

An Automatic Recommendation System using R

Christopher Byrd – Analytics System Architect - christopher.byrd@ihg.com



An Automatic Multivariate Testing System using R

Christopher Byrd – Analytics Systems Architect - christopher.byrd@ihg.com



Business Need: Relevancy + Maximizing Customer Engagement

Q. How to Optimize Consumer Interactions, with an eMail Application?

- Recommendation System
- Targeting System
- ☑ **Multivariate Testing**



What is Multivariate Testing?

- “True multivariable testing will not only be able to test millions of content variations, it will also be able to determine the impact each individual variable has on conversion, by itself, and in conjunction with other variables.” – Optimost
- “Multivariate testing is a method of experimentation that allows you to test multiple variables simultaneously...” - Google



Thank You Email - 10 Personalization Areas (10 Factors)



Got Content? What's the Optimal Combination?

A collage of promotional banners for Priority Club and SmartMart. The banners include:

- A banner for Priority Club with the text 'relax', 'Earn up to 40,000 points', and 'Join Priority Club Rewards and earn points toward merchandise, free stays and more.' with a 'Join now.' button.
- A banner for SmartMart with the text 'Smart MART Visit our company store' and a 'Go' button.
- A banner asking 'Where would you like to go next?' with a 'Book your stay.' button.
- A banner for 'Sign up & Save!' with a 'Save on your Stay with Priority Club Rewards Signature Visa Card'.
- A banner for 'Get exclusive news and offers.' with a 'Details' button.
- A banner for '5,000 bonus points to start.' with an 'Apply Now' button.
- A banner with the text 'No, but I did stay at a... Express'.
- A banner with the text '1-800-HOLIDAY'.

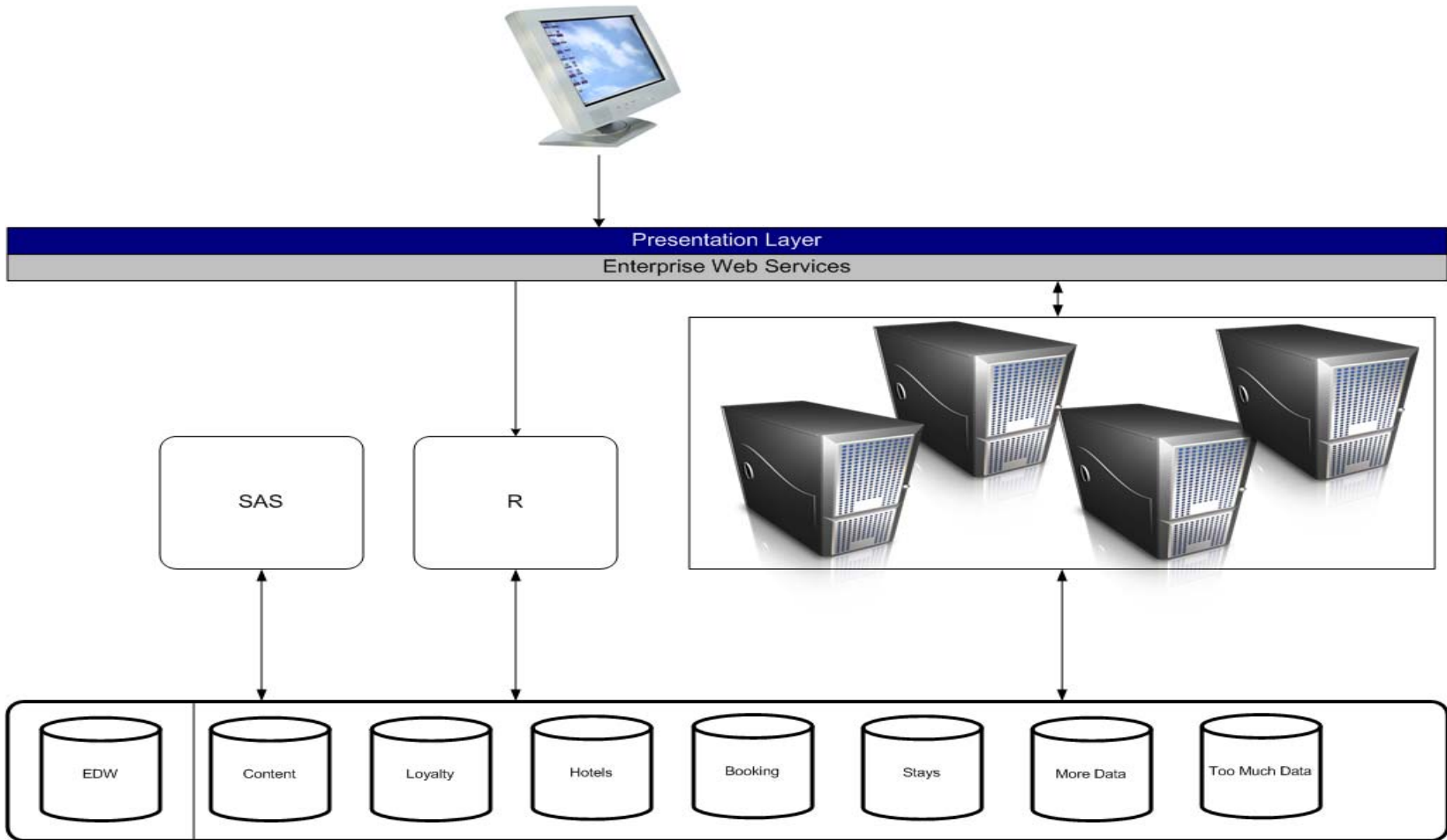
Why use R?

