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Lecture 14

Game Analytics

The Rise of Big Data

- Big data is changing game design
  - Can gather data form a huge number of players
  - Can use that data to inform future content

- **What can we do with all that data?**
  - What types of questions can we answer?
  - How does it affect our business model?

- **How do we collect all of this data?**
  - What are the technical challenges?
  - What are the legal/ethical challenges?

Game Analytics

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Game Analytics

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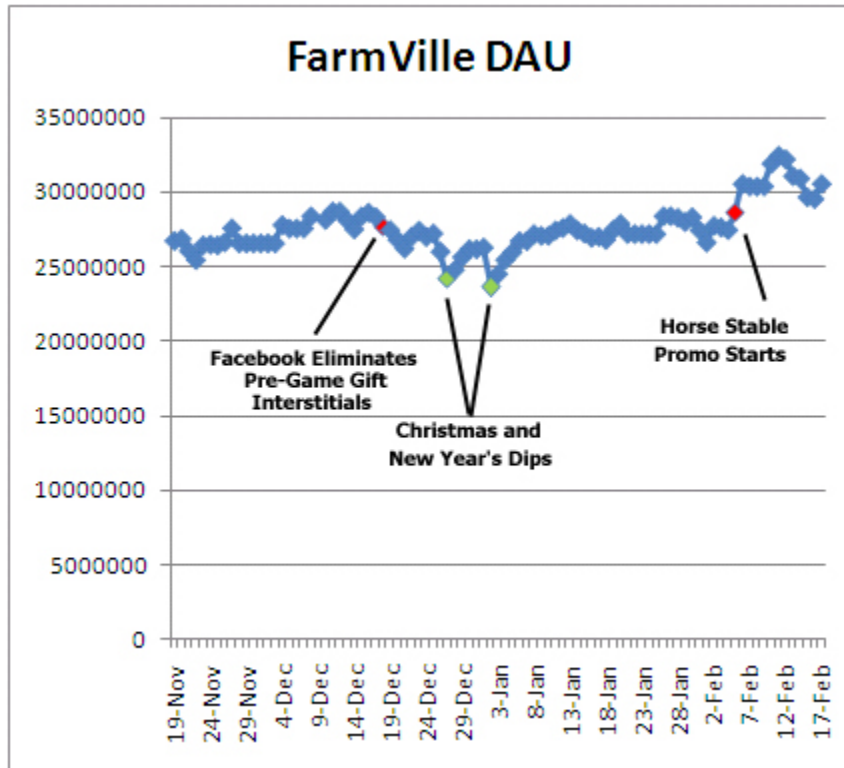at cornell university

The Role of Analytics

- Game development continues after you ship
  - Improvements to expand player base
  - Critical for DLC or in-game items

- Mixture of **business** and **game design**
  - How do you keep players playing the game?
  - What do they like? What makes them frustrated?
  - This is the new direction of game design

- Breaks down into **three categories**
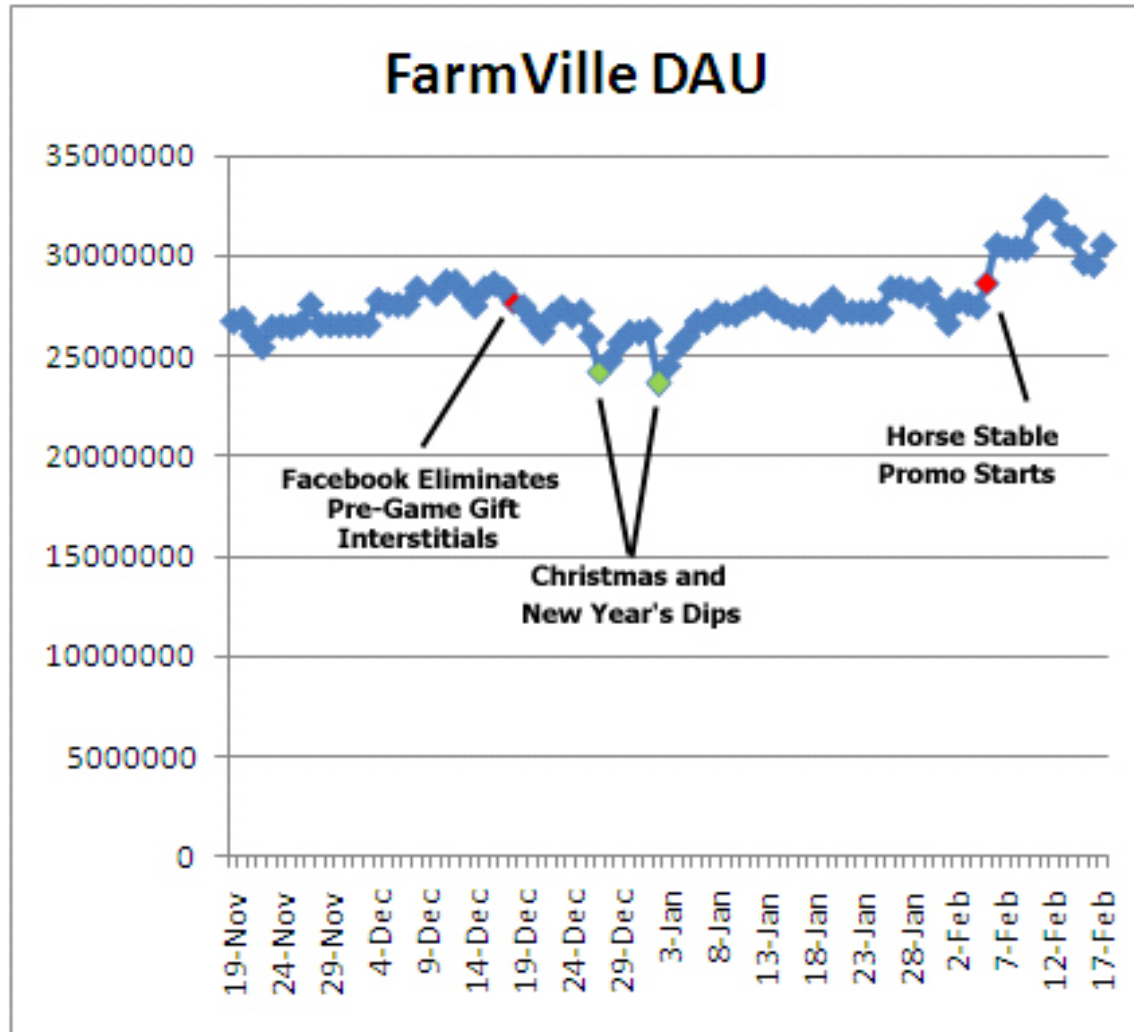 - Categories determined by data complexity

Game Analytics

Player Activity Analytics

FarmVille DAU chart with annotations:
- Facebook Eliminates Pre-Game Gift Interstitials
- Christmas and New Year's Dips
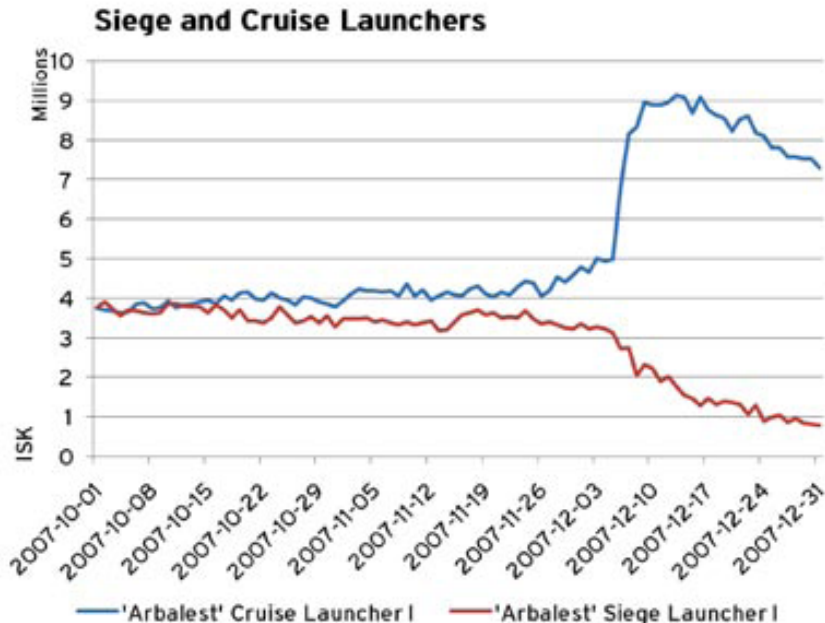- Horse Stable Promo Starts

- **Data for a single player**
  - Or for a given player group

- **Examples**:
  - How often do they play?
  - When does the player quit?
  - Can we get the player back?

