DoE APPROACHED DIFFERENTLY

MAKING EVERY EXPERIMENT COUNT IN PILOT PLANTS

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“THINKING IS ONE OF THE MOST IMPORTANT WEAPONS IN DEALING WITH PROBLEMS”, NELSON MANDELA (1918-2013)

Source: http://www.apartheidmuseum.org

DESIRE FOR DESIGN OF EXPERIMENTS

Design of Experiments is:

» Structured

» Efficient

Design of Experiments

» Analysis

runs

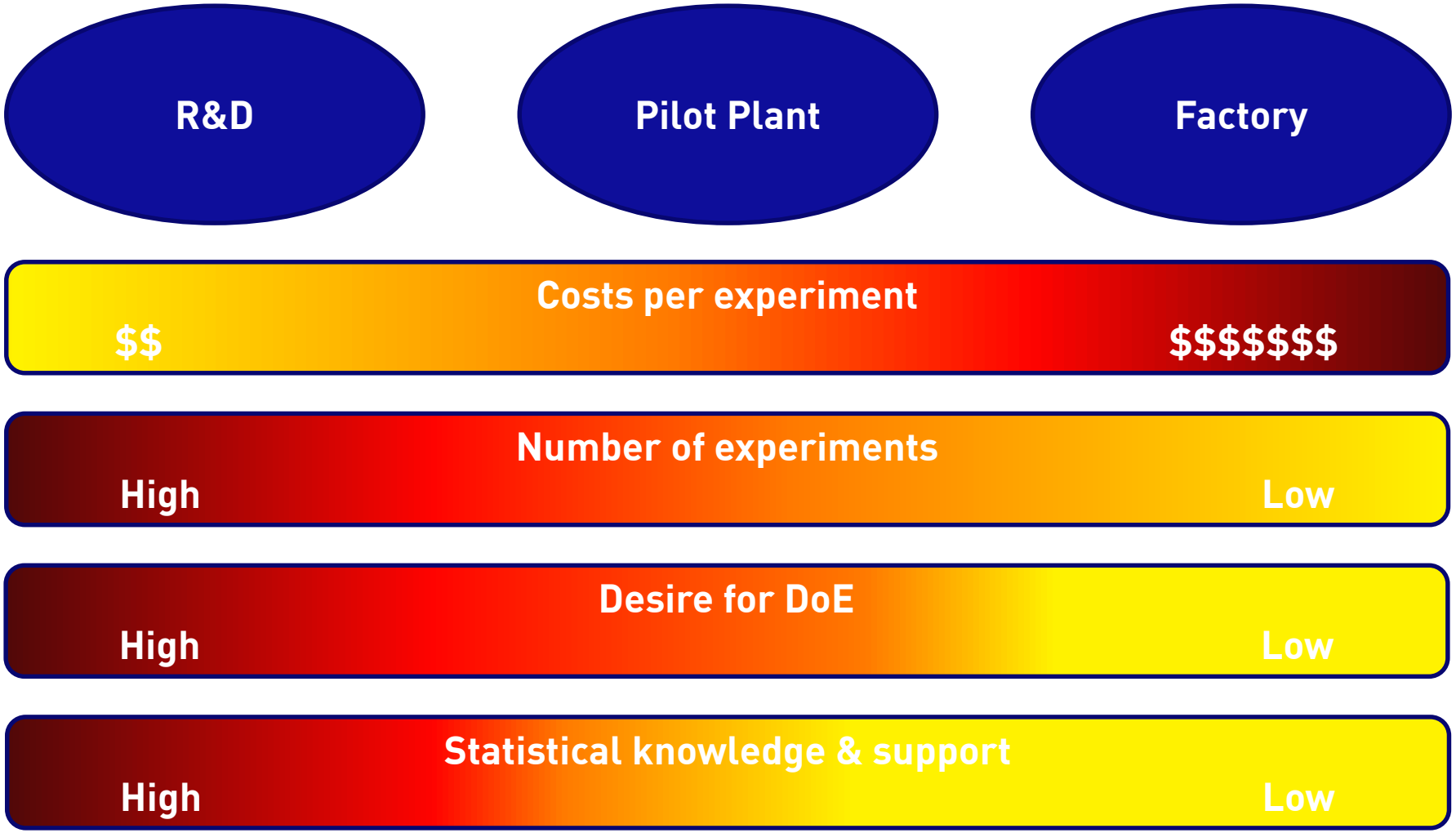
Experiments desires:

» Good preparation

» Good software tool(s)

"The basic idea of Design of Experiments is to ensure that the Research Questions you have can be answered – with a minimum effort – by the results of the experiments you do."