- *“...R would enable us to experiment with the use of multivariate testing, targeting, and recommendation systems all in one programming environment, to meet our business needs.”*

Agenda

- How R Fits in the Enterprise?
- Primary Packages used in Multivariate Testing
- Results

Enterprise Framework Flexible Architecture – Highly Customizable – Session Enabled



Primary Packages Extensible Markup Language (XML)

xmlTreeParse(doc, useInternal = TRUE)

```
<slot name="MAINIMGCTR">
  <content name="SP1_IMG_CTR_2" id="workspace://SpacesSto
    <title>Male Guest</title>
    <description>Male Guest Orange Shirt</description>
    <property name="imageUrl"><![CDATA[http://ihgvideo..
  </content>
  <content name="SP1_IMG_CTR_3" id="workspace://SpacesSto
    <title>Stay Smart</title>
    <description>Stay Smart</description>
    <property name="imageUrl"><![CDATA[http://ihgvideo..
  </content>
  <content name="SP1_IMG_CTR_1" id="workspace://SpacesSto
    <description>Cinnamon Buns</description>
    <property name="imageUrl"><![CDATA[http://ihgvideo..
  </content>
  <content name="SP1_IMG_CTR_5" id="workspace://SpacesSto
    <description>Female Guest</description>
    <property name="imageUrl"><![CDATA[http://ihgvideo..
  </content>
  <content name="SP1_IMG_CTR_4" id="workspace://SpacesSto
    <description>Flower Pillow</description>
    <property name="imageUrl"><![CDATA[http://ihgvideo..
  </content>
</slot>
```

Primary Packages AlgDesign – OptFederov and Gen.Factorial Routines

optFederov(model, data, arg1, ...)

① Factor Assignment

		Main Effects			Interactions			
		A	B	C	D (A-B)	E (A-C)	F (B-C)	G (A-B-C)
Tests	1	-	-	-	+	+	+	-
	2	+	-	-	-	-	+	+
	3	-	+	-	-	+	-	+
	4	+	+	-	+	-	-	-
	5	-	-	+	+	-	-	+
	6	+	-	+	-	+	-	-
	7	-	+	+	-	-	+	-
	8	+	+	+	+	+	+	+

Final email

Design Of Experiments (DOE)

Results Multiple Email Versions “in Market”

