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## STATGRAPHICS CENTURION XV

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STATGRAPHICS *Centurion* is the latest version of the STATGRAPHICS statistical analysis software for Windows. It includes all of the procedures in STATGRAPHICS Plus Version 5 plus many additions and enhancements. Some of the important additions and improvements are outlined below.

### USER INTERFACE

1. **Navigation bar** – An optional navigation bar has been added along the left side of the session window listing all windows in the StatFolio, plus tables and graphs within the analysis windows. Clicking on an item activates that item.
2. **Toolbar shortcuts** – The eleven buttons on the main toolbar that activate statistical procedures can be set to point to any desired procedures.
3. **Text output** – All text output in analysis windows has been converted from unformatted text to rich edit text. This allows for the use of proportionally spaced fonts. In addition, calculated statistics are now displayed in formatted tables, which can be easily copied to Excel, PowerPoint, or Microsoft Word and used in calculations.
4. **StatAdvisor output** – Statistics referred to in the StatAdvisor output may be highlighted in red on analysis text panes.
5. **Six-Sigma Menu** – Users may choose between the standard menu and a menu listing procedures grouped according to the Six Sigma DMAIC classification.
6. **StatWizard** – The StatWizard provides a new feature that allows users to search for desired statistical tests and analyses. After highlighting a key phrase, a list of all procedures containing the desired test or statistic is displayed. Clicking on an item in the list takes the user to the data input dialog box for that procedure.
7. **Preferences** - System defaults may be pre-set using the *Preferences* dialog box. Users may set preferred default values for many options, including:
  - a. The **confidence level** for intervals and StatAdvisor interpretation (90, 95 or 99).
  - b. The number of **significant digits** to be used for displaying statistics (3-10).
  - c. The rule to be used in determining the default **number of classes** in a histogram or frequency tabulation.
  - d. The features displayed on **box-and-whisker plots, probability plots, and density traces**.
  - e. The method for calculating short and long-term **estimates of sigma** in capability analyses and the indices to be displayed.
  - f. The default tests and statistics calculated for **two-way tables**.
  - g. The criteria used to select a model in **automatic forecasting**.
  - h. The terminology used in **gage studies**.
  - i. The type of **multiple comparison tests** used in the ANOVA procedures.
  - j. The type of **residuals** plotted by the ANOVA and regression procedures.
  - k. The statistics displayed when **summary statistics** are requested.
  - l. The **goodness-of-fit tests** performed by the distribution fitting procedures.
  - m. The type of runs tests and other options for **control charts**.
  - n. The highlight and crosshair cursor color used on **graphs**.

## DOCUMENTATION AND HELP SYSTEM

The entire documentation and help system has been rewritten. Over 2000 pages of new documentation and 1200 help screens include:

1. An on-line **User's Guide** that provides a quick introduction to using the program.
2. 160 **PDF documents** describing all major aspects of the program. A document exists for each statistical procedure, containing a detailed explanation of all options, a worked example, formulas, and related material.
3. Help screens for each procedure and dialog box, with links to the associated documentation.

## DATA HANDLING

1. The datasheet now includes **10 tabs**, each of which may be connected to a different data source. When a StatFolio is saved, so is the information about each data source.
2. Management of the data sources and StatLink polling have been integrated into a single dialog box under **DataBook Properties**.
3. Each of the 10 data sources may be set to **read-only** if desired.
4. New features have been added to the **ODBC query** including the capability to join data from multiple tables and the option to sort records using up to 3 fields
5. Date-handling has been improved when **importing Excel files** so that date and time formats are set automatically.

## NEW STATISTICAL PROCEDURES

1. **QFD Matrix** – plots a Quality Function Deployment Matrix in the form of a “House of Quality”.
2. **Cost-of-Quality Trend Analysis** – plots the components of quality-related costs and performs runs tests to look for significant trends.
3. **Process Maps** – creates process maps, flow charts, and similar diagrams.
4. **Spherical Coordinates Plot** – creates a 3D plot of data defined in spherical coordinates.
5. **Runs Charts** – creates runs charts for both individual and grouped data, and performs tests for trends, clustering, and other types of non-random behavior.
6. **Attribute Gage Studies** – for analysis of attribute data, using the analytical, signal theory, or risk analysis method as defined by the AIAG.

