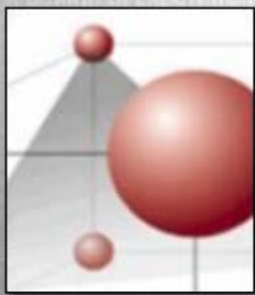


Design Quality Mode

Graph Type: Surface

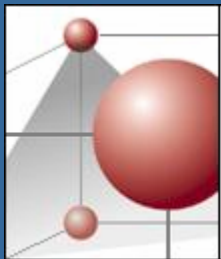
# **Fusion Pro**™



**S-Matrix Corporation**  
<http://www.smatrix.com>



# Simple, Powerful Design of Experiments Software



S-Matrix Corporation

[www.smatrix.com](http://www.smatrix.com)

Ready

# Fusion Pro

- Comprehensive Design Of Experiments (DOE).
- Sequential experimentation by Method of Steepest Ascent = Rapid Development.
- Design and Analysis Wizards guide you every step of the way.
- Trellis graphics for powerful visualization and presentation. Fully editable and exportable.
- MS Word-based reports.

Dr. Gerald J. Hahn of General Electric states:

“One of the greatest contributions of statistical thinking to science and technology is the disciplined planning of investigations, including statistical design of experiments.”

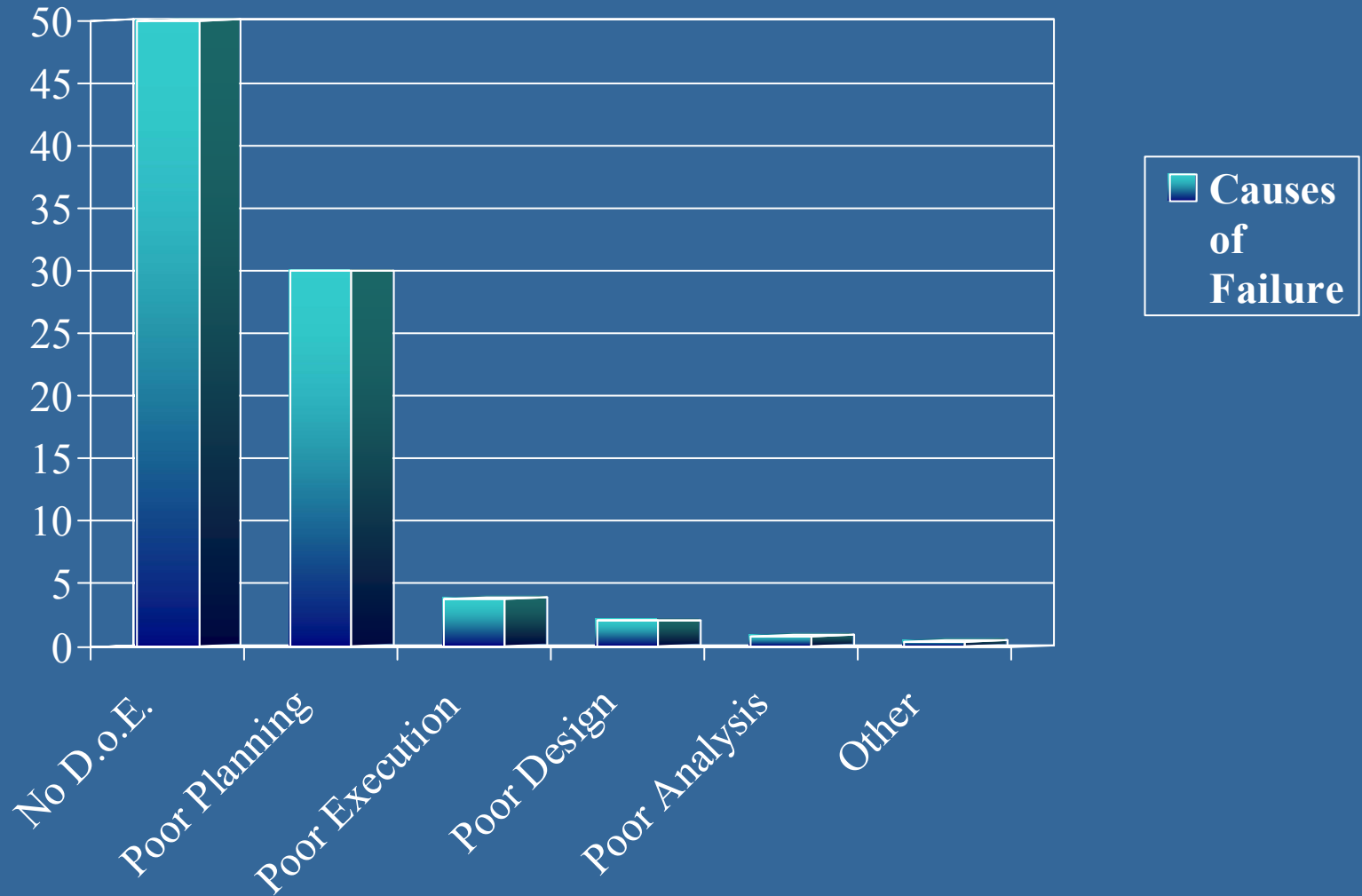
# Fusion Pro

Dr. Berton H. Gunter of MERK states:

**80%** of project failures can be attributed to not using DOE methods:

- **50%** to not using a statistical experiment design.
- **30%** to a lack of statistically-based project planning.

# Fusion Pro



## The Goal:

Dramatically reduce the number of project failures by **integrating DOE into standard practice** in all areas of R&D.

