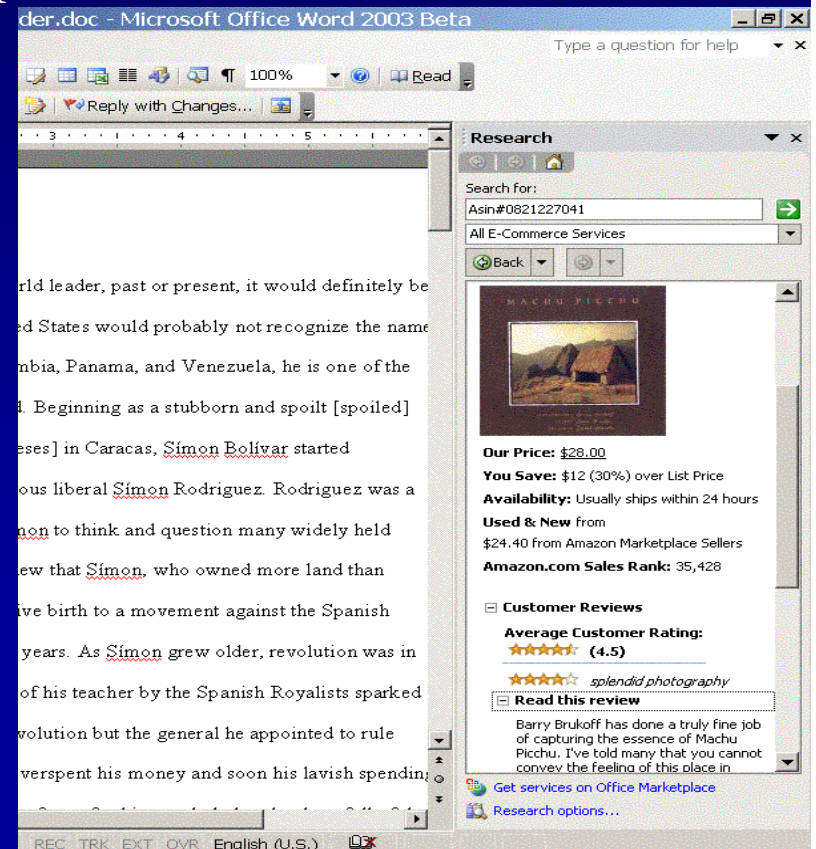
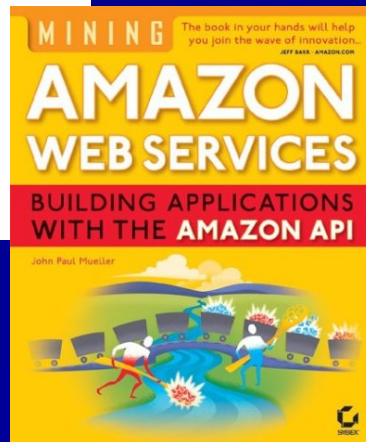
* As of 3/31/04 -- TTM Average Inventory Turns, Approximate AR Days and Ending AP Days

Amazon Web Services

- Mission

Enable innovation by exposing components of Amazon.com's technology platform and product data

- More than 50,000 registered developers



Copyright 2004, Amazon.com

Running a Large Website

- Amazon has six global websites
`www.amazon.com`, `www.amazon.co.uk`, `www.amazon.de`, `www.amazon.fr`,
`www.amazon.co.jp`, and `www.amazon.ca`
- Distributed development and deployment: pages call services for features
- Sites closely monitored
 - Service availability monitoring
 - Per minute site revenue upper/lower bounds
 - Internal performance service-level-agreements
T% of the time, pages must return in X seconds
(X varies by page type)
- Sites changes are mostly made by experimentation—A/B tests

A/B Tests

- A/B test basics
 - Control/treatment(s) test for limited time
 - Randomly show one or more treatments to visitors
 - Measure parameters, such units and revenue by category (and total), session time, session length, etc
- A/B tests insulate test from external factors
- Examples:
 - New home page design
 - Moving features around the page
 - Different algorithms for recommendations
 - Changing search relevance rankings
- Usually launch feature if desired metrics are (statistically) significantly better