EXPERIMENTING IN UNILEVER GLOBAL



INTRODUCING DoE IN PILOT PLANTS

Challenges:

» 40+ pilot plants, 500+ colleagues

» Statistics is “not their cup of tea”

» Possible lack of knowledge

- Many DoE’s available
- Analysis techniques
- Interpretation of results

Possible solutions:

» Detailed training

» Increase statistical support

» Force the use of DoE

» Simplify the process of applying DoE

SIMPLIFIED PROCESS OF APPLYING DoE IN PILOT PLANTS

Avoid statistically language:

» About type of DoE

» About analysis techniques

Focus on what information is required & knowledge they have

Help at every stage of setting up DoE & analysis

Forced decisions:

» Output of one design

» Predefined set of analysis techniques

HELPING HAND: "PLYOS" SOFTWARE TOOL

Plyos tool (globally available within Unilever):

- Runs in JMP
- Collects known information (responses, factors)
- Q&A for additional information (context sensitive)
- Explains every step and communicates decisions
- Checks input and suggests improvements based on Unilever constraints
- Supplies efficient DoE
- Analyses experimental data
- Helps in interpreting statistical results

FLOW OF PLYOS

Start

Responses

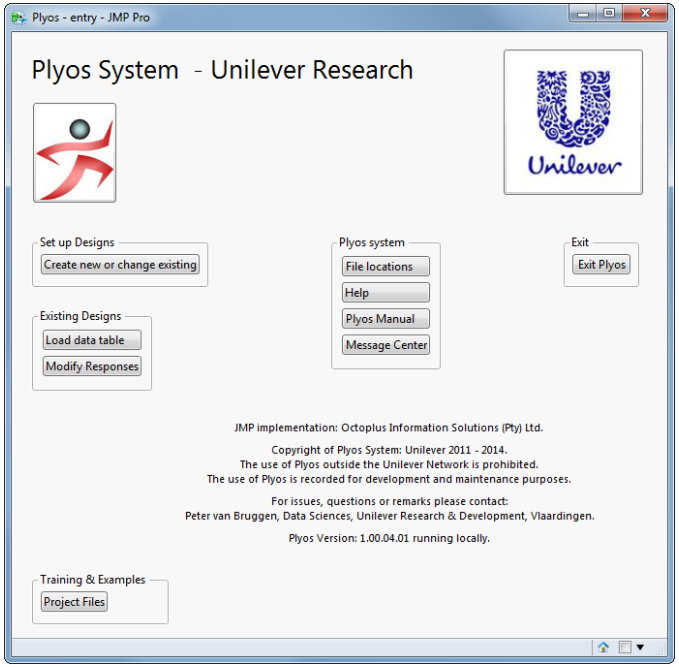
Factors

Q&A

Decisions & consequences

Ready to use design of experiments

Analysis of results



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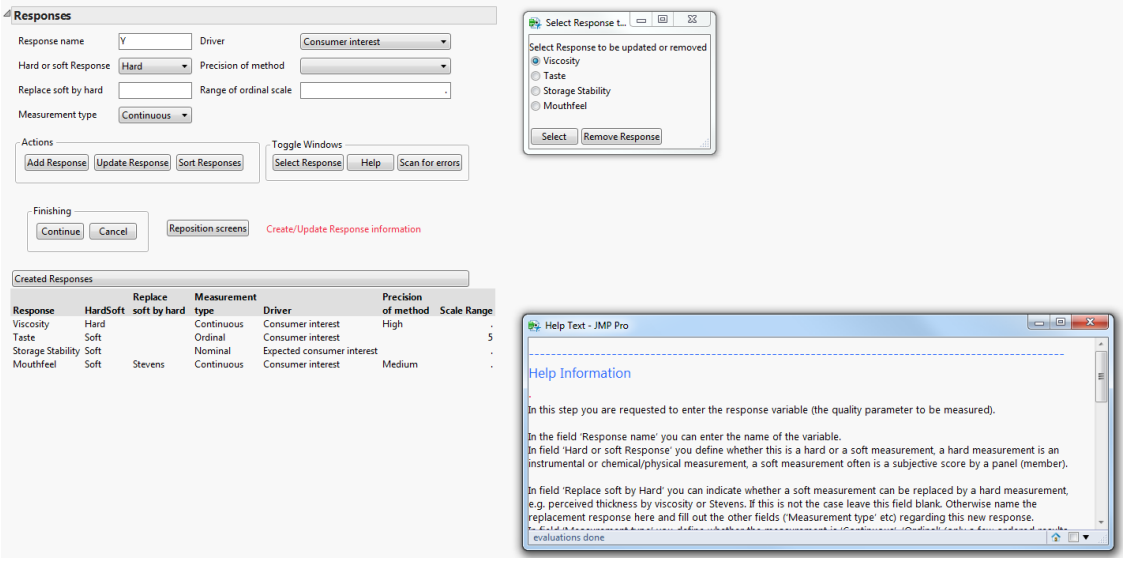