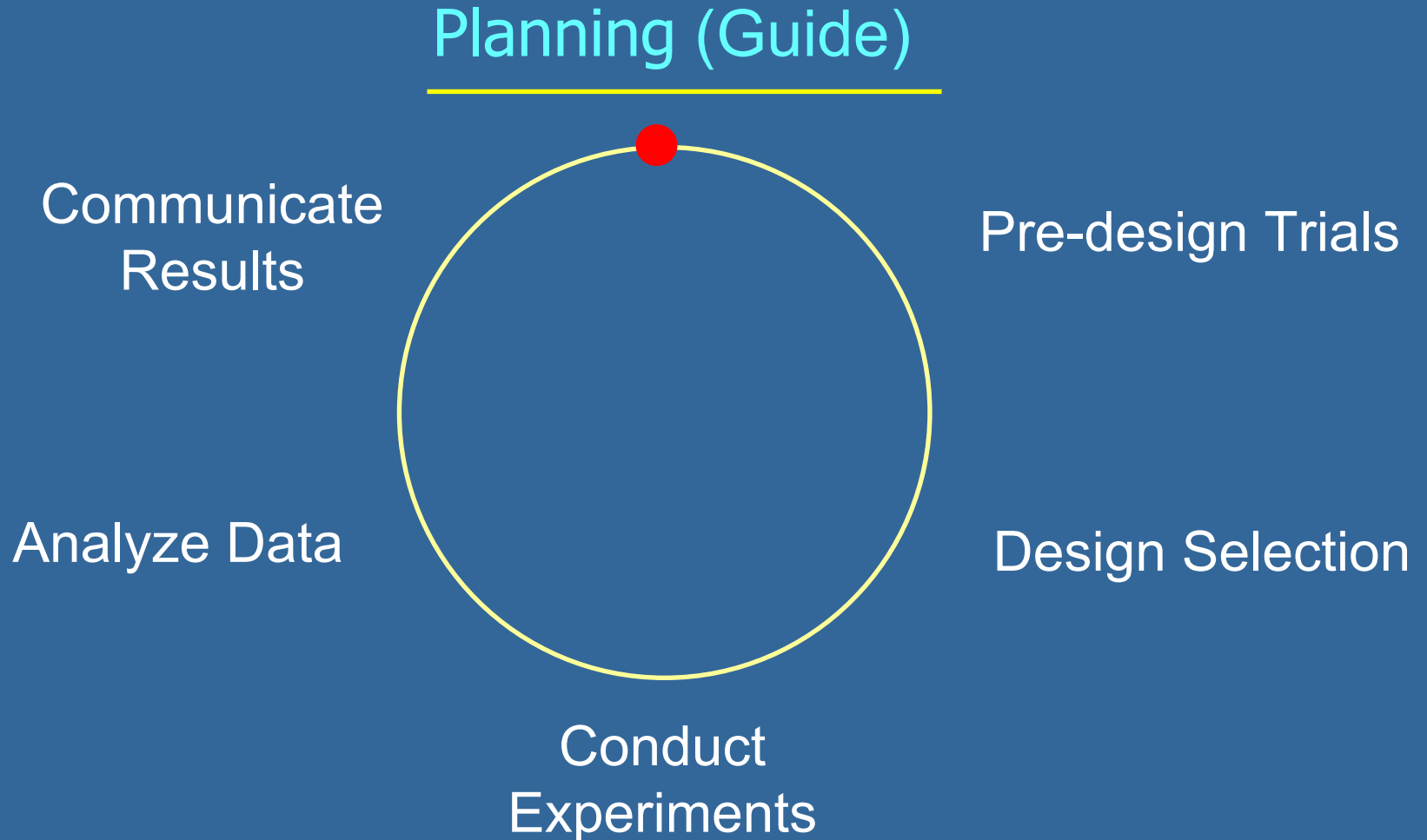
## The Challenge:

Working scientists and engineers understand, **and can defend**, the decisions by which they plan and conduct trial-and-error (successive approximation) experiments. **This is not true for DOE.**

Companies can not expect all their scientists and engineers to have the level of “deep statistics” knowledge required to effectively execute DOE methods.

# The Answer – Fusion Pro!

The ONLY complete DOE software  
that supports **ALL SIX STEPS** in  
the DOE Experimentation Cycle



