Internet Auctions: 
Game Theory and (Ir)rational Behavior

ORFE 401: eCommerce
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Rob Hill

- Class of '84 Management Systems, ORFE-equivalent
- Played on the Pro Squash Tour from 1985 to 1992
- Moved to telecom software and services sales
- Based in Madrid from 1999-2012
- Moved back to Denver in July 2012
- *Still* play lots of sports

- Focus and Love: BIG deals and sports

"Where your pleasure is, there is your treasure; where your treasure is, there is your heart; where your heart is, there is your happiness."

Saint Augustine
Agenda

• **Types of Auctions**
• **History of Internet Auctions (beyond eBay)**
  – FCC and European Wireless Auctions in the 1990
  – FCC Unused Television Spectrum Auctions March 2008
• **Rational Thinking, Irrational Behaviors...**
  • Spectrum Auctions
  • Home Sale Auction
  • Key Elements of a Successful Auction
• **Auctions in the B2B Environment**
  – A New Landscape for Vendors, Purchasing & Senior Management
  – Telecom Italia DSL Equipment Auction
  – Telefónica Revenue Assurance Project Auction
  – Games people play....
    • Changing the rules, cutting the cake differently
    • Weighted auctions: Telefónica Morocco Wireless Network
  – Does the lowest/highest price deliver the best value?
• **What about a “bad deal”? : Cerberus example**
• **Discussion**
Types of Auctions
Types of Auctions

• **Sealed Bid—one opportunity**
  – Do not optimize the process, but are fair unless collusion exists

• **Second Price Auction**
  • In a second price auction, the winner is the player with the highest bid and the price he pays is the second highest bid (eBay timed)

• **Interactive Auctions**
  – **First Price Auction**
    • The winner of the auction is a player with highest valuation (classic)
  – **“Timing” of Auctions**
    • Finish at a predetermined time
    • Finish “x” minutes after the highest bid
    • Have an initial qualification stage and then are timed

• **Dutch Auctions**
  – The final price is the highest value paid by all participants to exhaust the supply (Google IPO)

**Internet Auctions create the opportunity for more participants, more information, more pressure on bidders, and thus (IN THEORY) higher returns/value**
History of Internet Auctions (beyond eBay)
FCC Wireless Auctions in the 1990s

Previously, licenses were awarded:

• **By grant**
  – Main phone companies (Baby Bells, landline) got a license by default
  – Requirements for network build-out had loopholes

• **By lotteries**
  – U.S. Government gained little
  – Many licenses sold and resold, making fortunes for the lucky few
  – Performance was a secondary requirement for qualification

Then the U.S. Congress got involved…

– Auctions seen as the most equitable manner to allocate spectrum
– Game theory experts hired to maximize revenue

• **End results very positive**
  – Multiple rounds for bidding increased values
  – Back-end “delivery” requirements assured that the bidders were serious
  – More competition/carriers introduced to the marketplace
  – Big money paid to the U.S. Government for these licenses
3G Wireless Auctions in Europe in the 1990s

• U.S. spectrum auctions used as a template
• Late 1990s dot.com and telecom hysteria was RAMPANT
  – 3G was touted as the next revolution after PCs
  – European carriers were starting to branch out of their home countries
  – Stock valuations were highly inflated
• Perfect conditions for a seller
  – Limited quantity
  – Many buyers
  – Lots of cash
  – “Irrational exuberance”
• Expansive mentalities
  – “What will it cost me to expand my marketplace by xx million customers? For sure I can obtain synergies of scale…”
  – “I cannot lose this opportunity!”
• Defensive mentalities
  – “I need this technology to support my existing xx million customers. We must retain our customer base with this key technology.”
  – “I cannot lose this opportunity!”
3G Wireless Auctions in Europe in the 1990s (continued)

• Results were spectacular: over $100 BILLION raised
  – U.K. netted $35 billion (€650/person)
  – >13 bidders: 4 incumbents plus 9 new entrants
  – Germany raised $49 billion (€615/person)
  – Italy netted $14 billion (€240/person)
  – Total value of auctions was 1.5% of the European GDP
  – France and Spain awarded licenses based on merit