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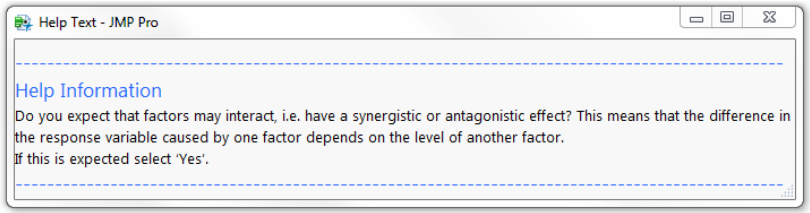

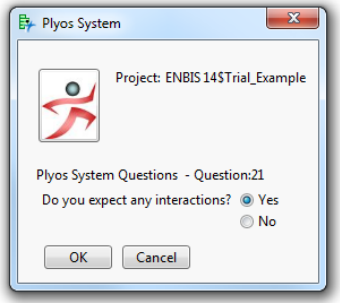

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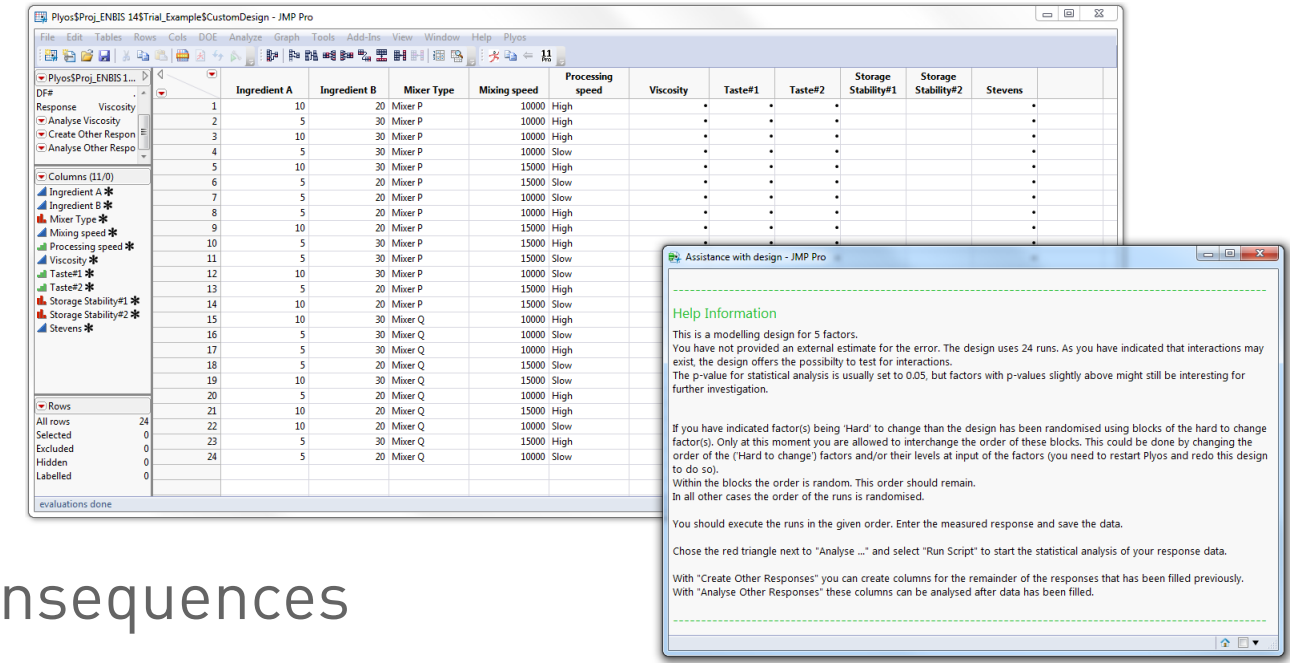