- Some support from platform
  - Generalities like play time
  - Found in Facebook, Steam
  - Custom solutions for more

Game Analytics

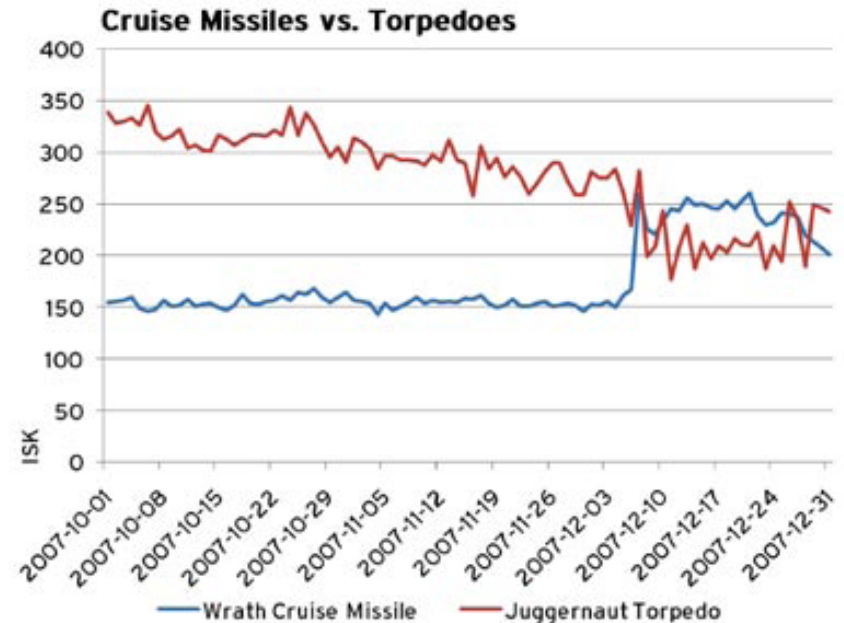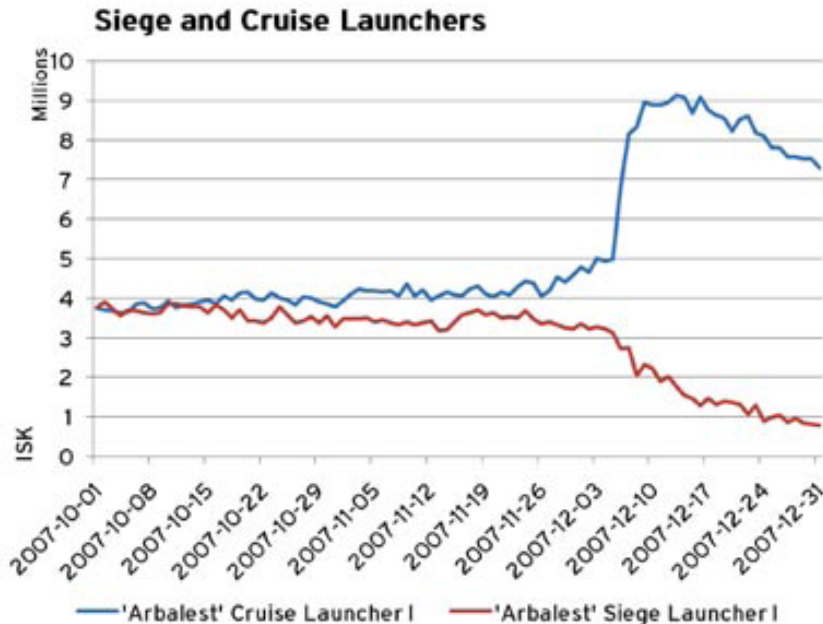# Player Activity Analytics

FarmVille DAU

Game Analytics

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Game System Analytics

Siege and Cruise Launchers

(chart legend) —'Arbalest' Cruise Launcher I   —'Arbalest' Siege Launcher I
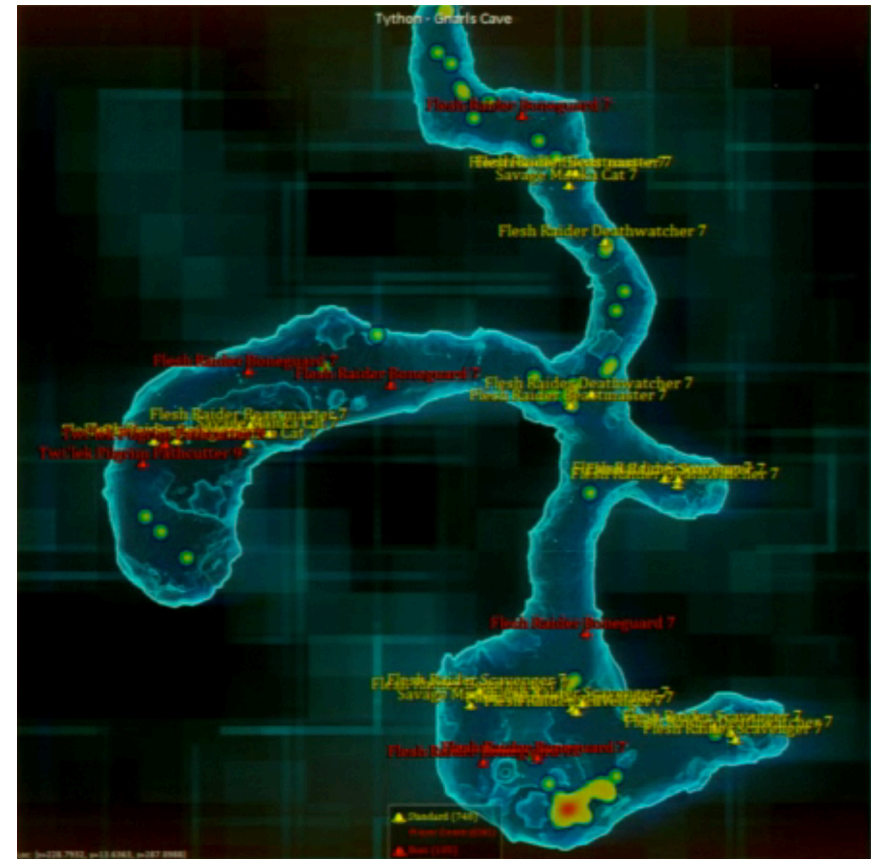
- **Non-spatial game data**
  - Behavior of many players
  - Often the game economy
  - Also issues of game balance

- Needs custom data gathering
  - Data tailored to your game
  - And so are the data queries

- But visualization is easy
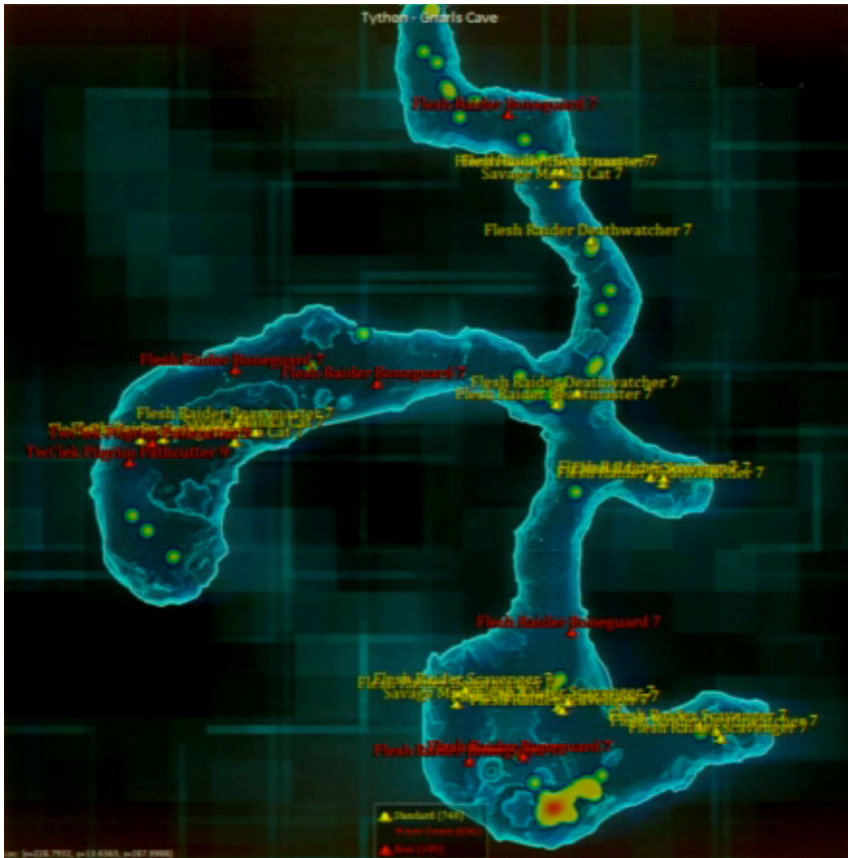 - Queries *format* is standard
  - Can use existing viz tools

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Game System Analytics

- **Example**: Weapon economy in *Eve Online*

Game Analytics

Spatial Data Analytics

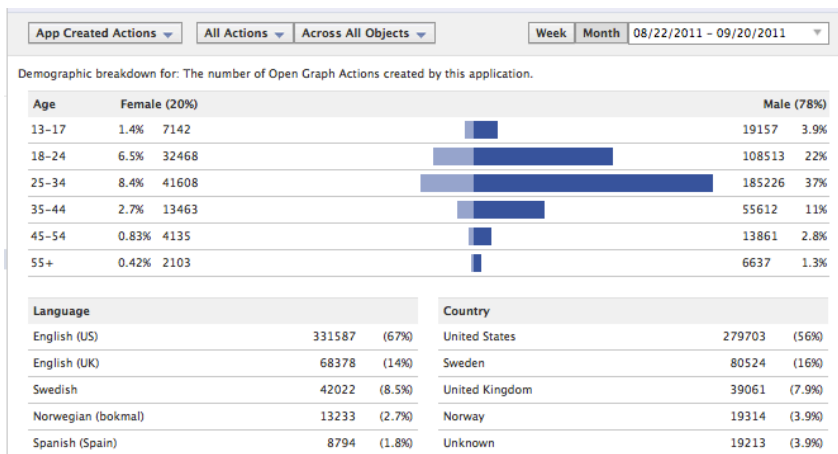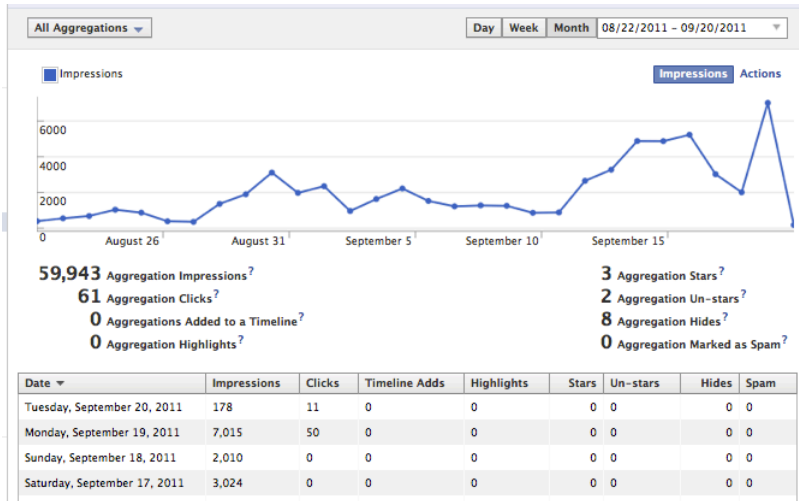Game Analytics