• But, then the bills came due…
3G Wireless Auctions in Europe in the 1990s (continued)

• But, then the bills came due…
  – The technology was immature; the network build-outs were very slow
  – Consumer uptake limited
  – The dot.com BUST hit

• In two years a total of $770 Billion of shareholder value evaporated in the European telcos
  – Not all of this was due to the 3G licenses, but the amount of debt acquired by telcos increased dramatically
  – Many carriers returned licenses, took HUGE write-offs
  – Some carriers had such high debt they sold or spun off their wireless businesses
  – Most deployments were delayed and geographic coverage greatly reduced
### FCC Unused Television Spectrum Auctions March 2008

**Auction 73**

<table>
<thead>
<tr>
<th>Auction Description</th>
<th>700 MHz Band</th>
</tr>
</thead>
</table>
| Dates               | Opened: 01/24/2008  
|                     | Closed: 03/18/2008 |

<table>
<thead>
<tr>
<th>Licenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,099 licenses: 352 Economic Area (EA) licenses, 734 Cellular Market Area (CMA) licenses, 12 Regional Economic Area Grouping (REAG) licenses with package bidding, and 1 nationwide license</td>
</tr>
</tbody>
</table>

| Qualified Bidders | 214 |

**Key Dates**

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Seminar</td>
<td>11/20/2007</td>
</tr>
<tr>
<td>Application Deadline</td>
<td>12/03/2007</td>
</tr>
<tr>
<td>Upfront Payment Deadline</td>
<td>01/04/2006</td>
</tr>
<tr>
<td>Auction Start</td>
<td>01/24/2008</td>
</tr>
<tr>
<td>Auction Close</td>
<td>03/18/2008</td>
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</tbody>
</table>

**Other Information**

- Announcements
- Auction 73 Web Page
- Auction 73 Releases
- Auction 73 Fact Sheet

**Round 261**

<table>
<thead>
<tr>
<th>Rounds Completed</th>
<th>261</th>
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</thead>
<tbody>
<tr>
<td>Bidding Days</td>
<td>38</td>
</tr>
<tr>
<td>Total PWB Amount</td>
<td>$19,592,420,000</td>
</tr>
<tr>
<td>Net Total PWB Amount</td>
<td>$19,429,624,150</td>
</tr>
<tr>
<td>Winning Bidders</td>
<td>101</td>
</tr>
<tr>
<td>Licenses with PWBs</td>
<td>1091</td>
</tr>
<tr>
<td>Number of PWBs</td>
<td>1090</td>
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</tbody>
</table>
“4G: The results are in” BBC Article

“The prize was, in theory, extremely valuable - the spectrum needed to bring fast new mobile phone services to customers across the UK. But at the end of a complex bidding process, the 4G auction has raised £2.34bn - about a 10th of the price paid at the 3G sale 13 years ago at the height of the dotcom bubble. It's also more than £1bn short of what the chancellor estimated in his autumn statement.”

Conclusion:

“Even if the Treasury is disappointed, the auction may be good news for the 4G rollout. We can now expect plenty of competition to offer fast new mobile services across the UK. But those people in 3G "notspots" will be hoping that this time they will not be left out of the faster future.”
Rational Thinking, Irrational Behaviors
Spectrum Auctions

• **Expansive (expensive) mentalities**
  – “I have a lot of money, I have a budget, BUT… I cannot lose this opportunity!”

• **Defensive (destructive) mentalities (BT in the U.K.)**
  – “I have a customer base, I have many customers AND… I cannot lose this opportunity!”

• **Predatory mentalities (Telefónica and the U.K)**
  – Bid up the prices with no intention of buying the licenses AND Lose today, win tomorrow!

