Facilitating an Analytics Transformation: The Disney Story

AMATYC

November 16, 2018

Mark W. Shafer
Senior Vice President, Revenue Management & Analytics
The views expressed are my own and not necessarily those of The Walt Disney Company.

Any analytics strategies or techniques attributed to Disney are not necessarily those that Disney may use in a given situation.
Agenda

- Who Are We
- How Did We Evolve
- Key Lessons Learned
2018 Revenue $59 Billion

- Media Networks: 41%
- Parks & Resorts: 34%
- Consumer Products & Interactive Media: 8%
- Studio Entertainment: 17%
To be the leader in the design, development, and integration of innovative decision science solutions to improve The Walt Disney Company business performance.
Disney Decision Science & Integration

Who Are We?

Mark Shafer, SVP
Revenue Management & Analytics

Karin Kricorian, Director
Management Science & Integration
Marketing & Content Analytics

Olivier Flament, Director
Management Science & Integration
Pricing & RM Integration

Tom Denslow, Director
Management Science & Integration
Sales Optimization & Media Research

Hai Chu, VP
Decision Science
Advanced Modeling and Scientific Engineering

Teddy Benson, Director
Decision Science & Integration
Data Modeling, Analytic Solution Development and Project Management

© Disney
Areas of Expertise

Who Are We?

Statistics
Cluster & Segmentation Analysis
Data Visualization

Probability Theory
Factor Analysis
Principal Components
Simulation

Extrapolative Forecasting
Explanatory Forecasting
Bayesian Forecasting
Unconstraining Methodology

Mixed Integer Programming
Linear Programming
Non-Linear Programming
Dynamic Programming

Economics Theory
Discrete Choice Modeling
Revenue Management Science (e.g. Overbooking)
Pricing Science (e.g. Elasticity Estimates)

Network Modeling & Graph Theory
Machine Learning
Decision Theory

Data Modeling
SQL (Structured Query Language)
SAS
250+ Cast Members
50+ PhDs
How Did We Evolve?
How Did We Evolve?

1995

Hotels
How Did We Evolve?

- Hotels
- Sales Optimization
- Merchandise
- Food and Beverage
- Disney Cruise Line
- Theme Parks
How Did We Evolve?

- Disney Parks, Experiences and Consumer Products
- Hotels
- Sales Optimization
- Merchandise
- Food and Beverage
- Disney Cruise Line
- Theme Parks

Brands: Disney, ESPN, Disney Channel, Freeform, ABC News, ABC, Pixar, Walt Disney Studios Motion Pictures, Theatrical Productions Ltd.
“Disney ... has turned this into a science.”

“...Disney even managed to do it by charging half as much for top tickets as some rivals.”
U.S. Air Force & Walt Disney awarded the 2017 INFORMS Prize
For Operations Research & Advanced Analytics
Key Lessons Learned
Key Lessons Learned

- Investment Profile
- Evangelizing Analytics
- Speed to Market
- Flaw of Averages
- You Are Never Finished
- Talent
- Importance of Integration
The “Birth” of Revenue Management

January 17, 1985
American Airlines announces Ultimate Super Saver fares.
Investment both **expands** the company’s revenues as well as keeps it successful.
Key Lessons Learned

- Investment Profile
- Evangelizing Analytics
- Speed to Market
- Flaw of Averages
- You Are Never Finished
- Talent
- Importance of Integration
There will come a time when you will be in a situation with the **right decision**, **wrong outcome**.
Key Lessons Learned

- Investment Profile
- Evangelizing Analytics
- Speed to Market
- Flaw of Averages
- You Are Never Finished
- Talent
- Importance of Integration
Speed to Market

Key Lessons Learned
Key Lessons Learned

- Investment Profile
- Evangelizing Analytics
- Speed to Market
- Flaw of Averages
- You Are Never Finished
- Talent
- Importance of Integration
Recognize you are **never right** and **you’re never done**.

- Dr. Adam Grant, University of Pennsylvania
Hotel Revenue Management Model

- Manual RM
- Science Based RM
- Probabilistic Upgrading
- CCRM
- CCRM/DTS Online
- Personalization
- Itinerary Planning Tool
- Enhanced Optimization
- Rules Based RM
- Availability Server
- Demand Tracking System
- Promotion Manager
- Hybrid HROS
- Strategic Value
- Rate Category Realignment
- Group & Space Optimization

Years:
- Pre 1995
- 1995
- 2002
- 2004
- 2007
- 2011
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
“Let your past inspire you, let it motivate you, but never let it hold you back.”

- Walt Disney
Key Lessons Learned

- Investment Profile
- Evangelizing Analytics
- Speed to Market
- Flaw of Averages
- You Are Never Finished
- Talent
- Importance of Integration
Talent

Key Lessons Learned
“If you can’t explain it simply, you don’t understand it well enough.”