Details on your latest Holiday Inn Express stay are shown below

<p>Reservations: 1-800-399-2591</p>	<p>Reservations: 1-800-399-2591</p>	<p>Reservations: 1-800-399-2591</p>	<p>Reservations: 1-800-399-2591</p>	<p>Reservations: 1-800-399-2591</p>	<p>Reservations: 1-800-399-2591 www.hiexpress.com</p>
<p>Thank you for staying with us!</p> <p>Dear LARRY,</p> <p>Thank you for choosing to stay with Holiday Inn Express JACKSONVILLE-SOUTH.</p> <p>We hope you enjoyed your stay and our Simply Smart® amenities.</p> <p>With over 1,700 locations worldwide we hope that you'll choose Holiday Inn Express for your next trip. And we look forward to welcoming you back at our hotel soon!</p> <p>Thank You!</p> <p>Holiday Inn Express Reservations: 1.800.399.2591 www.hiexpress.com</p> <p>P.S. Be sure to look over our newest destinations next time you consider staying at a Holiday Inn Express! View destinations.</p>	<p>Thank you for staying with us!</p> <p>Dear LARRY,</p> <p>Thank you for choosing to stay with Holiday Inn Express JACKSONVILLE-SOUTH.</p> <p>We hope you enjoyed your stay and our Simply Smart® amenities.</p> <p>With over 1,700 locations worldwide we hope that you'll choose Holiday Inn Express for your next trip. And we look forward to welcoming you back at our hotel soon!</p> <p>Thank You!</p> <p>Holiday Inn Express Reservations: 1.800.399.2591 www.hiexpress.com</p> <p>P.S. Be sure to look over our newest destinations next time you consider staying at a Holiday Inn Express! View destinations.</p>	<p>Thank you for staying with us!</p> <p>Dear LARRY,</p> <p>Thank you for choosing to stay with Holiday Inn Express JACKSONVILLE-SOUTH.</p> <p>We hope you enjoyed your stay and our Simply Smart® amenities.</p> <p>With over 1,700 locations worldwide we hope that you'll choose Holiday Inn Express for your next trip. And we look forward to welcoming you back at our hotel soon!</p> <p>Thank You!</p> <p>Holiday Inn Express Reservations: 1.800.399.2591 www.hiexpress.com</p> <p>P.S. Be sure to look over our newest destinations next time you consider staying at a Holiday Inn Express! View destinations.</p>	<p>Thank you for staying with us!</p> <p>Dear LARRY,</p> <p>Thank you for choosing to stay with Holiday Inn Express JACKSONVILLE-SOUTH.</p> <p>We hope you enjoyed your stay and our Simply Smart® amenities.</p> <p>With over 1,700 locations worldwide we hope that you'll choose Holiday Inn Express for your next trip. And we look forward to welcoming you back at our hotel soon!</p> <p>Thank You!</p> <p>Holiday Inn Express Reservations: 1.800.399.2591 www.hiexpress.com</p> <p>P.S. Be sure to look over our newest destinations next time you consider staying at a Holiday Inn Express! View destinations.</p>	<p>Thank you for staying with us!</p> <p>Dear LARRY,</p> <p>Thank you for choosing to stay with Holiday Inn Express JACKSONVILLE-SOUTH.</p> <p>We hope you enjoyed your stay and our Simply Smart® amenities.</p> <p>With over 1,700 locations worldwide we hope that you'll choose Holiday Inn Express for your next trip. And we look forward to welcoming you back at our hotel soon!</p> <p>Thank You!</p> <p>Holiday Inn Express Reservations: 1.800.399.2591 www.hiexpress.com</p> <p>P.S. Be sure to look over our newest destinations next time you consider staying at a Holiday Inn Express! View destinations.</p>	<p>No, but I did stay at a Holiday Inn Express® last night.</p> <p>Join Priority Club® Rewards and start earning Triple Points or Miles for your stays.</p> <p>Join now.</p>
<p>Privacy Statement</p>	<p>Privacy Statement</p>	<p>Privacy Statement</p>	<p>Privacy Statement</p>	<p>Privacy Statement</p>	<p>Privacy Statement</p>

Results Champion Challenger Framework

Details on your latest Holiday Inn Express stay are shown below

Thank you for Staying Smart @!