Spatial Data Analytics

- **Spatial game data**
  - Where are things happening
  - Critical for big MMOs
  - Also useful in level design

- Requires custom solutions
  - Custom data collection
  - Custom data visualization

- Complex tools made in-house by the game studios
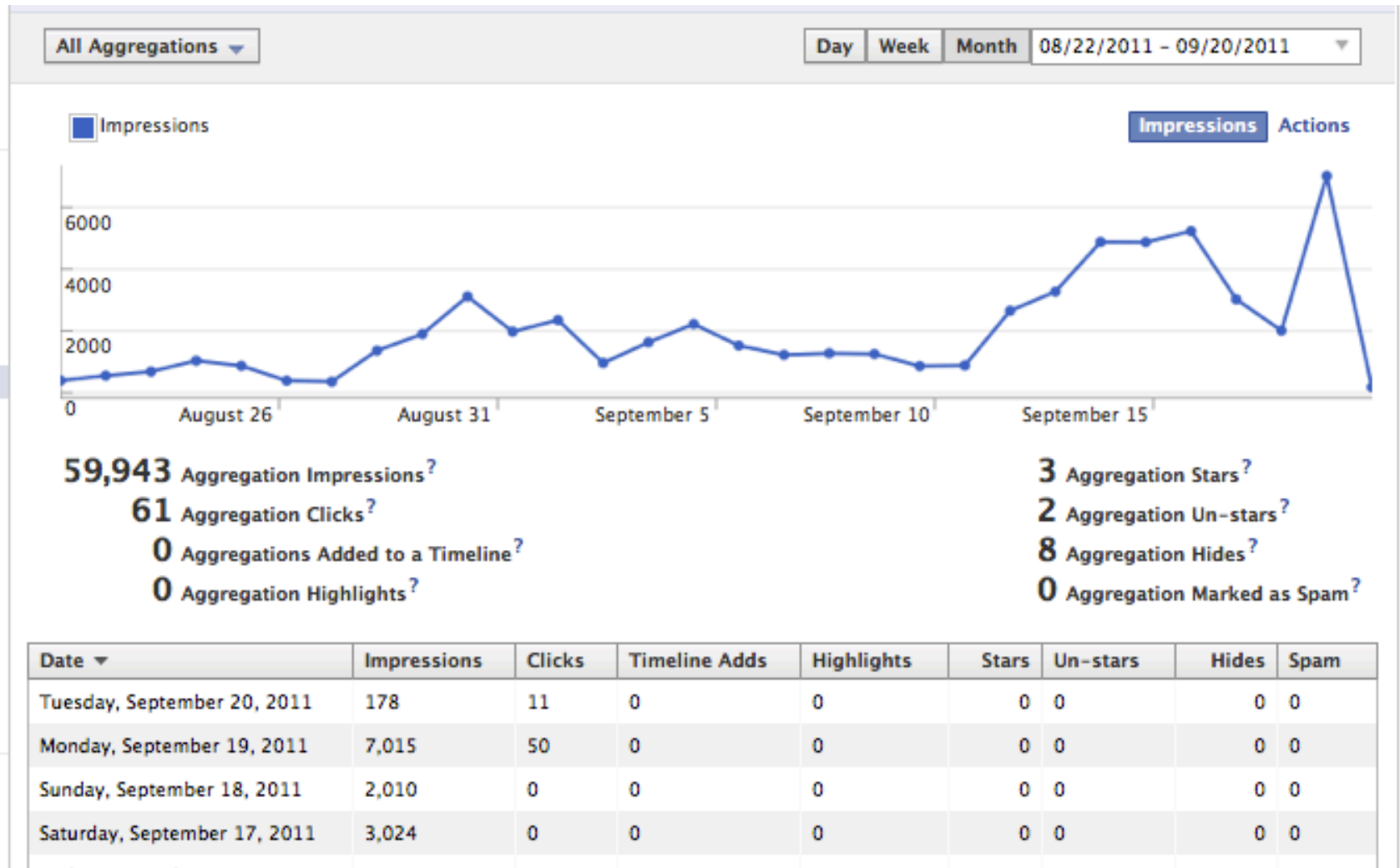 - Only worth it for big games

Player Activity: Facebook

- Tracks Facebook API usage
  - Game accesses user profile
  - Player launches game
  - Player sends a gift in game
  - Player receives gift in game

- Measures game activity
  - How popular is the game?
  - Does popularity change?

- Measures social elements
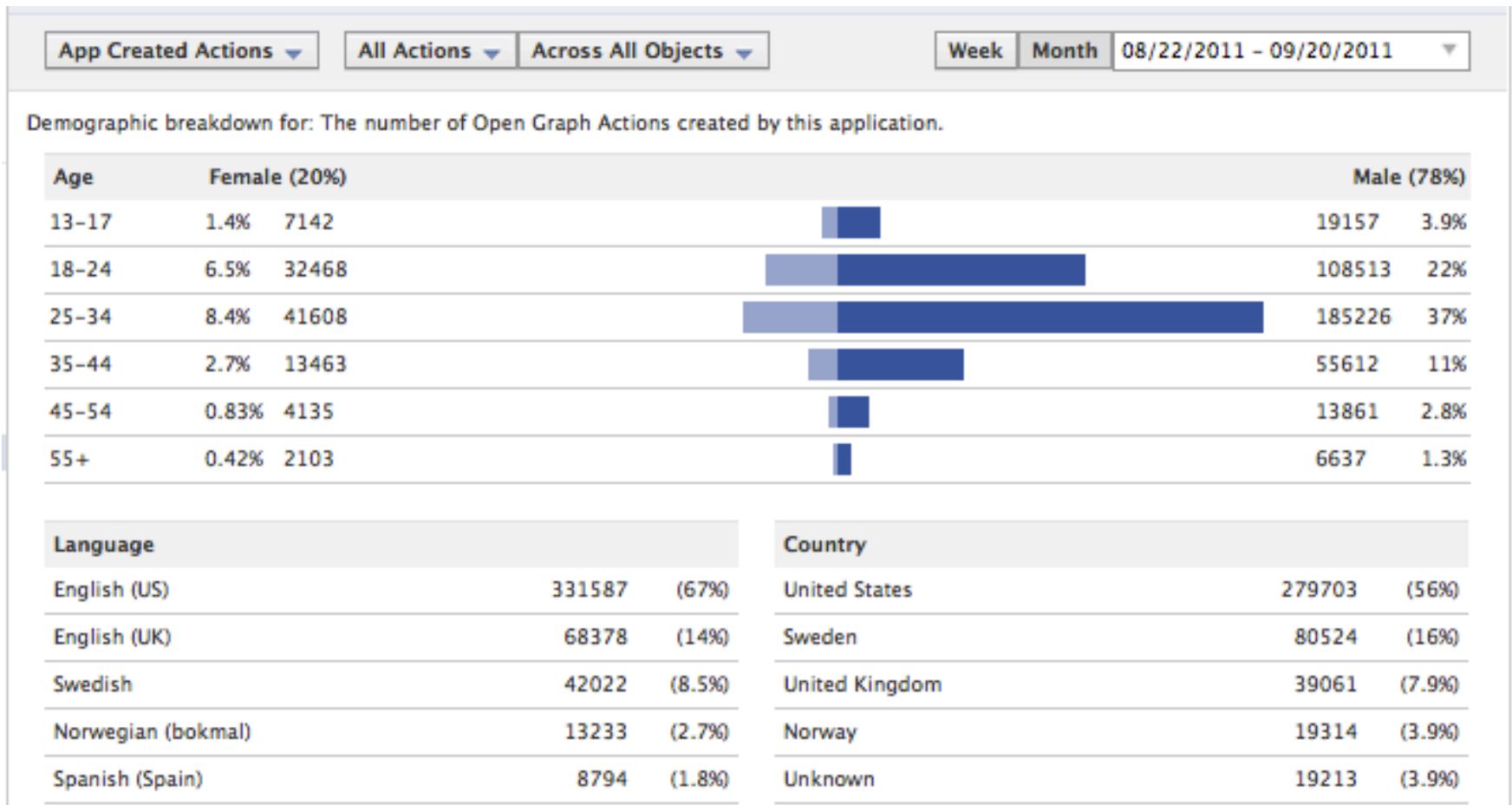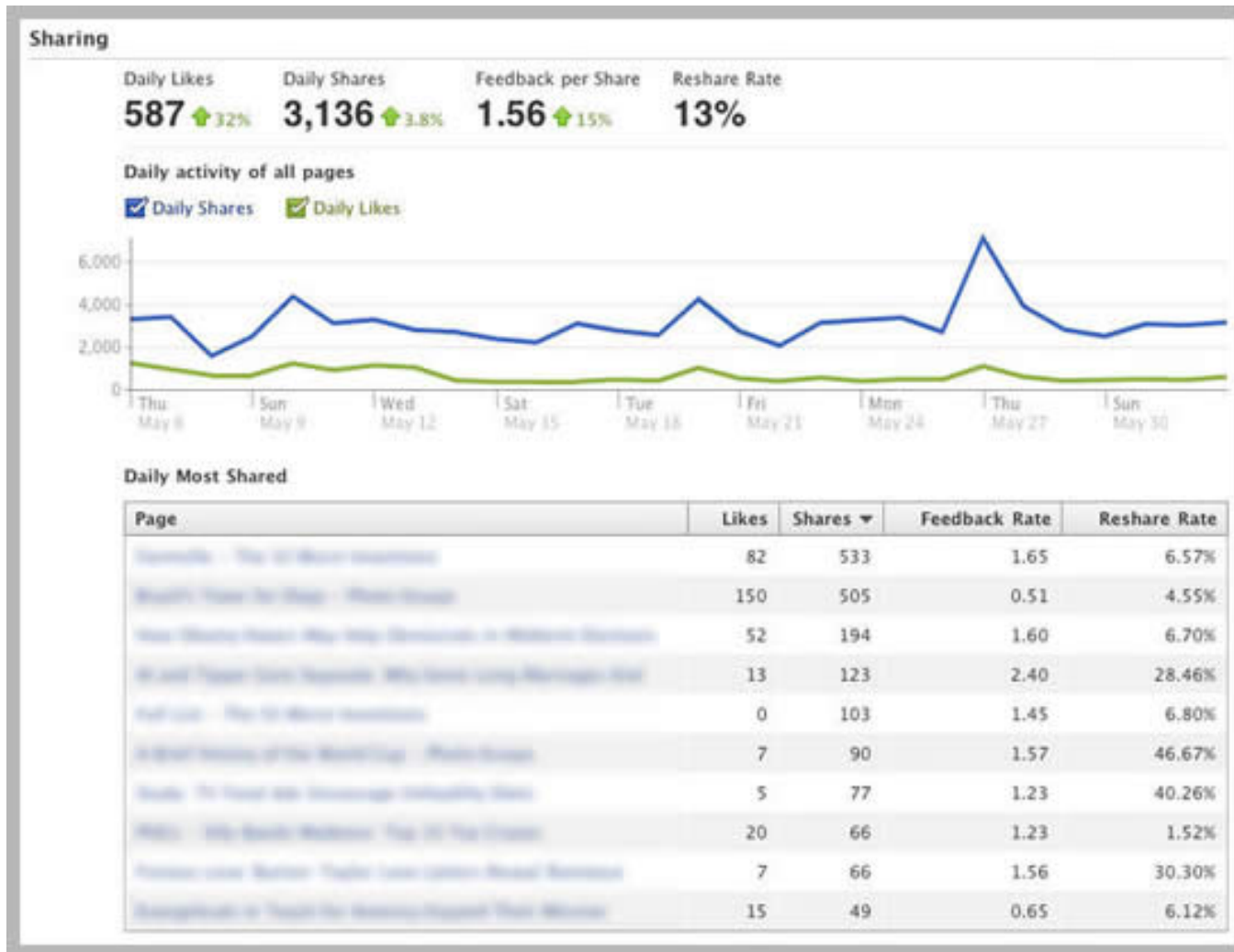 - How much engagement?

