



Monetizing Information: Competition in Online Markets

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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

Rationale Belief...

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

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%

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)

Is Price the Most Important Factor?

FEATURES BRINGING SHOPPERS BACK TO A WEB SITE

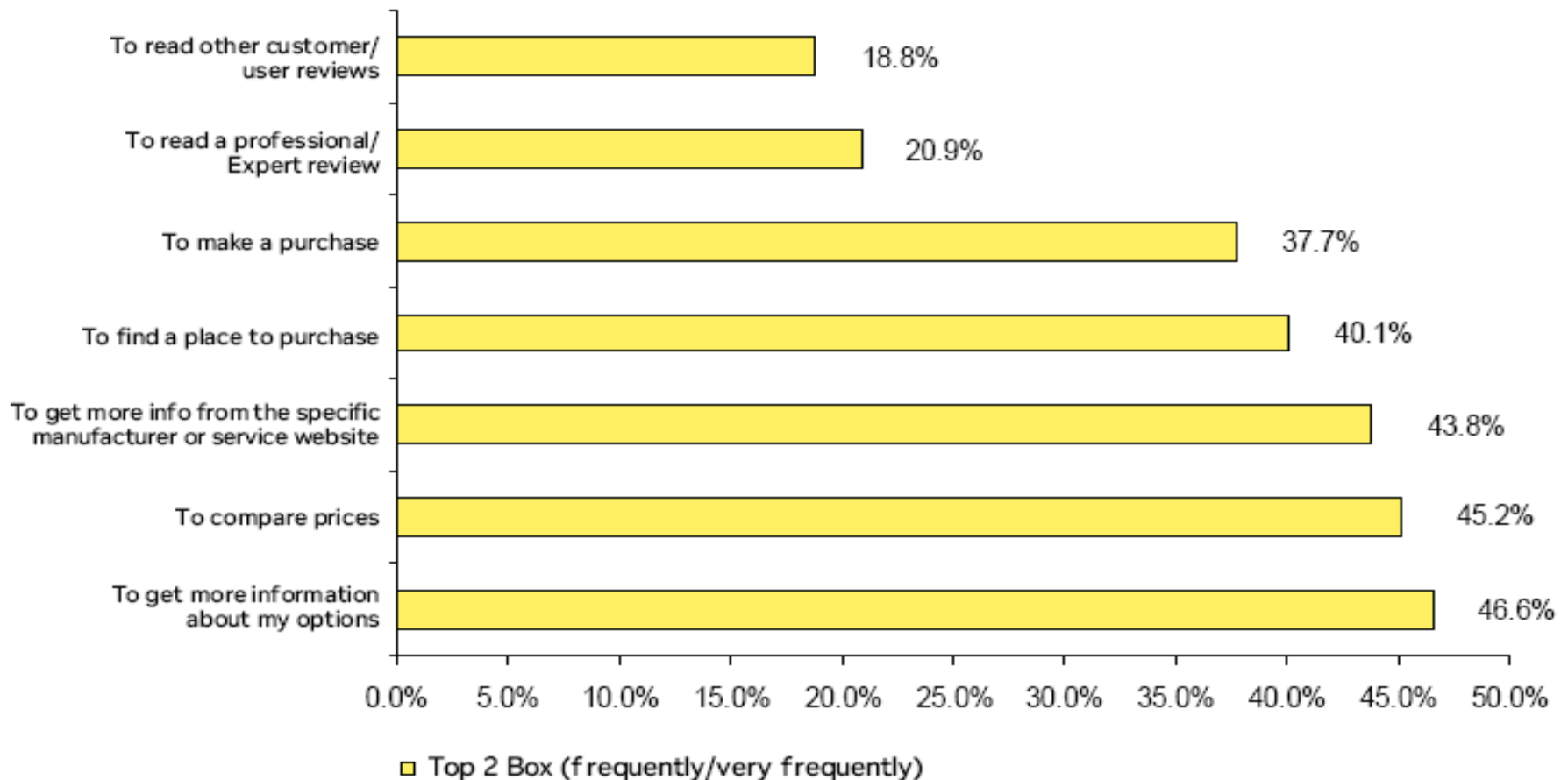
	top box		top-2 boxes
Free/Flat Shipping	66%	Free/Flat Shipping	92%
Privacy Policies/Guar	60%	Privacy Policies/Guar	83%
Order Tracking	56%	Order Tracking	88%
Rebates/Coupons	43%	Rebates/Coupons	76%
Online Outlet	39%	Online Outlet	75%
Customer Reviews	37%	Customer Reviews	74%
Comparison Capabilities	30%	Comparison Capabilities	73%
Price/Product Alerts	30%	Price/Product Alerts	63%
Live Help	30%	Live Help	58%