Challenges to A/B Tests

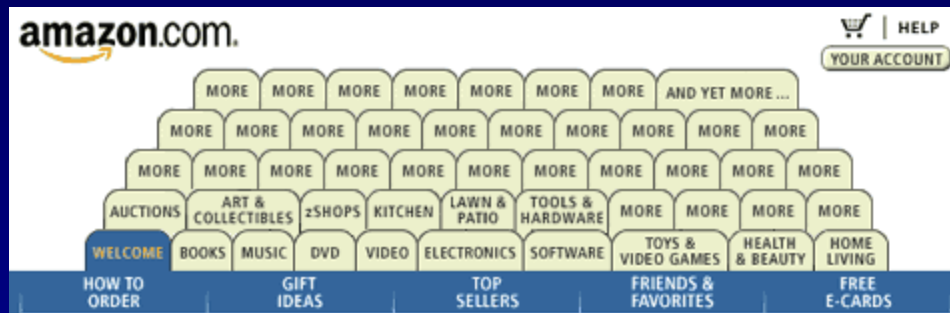
- Multiple A/B tests are running every day
- Challenges
 - Conflicting A/B tests (two experiments touch same feature). Scheduling, QA'ing
 - Long term effects. Some features are “cool” for the first two weeks and may die down
 - Primacy effect. Changing navigation may degrade performance temporarily
 - Consistency. Same person may get different treatment when they work from home/work
 - Statistical tests. Distributions are far from normal. They have large mass at zero (e.g. no purchase)

Data Trumps Intuitions

- Amazon constantly tests ideas.
- Even with experienced employees, many ideas fail to show significant improvement.
- Many times a prototype is easier to build than a model that predicts user response
- Examples in the next few slides

The Secret Life of Tabs

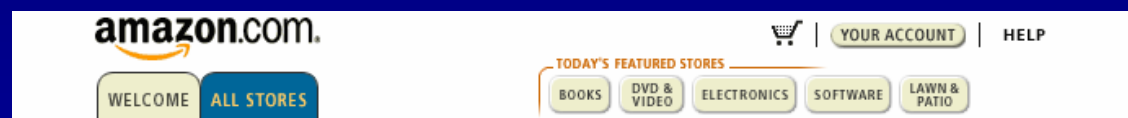
Started with a few tabs and ended up with the tab mountain



Which grew and grew...

Ok, it didn't really get this bad.