• **Shortened response times induce less than optimal seller behavior**
  – Emotions take over
  – Time to reason reduced
  – Desire to “win” overshadows rational decision process
Home Sale Auction

• House listed at $195,000, far in excess of realtor’s recommended list price
• Within three days:
  – Multiple offers, each with different constraints/contingencies
    • Each contingency created uncertainty for the sale
  – All offers were above the $195,000 list price
• Decision: Have an Auction!
  – Buyers given 2 days for “final” sealed bids
  – All confidentiality clauses rescinded
  – Result: 3 bids at ~$208,000, but all with contingencies
• Phase 2: Better rules!
  – No contingencies
  – Closing within 45 days
  – $10,000 non-refundable deposit payable immediately
  – All previous bid values were shared with each of the final bidders
  – Final bids due in 4 hours
• Result: $213,000 price
  – We closed 20 days later
Key Elements of a SUCCESSFUL Auction

- Clear Vision of Desired Outcome
- “Perfect” Information Between All Parties
- Transparent and Consistent Rules
- More Participants = Higher Returns

Many “well-designed” auctions have produced contrary results
Auctions in the B2B Environment
A New Landscape for Vendors, Purchasing & Sr. Management

• **Auctions Give Power to Purchasing Departments**
  – Collusion avoided
  – New vendors and technologies are fast-tracked
  – Preferred vendors’ personal relationships significantly diminished
  – The end negotiation is transparent

• **Auctions Require Senior Managers to Take Risks**
  – New vendors, new approaches to services,
  – AND the burden of operation is on the end users, not on Purchasing

• **Internet Auctions are *even more powerful***
  – Represent up to 90% of some large companies’ purchases
  – Via Internet speeds the process
  – Short time intervals accelerate the behavior changes
  – Seek to commoditize absolutely every element of the companies’ expenditures
  – Growing rapidly as more corporations trial and accept

*Internet Auctions are a very DISRUPTIVE TECHNOLOGY*
Telecom Italia DSL Equipment Purchase Auction

• Two current vendors were believed to be colluding...

• Telecom Italia qualified 4 vendors in total
  – 2 existing vendors, 2 new vendors
  – Very tightly defined criteria for delivery, performance and KPIs
  – Purchase of basic DSL equipment for 600,000 lines

• Format of the auction
  – The price per line increased €0.25 every minute
  – The first vendor to touch the low price won the deal

• Results:
  – A new vendor was chosen
  – Pricing was ~30% less than previous offers
  – The new vendor went on to sell an additional 2,000,000 lines
  – Telecom Italia used this for another network technology and saved 35% per unit with the same auction process
Descending Price Auctions

Even WORSE for the Seller
Telefónica Revenue Assurance Auction

• A three year, $10+ million contract with multiple sellers
• Buyer had “low-budget” commodity mentality
  – AND had a wide range of bids from vendors
  – They really didn’t know what the lowest price could be
• Auction Tactics
  – Clearly define the rules and deliverables
  – Use modified auction to maximize value to Telefónica
• First Price “hinge”
  – Set a “reasonable” 1\textsuperscript{st} price
  – If a vendor takes it, offer it to other vendors
  – If one or more vendors match 1\textsuperscript{st} price, then go DOWN
  – BUT
  – If no one takes 1\textsuperscript{st} Price, then go UP in price
  – First vendor to commit to the lowest price wins
• This creates both an interesting theoretical and operational challenge to the seller…
• Don’t bid the 1\textsuperscript{st} price, but JUMP on the 2\textsuperscript{nd} price!
Mixed Auction: The “Jaws” Squeeze Out Every Last Cent

Example: Telefónica Revenue Assurance Solution Auction

Lots of planning and thinking required!
Games People Play….

- **Changing the rules, cutting the cake differently**
  - First, total price
  - Then, price broken down by hardware, software, maintenance
  - Then, price per unit delivered
  - Then, price per unit per year, by year

- **Each time, the buyer exposes the underlying pricing structure and assumptions of the seller**

**RESULT:** further commoditization, higher value to buyer

But…you can sometimes beat the commoditization game, but it requires a willingness to lose

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<th>Total $</th>
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</table>
Games People Play: Weighted Auctions

- Designed to offer some advantage to preferred bidders
- Encourage more players or diversity of suppliers
- Offer a mix of optimal price and reward profile
  - (a different point on the buyer’s Pareto frontier compared to achieving absolute lowest price)
- **Seek** to assure that auction-induced behaviors continue to exist and will drive value