Fulfillment Process

Product Information

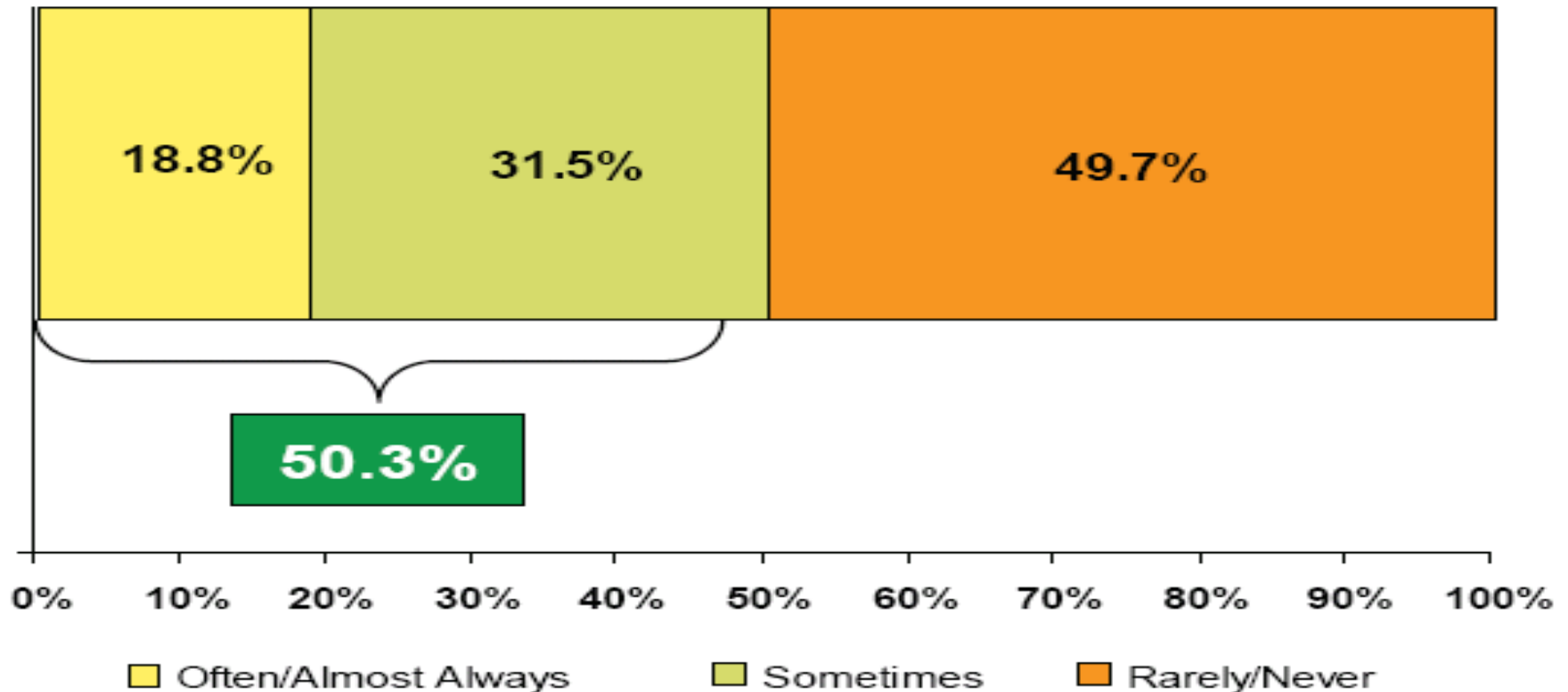
Small Business Patterns

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)



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?



Competing with Information!

