

Monetizing Information: Competition in Online Markets

Alok Gupta

Carlson School Professor of IDSc

4/2/2008

What's this about...

- > Economics based design and management of systems
 - Business Processes
 - Technology and Infrastructure
 - As a driver
 - As a support mechanism
 - Mechanisms
 - B2C
 - B2B

4/2/2008

Rationale Belief...

Online Prices Should converge, resulting in little or no price dispersion!

4/2/2008

Why is This Important?

Online Shopping by Product Category

Clothing and accessories	67%
Books/Magazines	67%
Music/DVD/Video	65%
Computer HD or SW	55%
Toys, Video games	50%
Consumer Electronics	48%
Tickets (movies, concerts, theatre)	43%
Gifts and Collectables	42%
Health & beauty items	38%
Gift Card/Certificates	38%
Furniture, home & garden	29%
Pet supplies	26%
Sporting goods	23%
Jewelry/watches	22%
Food	22%
Other	9%

Source: DoubleClick (www.performics.com)

Theory and Reality

Theory

- > Individuals can easily search the price information and everything else being equal price should converge (Bakos, 1997)
- > The "law of one price" is no law at all (Varian, 1980)
 - > Firms use randomization strategy
 - Making it difficult for individuals to search

Reality

- > Greater than 50% price dispersion exists due to
 - > Retailer heterogeneity
 - Branding
 - Awareness
 - Trust
 (Brynjolfsson and Smith, 2000)
- > Price dispersion persists over time, though
 - > Number of firms decline
 - > The range of prices tightens
 (Baye et. al., 2002)

4/2/2008

Is Price the Most Important Factor?

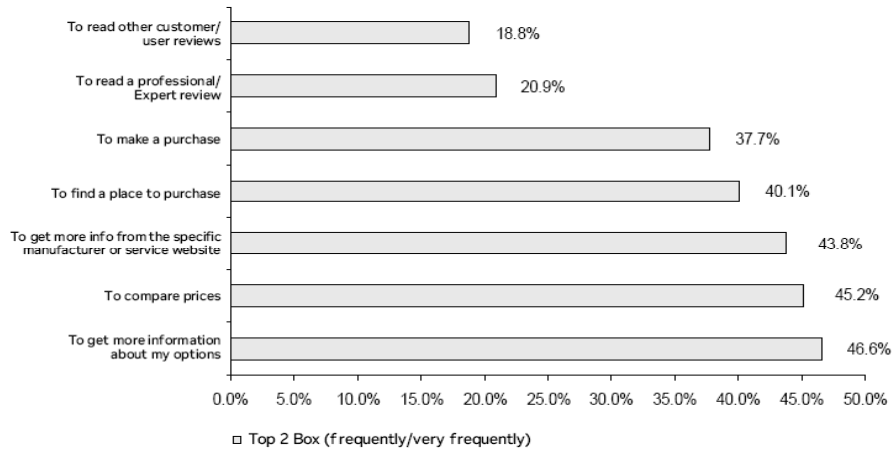
FEATURES BRINGING SHOPPERS BACK TO A WEB SITE

	top box		top-2 boxes
Free/Flat Shipping	66%	Free/Flat Shipping	92%
Privacy Policies/Guar	61%	Privacy Policies/Guar	83%
Order Tracking	56%	Order Tracking	88%
Rebates/Coupons	43%	Rebates/Coupons	76%
Online Outlet	39%	Online Outlet	75%
Customer Reviews	37%	Customer Reviews	74%
Comparison Capabilities	30%	Comparison Capabilities	73%
Price/Product Alerts	30%	Price/Product Alerts	63%
Live Help	30%	Live Help	58%

Source: DoubleClick (www.performics.com)