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Player Activity: Facebook

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Player Activity: Facebook

App Created Actions ▾ | All Actions ▾ | Across All Objects ▾ | Week | Month | 08/22/2011 - 09/20/2011 ▾

Demographic breakdown for: The number of Open Graph Actions created by this application.

Age	Female (20%)				Male (78%)
13-17	1.4%	7142		19157	3.9%
18-24	6.5%	32468		108513	22%
25-34	8.4%	41608		185226	37%
35-44	2.7%	13463		55612	11%
45-54	0.83%	4135		13861	2.8%
55+	0.42%	2103		6637	1.3%

Language			Country		
English (US)	331587	(67%)	United States	279703	(56%)
English (UK)	68378	(14%)	Sweden	80524	(16%)
Swedish	42022	(8.5%)	United Kingdom	39061	(7.9%)
Norwegian (bokmal)	13233	(2.7%)	Norway	19314	(3.9%)
Spanish (Spain)	8794	(1.8%)	Unknown	19213	(3.9%)

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Player Activity: Facebook

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Drilling Down: Funnel Charts

1000 People Clicked on the Ad

880 People Downloaded Client

650 People Created an Account

550 Entered Credit Card

200 Created a Character

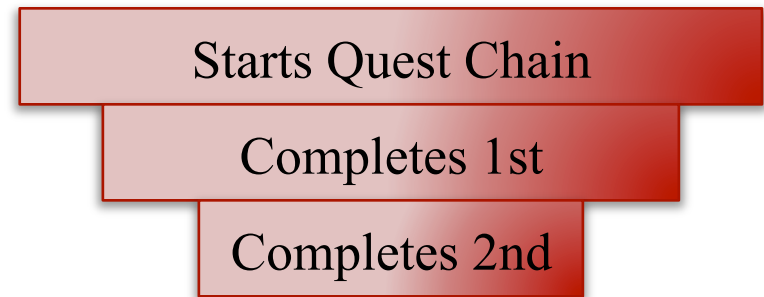180 Played 15 Minutes

What Happened?

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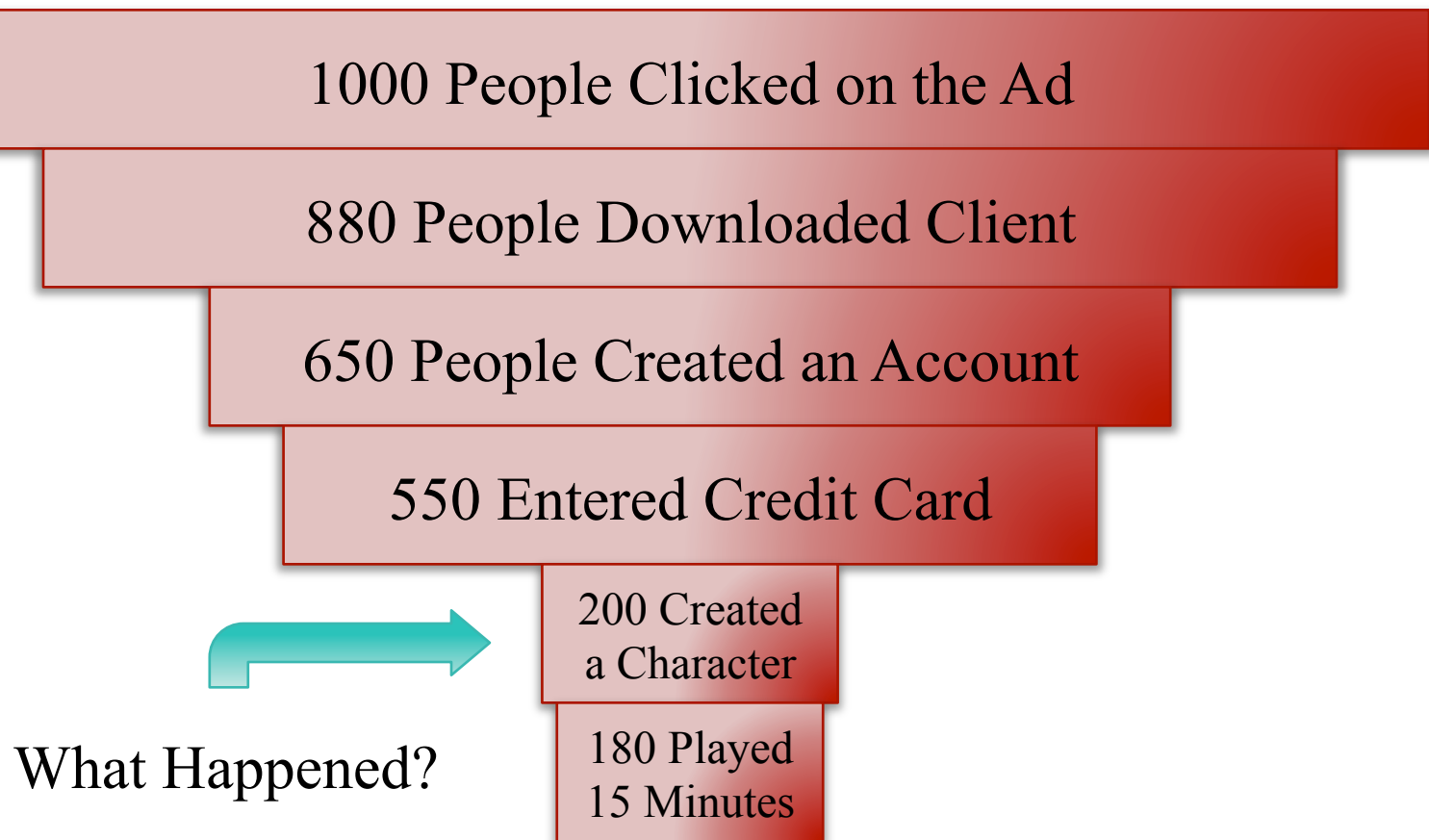
Funnel Charts and Design

- **Goal**: find "pain points"
  - When does player quit X?
  - Why doesn't player do Y?
  - Less pain = more accessible

