Sports Analytics: Consultant Perspective

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Objective and Approach

• Objective
  – Identify opportunities for future research

• Approach
  – Provide examples of decision-making in the National Hockey League (NHL)
  – Describe the data available to understand/model decision-making
Presentation overview

• Background
  – Attendees
  – Presenter
  – Hockey
  – NHL
  – NHL Organizations
  – Our clients

• Data and technology infrastructure

• Hockey operations objectives and decision-making
  – 3+ years
  – Current year
  – Current day/week/2-week period
  – In-game
BACKGROUND
Attendees

• Expectations/objectives for this session
• Research area(s) overview
Presenter

• Education
  – Computer Science
• Industry
  – Consulting
  – Software Engineering
  – Product Management
  – Analytics
• Teaching
  – Business Intelligence and Analytics (strategies and applications)
  – Web Analytics
  – Data Warehousing
  – Databases
• Objectives for this session
Hockey

...and then there’s this part
National Hockey League (NHL)

- Revenues for the 2011-12 season: $3.4 billion
- 30 teams:
  - Canada(7); USA (23)
  - Profitable (17); Not Profitable (13)
- NHL Board of Governors (one governor per team)
- Executives
  - Commissioner
  - Deputy Commissioner
  - Chief Legal Officer
  - CFO
  - Dir. of Hockey Operations
  - SVP of Player Safety
Hockey Organizations

Ownership

Executive

Hockey Operations  Coaching  Player Development  Scouting

Players
Analytics in organizations today

• Highlights*
  – Top-performing organizations are twice as likely to apply analytics to activities
  – The biggest challenges in adopting analytics are managerial and cultural
  – Visualizing data differently will become increasingly valuable

“The biggest challenges in adopting analytics are managerial and cultural”

• Story: “Your model works for all of our players with the exception of John Smith.”
“The biggest challenges in adopting analytics are managerial and cultural”
“The biggest challenges in adopting analytics are managerial and cultural”
Our clients

• Recall: Top-performing organizations are twice as likely to apply analytics to activities*

Our clients: Competing on Analytics

- Optimization: What’s the best that can happen?
- Predictive modeling: What will happen next
- Forecasting/extrapolation: What if these trends continue?
- Statistical analysis: Why is it happening?
- Alerts: What actions are needed?
- Query/drill down: Where exactly is the problem?
- Ad hoc reports: How many, how often, where?
- Standard reports: What happened?


From Troy’s presentation: “…manage them better…”
DATA AND TECHNOLOGY INFRASTRUCTURE
Data

- Event level (shots, hits, penalties, etc.)
  - Each event type has additional attributes (e.g. shot has: shot type, location, location on net)
- Player-game level (e.g. player time on ice by manpower)
- Team-game level
- Game level
- Player demographics
- Salary
- Derived
- 2007 – present
- NHL
- Some American Hockey League data (AHL)
Technology infrastructure

Data Source 1

Data Source 2

Data Source n

Data Staging Services:
- Clean
- Standardize
- Full load vs. Partial/Real-time load
- Derived metrics and dimensions
- Descriptive and predictive models implemented

Extract

Load

Business Data Marts

Data Mart 1 (Biz)

Data Mart 2 (Biz)

Data Mart m (Biz)

Access

Data Access Tools

- Pentaho User Console (BI client)
- Recurring Reports (e.g. PDF/Excel)
- Saiku Analysis
- Excel
- Tableau
- R/Stata
- SQL Client

Research Data Marts

Data Mart 1 (Research)

Data Mart 2 (Research)

Data Mart m (Research)

Access

• R/Stata
• SQL Client
• Excel
• Tableau
HOCKEY OPERATIONS: OBJECTIVES AND DECISION-MAKING
Objectives: 3+ years

• Have an “acceptable” level of success each year
• Draft effectively
• Develop players effectively
• Make effective personnel changes
  – Cap management
  – Team strategy
• *Question: Is there anything missing?*
Objectives: Current year

- Make the play-offs
- Get to the nth round/win the play-offs
- Make effective personnel changes
  - E.g. Trade unrestricted free agents when the play-offs are not achievable
- *Question: Is there anything missing?*
Objectives: Current day/week/2-week period

• Perform as expected
  – Win games the right way
  – Lose games that should be lost

• Players perform as expected

• Question: Is there anything missing?
Objectives: In-game

• Win
• Stay healthy
• Question: Is there anything missing?
Decision-making: 3+ years

- Decisions:
  - Who to draft
  - Which personnel changes to make
  - What a player is worth
Decision-making: Current year

• Decisions:
  – What to do with the compressed schedule this season
  – Story: “I don’t give the scouts the reports. I use them to make sure our scouts are doing their jobs effectively.”
  – How to adjust for injuries
  – Dump unrestricted free agents or aim for a championship
Decision-making: Current day/week/2-week period

- Decisions:
  - Regular pro/amateur scouting
  - How to help players perform to expectations
    - Story: “Why isn’t John Smith scoring at historical rate?”
  - Game preparation
    - Which approach to use against upcoming opponent
    - What 3 focus-items to provide players
    - How long a player’s shift should be
    - How many minutes a player should play
  - Which goaltender to play
Decision-making: In-game

- When to pull the goalie
- When to change the approach based on winning/losing
- How will a fight impact the likelihood of a win
- Dump-and-chase or carry the puck into the offensive zone
Challenges

• (general ones covered earlier)
• Player market isn’t very liquid
• Individual vs. team incentives
• Modeling
  – Players are playing offense and defense at the same time
  – Players play differently based on the state of the game
  – Interactions between line-mates and opponents
  – Some key gaps in the data that are captured
  – Limited amount of data in the NHL’s “feeder” leagues
Challenges (cont’d)

• Getting side-tracked on analytics
  – Chasing the “perfect” metric(s)
  – Investing too heavily in technology relative to great analysts
  – Waiting for more/new/cleaner data to support decision-making
  – Perception of immunity to and/or lack of understanding of human biases in decision-making