

MIKE AMBINDER, PhD VALVE

DATA TO DRIVE DECISION-MAKING





HOW AND WHY VALVE USES DATA TO DRIVE THE CHOICES WE MAKE



Data to Drive Decision-Making

- Decision-Making at Valve
- Introduction to experimental design
- Data collection/analysis infrastructure
- Examples
 - —Playtesting (L4D)
 - —DOTA 2
 - -CS:GO





DECISION-MAKING AT VALVE



Decision-Making at Valve

- No formal management structure
- Decision-making is a meritocracy
- All data is available to every employee
- We just want to make the best decisions possible.
- We don't want to rely on 'instinct' \rightarrow it is fallible

VALVE ORGANIZATIONAL CHARTS

(AS ENVISIONED BY EMPLOYEES)



Decision-Making



- Explicit
- Data-driven
- Theory-driven
- Measurable Outcomes
- Iterative

Explicit

- What problem are you trying to solve?
- Define terminology/constructs/problem space
- Ask the 'second' question
- Force yourself to be specific
- Force yourself to be precise

Data-Driven



- What do we know about the problem?
- What do we need to know before we decide?
- What do we still not know after we decide?

Theory-Driven

• What does the data mean?

-Is it consistent with expectations?

—Is it reliable?

- Model derived from prior experience/analysis
- Coherent narrative
- Prove a hypothesis right (or wrong)
- Want result AND explanation

Measureable Outcomes

- Define 'Success'
- How will we know we made the right choice?
- Know the 'outcome' of your decision







If it can be destroyed by the truth, it deserves to be destroyed by the truth. – Carl Sagan

INTRODUCTION TO EXPERIMENTAL DESIGN



THE SCIENTIFIC METHOD



Experimental Design

- Observational
 - -Retrospective vs. Prospective
 - -Correlational not causal
- Experiment
 - -Control Condition and Experimental Condition
 - —Account for confounding variables
 - —Measure variable of interest

Global Average Temperature Vs. Number of Pirates





Experimental Design

- What have we learned?
- What biases are present?
- How are future experiments informed?
- What other hypotheses need to be ruled out?
- What should we do next?





DATA COLLECTION/ANALYSIS INFRASTRUCTURE

Valve Data Collection

- · Record lots and lots (and lots) of user behavior
- If we're not recording it, we'll start recording it
- Define questions first, then schema
- Collection → Analysis → Communication

Data Collection - Games

OGS – Operational Game Stats

cs/Go

- Platform for recording gameplay metrics
- Kills, Deaths, Hero Selection, In-Game Purchases, Matchmaking wait times, Bullet trajectories, Friends in Party, Low-Priority Penalties, etc.

DOTA 2

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Data Collection - Games

- Organizational schemas defined for each game
- Data sent at relevant intervals
- Daily, Monthly, Lifetime Rollups, Views, Aggregations





ValveStats











Dota 2 Matches



Dota 2 Perf



DOTA Geographic Purchases



Dota Item Purchases / Drops



DotA Sales by Currency



Dota Weekly



Data Collection - Steam



- Steam Database Raw data
- SteamStats Database Analysis/Summary of Raw Data
- Record all relevant data about Steam user behavior

Server Stats

Steam3 Content Servers Server Test Results

Content System

Current Traffic Map Aggregate CS Statistics CDN Traffic Content Download Download Rates

Regions

North America South America Western Europe Eastern Europe Russian territories Oceania Asia South East Asia EU EEA

Countries

Afghanistan United States Aland Islands Albania Algeria

Reports

Affiliates Best davs Friend Blocking Cached Credit Cards Crashes Cloud Stats Credential Stats Community Stats Coupons Free-2-Plays Facebook Gifts Hardware survey Media views New users Oxcart apps Payment methods Payment analysis Player numbers Playtime stats Economy Trades Purchase failures Revoked Legacy Keys Sales by year Non-Steam games (shortcuts) Steam Apps and Subscriptions Steam Support Support Tickets SteamGuard Stats Steamstats query performance Steamworks retail report Thirdparty CD Keys VAC Ban Report Wallet stats

STEAMWORKS PRODUCT DATA

Home | Games | Packages | Regions | Users | Players | Support | Economy

Lifetime Overview

Revenue Units First Sale Date Last Sale Date Selling For Peak Concurrent Users (PCU) \$ per Day per PCU Unique Users Unique Purchasers Conversion Rate Avg Rev per User (ARPU) Avg Rev per Paying User (ARPPU) Avg Rev per Day (ARPD)