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

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

An Illustrative Example

Orbitz

Hotwire

Address: http://www.orbitz.com/App/FlightSearchResults

ORBITZ home flights hotels cars cruises vacations deals customer care TRAVEL WATCH MY STUFF REWARDS REGISTER SIGN IN HELP

ORBITZ **MATRIX** DISPLAY

Fri, Aug 22 anytime New York (All Locations), NY (NYC) + 50 miles
San Francisco (All Locations), CA (SFO)

Thu, Sep 4 anytime San Francisco (All Locations), CA + 50 miles
(SFO)

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SELECT STOPS	American Airlines	United Airlines	Northwest Airlines	Continental Airlines	Multiple Carriers	American Trans Air	Delta Air Lines	Frontier Airlines	US Airways	America West
0	\$321+	\$301+	\$301+	\$301+		\$361+				
1	\$255+ see below	\$266+	\$299+	\$301+	\$307+	\$312+	\$316+	\$319+	\$329+	\$334+
2+					\$647+					

Fares are per person, using e-tickets, and include all taxes and fees. Some itineraries require paper tickets with an additional charge.

Lowest fare above beats this trip's industry average by \$92

list flights by: lowest price departure times shortest flights

PRICE (USD)	AIRLINE	TIMES	FROM (airport codes)	TO (airport codes)	STOPS
SELECT Web Fare \$255	American Airlines 1295	8:25a-11:03a plane change 12:09p-1:42p	New York (JFK) Dallas/Fort Worth (DFW)	Dallas/Fort Worth (DFW) Oakland (OAK) total duration: 8h 17min	1
SELECT \$328 per person	American Airlines 15	11:00a-1:52p	New York (JFK)	San Francisco (SFO) St Louis (STL) total duration: 5h 52min	0
SELECT \$328 per person	American Airlines 2874	12:55a-6:36a plane change 7:40a-11:07a	San Francisco (SFO) St Louis (STL)	Newark (EWR) total duration: 7h 12min	1
SELECT \$328 per person	American Airlines 15	11:00a-1:52p	New York (JFK)	San Francisco (SFO) St Louis (STL) total duration: 5h 52min	0
SELECT Web Fare \$434 per person	American Airlines 3158	10:05a-3:52p plane change 4:40p-8:09p	San Francisco (SFO) St Louis (STL)	Newark (EWR) total duration: 7h 4min	1
SELECT Web Fare \$457 per person	American Airlines 15	11:00a-1:52p	New York (JFK)	San Francisco (SFO) Chicago (ORD) total duration: 5h 52min	0
SELECT Web Fare \$457 per person	American Airlines 1548	6:11a-12:12p plane change 1:00p-4:14p	San Francisco (SFO) Chicago (ORD)	New York (LGA) total duration: 7h 3min	1
SELECT Web Fare \$457 per person	American Airlines 370	1:00p-4:14p	New York (LGA)	San Francisco (SFO) total duration: 8h 28min	1
SELECT Web Fare \$457 per person	American Airlines 3111	6:00a-11:28a	New York (LGA)	San Francisco (SFO) total duration: 8h 28min	1
SELECT Web Fare \$457 per person	American Airlines 16	12:25p-8:53p	San Francisco (SFO)	New York (JFK) total duration: 5h 28min	0

American Airlines flight with 1 stop or less (28 flights out of 233 total)

[See all 233 flights](#) [change search](#) [return to top of page](#)

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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 tickets: **\$176**
booking fee per ticket: + \$5

Total cost per ticket: \$181

[CONTINUE](#)

IMPORTANT: Your flight times and airline name will be shown only after your purchase is complete.

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

Priceline

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Airfare First Time Users

Please Review Your Request

Depart: Mon, November 17, 2003
Return: Sat, November 22, 2003

Departing Airport: Minneapolis St Paul Intl (MSP)
Arrival Airport: Atlanta - Hartsfield Intl (ATL)

Flight Times: The airlines will choose your flight times. Your trip will start between **6 a.m. and 10 p.m.**, and you will arrive no later than 12:30 a.m. the next day.

Passengers: Rob Kauffman

Connections: Maximum of **1 connection** each way. (layovers will be no longer than 3 hours)

Aircraft: Jet aircraft
Delivery: Electronic Ticket

Offer Price:	\$130.00 (per ticket)
Applicable Taxes:	\$40.00 (per ticket)
Ticket Cost:	\$170.00 (per ticket)
Processing Fee:	\$6.95 (per ticket)
Subtotal:	\$176.95 (per ticket)
Number of Tickets:	1
Total Charges:	\$176.95

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Prices below include all taxes and fees, and are quoted in US dollars. Prices not guaranteed until booked.