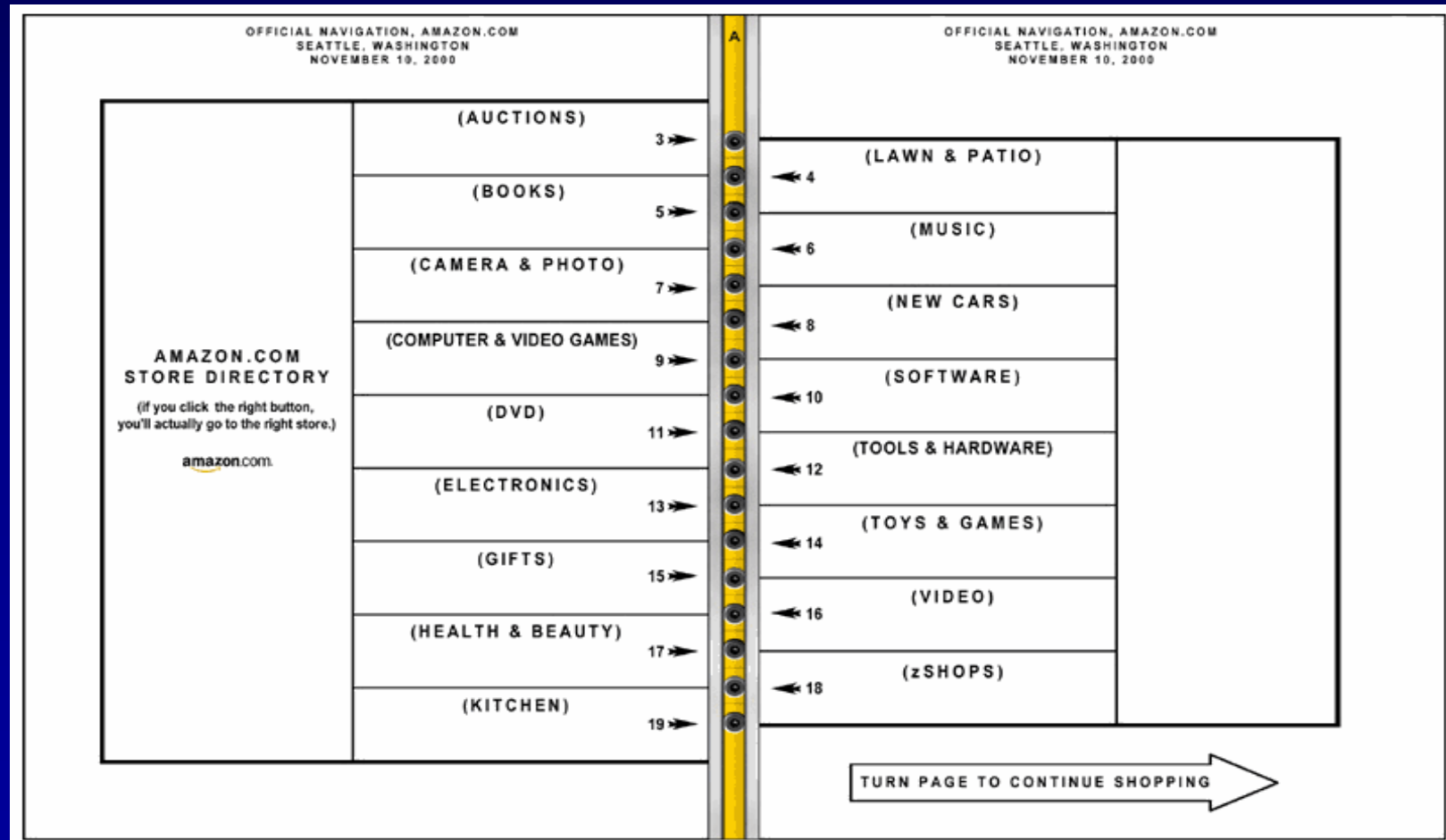
...then the "chicklets" arrived to save us – orders significantly higher



...and now we're back to tabs again because new version performed better

Our Final Proposal

Inspired by the Palm Beach County, Florida, ballot form, live at <http://www.amazon.com/exec/obidos/subst/home/all-stores-ballot.html>



Things Which Didn't Fly

- Trying to scale tabs (part 1)
- The February 2000 gateway that never was
 - Searches increased
 - Orders reduced (statistically significant)

The screenshot shows the Amazon.com homepage with a yellow header. The search bar is at the top right, and the navigation menu is on the left. The main content area features a banner for 'A World of Science' and a grid of category links under 'ALL STORES'. On the right, there are sections for 'Hello, Doug Welzel', 'Call for Entries', 'Your Recommendations', 'Quick Picks', and 'Amazon.com 100 Hot Books'.

amazon.com Search: All Products GO! [HELP](#) [YOUR ACCOUNT](#)

Auctions: [First-Edition Books](#), [Used CDs](#), [Rare Videos](#), [Pokémon](#), [Comics](#)

A World of Science
Relive your childhood wonderment about the seas and stars with everything from [bestselling science books](#) to [globes](#) to a portable electronic telescope.