Small Business Patterns

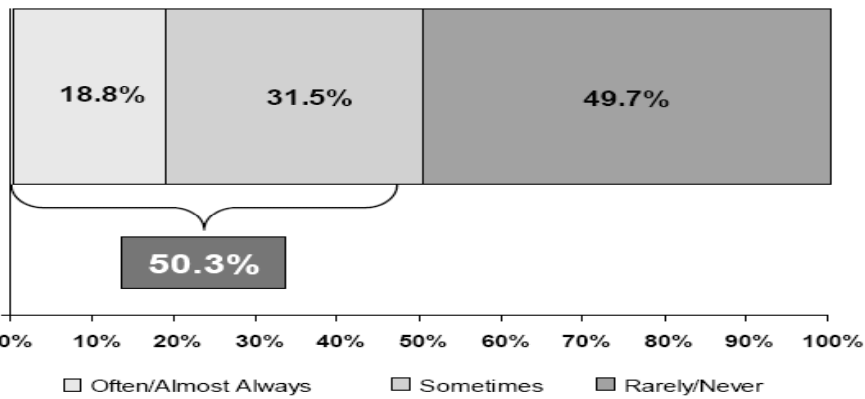
How often do you use search engines to do each of the following for your business?
 (Rate on a Scale of 1-5 where 5 means "very frequently" and 1 means "not at all frequently") (N=292)



Source: DoubleClick (www.performics.com)

The Value of Information

How frequently do you discover new/relevant products/services for your business that you weren't aware of, but learned as a result of your searches?



4/2/2008

Competing with Information!

4/2/2008

Information...

- > Is the competitive tool for the Internet
 - > Facilitation (google, froogle, BizRate, etc.)
 - > Organization (Amazon, Yahoo Pipes, mashups...)
 - > Derivation (DoubleClick, Google Analytics, etc.)
 - > Transparency and monetization
 - Understand consumers'
 - needs
 - Usage patterns
 - Importance/Valuation

4/2/2008

My Contention

- > Web based commerce will evolve to competition based on “information transparency.”
 - > Firms need to compete by developing focused information revelation strategies and appropriately pricing their product.

“Before, companies guarded and filtered information, now, we are all naked.”

Eugene Polistuk, Former CEO Celestica

4/2/2008

An Illustrative Example

4/2/2008

Orbitz

Hotwire

Search Results for Minneapolis, MN to Atlanta, GA

Depart: Mon, Nov 17, 2003
MSP Minneapolis/Saint Paul Intl. Airport

Return: Sat, Nov 22, 2003
ATL Atlanta Hartsfield Intl.

Stops: Nonstop or 1 connection

Round-trip ticket: **\$176**
Booking fee per ticket: **\$181**
Total cost per ticket: **\$181**

Search Expires at 2:51PM PDT on 10/18/03 - Ref No. 8650404272

Priceline

4/2/2008

Hotwire: Airline Tickets, Hotel Reservations, Car Rentals - Discount Travel Deals, Last-Minute Travel Tool! - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www.hotwire.com/air/results.jsp?lid=air/searching.jsp;search:loc:0:search

rediff Cricket rediff Movies CNN CNN/Money Crinfo Live Cricket Stream... >>> Simply Kool <<<

Firefox prevented this site from opening a popup window. Click here for options...

DVD rentals delivered to you
Only \$9.99 a month [Click here](#)

Welcome - Have an account? [Sign in](#) [My Trips](#) | [My Account](#) | [Customer Care](#)

Home Flights Hotels Car Rentals Packages Cruises Deals & Destinations

Minneapolis, MN (MSP) to Hartford, CT (BDL)
Prices below include all taxes and fees, and are quoted in US dollars. Prices not guaranteed until booked.

Need exact flight times or a specific airline? [Find Regular Fares from \\$560](#)

\$369 roundtrip per person Clearance Fare

Any time of day outbound departure Minneapolis (MSP) to Hartford (BDL)
Fri, Jan 27 not a red-eye Hotwire Airline Supplier
0 - 1 Stops

Any time of day return departure Hartford (BDL) to Minneapolis (MSP)
Sat, Jan 28 not a red-eye Hotwire Airline Supplier
0 - 1 Stops

[Continue >](#)

\$560 roundtrip per person Regular Fare

Regular Fares offer exact flight times and airline names. [View regular fares](#)

Change your search

Departing: MSP - Minneapolis 01/27/06

Returning: BDL - Hartford 01/28/06

Tickets: 1

[Search again](#)

Start a new search

Shopping Tips

- Leave a week later (02/03/06 - 02/04/06)

Need exact flight times?