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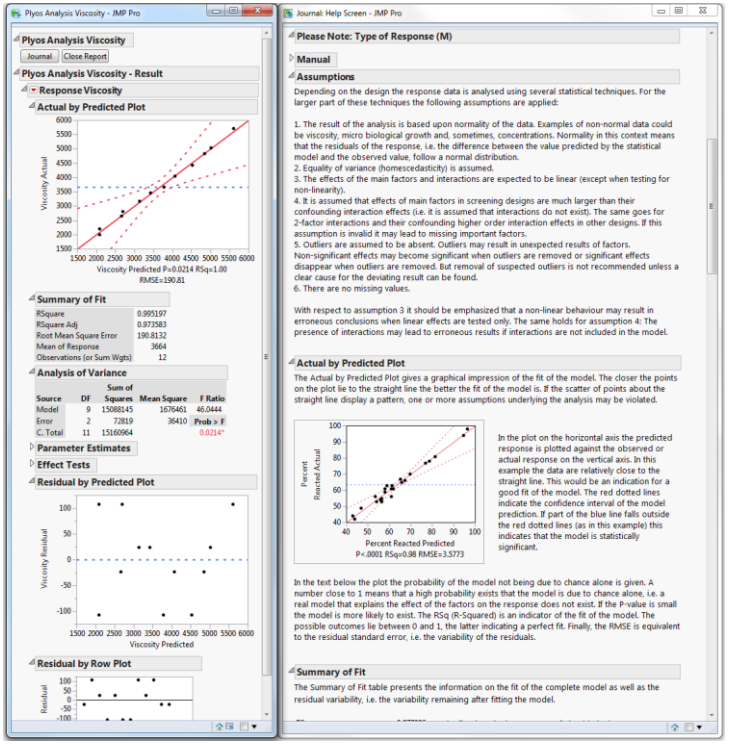

DEVELOPMENT CHALLENGES

Major challenges/problems during development of Plyos:

- How to assure the correct design as output?
- How to create the design?
- How to present the right help at the right stage?

Some minor challenges:

- JMP language issues
- JMP default setting issues
- JMP version issues

DEVELOPMENT:
HOW TO ASSURE THE CORRECT DESIGN

Problem:

- What design would be needed?
- Could we describe the constraints?

Decision:

- Driven by expert knowledge we defined over 280 different situations with specific demands.

Solution:

- Creation of a table with demands/constraints per design (the “Backbone”).

DEVELOPMENT: HOW TO CREATE THE DESIGN

Problem:

- Use of classical designs (no Custom Design).
- Not showing the JMP DoE dialogue panels.

Decision:

- Create designs manually.

Solution:

- Use of nested loop procedures.
- Data table with coded designs for other designs.

DEVELOPMENT: RIGHT HELP AT RIGHT STAGE

Problem:

- Help for DoE set up process, the use of the tool, (forced) decisions by the tool, design data tables and analysis techniques.
- Easy maintenance.

Decision:

- Store help text in different sources.

Solution:

- Some in scripts, most in data tables, description of analysis techniques in a journal.

DEVELOPMENT: MINOR CHALLENGES

JMP language issues:

» Test on language at start of Plyos.

JMP default setting issues:

» No solution found.

» Warnings in help text.

JMP version issues:

» Separate subroutines build for JMP9 & JMP11.

» No longer an issue (all uses JMP11).

ROLL OUT OF PLYOS

Use of Plyos is self-explanatory:

» Guided manual

» Additional procedures available

The use of Plyos is also part of a training:

» Minor background of DoE

» Practising the use of Plyos

» Focus on preparation to set up DoE:

- "Think Hard Before You Start"

USER STATISTICS (2012-2014)

Worldwide availability

» 20+ countries

500+ registered users

» ~100 “hard core” users

Creation of DoE for 600+ business cases started in Plyos

» Plyos delivered DoE in ~95% of the cases

» ~5% needed input of a statistician

Supported by senior management

CONCLUSION

Simplification of the DoE process seems to be successful.

» First time users react positive:

- "... I found it easy to play with as a beginner even without the manual. The interface is user-friendly. ... I was clearly guided by the system to reach the final step. ..." (S.Wang, China).

» Questions we receive are primarily on design details not on tool details:

- E.g. about differences between continuous, ordinal, nominal or interactions.

Possible lack of attraction to the DoE technique remains a concern. It is improving in time.

"Think Hard Before You Start" approach is beneficial.

THANKS TO A FANTASTIC TEAM

Winfried Theis
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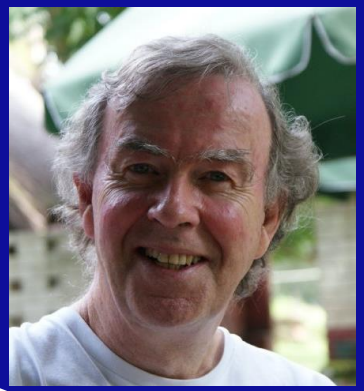

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Thank You
Questions?
Plyos