Gift Certificates, Valentine's Day, Wish List, Rare Items Community, Deals of the Day, Free Music Downloads, Oprah®

ALL STORES

Auctions Signed Books , Used VHS , Comics	Software Business , Games , Great Deals
Books Bestsellers , Health , Rare	sothebys.amazon.com Special Sales , Jewelry , Paintings
DVD Top Sellers , Coming Soon , Used	Toys Age Ranges , Great Deals , Penny Auctions
Electronics Digital Imaging , DVD Players , Used	Video Top Sellers , New Releases , Used
Free e-Cards Valentine's Day , Humor	Video Games New Releases , Hot Games , Used
Home Improvement Tools , Lawn & Garden , Housewares	zShops Computers , Gourmet Food , Watches
Music Top Sellers , New Releases , Used	

Shopping Services
 [E-mail Recommendations](#): Our editors' picks

Special Features
* [Join Associates](#): Sell stuff from your Web site

Hello, Doug Welzel
(If you're not Doug Welzel, [click here.](#))

Call for Entries
 Announcing the [PEN/Amazon.com Short Story Award](#). Top prize? Publication and \$10,000!

Your Recommendations
[Books](#), [Music](#), [DVD & Video](#), [Toys & Video Games](#), [Electronics & Software](#)

Quick Picks

1. [The Book Of Secrets](#)
Loreena McKennitt
2. [Gravity of Love](#)
Enigma
3. [Songs From A Secret Garden](#)
Secret Garden

Amazon.com 100 Hot Books

1. [Harry Potter and](#)

Things Which Didn't Fly

- Trying to scale tabs (part 2)
- Another attempt from 2000
 - Orders reduced again (statistically significant)

The screenshot shows the Amazon.com homepage with a navigation menu on the left side. The menu items are:

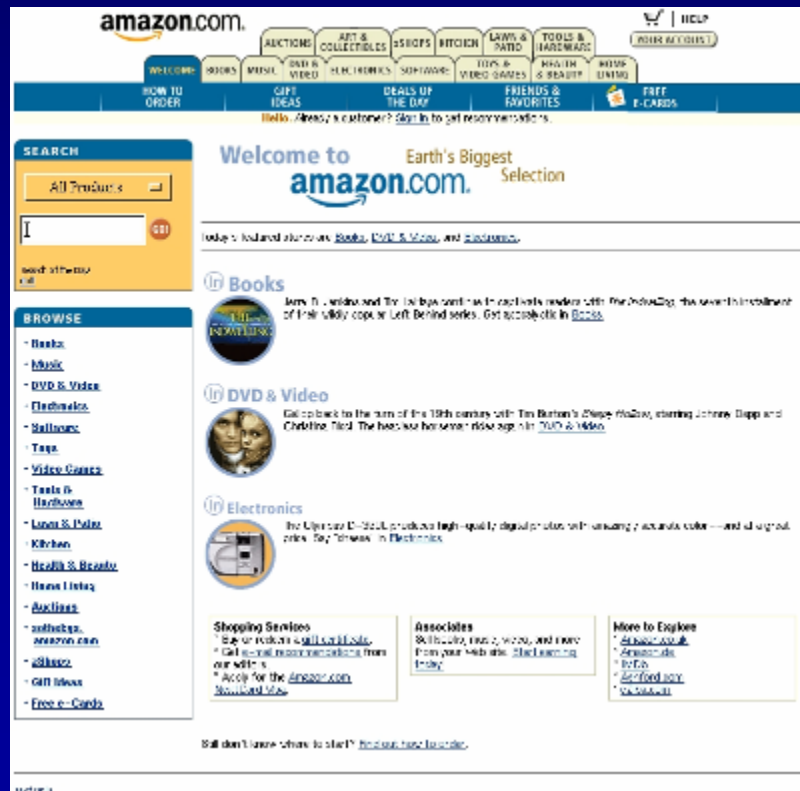
- Auctions**: Signed Books, Used VHS, Comics
- Books**: Bestsellers, Health, Rare
- DVD**: Top Sellers, Coming Soon, Used
- Electronics**: Digital Imaging, DVD Players, Used
- Free e-Cards**: Friendship, Hi, Humor
- Home Improvement**: Tools, Lawn & Garden, Housewares
- Music**: Top Sellers, New Releases, Used