Ready

# Fusion Pro

**Planning** - Method of Steepest Ascent feature guides you step-by-step through sequential experimentation.

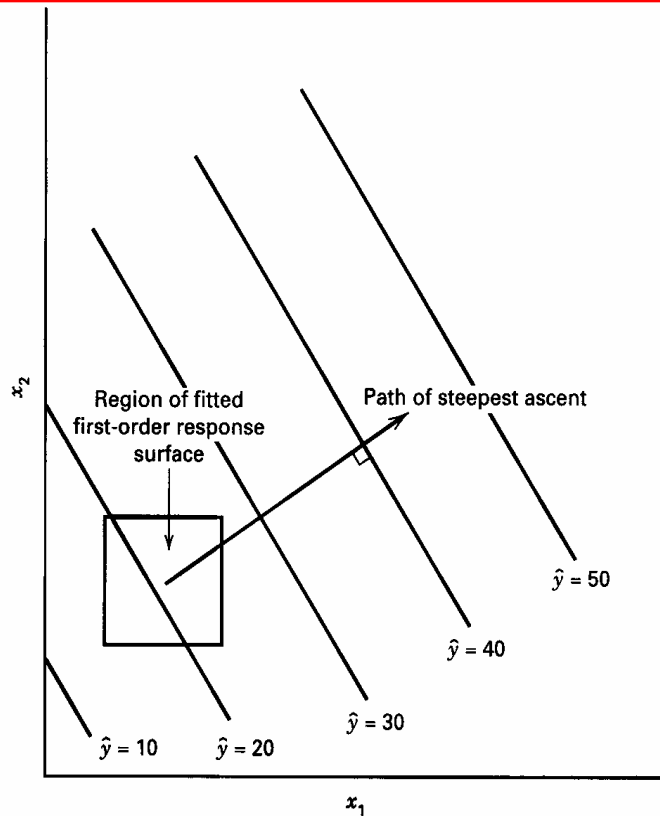
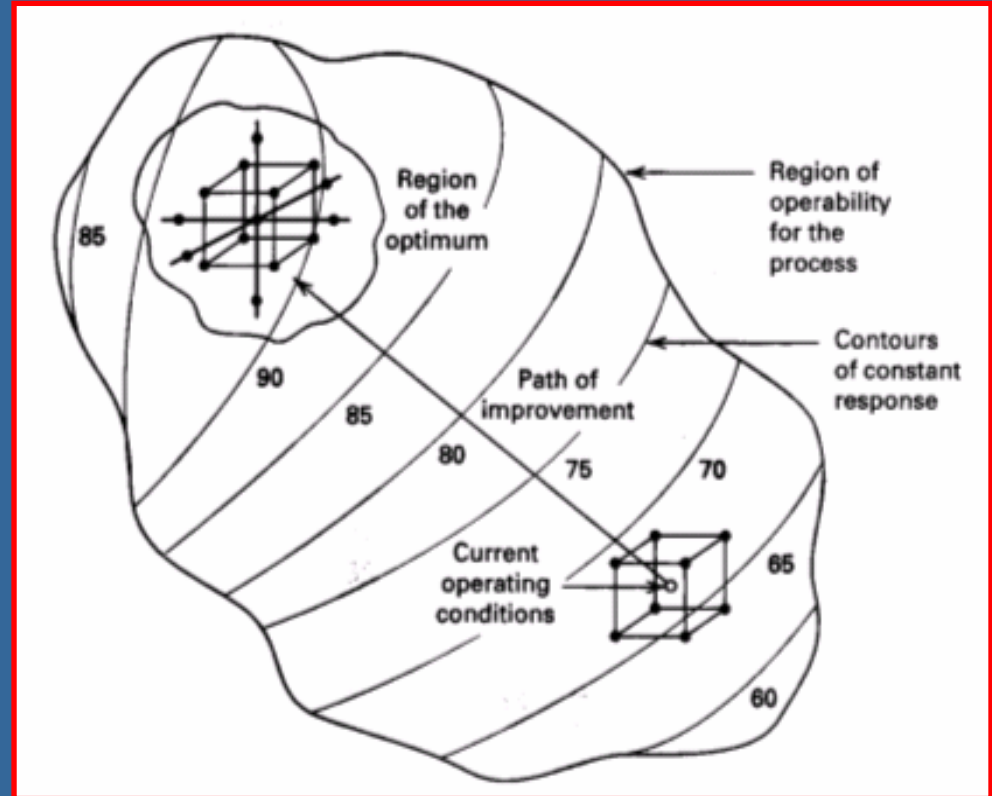
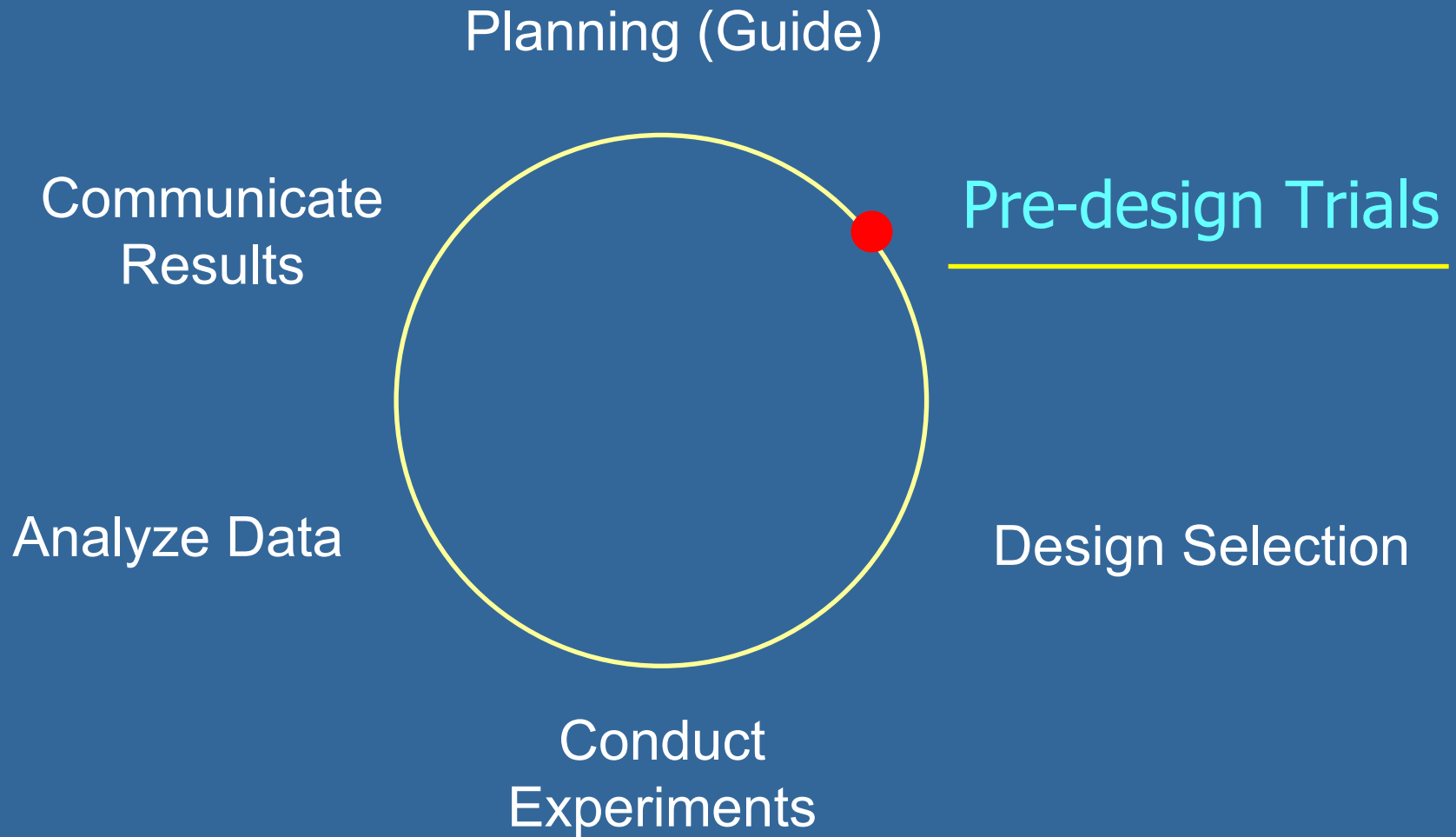


Figure 11-4 First-order response surface and path of steepest ascent.



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**Pre-design Trials** feature lets you make sure you are going to get analyzable data before you carry out a full designed experiment.