- Albert Einstein
Key Lessons Learned

- Investment Profile
- Evangelizing Analytics
- Speed to Market
- You Are Never Finished
- Talent
- Importance of Integration
- Flaw of Averages
Ability to produce results and the ability to consume results

- Professor Sam Ransbotham, Boston College
Max Objective

\[ RR + SR \geq \text{Objective s.t.} \]
\[ \sum_{p,r} RR_{pr} = RR \]
\[ \sum_{p,r} SR_{pr} = SR \]
\[ \{ \sum_{r} \left[ \sum_{m} (1 - d_{prm}) (y_{prmt}^p - y_{prmt}^k) + (1 - d_{prmt})(w_{prmt}^p - w_{prmt}^k + w_{prmt}^c - w_{prmt}^k) + \sum_{j=0}^{\gamma} (1 - d_j)(z_{prj}^p - z_{prj}^k + z_{prj}^c - z_{prj}^k) \right] \} = RR_{pr} \quad \forall \ p, r \]
\[ \{ \sum_{r} \left[ (1 - \gamma)\Delta_{pr} \sum_{m} (y_{prmt}^c - y_{prmt}^k) - \Delta_{pr} + \Delta_{pr} \Delta_{pr} + \Delta_{pr} \Delta_{pr} + \sum_{m} (w_{prmt}^c - w_{prmt}^k + w_{prmt}^c - w_{prmt}^k) + \sum_{j=0}^{\gamma} (z_{prj}^c - z_{prj}^k + z_{prj}^c - z_{prj}^k) \right] \} = SR_{pr} \quad \forall \ p, r \]
\[ \Sigma_i (x_i^{p_{r_j}} + z_i^{p_{r_j}}) + \sum_{m} (y_{prmt}^c + w_{prmt}^c + w_{prmt}^c) \leq C_{pr} \quad \forall \ p, r, t \]
\[ z_{prj}^{p_{r_j}} \leq \sum_{(s,t)} x_{st} \max(0, \frac{\Delta_{prj}}{\Delta_{prj}}) \quad \forall \ p, r \]
\[ -z_{prj}^{p_{r_j}} = \sum_{(s,t)} x_{st} \min(0, \frac{\Delta_{prj}}{\Delta_{prj}}) \]
\[ z_{prj}^{c} \leq \sum_{(s,t)} x_{st} \max(0, \frac{\Delta_{prj}}{\Delta_{prj}}) \quad \forall \ p, r \]
\[ -z_{prj}^{c} = \sum_{(s,t)} x_{st} \min(0, \frac{\Delta_{prj}}{\Delta_{prj}}) \]
\[ y_{prmt}^c \leq \sum_{(s,t)} x_{st} \max(0, \frac{\Delta_{prmt}^c}{\Delta_{prmt}^c}) \quad \forall \ p, r, t \]
\[ -y_{prmt}^c = \sum_{(s,t)} x_{st} \min(0, \frac{\Delta_{prmt}^c}{\Delta_{prmt}^c}) \]
\[ w_{prmt}^c \leq \sum_{(s,t)} x_{st} \max(0, \frac{\Delta_{prmt}^c}{\Delta_{prmt}^c}) \quad \forall \ p, r, t \]
\[ -w_{prmt}^c = \sum_{(s,t)} x_{st} \min(0, \frac{\Delta_{prmt}^c}{\Delta_{prmt}^c}) \]
Importance of Integration

Key Lessons Learned
Importance of Integration

Key Lessons Learned
Key Lessons Learned

- Investment Profile
- Evangelizing Analytics
- Speed to Market
- Flaw of Averages
- You Are Never Finished
- Talent
- Importance of Integration
“Flaw of Averages”

- Sam Savage, author
When U.S. Air Force discovered the . . .

flaw of averages
Cost of Being Wrong

Often, a resort will have sufficient or excess demand to fill its capacity; however, it will not always be a perfect fit to the mix of room categories.

<table>
<thead>
<tr>
<th>ROOM TYPE</th>
<th>Standard</th>
<th>Preferred</th>
</tr>
</thead>
<tbody>
<tr>
<td>RATE</td>
<td>$100</td>
<td>$110</td>
</tr>
<tr>
<td>CAPACITY</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>AVERAGE DEMAND</td>
<td>15</td>
<td>4</td>
</tr>
</tbody>
</table>

Capacity = 15 rooms
Demand = 19 rooms

How many of the preferred rooms should be “protected” for Guests willing to pay a preferred rate versus over-selling additional standard rooms?
Cost of Being Wrong

$10 Under Protect

VS.

$100 Over Protect
## Cost of Being Wrong

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Standard Demand</th>
<th>Capacity</th>
<th>Preferred Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prob</td>
<td>Rate</td>
<td>EMRR</td>
</tr>
<tr>
<td>1</td>
<td>100%</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td>2</td>
<td>100%</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td>3</td>
<td>100%</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td>4</td>
<td>100%</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td>5</td>
<td>100%</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td>6</td>
<td>100%</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td>7</td>
<td>100%</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td>8</td>
<td>100%</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td>9</td>
<td>100%</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td>10</td>
<td>99%</td>
<td>$100</td>
<td>$99</td>
</tr>
<tr>
<td>11</td>
<td>98%</td>
<td>$100</td>
<td>$98</td>
</tr>
<tr>
<td>12</td>
<td>90%</td>
<td>$100</td>
<td>$90</td>
</tr>
<tr>
<td>13</td>
<td>83%</td>
<td>$100</td>
<td>$83</td>
</tr>
<tr>
<td>14</td>
<td>66%</td>
<td>$100</td>
<td>$66</td>
</tr>
<tr>
<td>15</td>
<td>50%</td>
<td>$100</td>
<td>$50</td>
</tr>
</tbody>
</table>

**Comparing EMRRs**

- Only protect 2 preferred room types and oversell the standard room type by 3;
- a $40 gain ($1,481 vs. $1,441 in expected revenue)
“Any organization that is not a math house now or is unable to become one soon is already a legacy company.”

- RAM CHARAN, AUTHOR

The Attacker’s Advantage:
Turning Uncertainty Into Breakthrough Opportunities

In today's global analytics arms race, YESTERDAY'S STRATEGIC ADVANTAGE CAN QUICKLY BECOME TOMORROW'S INDUSTRY STANDARD. To stay competitive, we must continue to invest and evolve at an ever increasing rate.
THANK YOU!