Done

priceline.com

DEPARTURE: Friday, January 27, 2008
 RETURN: Saturday, January 28, 2008
 Minneapolis, MN (MSP) → Hartford, CT (BDL)

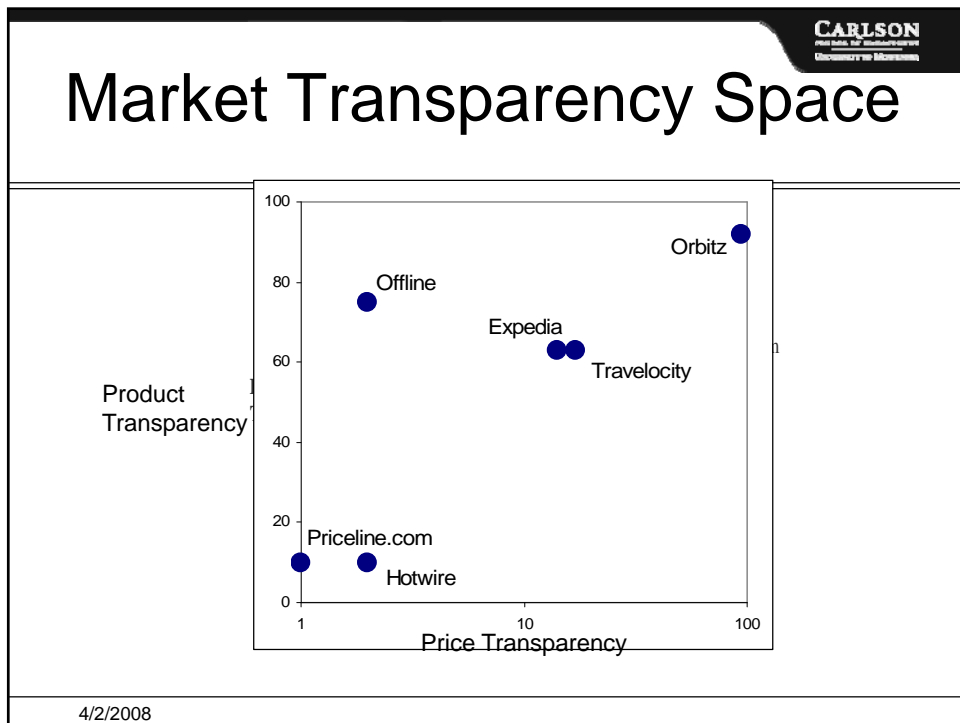
Best Deal: Name Your Own Price

Lowest Price Flights	from \$557	from \$557	from \$540	from \$574	from \$735	from \$1,251	from \$1,273
Non-Stop Flights	There are no non-stop flights available that match your search.						

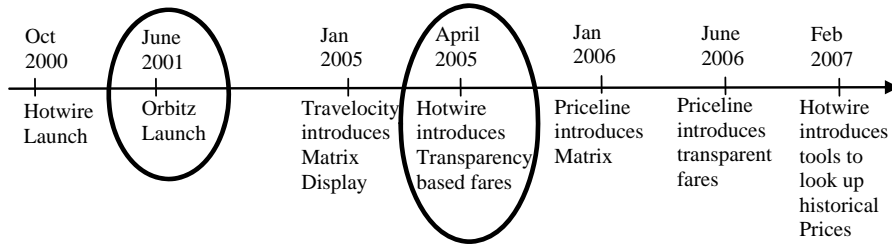
ORBITZ MATRIX DISPLAY

Deeper Discounts: Below-published fares, even last minute. Be flexible, save more.