The main content area features a search bar, a "New Stuff Just for You" section with a "Hello! New to Amazon.com?" message, and a "Call for Entries" section for the PEN/Amazon.com Short Story Award. The right sidebar lists various product categories with icons:

- The Right Stuff**: Power up with the latest sanders and other tools, plus tools for kids.
- Software**: Business, Games, Great Deals
- sothebys.amazon.com**: Special Sales, Paintings, Jewelry
- Toys**: Age Ranges, Great Deals, Dollar Deals
- Video**: Top Sellers, New Releases, Used
- Video Games**: New Releases, Hot Games, Used
- zShops**: Computers, Gourmet Food, Watches

Keeping it Simple

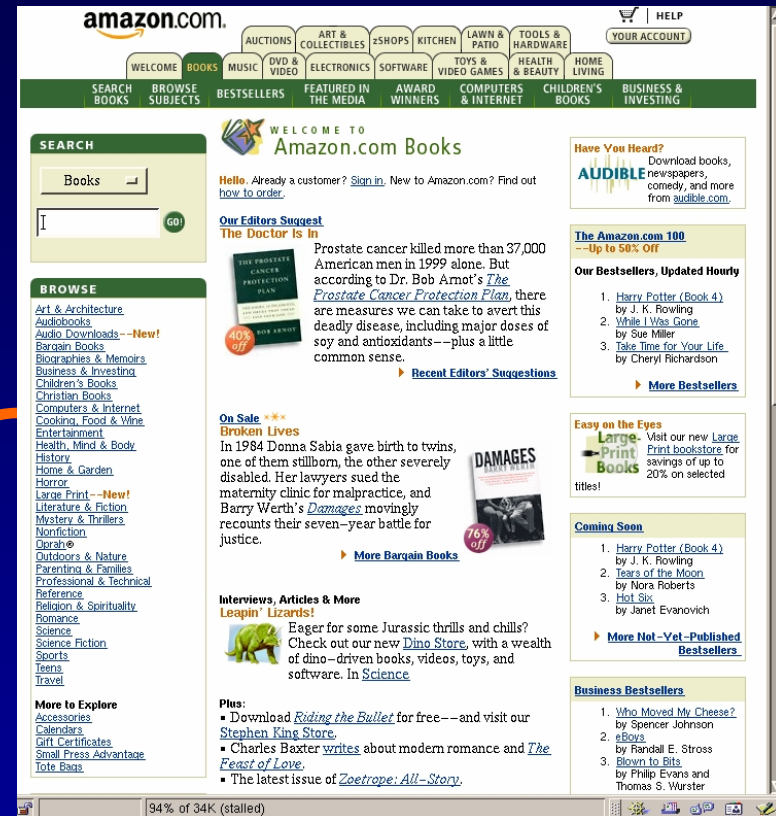
- Simpler is better, right?



- No. Orders significantly down

Keeping it Simple

- Take two?



- No
 - Abandonment up
 - Cart adds down
- Maybe it was the sickly green color...

Small Change, Big Difference

- Spot the difference?

WELCOME BOOKS MUSIC DVD & VIDEO ELECTRONICS & SOFTWARE TOYS & VIDEO GAMES HOME IMPROVEMENT AUCTIONS zSHOPS

HOW TO ORDER GIFT IDEAS DEALS OF THE DAY COMMUNITY FREE E-CARDS

***With Amazon.com Anywhere, you don't need a PC to shop online. [Get it now!](#)

Thursday, March 9, 2000

SEARCH

All Products

GO!

Search of the Day: [role-playing games](#)

Auctions: Bargain Electronics, DVD Players, Laptops, Cheap Software, Dollar Deals

amazon.com

Shop Anywhere
With Amazon.com Anywhere, you don't need a PC to shop online. [Get it now!](#)

New for You

Andrej Gregov, here's what's **New for You.** (If you're not Andrej Gregov, [click here](#)).