**Generate Design Options - User-interactive Mode**

**Wizard Options**

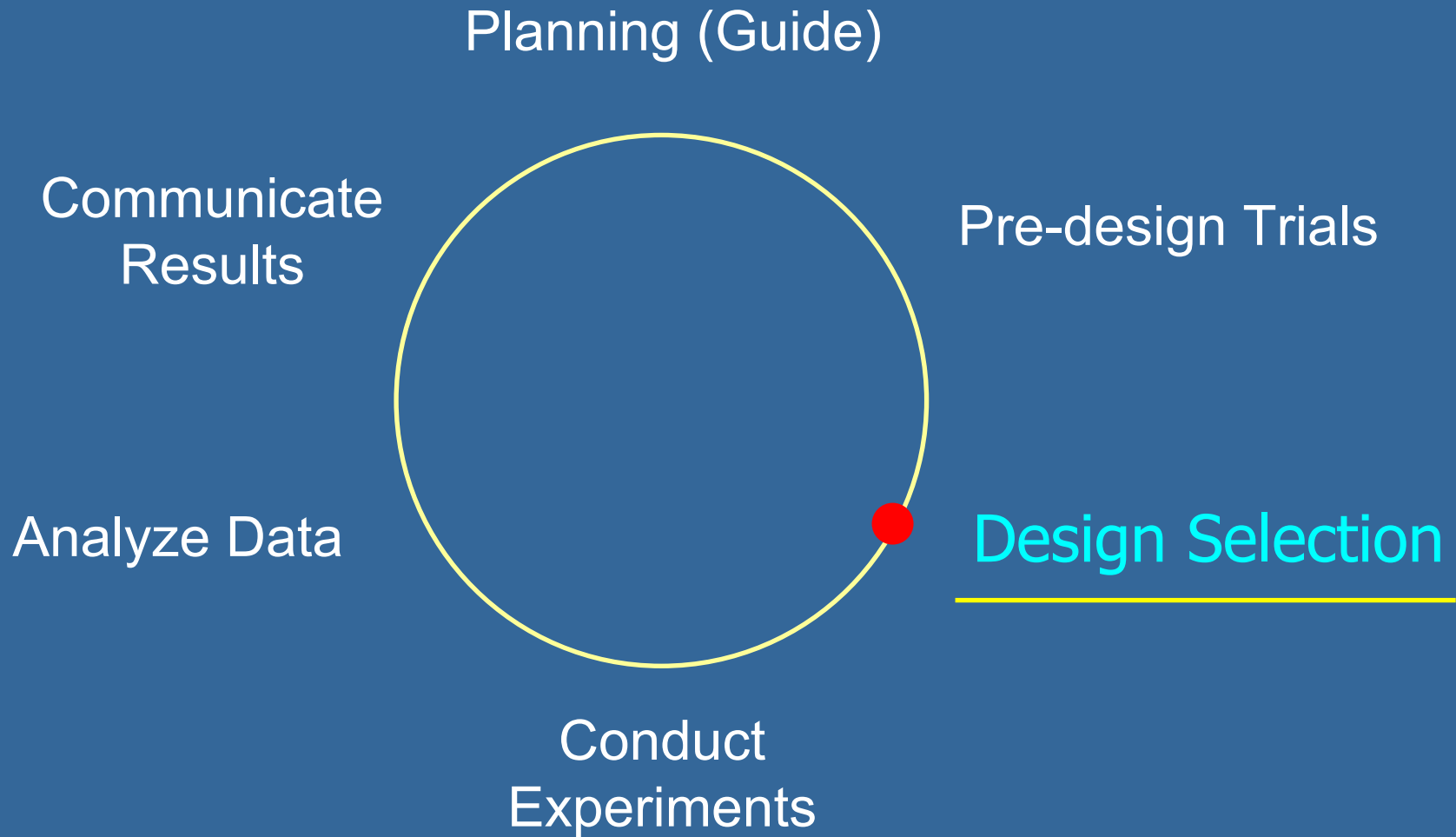
- Design Navigator Wizard — Select this option if you DO NOT KNOW the most correct design type for your variables and goals.
- Design Menu Wizard — Select this option when you KNOW the design type you want to generate.

**Design Options**

- Pre-design Trials
- New
- Fold-over
- Complement
- Augment
- Modelrobust Repair
- Model-specific Repair
- Method of Steepest Ascent

Next >> Cancel ?

# Fusion Pro



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**Design Selection** – Design Navigator Wizard guides you to the correct experiment design for your study variables & goals.

Phase of Work - User-interactive Mode

What phase of work are you in?

Screening

Optimization

Your answer selects one of two types of experiments: Screening and Optimization. The two experiment design types are described below.

Screening

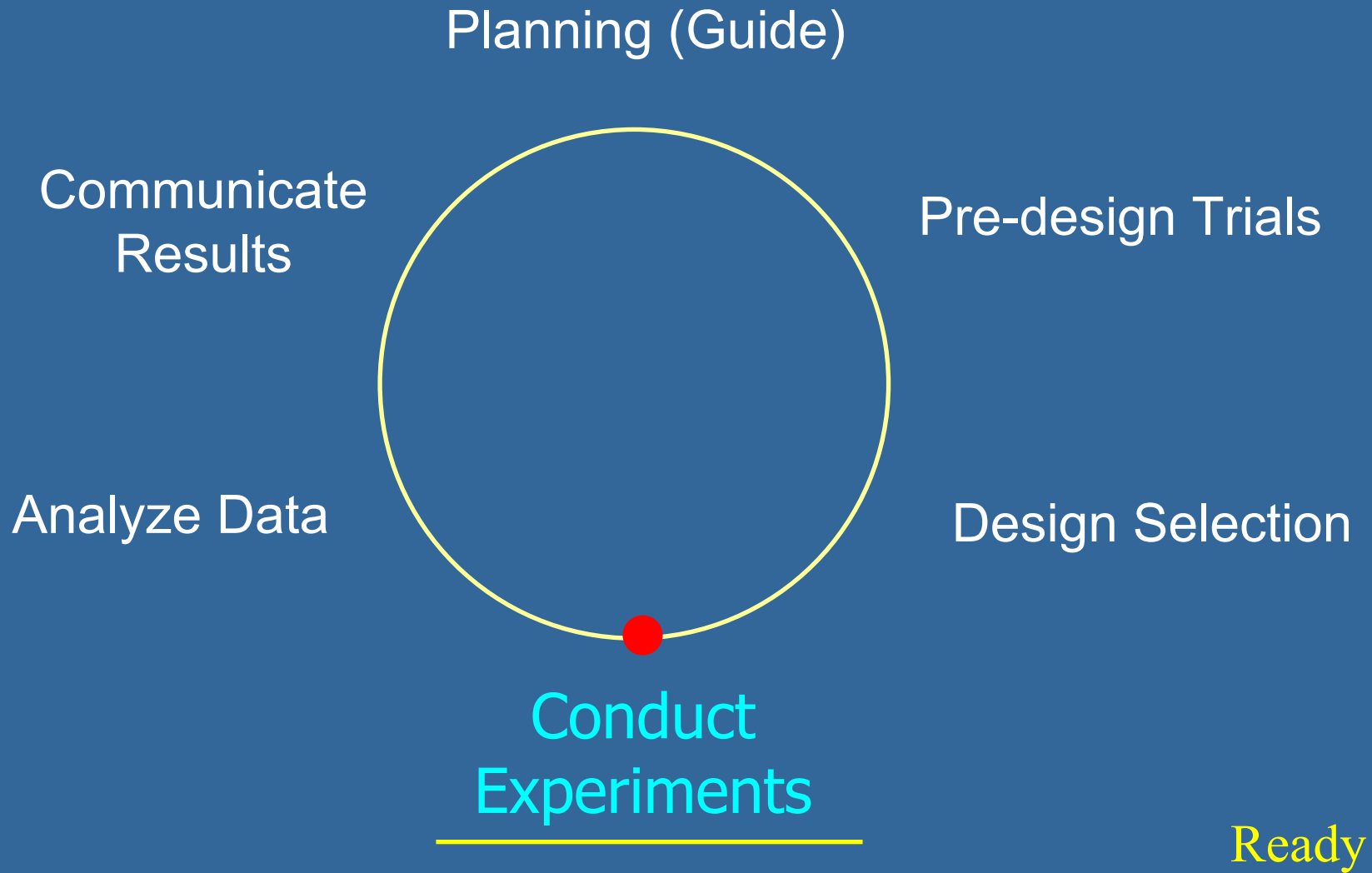
The screening phase has very specific information goals. You should not begin project work in the optimization phase until all applicable screening goals are met. You use screening designs to determine:

1. Which experiment variables are the major effectors of the product quality and performance characteristics you are studying.
2. Which materials, equipment, etc. are the best ones to use of the alternatives available for the experiment variables.