7. **Control Chart Design** – selects subgroup size and/or smoothing parameters for control charts based on the desired average run length.
8. **Screening Design Selection** – selects a screening design, including number of replicates and centerpoints, in order to achieve a specified power.
9. **Multivariate Capability Analysis** – calculates defects per million and capability indices based on simultaneous specifications for multiple (possibly related) variables.
10. **Map by State** – color codes a map of the United States according to values of a selected variable.
11. **Capability Analysis for Attribute Data** – based on either the percent defective or defects per unit, following the methods suggested by the AIAG.
12. **Median Polish of Two-Way Tables** – estimation of row and column effects using Tukey’s method.
13. **Partial Least Squares** – fitting of regression models using PLS, particularly helpful when the number of predictors exceeds the number of observations.
14. **Negative Binomial Regression** – estimation of regression models for data which follow a negative binomial distribution.
15. **Cox Proportional Hazards** – estimation of life data relationships using Cox’s proportional hazard models.
16. **Multivariate EWMA Chart** – control chart for monitoring multivariate data using an EWMA procedure.
17. **Cuscore Control Charts** – charts designed to detect pre-determined types of patterns.
18. **Bayesian Neural Network Classifier** – neural network model for classifying observations into groups.
19. **Six-Sigma Calculator** – calculator to convert between different quality metrics, including Z-scores, DPM, Cpk, and the Sigma Quality Level.
20. **Splines** – cubic and bicubic splines for interpolation.

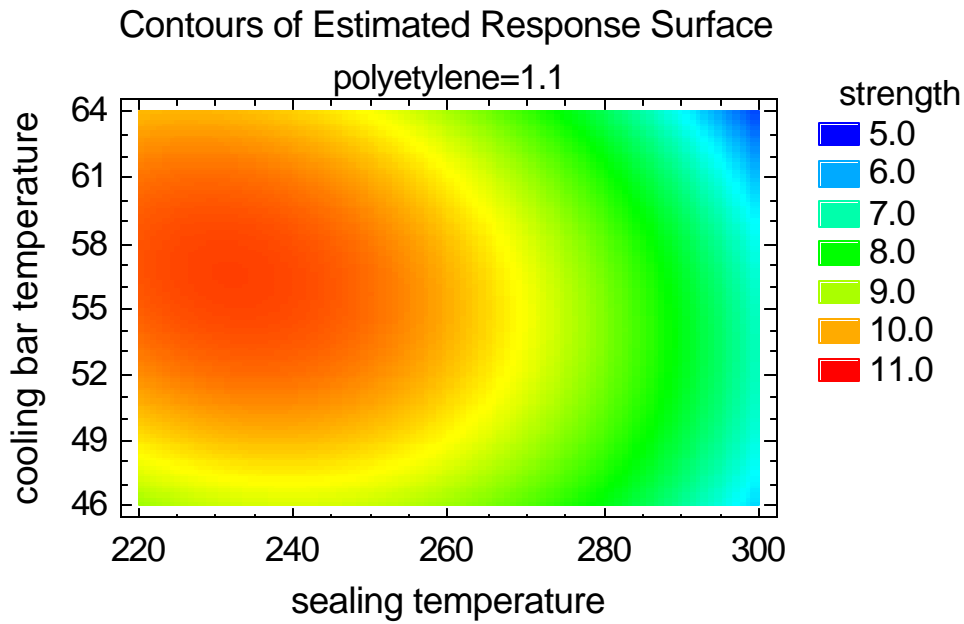
## ENHANCEMENTS TO EXISTING STATISTICAL PROCEDURES

1. **Probability Distributions** – the number of available distributions has been expanded from 27 to 45. This applies to both the probability plotting and distribution fitting procedures.
2. **Distribution Fitting** – Up to 5 distributions may be fit simultaneously. A table has been added that fits all distributions and ranks them by goodness-of-fit. The goodness-of-fit tests are saved as user preferences. Rootograms and suspended rootograms have been added. Estimated parameters are displayed on graphs.