New Releases

[Dance & DJ](#)

WELCOME BOOKS MUSIC DVD & VIDEO ELECTRONICS & SOFTWARE TOYS & VIDEO GAMES HOME IMPROVEMENT AUCTIONS zSHOPS

HOW TO ORDER GIFT IDEAS DEALS OF THE DAY COMMUNITY FREE E-CARDS

*****Hello, Andrej Gregov.** We have [recommendations](#) for you in [Books](#), [Music](#), and [more](#).

Thursday, March 9, 2000

SEARCH

All Products

GO!

Search of the Day: [role-playing games](#)

Auctions: Bargain Electronics, DVD Players, Laptops, Cheap Software, Dollar Deals

amazon.com

Shop Anywhere
With Amazon.com Anywhere, you don't need a PC to shop online. [Get it now!](#)

New for You

Andrej Gregov, here's what's **New for You.** (If you're not Andrej Gregov, [click here](#)).

New Releases

[Dance & DJ](#)

- Promotion of a highly effective area
- Cart adds up significantly

Data Driven Automation

- Data is king at Amazon
- Many examples of data driven automation
 - Channel management
 - Website real estate management system
 - Automated email measurement and optimization
 - Merchandising
 - Customers who bought X also bought...
 - Recommendations
 - New releases, top sellers
 - Purchase Circles™
 - Advertising
 - Automatic ad generation and bidding

Home Page Slots

- Amazon's home page is prime real-estate
- The past:
 - Every category VP wanted top-center
 - Friday meetings about placements for next week were getting too long, too loud, and lacked performance data
- Today: automation replaces intuitions
 - Home page is made up of slots
 - Anyone can submit content for a slot
 - Content is chosen based on real-time experimentation

Email Channel Management

- Campaign calendar used to be manually managed
 - Weak measurement
 - Costly to schedule and use
- New system
 - Automatically optimizes content to improve customer experience
 - Avoids sending an e-mail campaign that has low clickthrough or high unsubscribe rate
 - Includes inbox management (avoid sending multiple emails/week)
 - Has growing library of automated email programs
 - New releases
 - Recommendations
- Challenges
 - Minimum circulations for emails
 - Targeted inventory management

Customers Who Bought X...

- Amazon's signature feature
- Relies on having and crunching massive data
 - Every purchase, every page, every search
 - Techniques for sifting patterns from noise
- Two additional examples
 - Customers who shopped for X also shopped for...
 - Customers who searched for X also bought...
- Challenges
 - Sensitivity filtering
 - Data needs especially high in some areas
 - Apparel and toy catalogs “turn” very quickly

Customers who bought this book also bought:

- [Good to Great: Why Some Companies Make the Leap... and Others Don't](#) by Jim Collins ([Rate it](#))
- [Discussion Guide: Execution -- The Discipline Of Getting Things Done \[DOWNLOAD: PDF\]](#) by Editors of BrownHeron (Author) ([Rate it](#))
- [First, Break All the Rules: What the World's Greatest Managers Do Differently](#) by Marcus Buckingham (Author), Curt Coffman (Author) ([Rate it](#))
- [The Five Dysfunctions of a Team: A Leadership Fable](#) by Patrick M. Lencioni (Author) ([Why?](#))
- [Built to Last : Successful Habits of Visionary Companies](#) by Jim Collins (Author), Jerry I. Porras (Author) ([Rate it](#))

► **Explore Similar Items:** 20 in Books, 3 in Magazine Subscriptions, and 1 in Electronics

Your Recommendations

Hello, Matt Round. We have [recommendations](#) for you. (If you're not Matt Round, [click here](#).)

- Amazon's recommendations widely recognized as being amongst the best in world
 - IEEE paper published on underlying item-to-item correlations
 - Relatively simple algorithm fed off of massive dataset
 - The secret sauce is in the small tweaks to the basic idea
- Challenges
 - Massive data size
 - millions of customers
 - millions of items
 - Recommendations made in real time

Goldbox



- Goldbox is a cross-sell and awareness raising tool
- We allow customers to buy items at an additional discount
- We get a lot of suggestions on how to improve our goldbox offers to make them more personalized, but...
- It's by design. We discount items to encourage purchases in new categories!