- But do not necessarily want to eliminate them all
  - Easy game = casual game
  - Turns off hardcore players
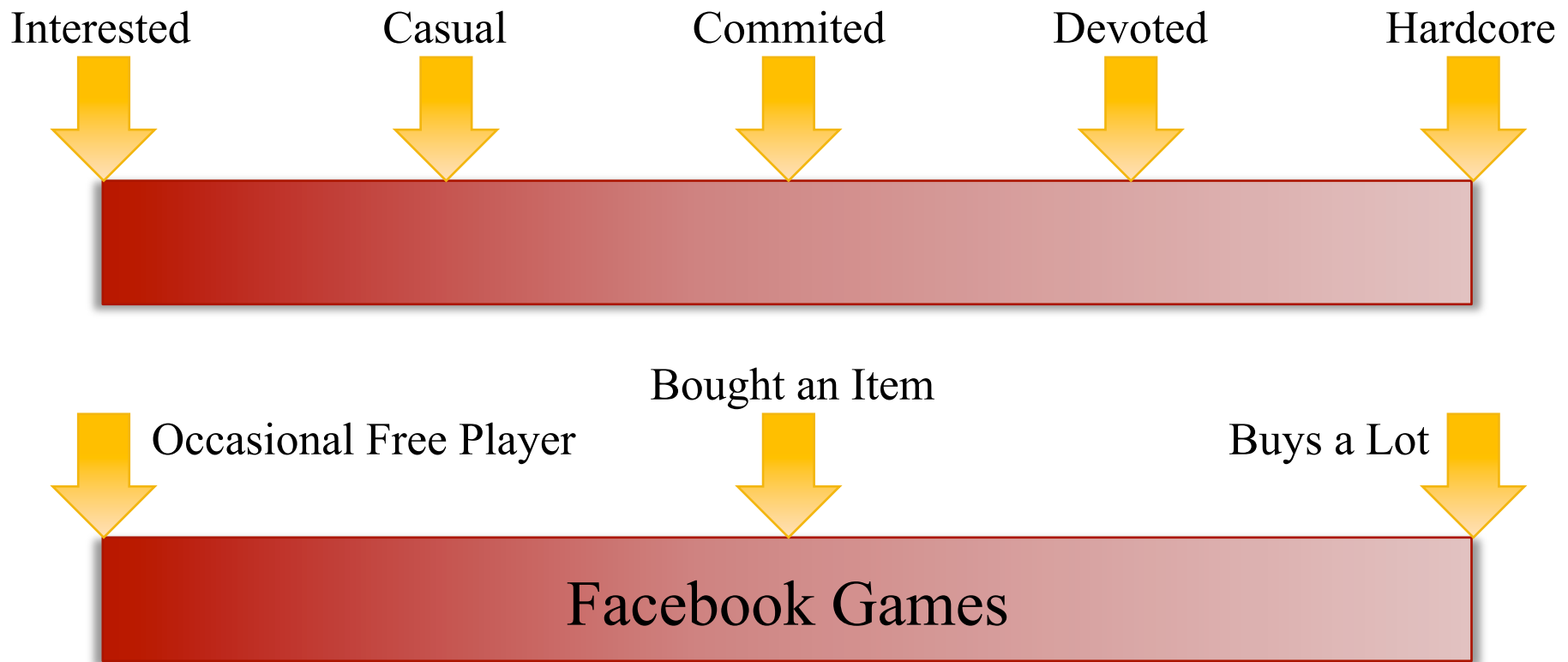 - Hardcore players are needed for almost any game (???)

Starts Quest Chain

Completes 1st

Completes 2nd

Creates a Character

Reaches 10th Level

Reaches 20th

Joins Guild

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Casual-Hardcore Spectrum

Casual and Core are property of **players**, not the **game**

Interested   Casual   Commited   Devoted   Hardcore

Weekly Player

Only Plays Demo   eSports Ranked

FPS Games

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Casual-Hardcore Spectrum

Casual and Core are property of **players**, not the **game**

Interested   Casual   Commited   Devoted   Hardcore

Bought an Item

Occasional Free Player   Buys a Lot

Facebook Games

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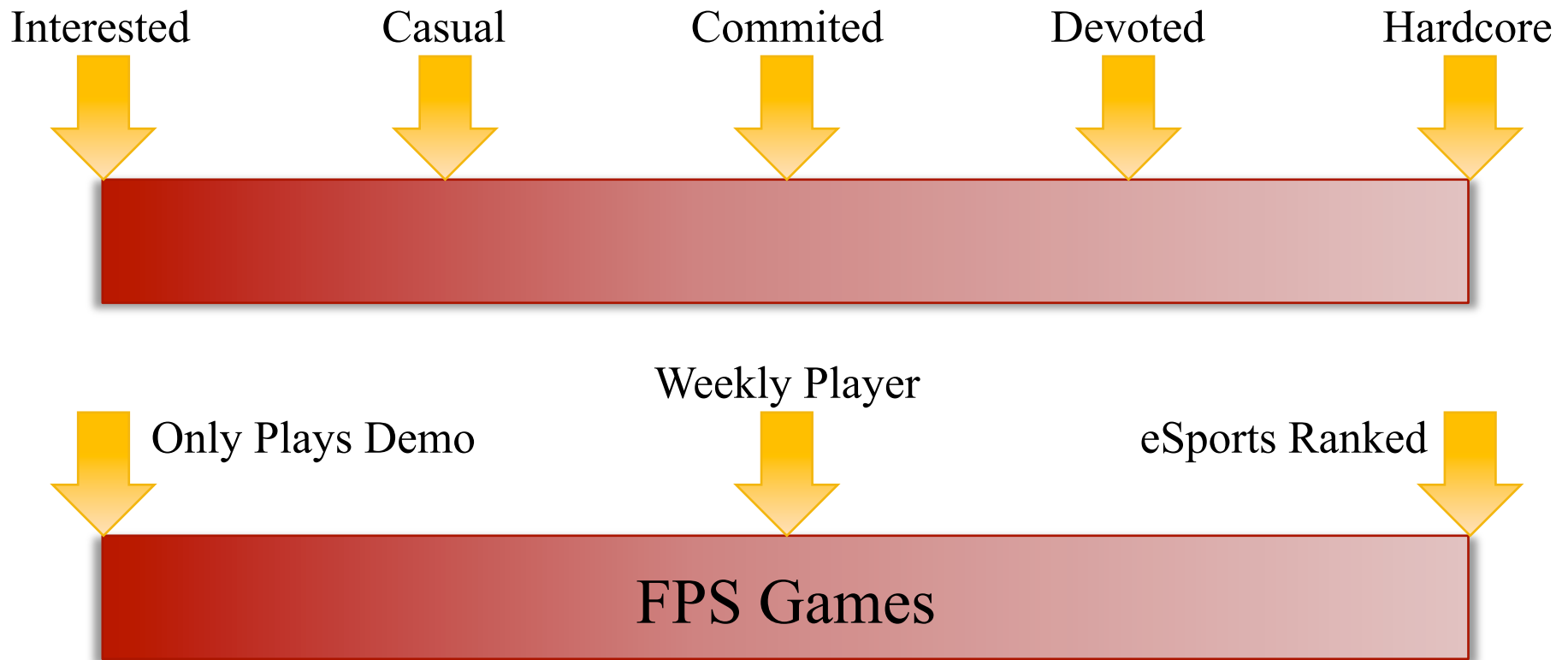
Casual-Hardcore Spectrum

Casual and Core are property of **players**, not the **game**

Goal of funnel is to find out how far apart these are

Interested   Casual   Commited   Devoted   Hardcore

Game Analytics
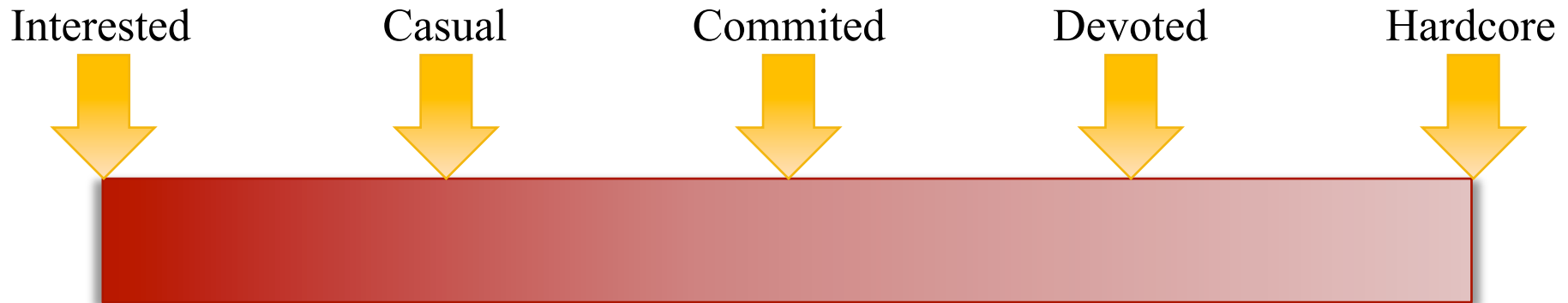
Idea from Web Design: A/B Testing

- Develop two versions of a page

- Randomly show different versions to users

- Track users interact with page

- Evaluate the result with statistics
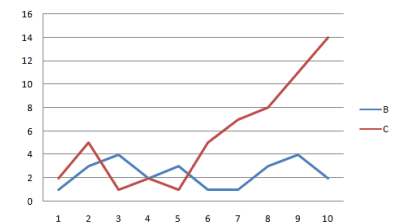
- Choose the "better" version

the
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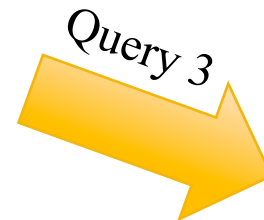at cornell university

A/B Testing in Game Development

- Develop two versions of a **game mechanic**

- Randomly show different versions to users

- Track users interact with page

- Evaluate the result with statistics

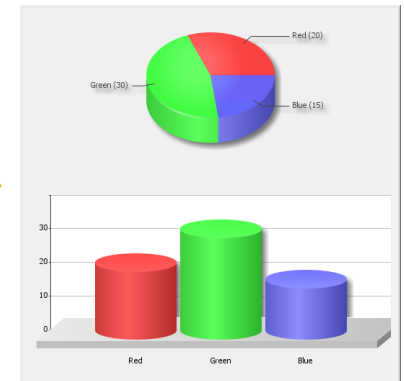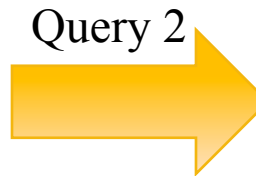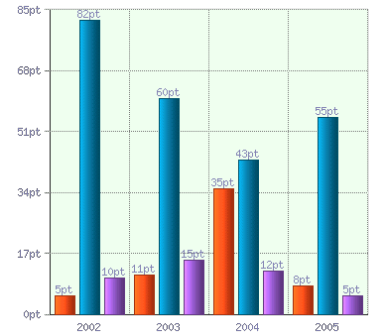- Choose the "better" version

Game Analytics

Game Specific Data

- Funnel charts are typically game specific
  - **What** distinguishes casual from core?
  - Cannot get this from platform specific tools

- This requires **custom instrumentation**
  - Functions called at specific activity
  - Record result of activity … *somewhere*
  - Almost exactly the same as profiling
  - Except that there are no pre-made tools

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Logging Game Data

Log

Data
Store

Query 1

Query 2

Query 3

Game Analytics
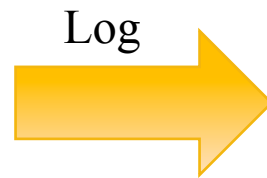
Player Logging: Other Benefits

- **Helping players**
  - Restoring lost items
  - Fixing data corruption

- **Finding cheaters**
  - Did they use an exploit?
  - Is their skill plausible?