<< Back    Next >>    Cancel

Ready

# Fusion Pro



# Fusion Pro

**Conduct Experiments** - Automatic Bookkeeping feature keeps a running record of all your experiments and test results for a given project.

1. Design of Experiments

- ... Create a Design
- ... Design Reports
- ... Design Matrix Quality

2. Data Mining / Analysis

- Data Entry / Mining**
- ... Data Analysis
- ... Custom Model Builder

3. Response Graphics

- ... Single Response Series
- ... Multiple Response Series

4. Optimization

- ... Automated Optimizer
- ... Overlay Graphics
- ... Point Predictions

5. OLE Automation Tools

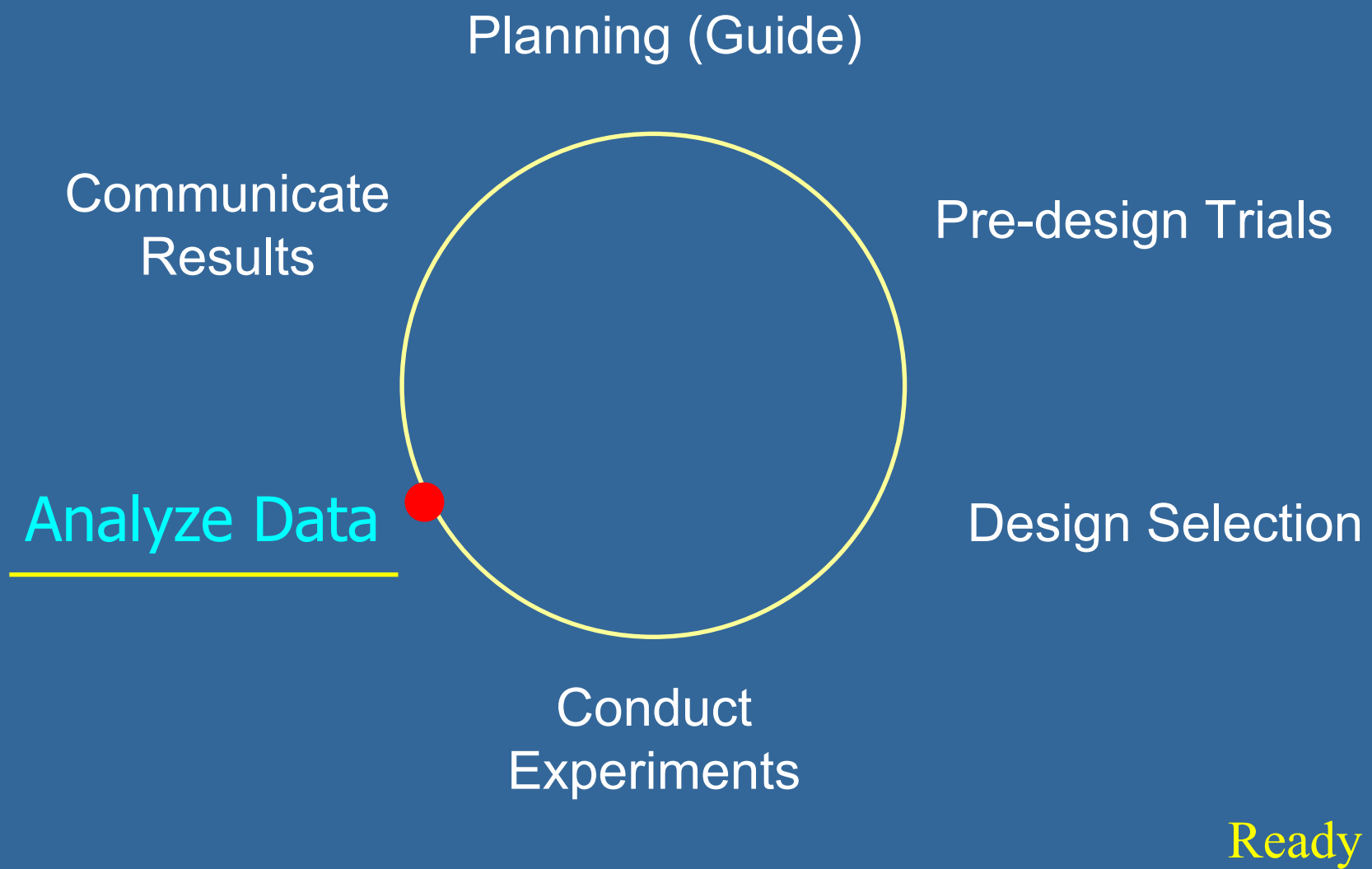
- ... MS Word
- ... MS Excel

	A	B	C	D
1	<b>Run No.</b>	<b>Time (X)</b>	<b>Temp. (X)</b>	<b>Yield (Y)</b>
2	1	30	150	39.3
3	2	40	150	40.9
4	3	30	160	40
5	4	40	160	41.5
6	5	35	155	40.3
7	6	35	155	40.5
8	7	35	155	40.7
9	8	35	155	40.2
10	9	35	155	40.6
11	<b>Run No.</b>	<b>Time (X)</b>	<b>Temp. (X)</b>	<b>Yield (Y)</b>
12	Step 1	40	157	41
13	Step 2	45	159	42.9
14	Step 3	50	161	47.1
15	Step 4	55	163	49.7
16	Step 5	60	165	53.8
17	Step 6	65	167	59.9
18	Step 7	70	169	65
19	Step 8	75	171	70.4
20	Step 9	80	173	77.6
21	Step 10	85	175	80.3
22	Step 11	90	177	76.2
23	Step 12	95	179	75.1

Historical Data Current Design

Ready

# Fusion Pro



# Fusion Pro – PlainTalk Report

The screenshot shows the Fusion Pro software interface. At the top, there are two dropdown menus: 'Response Data' set to 'PEAK AREA' and 'Analysis Results' set to 'PlainTalk Report'. To the right of these is a 'Lab Notebook' button. The main content area is titled 'Error Analysis Results: Transformed PEAK AREA'. It contains two sections: 'Interpretation(s)' and 'Recommendations'. The 'Interpretation(s)' section states: 'The response data contain more variation than can be attributed to overall experimental error alone. Therefore, data analysis is appropriate.' The 'Recommendations' section states: 'Error analysis is complete. Proceed to the Regression Analysis Results section below.' Below this is another section titled 'Regression Analysis Results: Transformed PEAK AREA'. It also contains 'Interpretation(s)' and 'Recommendations' sections. The 'Interpretation(s)' section states: 'The regression analysis model fits the response data. Data analysis is complete.' The 'Recommendations' section contains two paragraphs: 'View the Mean Effects Ranking Table and Chart Report. The table lists the statistically significant variable effects in order from strongest to weakest effector of the response.' and 'In the RESPONSE GRAPHICS module, graph the effects of those variables identified in the Ranking Table and Chart as the strongest effectors.'