XXXXXXXXXX 7 8 9 10
OFFER

Ron, you now have 60 minutes before these deals expire!
Order now for special Gold Box™ savings, or hold the deal you prefer to see another.

<p>Le Creuset 9-1/2-Inch Nonstick Omelet Pan, Cherry Red [Kitchen & Housewares]</p>  <p>List Price: \$90.00 Our Regular Price: \$49.99 Gold Box Coupon: \$7.50</p> <p>Special Gold Box Price: \$42.49 You Save: \$47.51</p> <p>Availability: Usually ships within 24 hours</p> <p>▶ See full product details Avg. Customer Rating: ★★★★★</p> <p><input type="button" value="Buy now!"/> <input type="button" value="Hold this offer"/></p>	<p>OR</p>	<p>Pirates of the Caribbean - The Curse of the Black Pearl [DVD]</p>  <p>List Price: \$29.99 Our Regular Price: \$19.49 Gold Box Coupon: \$1.95</p> <p>Special Gold Box Price: \$17.54 You Save: \$12.45</p> <p>Availability: Usually ships within 24 hours</p> <p>▶ See full product details Avg. Customer Rating: ★★★★★</p> <p><input type="button" value="Buy now!"/> <input type="button" value="Hold this offer"/></p>
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Intro to Sponsored Links

- Short, text-only ads
- Pay per Click / Cost per Click (PPC/CPC)
- Sold in real-time auctions
- Keyword targeted at search keywords

Google search results for "da vinci code". The search bar shows "da vinci code" and "Search". The results page shows organic results for "da vinci code" and a sponsored link for "Da Vinci Code Decoded".

Web Images Groups News Froogle ^{New!} more »
da vinci code Search Advanced Search Preferences

Web Results 1 - 10 of about 744,000 for **da vinci code**. (0.17 seconds)

Da Vinci Code Decoded Sponsored Link
www.davincicode.org The Truth Behind the New York Times #1 Bestseller!

News results for **da vinci code** - View all the latest headlines
Da Vinci: Inventor of the Car? - China Daily - Apr 24, 2004

Amazon.com: Books: **The Da Vinci Code**
... Editorial Reviews Amazon.com With **The Da Vinci Code**, Dan Brown masterfully concocts an intelligent and lucid thriller that marries the gusto of an ...
www.amazon.com/exec/obidos/tg/detail/-/0385504209?v=glance - 83k - Apr 24, 2004 - [Cached](#) - [Similar pages](#)

The Official Web Site of Bestselling Author Dan Brown
Dan Brown is published by Random House, which will be releasing a new novel, **The Da Vinci code**, this fall. WOW... Blockbuster perfection. ...
www.danbrown.com/novels/davinci_code/reviews.html - 29k - [Cached](#) - [Similar pages](#)

The Da Vinci Hoax
Is the **Da Vinci Code** for real? Discover the truth now!
www.davincihoax.com

Deciphering Da Vinci Code
What is the novel saying about religion and why are we interested?
www.explorefaith.org

Da Vinci Code Guide
Get a Reader's Guide to Dan Brown's bestselling thriller.
www.DepthandDetails.com

Breaking Da Vinci?
The infallible Word came from a 4th

YAHOO! search results for "da vinci code". The search bar shows "da vinci code" and "Yahoo! Search". The results page shows sponsored links for "The Da Vinci Code" and organic results for "The Official Web Site of Bestselling Author Dan Brown" and "The Da Vinci Code at Amazon".

YAHOO! search da vinci code Yahoo! Search Advanced Preferences
Related: da vinci code movie, dan brown da vinci code, da vinci code book More...