- **In-game advertising**
  - But beware selling user data
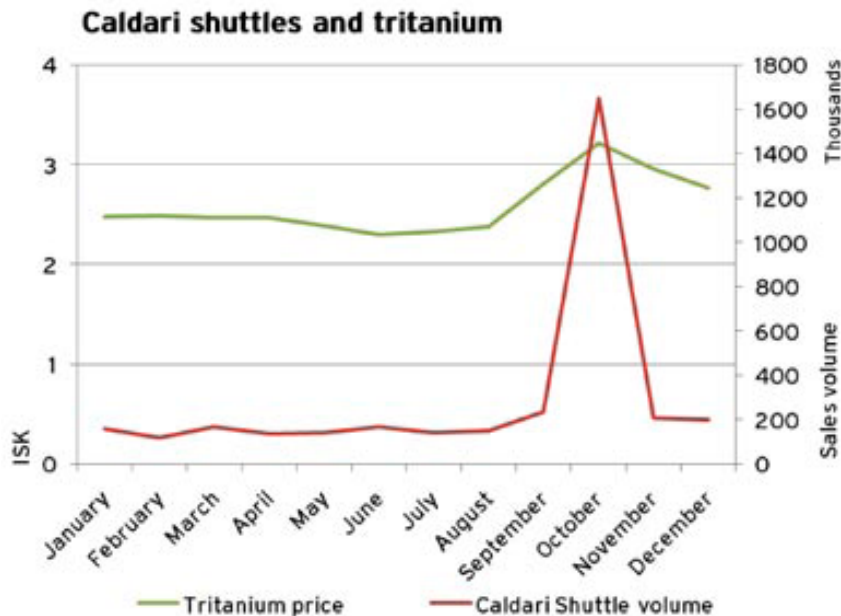 - Most states have data laws

- Game is run as a **service**

Gameplay Activity

QUARTERLY ECONOMIC NEWSLETTER

EVE ONLINE
4th QUARTER 2007

- Very similar to player activity
  - Custom instrumentation code
  - Put in datastore and queried
  - Only difference is what looking for

- Focusing on game mechanics, not individuals
  - But focus on **non-spatial** game systems
  - Want systems that can be visualized numerically
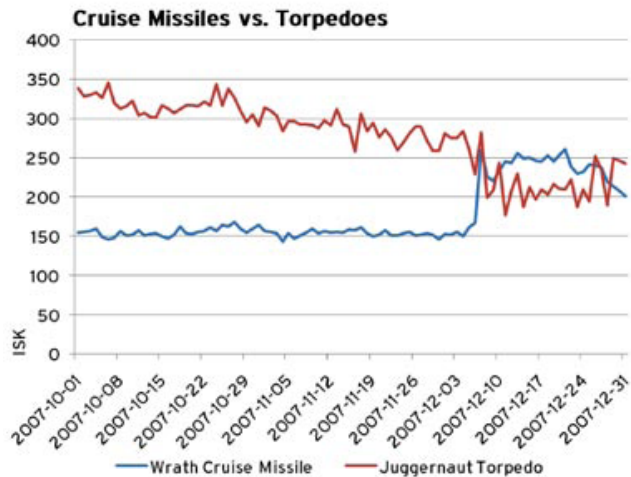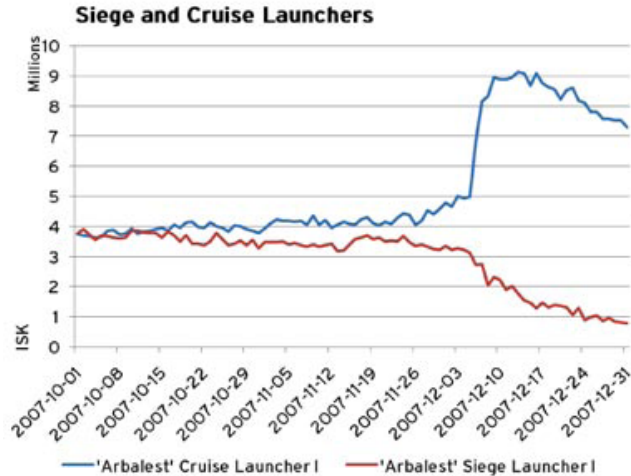 - Generally means **resources** and **game economies**

Game Analytics

EVE Examples: Titanium

Caldari shuttles and tritanium

— Tritanium price   — Caldari Shuttle volume

- Shuttles can be reprocessed
  - Can turn back into minerals
  - Can use (for building) or resell these minerals

- Shuttles have a fixed cost
  - What if player is bankrupt?
  - Gives players a fallback

- Puts price cap on Titanium
  - If too much, buy shuttles
  - Do we like this design?

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EVE Examples: Weapons

Siege and Cruise Launchers

—'Arbalest' Cruise Launcher I ——'Arbalest' Siege Launcher I

Cruise Missiles vs. Torpedoes

——Wrath Cruise Missile ——Juggernaut Torpedo

- *Trinity* altered gameplay
  - Changed torpedo mechanics
  - Range was made shorter
  - But rate of fire increased

- But players valued range
  - Torpedos volume dropped
  - Cruise Missiles spiked
  - Similar chart for launchers

- But this not mean that the redesign was a bad idea

Game Analytics

Spatial Game Data

- Needed for anything that depends on **location**
  - Identify where players are having difficulty
  - Critical for MMOs, large and persistent worlds
  - **Example**: player death heat maps

- Visualization is much, much harder
  - Spatial representation is particular to your game
  - There are no simple, existing solutions
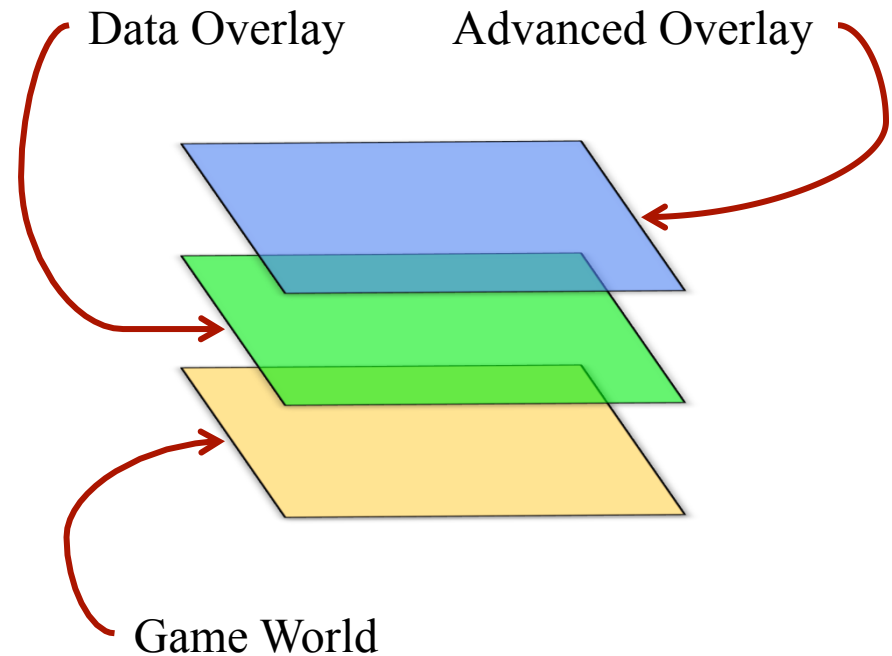 - Companies create their own custom tools

Game Analytics

Spatial Data: Heatmaps

Zone of Death!