Response Data: PEAK AREA

Analysis Results: PlainTalk Report

Lab Notebook

### Error Analysis Results: Transformed PEAK AREA

**Interpretation(s)**

The response data contain more variation than can be attributed to overall experimental error alone. Therefore, data analysis is appropriate.

**Recommendations**

Error analysis is complete. Proceed to the Regression Analysis Results section below.

### Regression Analysis Results: Transformed PEAK AREA

**Interpretation(s)**

The regression analysis model fits the response data. Data analysis is complete.

**Recommendations**

View the Mean Effects Ranking Table and Chart Report. The table lists the statistically significant variable effects in order from strongest to weakest effector of the response.

In the RESPONSE GRAPHICS module, graph the effects of those variables identified in the Ranking Table and Chart as the strongest effectors.

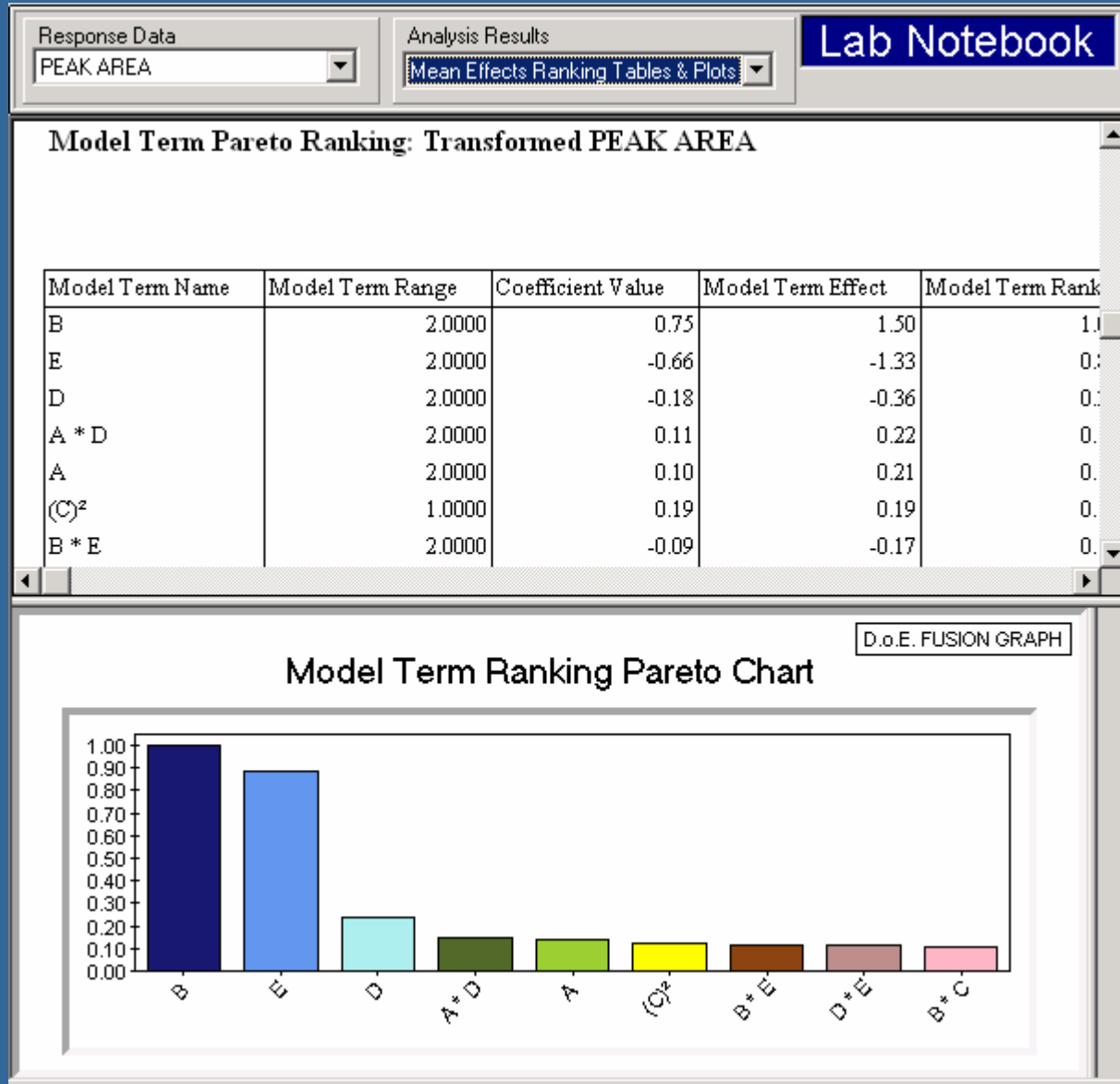
**Automatically evaluates the analysis results**

for correctness and defensibility.

When a result needs attention, the **PlainTalk Report** tells the user exactly what to do next.