Lifetime Steam revenue Lifetime Steam units Lifetime Retail units Lifetime total units Lifetime total DLC units Current players Median time played Unique users New users New user total \$ spent New user average \$ spent Publisher

Demo version

Top games by current player count

ame	Peak Today	Current Players
ota 2		
ounter-Strike: Global Offensi		
ootball Manager 2014		
am Fortress 2		
e Elder Scrolls V: Skyrim		
id Meier's Civilization V		
ounter-Strike		
ayZ		
ust		
arry's Mod		





PLAYTESTING



Valve's Game Design Process

→ Goal is a game that makes customers happy →
Game designs are hypotheses →
Playtests are experiments →
Evaluate designs based off playtest results →
Repeat



Playtest Methodologies



- Traditional
 - -Direct Observation
 - -Verbal Reports
 - —Q&As



Playtest Methodologies



- Technical
 - -Stat Collection/Data Analysis
 - -Design Experiments
 - —Surveys
 - Physiological Measurements (Heart Rate, Eyetracking, etc.)







Enabling Cooperation

- · Coop Game where competing gets you killed
- Initial playtests were not as enjoyable as hoped
- Initial playtests were not as cooperative as hoped —Players letting their teammates die —Ignoring cries for help

Enabling Cooperation

- Explicit: Players letting teammates die
- Data-Driven: Surveys, Q&As, high death rates
- Theory-Driven: Lack awareness of teammate location
- Measurements: Surveys, Q&As, death rates
- Iterative:

Hypothesis: Give better visual cues to teammate location







Pre

Post

Results



- Survey ratings of enjoyment/cooperation increased
- Anecdotal responses decreased
- Deaths decreased

Enabling Cooperation

- Explicit: Players letting teammates die
- Data-Driven: Surveys, Q&As, high death rates
- Theory-Driven: Lack awareness of teammate location
- Measurements: Surveys, Q&As, death rates
- Iterative: Where else can visual cues aid gameplay?



DOTA 2



[ALLIES] Binder: Hello, good sir, I am new to DOTA. Any advice for playing Helicopter Man?

[ALLIES] Piggles ULTRAPRO: Greetings DOTA citizen! I relish the opportunity to share my expertise with a new player! [ALLIES] Binder: Fantastic! In others news, I have recently died. [ALLIES] Piggles ULTRAPRO: Not a problem, friend! I will prepare some rational and constructive feedback to help you learn the

game.

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Say (TEAM)

Improve Player Communication



- Explicit: Reduce negative communication
- Data-Driven: Chat, reports, forums, emails, quitting
- Theory-Driven: No feedback loop to punish negativity
- Measurements: Chat, reports, ban rates, recidivism
- Iterative: Will this work in TF2? Do these systems scale?

Hypothesis: Automating communication bans will reduce negativity in-game

	REPORT PLAYER
m2	Select a category
?	
	Communication Abuse
	More information:
CANCEL	Reports Remaining: 2 SUBMIT



Results

- 35% fewer negative words used in chat
- 32% fewer communication reports
- 1% of active player base is currently banned
- 61% of banned players only receive one ban



CS:GO



Weapon Purchases by Budget

StartingMoneyAdjusted (bin)



Weapon Balance



- Explicit: M4A4 usage is high; few choices in late-game
- Data-driven: Purchase rates
- Theory-driven: Greater tactical choice \rightarrow Player retention
- Measurements: Purchase rates, playtime, efficacy
- Iterative: Inform future design choices

Hypothesis: Creating a balanced alternative weapon will increase player choice and playtime

Weapon Purchases by Budget

StartingMoneyAdjusted (bin)



Results

STEAM DEV DAYS

- ~ 50/50 split between new and old favorites
- Increase in playtime
 - —Conflated with other updates
 - -Difficult to isolate
- Open question as to whether or not increased weapon variability increases player retention

Where Can You Begin?

STEAM DEV DAYS

- Start asking questions
- Gather data—any data
 - —Playtests
 - —Gameplay metrics
 - -Steamstats
 - —Forum posts/emails/Reddit

Tell us what data you'd like us to provide





THANKS!!!

Contact Info



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