Web Images Directory Yellow Pages News Products powered by hp

INSIDE YAHOO!
Books: find **The Da Vinci Code** on Yahoo! Shopping Books

SPONSOR RESULTS (What's this?) (Become a Sponsor)

The Da Vinci Code - \$11.22 Make Overstock.com your one-stop-shop for your media needs. Find the latest book, movie, music and gaming titles at deep discounts. Flat-rate shipping. Overstock.com - Your Online Outlet.
www.overstock.com

Deciphering The Da Vinci Code What is Dan Brown's novel telling us about religion and why are we so interested?
www.explorefaith.org

TOP 20 WEB RESULTS out of about 1,740,000. Search took 0.14 seconds. (What's this?)

1. **The Official Web Site of Bestselling Author Dan Brown**
The Official Web Site of Bestselling Author Dan Brown, author of the novels Digital Fortress, Angels and Demons and Deception Point. Dan Brown is published by Random House, which will be releasing...
www.danbrown.com/novels/davinci_code/reviews.html - 28k - [Cached](#) - [More pages from this site](#)
2. **The Da Vinci Code at Amazon**
... With **The Da Vinci Code**, Dan Brown masterfully concocts an intelligent and lucid thriller that marries the gusto of an international murder mystery with a collection of fascinating esoteria ...
www.amazon.com/exec/obidos/ASIN/0385504209 - [More pages from this site](#)

Sponsor Results
The Da Vinci Code - Yahoo! Shopping
Compare prices and products from more than 150,000 stores across the Web. Yahoo! ...
shopping.yahoo.com
[See your message here...](#)

Automated Bidding

- Sponsored links initially done by humans
- Automated program
 - Generates keywords
 - Writes ads (creative)
 - Determines landing page
 - Manages bids
 - Measure conversion rate
 - Profit per converted visitor
 - Update bid

Challenge: Quick Cycle

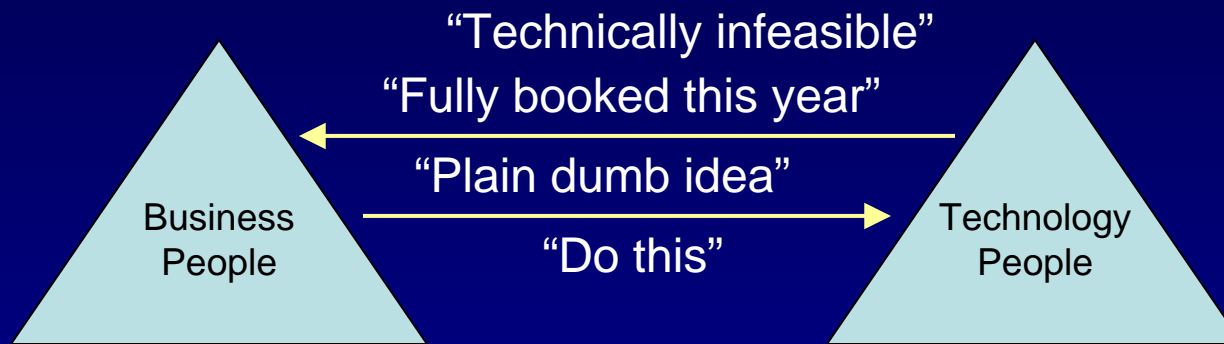
- This automated ad:

How to Make Love Like a Porn Star
By Jenna Jameson. Only \$18.17. Free Super Saver Shipping.

- Received tens of thousands of clicks from porn searches, but few actually purchased the book
- Update cycle must be quick to avoid large losses

Organized for Execution

- How it used to be



- This works rather better



- Small, cross-functional teams
 - Able to execute end-to-end
- Self directed
 - Established group goals and measure progress

Shameless Plug! We're Hiring

- amazon.com/jobs
 - Engineers, team leads, technical Project managers
 - Amazon offers an unmatched opportunity
 - Operate at extreme scale
 - Data trumps intuition and there is a lot of data
 - Unbeatable visibility for your work
 - See results in days not months or years
 - It's fun. Honest
- Merchant.COM – launch your site on the Amazon platform