Ready

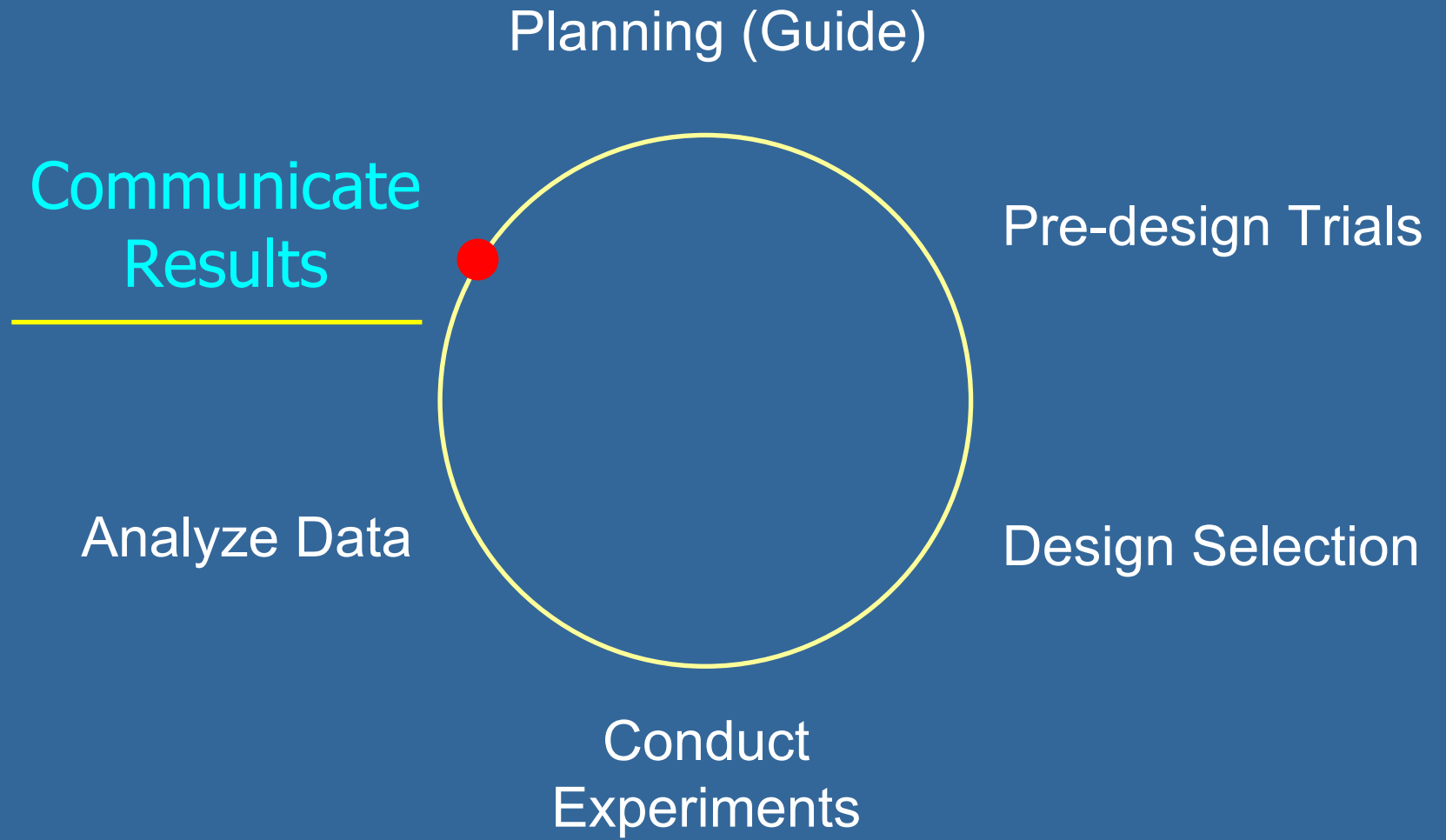
# Fusion Pro – Effects Ranking



**Automatically ranks the study variable effects** from highest to lowest in terms of relative influence on the response.

Effects ranking is presented in both tabulated and graphical formats.

# Fusion Pro



Ready

# Fusion Pro

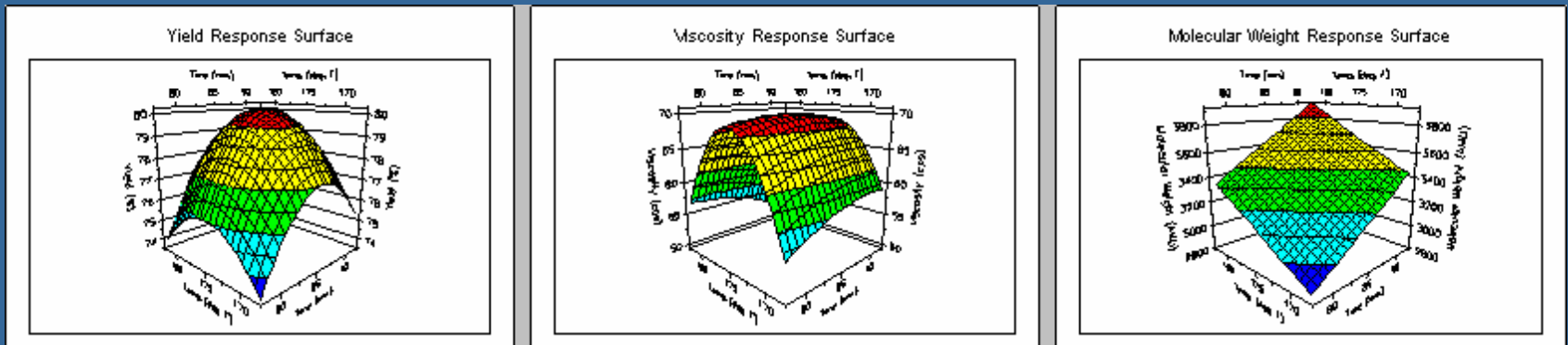
**Communicate Results** - Trellis graphics provide at-a-glance visualization of results.