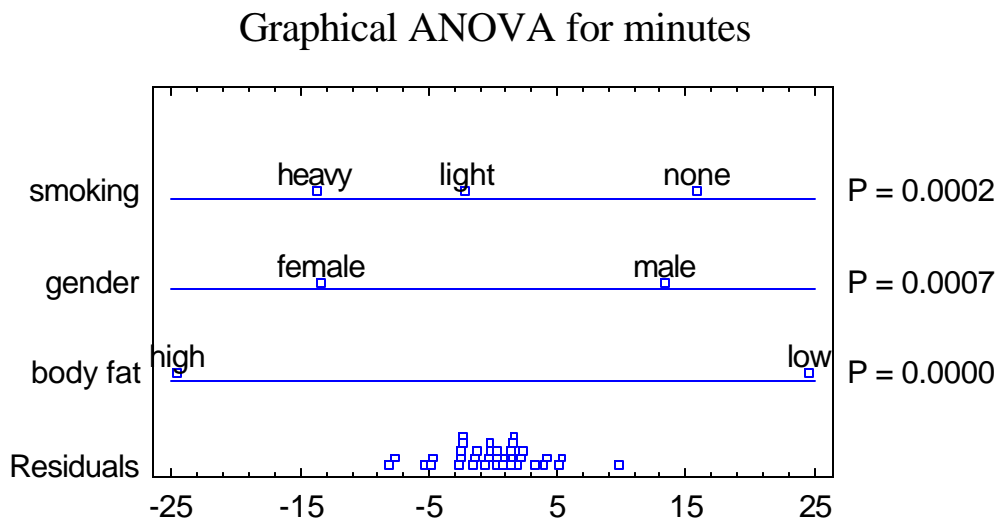
3. **Weibull Analysis** – Both 2-parameter and 3-parameter distributions may now be fit.
4. **Summary Statistics** – The number of summary statistics has been expanded from 19 to 28.
5. **Capability Analysis for Variables** – Both long-term and short-term indices may be displayed. Multiple options have been added for estimating sigma, including the use of unbiasing constants. New capability indices have been added, including CM, CCpk, and Sigma Quality Level. Both one-sided confidence bounds and two-sided confidence intervals may be calculated for capability indices. The user may now choose to calculate capability indices for non-normal distributions based on either equivalent zscores or the distance between distribution percentiles. An integrated transformation option has been added including logarithm, power, and Box-Cox transformations.
6. **Crosstabulation and contingency tables** - New features include likelihood ratio and trend tests, confidence intervals for odds ratios and relative risk, adjusted residuals, and choice of scoring for ordinal variables. Category order may be alphabetical or by order of occurrence.
7. **Control charts** – Users may now choose to base the control charts on any of 27 distributions, with parameters either estimated from the data or supplied by the user. Alternatively, a transformation may be specified, including an optimized Box-Cox transformation, while charts are drawn in the original metric. Short and long-term capability indices include the same choices as in capability analysis, as do the choices for estimating sigma. System preferences stored include choice of warning limits, runs tests to be applied, and desired smoothers. A new runs test based on sequences of alternating ups and downs has been added.
8. **Simple regression and calibration models** – The choice of models has been expanded from 12 to 27. The models may now be estimated by least squares, least absolute deviations, or Tukey's 3-group median method.
9. **Analysis of variance** – A new Graphical ANOVA has been added, from the upcoming second edition of *Statistics for Experimenters*. Mood's median test has always been added.
10. **Box-Cox transformations** – now calculates an approximate confidence interval for the power parameter.