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\$369 roundtrip per person

[Clearance Fare](#)

Any time of day outbound departure
Fri, Jan 27
not a red-eye

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Any time of day return departure
Sat, Jan 28
not a red-eye

Hartford (BDL) to
Minneapolis (MSP)
[0 - 1 Stops](#)

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\$560 roundtrip per person

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MSP - Minneapolis

01/27/06

Returning:

BDL - Hartford

01/28/06

Tickets

1

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Shopping Tips

- ◆ [Leave a week later](#)
(02/03/06 - 02/04/06)

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Airfare

DEPARTURE » Friday, January 27, 2006
Minneapolis, MN (MSP) → Hartford, CT (BDL)

RETURN » Saturday, January 28, 2006
Hartford, CT (BDL) → Minneapolis, MN (MSP)

MODIFY SEARCH

BEST DEAL Name Your Own Price®	All Airlines	American Airlines	US Airways	United Airlines	Midwest Airlines	Delta Airlines	Continental Airlines
	Lowest Price Flights	from \$557	from \$557	from \$640	from \$674	from \$795	from \$1231
Non-Stop Flights	There are no non-stop flights available that match your search.						
DEEP DISCOUNTS Name Your Own Price®	Save up to 40% when you Name Your Own Price® for your trip.						START HERE

Prices are for e-tickets and include taxes and fees. Extra fees* apply for paper tickets.

Showing 1-6 of 6 Airlines

Choose Your Departing Flight (You'll choose a return flight on next page)

Results » 1-20 | 21-36

Now Viewing:

Outbound Flights

Sort By » Price Trip Duration Departure Time Arrival Time

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Nearby airports
from total \$744

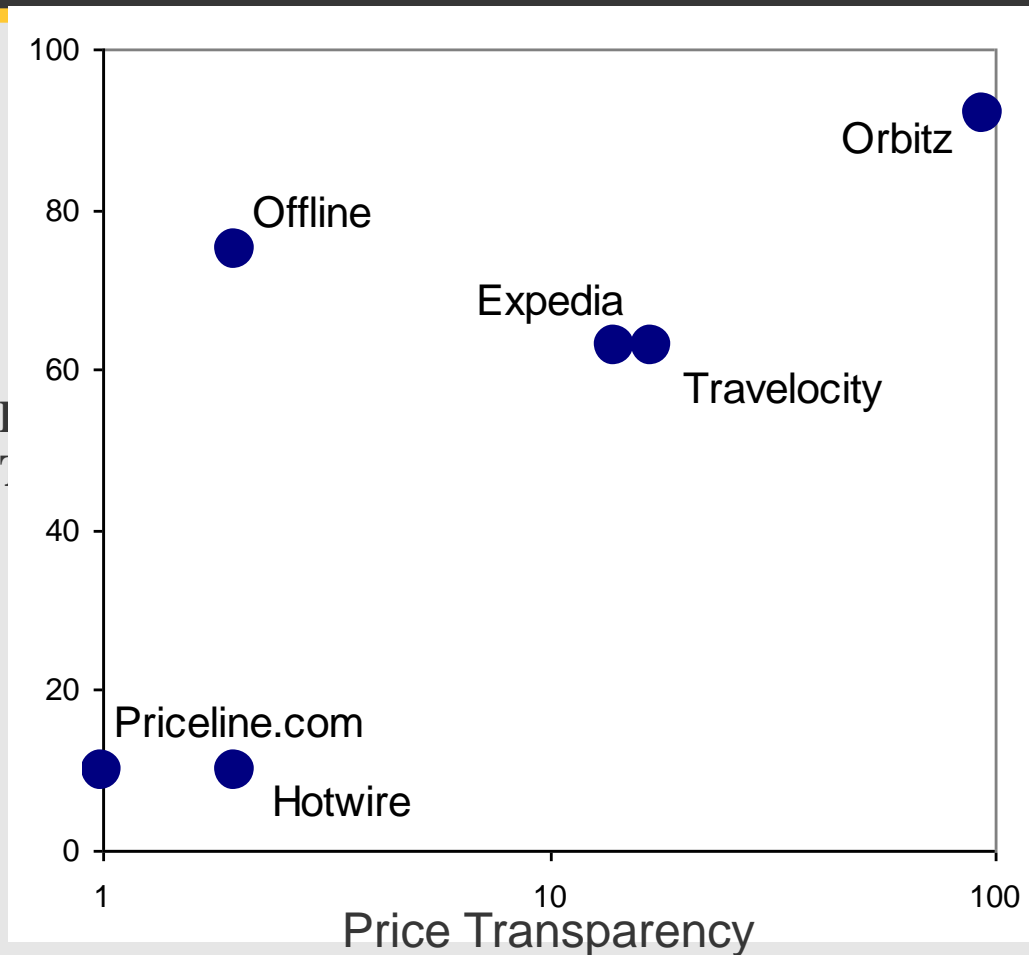
Stops	American Airlines	Multiple Carriers	US Airways	United Airlines	Northwest Airlines	Midwest Airlines	Continental Airlines	Delta Air Lines
Non-stop					\$1,238 total \$1,265			
1 stop	\$462 total \$510	\$462 total \$510	\$598 total \$643	\$740 total \$788	\$1,233 total \$1,271	\$1,136 total \$1,181	\$1,182 total \$1,227	\$1,193 total \$1,234
2+ stops					\$979 total \$1,026			