Dear [NAME],

Thank you for staying with [Holiday Inn Express](#) last night.

We hope you enjoyed our stay and our Simply Smart @ amenities.

With over 1,700 locations worldwide we hope that you'll choose Holiday Inn Express for your next trip. And we look forward to welcoming you back at our hotel soon!

Thank You!

Holiday Inn Express
Reservations: 1-800-999-2999
[www.hisexpress.com](#)

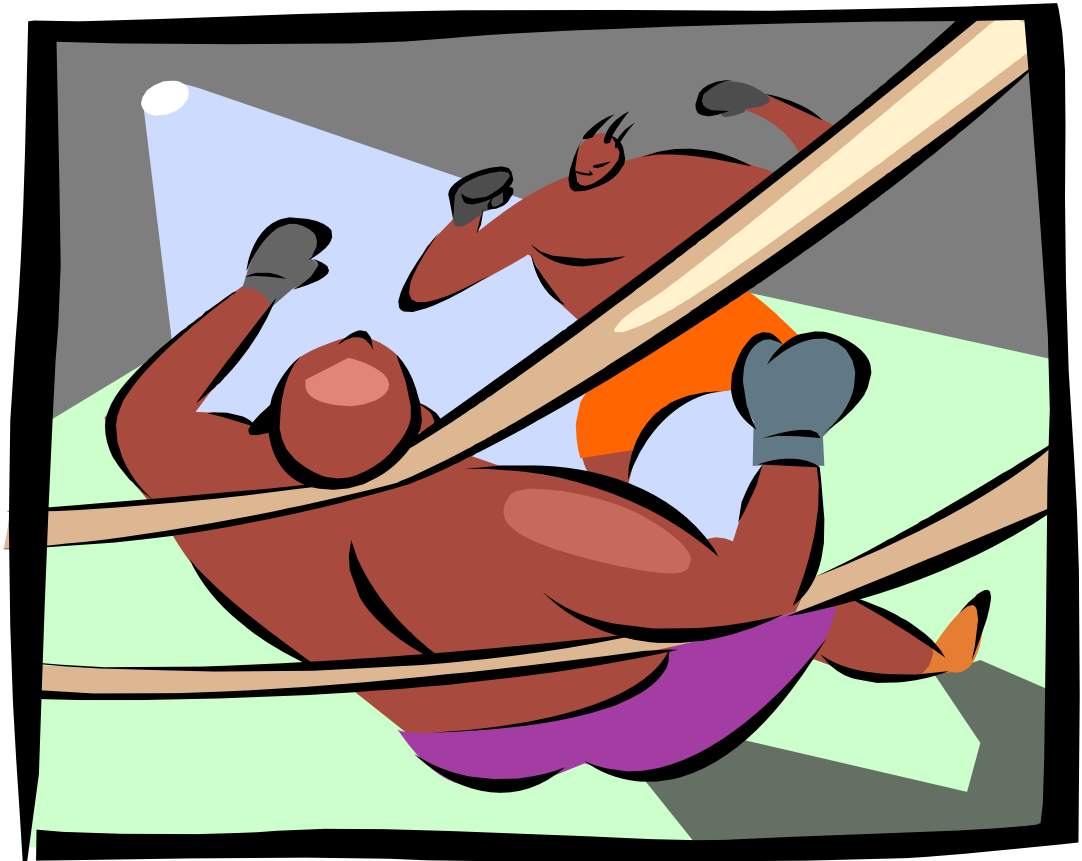
P.S. Be sure to look over our newest destinations next time you consider staying at a Holiday Inn Express!
[View destinations](#)

Join Priority Club®
Rewards and start earning Triple Points or Miles for your stays.
[Join now](#)

No, but I did stay at a Holiday Inn Express® last night.

7%

9%



Compile Behavioral Feedback to Determine a Winner per Segment

Results Preliminary – Open and Click Thru Rates

- ▲ 20% increase in Opens
- ▲ 30% increase in Click Thru



“Thank You!”

Join Priority Club®
Rewards and earn points
toward merchandise,
free stays and more.

Join now. ➤

Winning Combination!