Stops	Price	American Airlines	Multiple Carriers	US Airways	United Airlines	Northwest Airlines	Midwest Airlines	Continental Airlines	Delta Air Lines
Non-stop						\$1,238 total \$1,265			
1 stop	\$462 total \$510	\$462 total \$510	\$598 total \$645	\$740 total \$788	\$1,233 total \$1,271	\$1,136 total \$1,181	\$1,182 total \$1,227	\$1,193 total \$1,234	
2+ stops					\$979 total \$1,025				



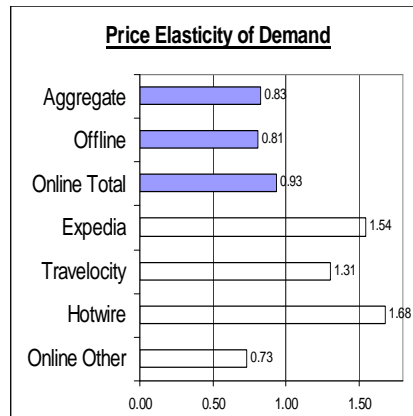
Timeline



4/2/2008

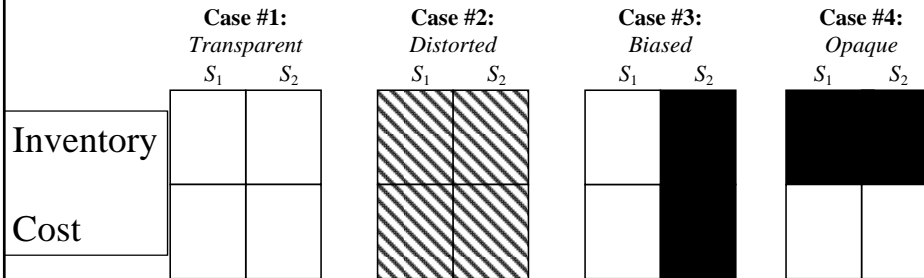
Effect of Transparency

- > Combined booking data and ticketed price data for 2.15 MM tickets.
 - > 46 Origin/Destinations
 - > Economy class
 - > Offline and online agencies
 - > 1 year period: 09/2003-08/2004



4/2/2008

Market Transparency Strategy



Information revelation to consumers, competitors, intermediaries, suppliers

4/2/2008

Consumable Information, Complex Mechanisms and User Behavior

4/2/2008

FCC Auctions

- > In March 2008, FCC auctioned 700 MHz band which currently carries on-air television broadcasts; this band will be freed up after February 17, 2009 when all broadcasts will become digital.
- > Verizon and AT&T won most of the auctions.
- > These auctions were for various bands (frequencies) and geographical locations.
- > The process took several auctions; in a given auction, several frequencies over several territories were sold together.
- > Such auctions are called Combinatorial Auctions.

4/2/2008

Transparency in Complex Trading Mechanisms

- > Combinatorial Auctions
 - > Multiple items (goods) or units are auctioned simultaneously
 - > Bids on item combinations are allowed, e.g.,
 - \$400 on (TV, DVD player, speaker set)
 - > Motivation: complementarity and substitutability
 - Complimentarity -- Such as TV and DVD Player
 - Substitutability – A portable TV v/s DVD player

4/2/2008

Original Motivation

- > PQT Auctions – iterative multi-unit, no partial fulfillment auctions
 - > Bidder bewilderment
 - “I wasn’t in the winner list but ultimately I won without changing my bid...”
 - “What new bid do I place for x units? I bid higher than the highest winning bid but still wasn’t included in the winner’s list...”

4/2/2008

Practical applications

- > FCC spectrum auctions (McAfee and McMillan 1996; Banks et al. 2003)
- > Rights to use railroad tracks (Brewer & Plott 1996)
- > Delivery routes (Caplice 1996, Sandholm 2000)
- > Airport time slots (Rassenti et al. 1982)
- > Procurement of school meals (Epstein et al. 2002)

4/2/2008

Complexity of combinatorial auctions

- > Challenges:
 - > The number of possible packages increases exponentially with number of items
 - Winner determination is NP-hard
 - Participation is cognitively complex
- > Earlier solutions
 - > Discrete bidding rounds with rules and restrictions

4/2/2008

An Example

- > Auction set: { A, B, C, D }
- > Bids:

1. \$50 on { A }	WIN: \$50 (1)
2. \$70 on { A, B }	WIN: \$70 (2)
3. \$80 on { B, C }	WIN: \$130 (1, 3)
4. \$65 on { C, D }	WIN: \$135 (2, 4)
5. \$10 on { D }	WIN: \$140 (1, 3, 5)
6. \$30 on { B }	WIN: \$145 (1, 4, 6)

4/2/2008

Our Focus: Bidder Support

- > Questions:
 - > Is my bid *currently* winning?
 - > Is it *possible* for my bid to win?
 - > I want to bid on itemset *X*. How much should I bid to be among the currently winning bids?
 - > Which bids are winning right now?
- > Facilitate: combinatorial auctions on eBay

4/2/2008

Our Approach

Google it!