Fares are per person in US dollars, using e-tickets. Total fare includes all taxes and fees.

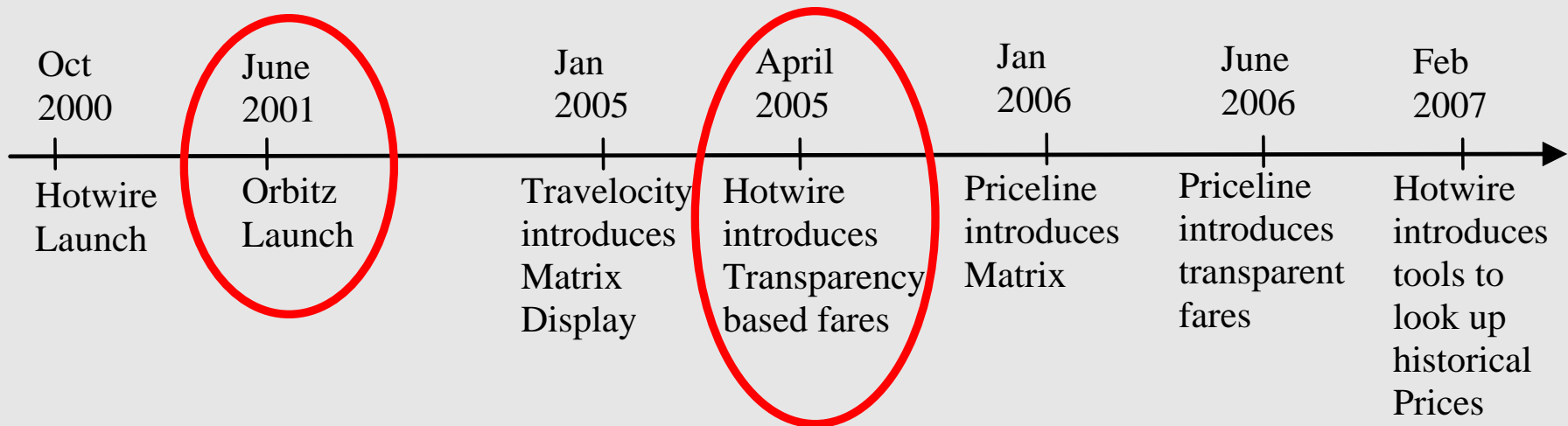
Some itineraries require paper tickets with an additional charge. Changes after purchase are subject to change fees.

