Instructors

Jeff Sauro, PhD
Founding Principal

Jeff Sauro PhD, is the founding principal of MeasuringU. For over twenty years he’s been conducting UX research, including benchmarking studies for clients. Jeff has published over twenty-five peer-reviewed research articles and five other books, including *Benchmarking the User Experience*, *Customer Analytics for Dummies* and *Quantifying the User Experience*.

Jim Lewis, PhD, CHFP
Distinguished User Experience Researcher

Jim is a Certified Human Factors Professional with a Ph.D. in Experimental Psychology (and M.A. in Engineering Psychology, minor in applied statistics). Before joining MeasuringU Jim worked at IBM for nearly 40 years. He is an IBM Master Inventor (> 90 US patents) and has published over 100 articles and papers.
Multiple Regression (Key Driver Analysis)
Topics Covered

• Overview of Multiple Regression (KDA)
• Visualizing Key Drivers
• Multiple Regression in SPSS
• Two In Depth KDA Exercises
Overview of advanced UX analytical methods

Analysis of Differences
- t-Test
- A/B Two-Proportion Test
- Top Task Analysis
- Correlation

Analysis of Structure
- Basic ANOVA
- Advanced ANOVA
- Basic Linear Regression
- Advanced Regression
- Discriminant Analysis
- Logistic Regression
- Kano Model
- Conjoint/MaxDiff
- Cluster Analysis
- Latent Class Analysis
- Factor Analysis

Lower Complexity

Higher Complexity

More info: 5 Advanced Stats Techniques & When to Use Them
Applications of advanced analytical methods

| Question                                      | Methods              | Sample Application                      |
|-----------------------------------------------|----------------------|----------------------------------------|
| **Are there significant differences?**        | Two Proportion Test  | A/B testing                            |
|                                                | t-Test               | Test two designs                       |
|                                                | ANOVA                | Test multiple designs and interactions  |
| **Are there significant similarities?**       | Correlation          | Assess relationships (e.g., CSAT and age) |
| **Are there significant predictors?**         | Linear Regression    | Key driver analysis                     |
| **Is there latent (hidden) structure?**       | Cluster Analysis     | Persona development                     |
|                                                | Factor Analysis      | Develop standardized UX questionnaire   |
|                                                | Latent Class Analysis| Advanced persona development            |
| **Can we determine membership in classes?**  | Discriminant Analysis| Customer segment classification tool     |
|                                                | Logistic Regression  | Statistical basis for feature prioritization |
| **What are the most important features/tasks?**| Conjoint Analysis    | Exhaustive feature prioritization       |
|                                                | MaxDiff Analysis     | Streamlined feature prioritization       |
|                                                | Kano Model           | Alternative feature prioritization method|
|                                                | Top Task Analysis    | Identify most important tasks           |

More info: [5 Advanced Stats Techniques & When to Use Them](#)
Galton observed that certain traits skipped generations and produced smaller and smaller effects.

A variable is not influenced simply by a single important cause but by many causes of greater and lesser importance.
Key Drivers Address Common Business Questions

• What variables affect an outcome measure (KPI)?
• What is the relative importance of the variables?
• What should be focused on or improved?

For example, what impacts customer loyalty?
• A new feature
• Price
• Usability
• Service Experiences
### Multiple Regression/Key Driver Analysis Output

#### Independent Variables (Possible Predictors)

- EasyPayOnline
- EasySettings
- GoodPrice
- Understandable
- StickWithIt
- EasyClaim
- MeetNeeds
- BundleDiscounts

#### Dependent Variable (outcome being predicted)

- Constant

#### Beta Weights are the relative importance

#### Statistical Significance of the predictor

| Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig. | Collinearity Statistics |
|-------|-----------------------------|---------------------------|---|------|-------------------------|
|       | B | Std Error | Beta |     | Tolerance | VIF |
| 1     | 0.809 | 0.147 | 0.064 | 0.036 | 0.083 | 1.793 | 0.074 | 0.483 | 2.071 |
|       | 0.080 | 0.037 | 0.146 | 0.031 | 0.206 | 2.152 | 0.032 | 0.416 | 2.406 |
|       | 0.212 | 0.036 | 0.146 | 0.031 | 0.206 | 4.649 | 0.000 | 0.525 | 1.904 |
|       | 0.054 | 0.020 | 0.212 | 0.036 | 0.296 | 5.937 | 0.000 | 0.416 | 2.406 |
|       | 0.083 | 0.028 | 0.054 | 0.020 | 0.094 | 2.747 | 0.006 | 0.971 | 1.149 |
|       | 0.103 | 0.038 | 0.083 | 0.028 | 0.110 | 2.923 | 0.004 | 0.727 | 1.375 |
|       | 0.078 | 0.025 | 0.103 | 0.038 | 0.134 | 2.710 | 0.007 | 0.423 | 2.366 |