Game Analytics
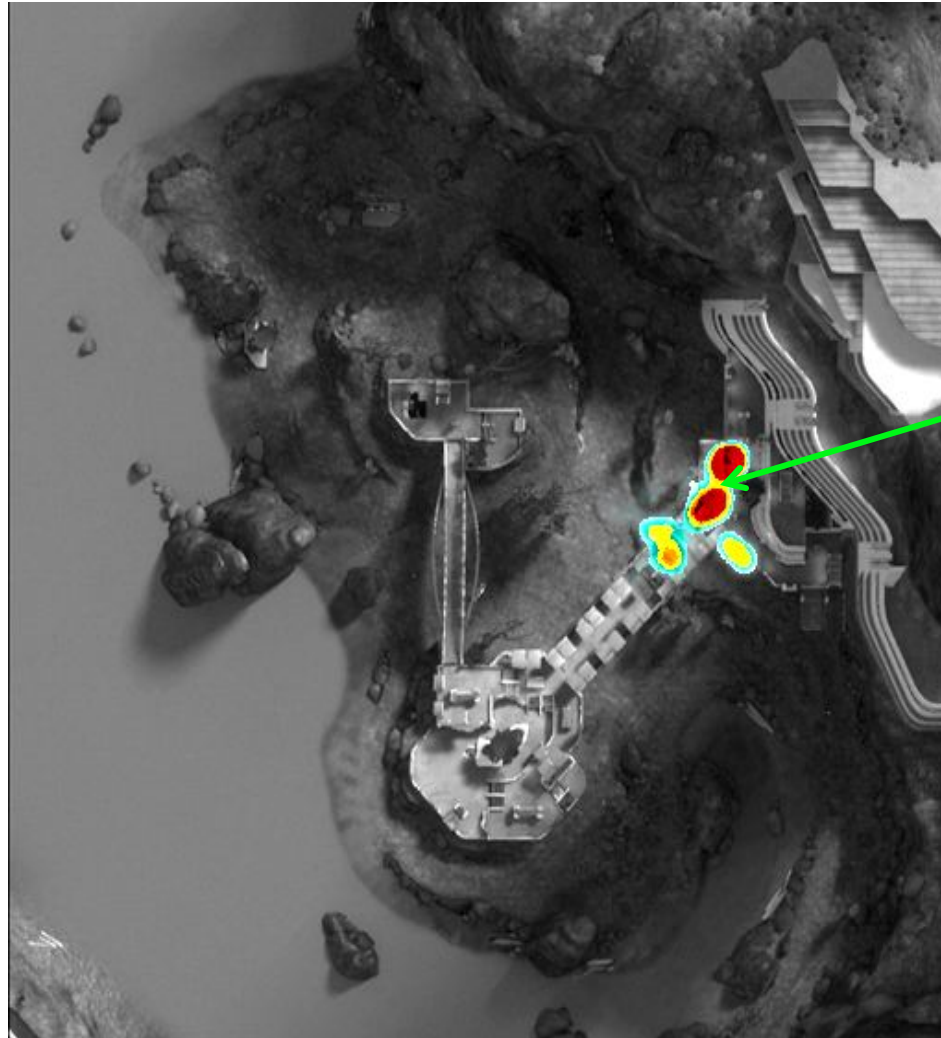
Simple Solution: Overlays

- Use game drawing code
  - Render world normally
  - Or in a compressed view
  - Integrate in level editor?

- Draw data in layer on top
  - Heat maps for histograms
  - Labels for filtered data
  - Other standard techniques (word clouds?)

- Google tools and HTML5
  - Especially if a web game

Data Overlay   Advanced Overlay

Game World

SWTOR Example: Chat Logs

Filter on:
How do I…
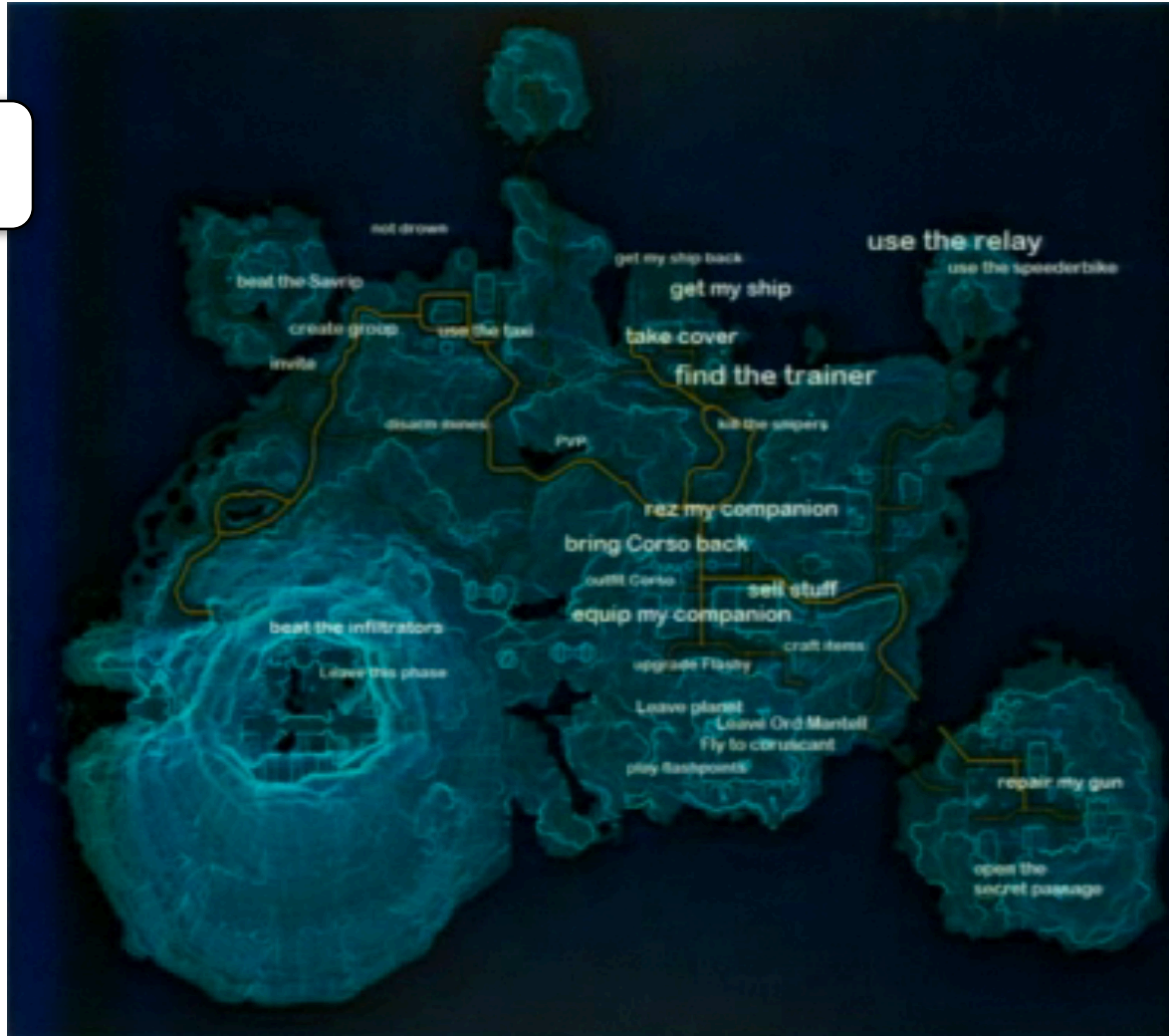
Game Analytics

SWTOR Example: Chat Logs

Filter on:
Bug, Broken

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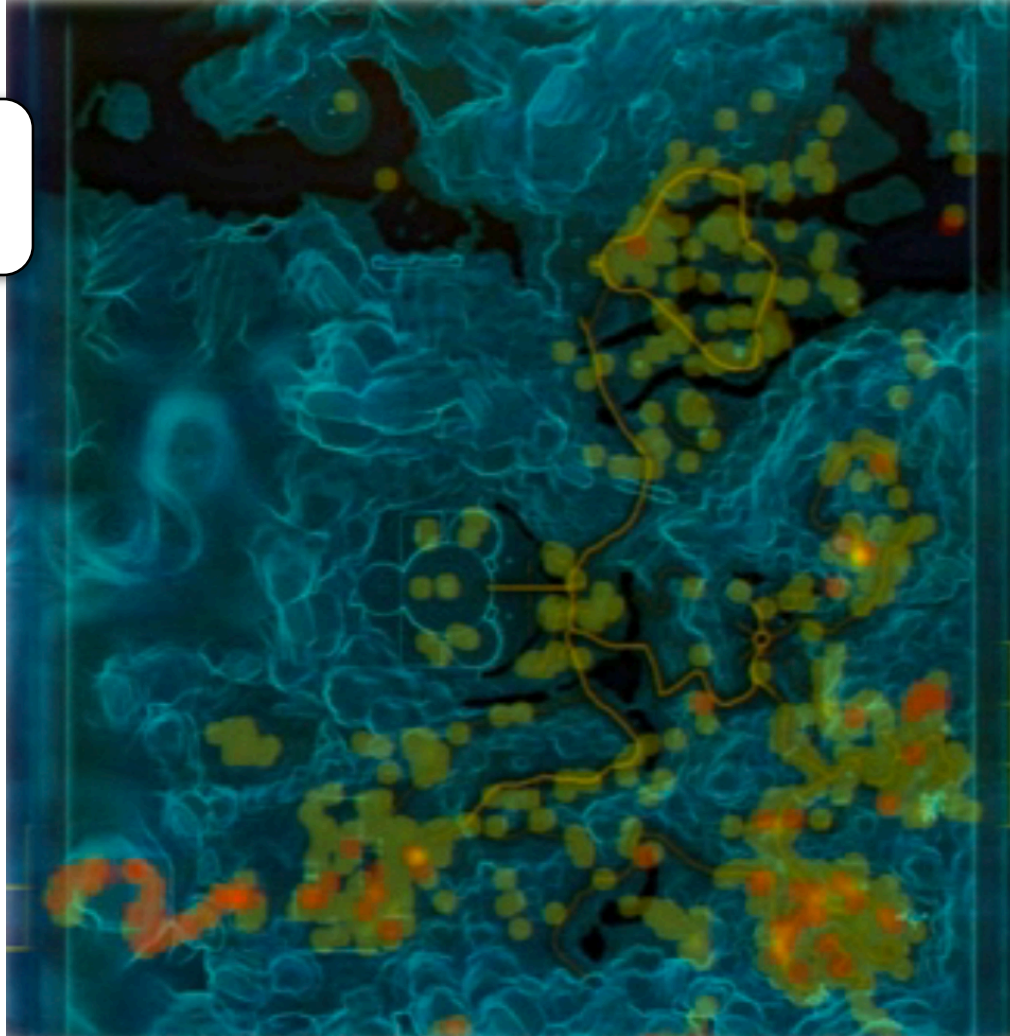
SWTOR Example: Player Deaths