Market Transparency Space

Product
Transparency

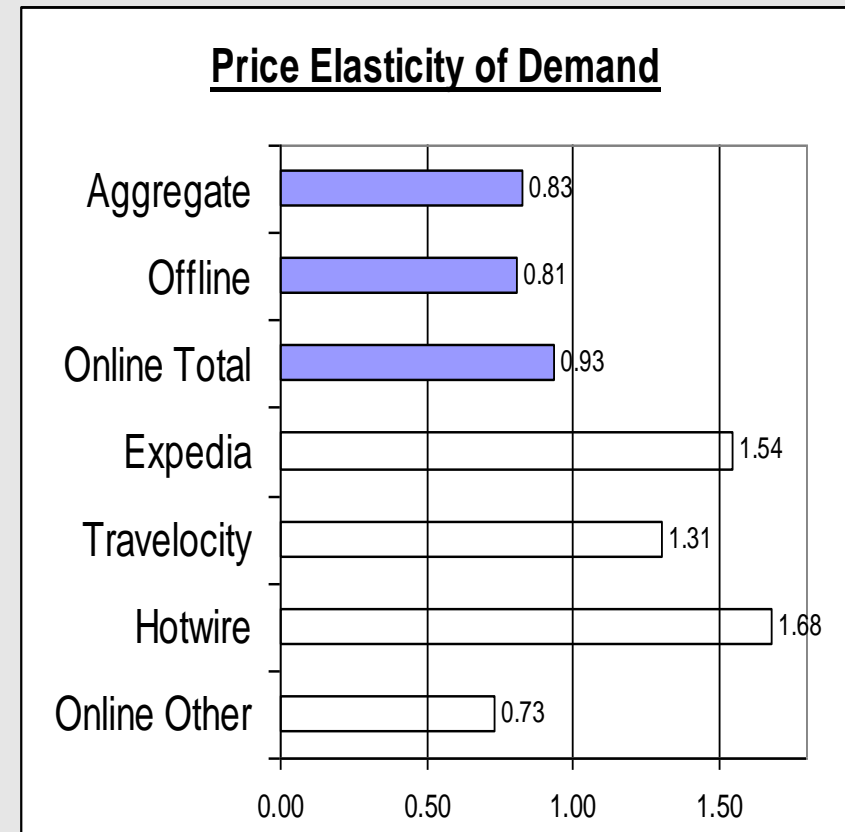


Timeline

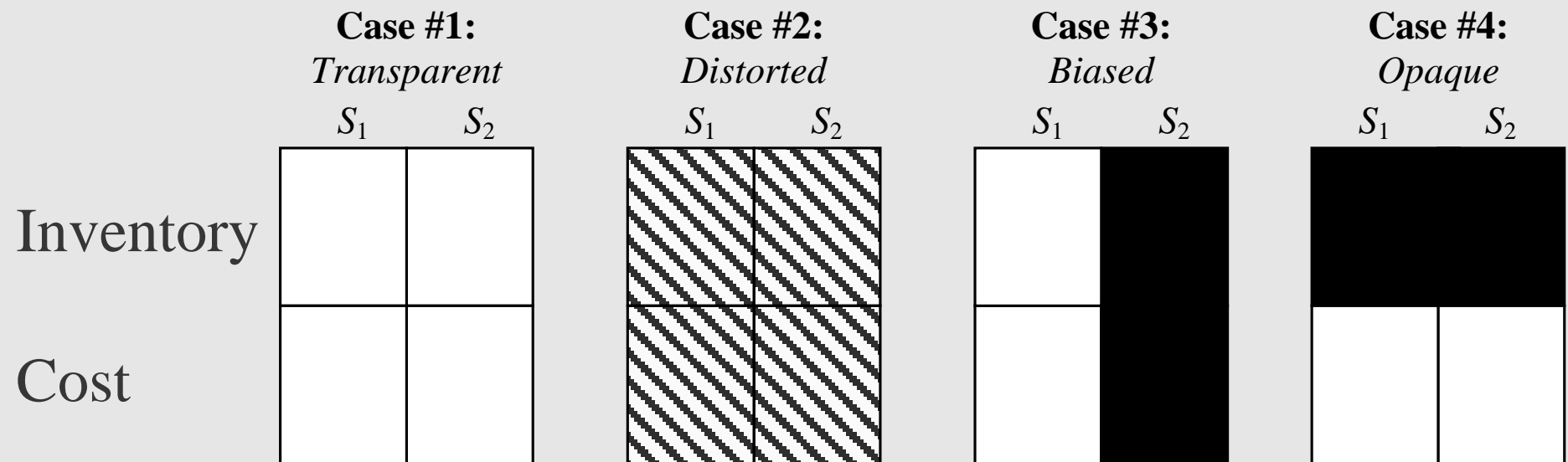


Effect of Transparency

- > 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



Market Transparency Strategy



Information revelation to consumers, competitors, intermediaries, suppliers

Consumable Information, Complex Mechanisms and User Behavior

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.

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

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...”

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)

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

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) |

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

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)

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

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):**

The winning bids are in bold red. (The highlighted bids are yours)

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

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

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

B \$100.00

Your valuation:

C \$50.00

D \$25.00

E \$12.50

F \$25.00

To at least stand a chance of winning, bid:

To be currently winning, bid:

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

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

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

Likelihood of Acceptance

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

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



Thank You!