*a. Dependent Variable: SUPRO*
Visualizing Weights (Importance) and Standing (Means)

Weights & Relative Standing (%Satisfied)
Raw Means Converted to Percentages

Weights Only Graph
As Percent of Variance Explained

More info: 10 Things to Know about Key Driver Analyses
Key Driver Analysis: The Art of Visualizing Importance

One visualization we use is the rectangle chart (a type of pie chart) to show relative importance of significant drivers.

The areas of the rectangles correspond to the percentage of overall variance in the dependent variable that the significant independent variables share.

More info: 10 Things to Know about Key Driver Analyses
Predicting UX Quality (SUPR-Q) for Mass Merchant Websites

| 01 | Product images are clear (4%) |
| 02 | It's easy to see exactly how much I'll be charged |
| 03 | It's easy to browse for items (9%) |
| 04 | Product descriptions are clear (12%) |
| 05 | It's easy to search for items |
| 06 | The checkout process is smooth (17%) |
| 07 | Shipping costs are clear |
| 08 | The search results are relevant |
| 09 | It's easy to find item specifications |
| 10 | It's easy to select sizes and colors |
| 11 | I can quickly find the brands I want |
| 12 | It's easy to find exactly what I want (9%) |
| 13 | I can find deals and discounts (5%) |
| 14 | I can find ratings / reviews for products I'm interested in |
| 15 | Product recommendations are relevant (8%) |
| 16 | It's faster than going to a brick-and-mortar store |
| 17 | I can find inspiration for products I might want on the website |
| 18 | My shopping experience was personalized (8%) |
| 19 | The sponsored ads are relevant |

More info: [10 Things to Know about Key Driver Analyses](#)
Visualizing Importance & Relative Standing (% Satisfied)

KDA scatterplot simultaneously shows:

1. the importance (beta weight) of an independent variable
2. its mean expressed as a percentage of its range.

After scaling the axes to match the magnitudes of these variables, we divide the space into **four quadrants** for prioritization:

- **Fix**: High importance/low magnitude indicates a need to improve
- **Leverage & Expand**: High importance/high magnitude suggests finding ways to capitalize on this success
- **Maintain**: Low importance/high magnitude suggests maintenance-level effort to keep magnitude high but limited investment due to relatively low importance
- **Low Gain**: Low importance/low magnitude indicates lowest priority for investment

More info: [10 Things to Know about Key Driver Analyses](#)
Key Driver Analysis Methods & Additional Considerations

1. **Multiple Linear Regression**
   - Predictors can be continuous (e.g., rating scales) or binary (yes/no) or dummy coded
   - Need to watch for too much correlation between variables (multi-collinearity)
   - Start with all variables and use Backward Elimination to retain only significant ones
   - Can get situation with negative beta weights which can be hard to interpret

2. **Binary Logistic Regression**
   - When outcome variable is binary, use logistic regression and will need to interpret logits (log odds)

3. **Shapley Value Regression**
   - More advanced analytical technique that avoids problems with negative beta weights

More info: [10 Things to Know about Key Driver Analyses](#)
Key Driver Analysis: Variable Selection

- Another part of the art of KDA is **variable selection**
- The numbers don’t know where they came from, but we do
- Most of our KDAs model the relationship between measures at different links in the causal chain
- For easiest interpretation, keep independent variables at about the same level in the chain
- In our SUPR-Q studies we routinely model which independent variables drive overall SUPR-Q scores and likelihood-to-recommend
- SEM can model multiple levels

More info: [Leading vs. Lagging Measures in UX](#)
Summary: Multiple Regression (Key Driver Analysis)

1. KDA is a mix of math and art
   - **Math:** Use of multiple regression to obtain beta weights
   - **Art:** Visualization and selection of variables

2. KDA Visualizations:
   - One visualization is the **rectangle graph** based on variance accounted for in the regression model
   - Another visualization is the **KDA importance/magnitude scatterplot** with Fix, Leverage & Expand, Maintain, and Low Gain quadrants

3. When selecting variables for the analysis, think of the causal chain and try to keep predictors at about the same level
MeasuringU is a research firm based in Denver, Colorado focusing on quantifying the user experience.