Legend:
Orange = group
Green = solo

Game Analytics

SWTOR Example: Player Deaths

Legend:
Orange = group
Green = solo

Enemy level -
player level

Game Analytics

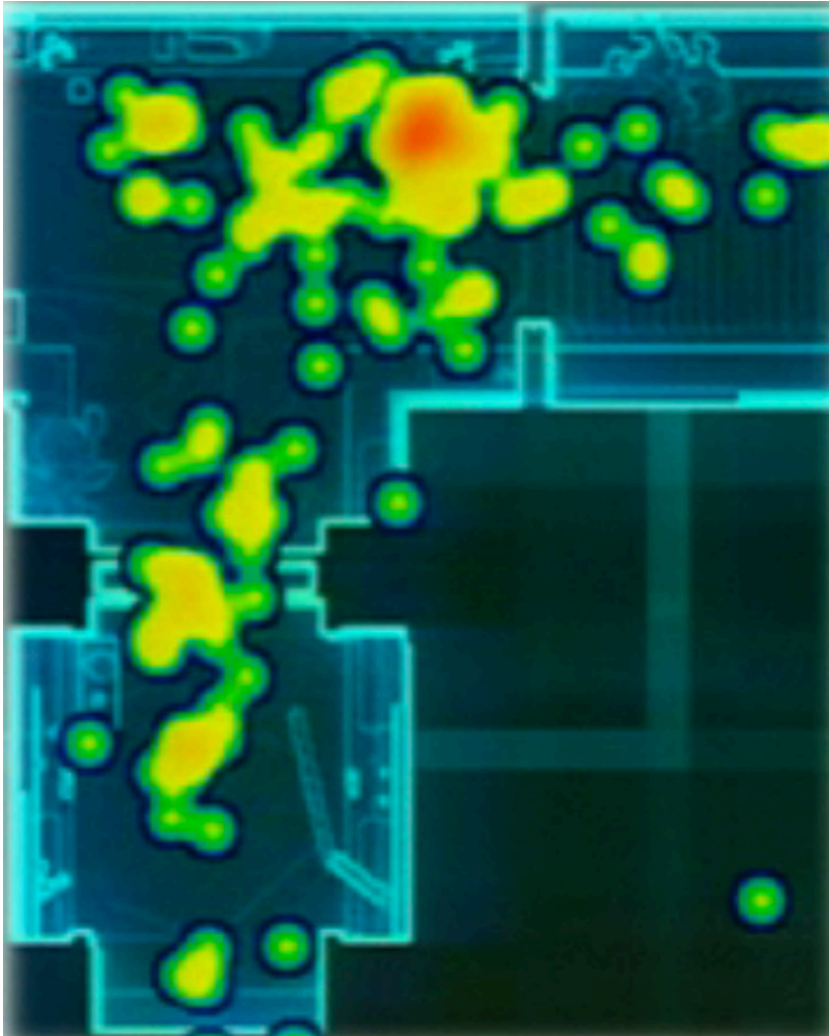the gamedesigninitiative
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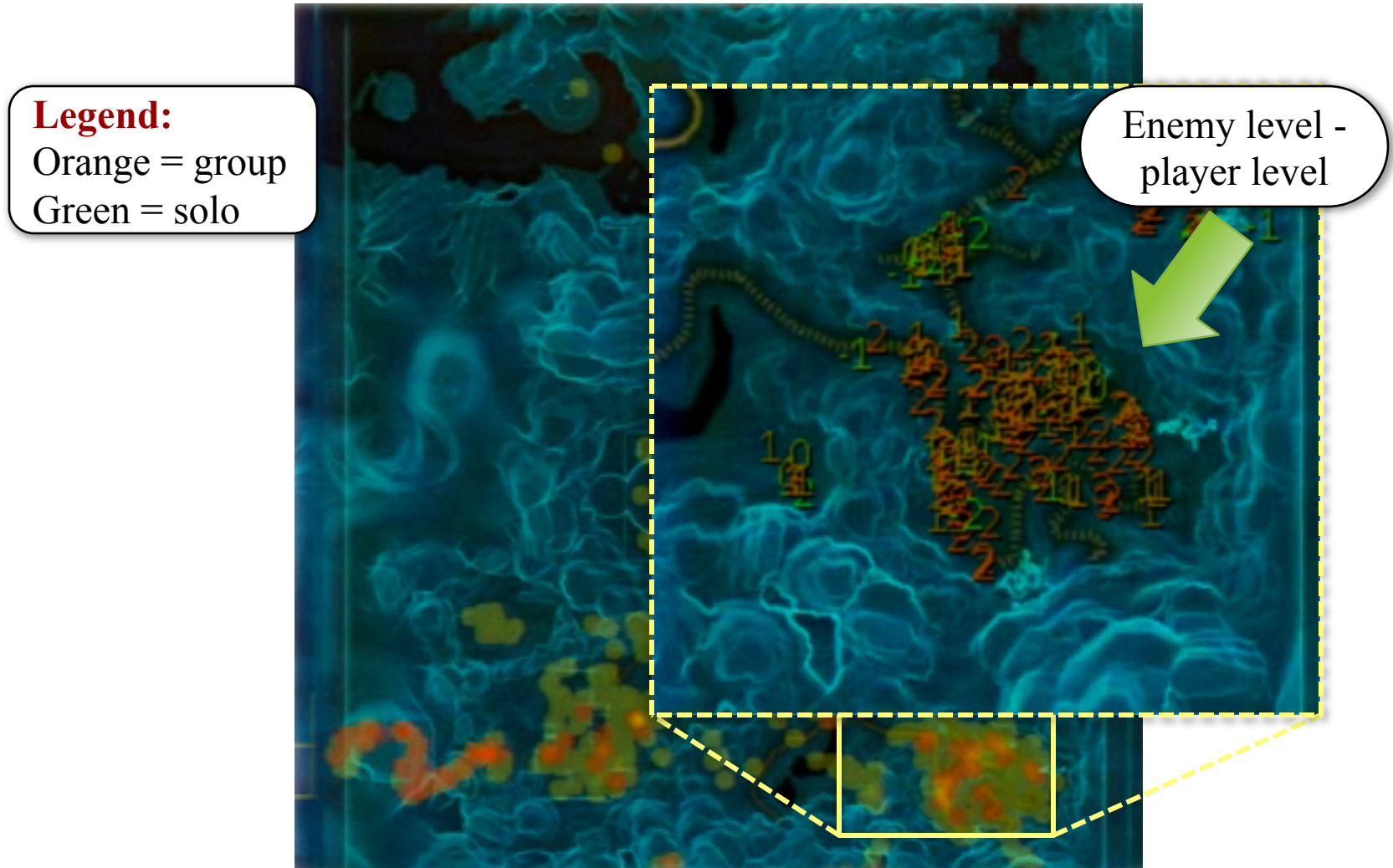
SWOTOR Example: Patrol Paths

Encounter "pull" radius
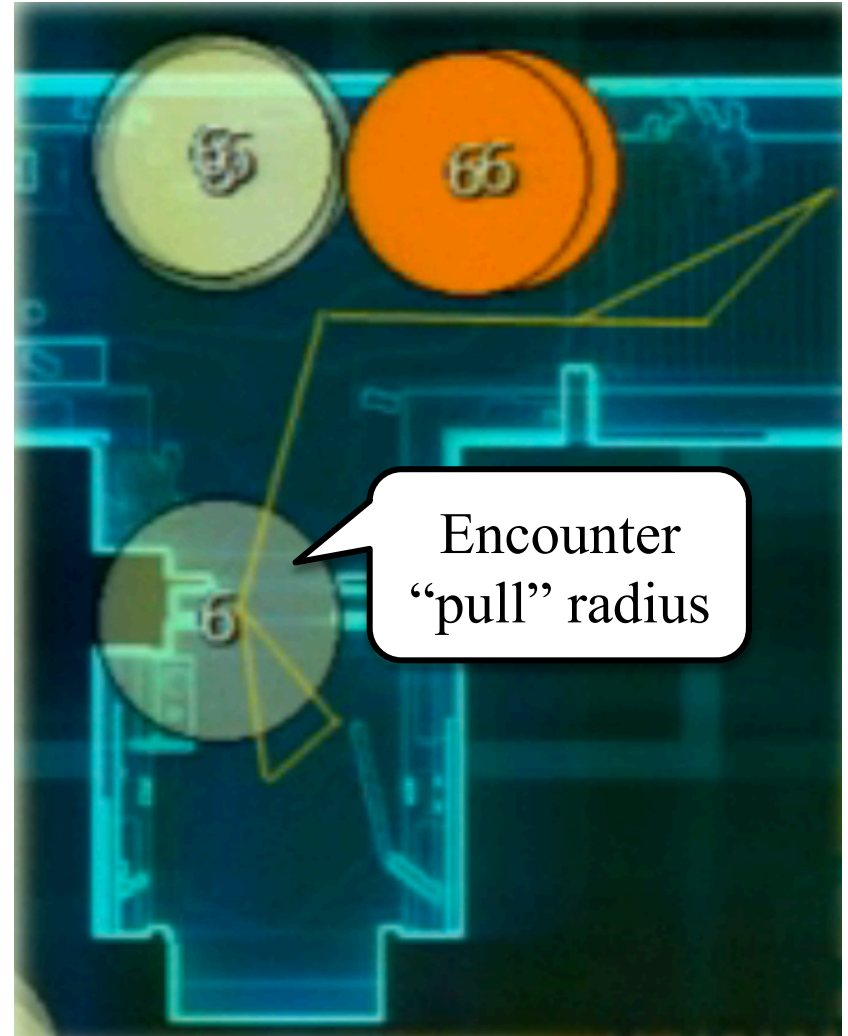
Game Analytics

Summary

- Gameplay analytics are increasingly important
  - Often driven by your business model
  - Crucial for monetized/free-to-play games

- Often break data into different types
  - **Player analytics**: activity of a player over time
  - **Gameplay analytics**: game economy and balance
  - **Spatial analytics**: Locality of behavior in game

- **Next time**: How do we get all this data?

Game Analytics