- Example Trellis of 3 Responses

Yield (%):  
> 78.5

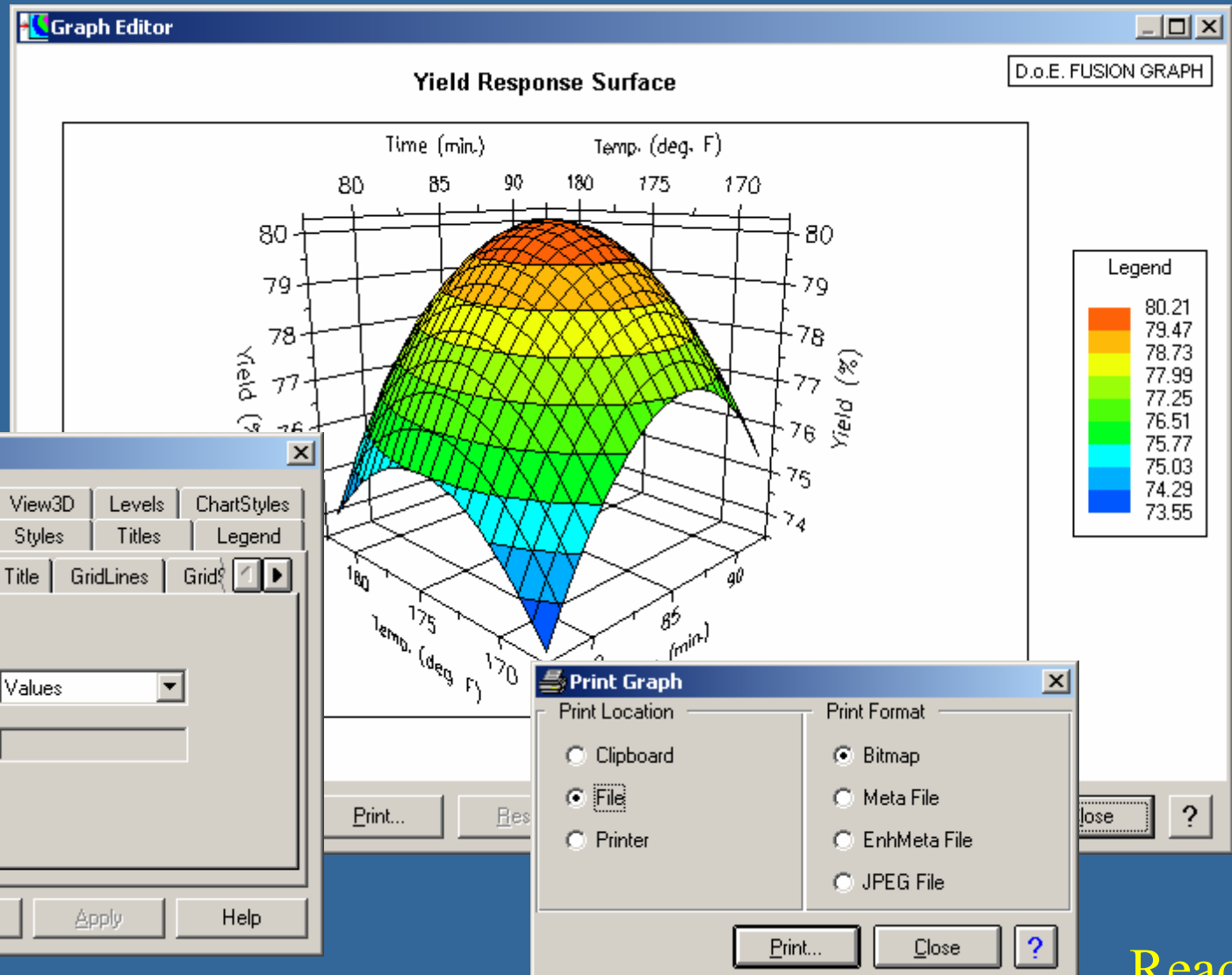
Viscosity (cps):  
62 – 68

Molec. Wt (amu):  
< 3400



# Fusion Pro

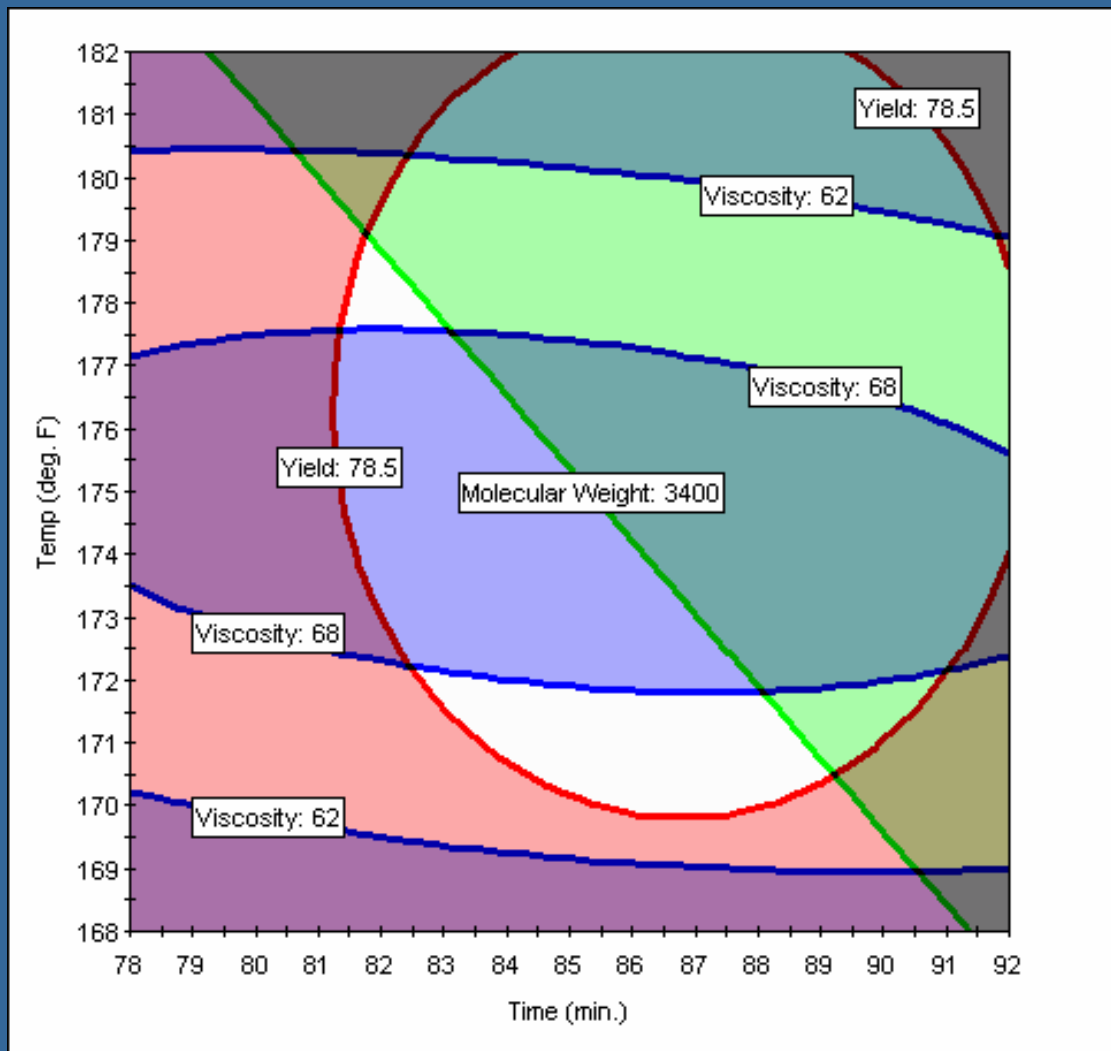
**Communicate Results** - Trellis graphics - each graph is fully editable and customizable.



Ready

# Fusion Pro

**Communicate Results** - Optimization Overlay Graphics instantly visualize the “sweet spot” and it’s robustness.



## Response Goals

**Yield:** > 78.5

**Viscosity:** 62 – 68

**Molecular Wt:** < 3400

Ready

# DOE Applications

- **Study Variation** (Precision & Reproducibility)
- **Screening** (Reduce Dimensions & Range)
- **Robustness** (Mapping of Response Surface)
- **Optimization** (Best Operating Conditions)

# DOE Applications

- Equipment & Instrument Qualification
- Method Development, Validation & Transfer
- Assessing the Need and Level of Components and Process Steps
- Establishing Operating Conditions (Limits)



# Fusion Pro

As the quote below presents, Fusion Pro represents “the best” in rigorously correct, easy-to-use DOE software:

“I believe that **Fusion Pro represents state-of-the-art** in Design of Experiments software. In addition, the Technical Data Mining capabilities are excellently integrated with DOE, and represent sound statistical thinking in both the feature content and tailoring of the underlying statistical engines ...”

Douglas C. Montgomery, Ph.D.

End