Example:
- **Telefónica Morocco Wireless Equipment Installation Auction**
  - Two bidders with strong recommendations from senior management and excellent history doing the same type of turnkey projects
  - Two other bidders who want to buy the business and offer references within the industry
  - Classic case of a Line Management vs. Purchasing Dept. conflict
Telefónica Morocco Wireless Equipment Installation Auction

<table>
<thead>
<tr>
<th>Minutes</th>
<th>Price $ Millions</th>
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<tbody>
<tr>
<td>2</td>
<td>$200</td>
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<tr>
<td>4</td>
<td>$220</td>
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<tr>
<td>6</td>
<td>$240</td>
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<td>8</td>
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<td>12</td>
<td>$300</td>
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<td>14</td>
<td>$320</td>
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<td>16</td>
<td></td>
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<td>18</td>
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</tbody>
</table>

- **New Entrant Bid**
- **Actual Bid Existing Provider**
- **Weighted Value Existing Provider**
Does the Lowest/Highest Price Deliver the Best Value?

• **Properly designed** auctions tend to deliver value
• The Internet accelerates the entire process
  – Number of Players
  – Decision times
  – Delivery times
  – Realization that you made a mistake
  – Correction time
• **Internet Auctions** continue to grow and will continue to grow in importance to corporations big and small

• **Both buyers and sellers** can benefit significantly if they:
  – Think ahead
  – Plan ahead
  – And, most importantly:

  **Stick to their plans!**
What About a “Bad Deal”?  
Cerberus Buying United Rentals

American private equity group with $30 Billion in assets  
Founded by Princetonians

$3 Billion American rental and storage company
Cerberus buying United Rentals

- Background: Year 2007. Cerberus private equity buying Chrysler, GMAC, on a ROLL. Unique business model from other private equity groups. Stock markets strong, economy strong. Cerberus looking for more acquisitions...
- Cerberus mentality: “United Rentals is a solid, cash flow generating company that is growing.”
- United Rentals mentality: “We will sell at the right price.”
- But...the stock market started to decay. Cerberus was starting to have troubles with several other investments. United Rentals grow had slowed rapidly in three months.

- The contract of sale, for a total of $7 billion, at $34.50 a share, contained two cancellation clauses:
  - “material adverse change” at the company (not the case, or hard to prove)
  - “$100 million maximum damages” for cancellation
Pros and Cons for Continuing (Cerberus view)

Pros
• Proceed with the deal, try to negotiate a lower price due to the market collapsing and United Rentals’ reduced value
• Avoid litigation
• Maintain Cerberus “image” and limit “embarrassment factor”

Cons
• Cash requirements from other portfolio companies
• Stock markets declining, signs of recession
• $100 million payment
• Damage to image
• Potential litigation issue
Decision and Aftermath

Result:
• Cerberus cancelled the contract
• United Rentals stock went from ~$32 to $23 immediately
• United sued, stating that there were “no materially adverse changes” in United’s business and that United had complied with all items in the sales agreement
• Cerberus countered stating that the only liability was a $100 million payment if the deal was cancelled
• Result: Cerberus position upheld by the courts

Aftermath: United Rentals stock today is $9.30. Cerberus is in a lot of financial trouble due to its large investments in Chrysler, GMAC and the global recession

Analysis: smart lawyers for Cerberus, “taking a tough decision,” too much optimism initially, things can change in three months…
Discussion
Sources for Further Reading…

- FCC Spectrum Auctions article, 1989 Heritage Foundation
- “The Wrong Culprit for Telecom Trouble”, Financial Times, Nov 26, 2002 article by Paul Klemperer
- “Auctions: Theory and Practice” by Paul Klemperer
- El País, Spanish newspaper article, October 2000, “Are Auctions Always the Best?”
- Paul Klemperer www.paulklempener.org or www.nuff.ox.ac.uk/economics/people/klemperer.htm
- Various articles and books by Barry Nalebuff, including “Co-opetition: A Revolution Mindset That Combines Competition and Cooperation… The Game Theory Strategy That's Changing the Game of Business”
- Games Chase the Global Fan, Cricket Auction, by John Mehaffey, March 2008
Sources for Further Reading…continued

• 4G: The Results are In, http://www.bbc.co.uk/news/technology-21517376 article on UK 4G Spectrum Auctions Feb 2013