- > Analysis of problem complexity revealed that if solutions could be maintained then change in solution due to a new bid can be computed in real-time.
- > Designed and mathematically defined some fundamental concepts such as *dead & live* bids, and *sub auctions*.
 (Adomavicius and Gupta, *ISR* 2005)

4/2/2008

Level of Transparency

- > What is appropriate level of transparency that
 - > Provides high efficiency
 - To create higher societal wealth
 - > Is fair
 - To create incentives for adoption

4/2/2008

Real-time Bidder Support Infrastructure – Outcome Feedback

- > Based on bid classification scheme developed in

The screenshot shows a bidding interface with the following elements:

- Elapsed Time:** 00:01:11 (hh:mm:ss)
- Time since last bid:** 00:00:13 (hh:mm:ss)
- Refresh** button
- Select lots:**
 - A \$50.00
 - B \$100.00
 - C \$50.00
 - D \$25.00
 - E \$12.50
 - F \$25.00
- Your valuation:** \$165.00
- Specify your bid (\$):** (no decimals)
- Submit Bid** button
- Bid History (Reverse chronological):**

Bid No.	Bid Set	Bid Amount	Bid Time
6.	A	\$75.00	00:00:57
5.	BC	\$80.00	00:00:48
4.	ABC	\$140.00	00:00:42
3.	BC	\$80.00	00:00:32
2.	C	\$50.00	00:00:19
1.	AB	\$100.00	00:00:10

Additional text in the interface: "The winning bids are in bold red" and "(The highlighted bids are yours)".

4.	[BC; \$15]	<i>Live and Winning</i>
5.	[AB; \$13]	<i>Live but not Winning</i>

4/2/2008

Real-time Bidder Support Infrastructure - Process Feedback

Elapsed Time: 00:01:44 (hh:mm:ss) Time since last bid: 00:00:09 (hh:mm:ss) Refresh

Select lots:

A \$50.00

B \$100.00

C \$50.00

D \$25.00

E \$12.50

F \$25.00

Your valuation: \$50.00

Specify your bid (\$): (no decimals) Submit Bid

To at least stand a chance of winning, bid: \$51.00

To be currently winning, bid: \$56.00

The winning bids are in bold red

(The highlighted bids are yours)

Bid History (Reverse chronological)

Bid No.	Bid Set	Bid Amount	Bid Time
6.	A	\$75.00	00:01:35
3.	BC	\$80.00	00:00:42
2.	C	\$50.00	00:00:29
1.	AB	\$100.00	00:00:14

b. [AB; \$13] *Live but not Winning*

4/2/2008

Effect of Transparency

- > Overall Economic Impact
 - > Transparency increases efficiency (or reduces waste) thereby increasing the overall wealth created by the transaction.
- > Participant Benefits
 - > Auctioneer Benefit
 - Larger with partial transparency
 - > Bidder Benefits
 - Larger with complete transparency
- > Bidder Behavior
 - > Much more closer to typical auctions with complete feedback
 - > More strategic behavior with partial transparency

4/2/2008

Likelihood of Acceptance

	Level 1	Level 2	Level 3
Promoters	25%	41%	54%
Detractors	19%	13%	6%
NPS	6 points	28 points	48 points

4/2/2008

Final Word

- > Design of customer-oriented systems need to take economic impact into account
- > By understanding its users and controlling the transparency of appropriate information, systems can
 - > Provide control over the process/economic activity
 - > Control/provision of incentives
- > Transparency needs to be explicitly considered in system design
 - > Not just provision of data but provision of 'useful data'
 - > Need to understand user behavior

4/2/2008



Thank You!