## EXAMPLES

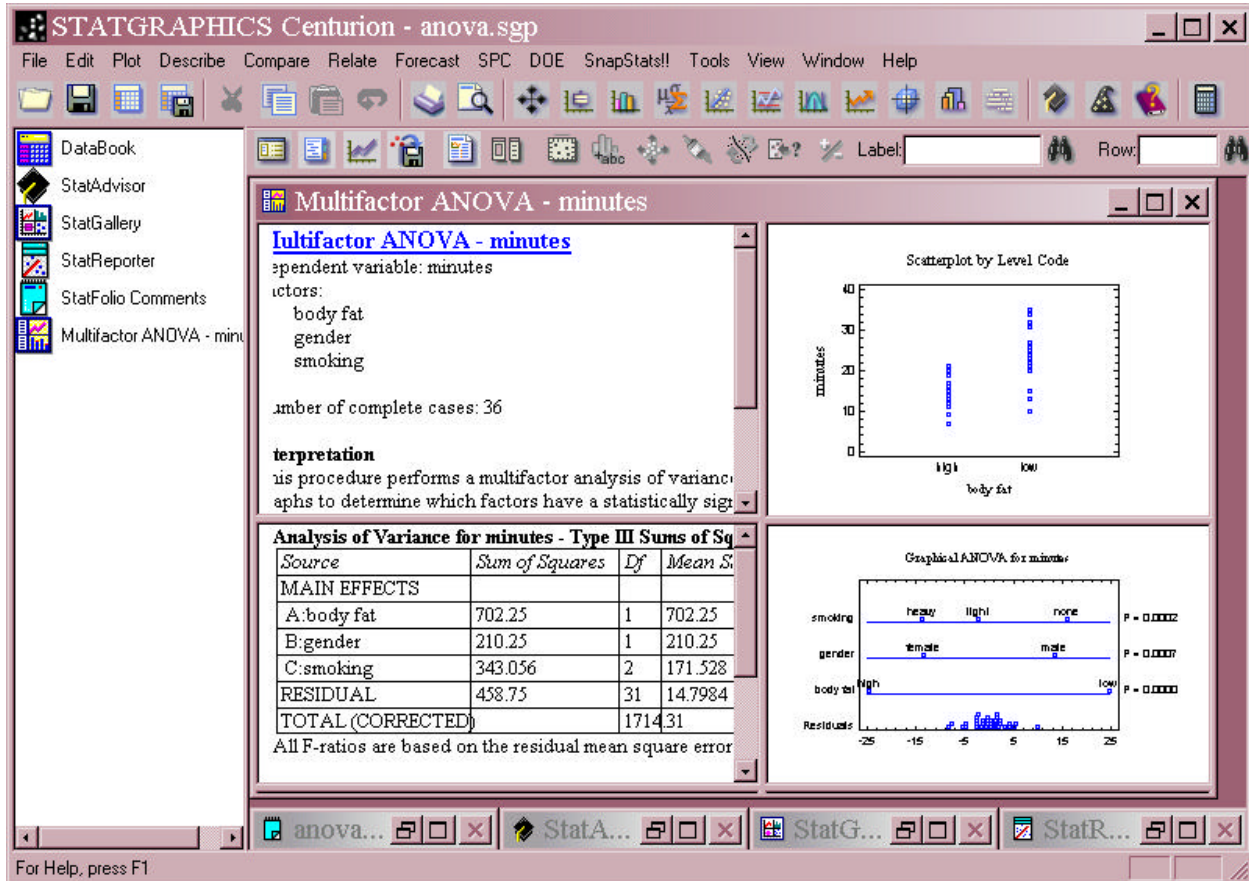
### New contour plots



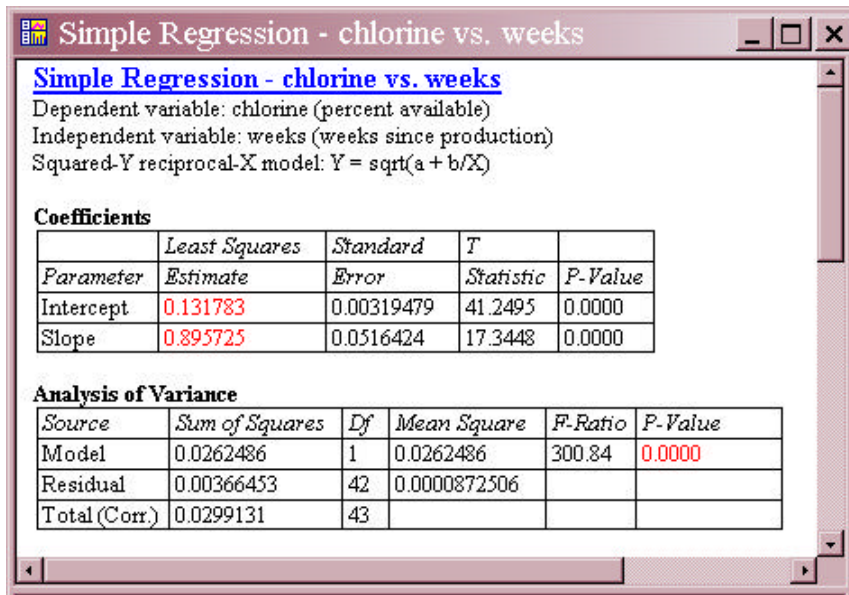
### New graphical ANOVA



## New interface



## New tabular output



## New distributions

### Distribution Fitting Options

**Distribution**

<input type="checkbox"/> Bernoulli	<input type="checkbox"/> Exponential Power	<input type="checkbox"/> Lognormal (3-parameter)
<input type="checkbox"/> Binomial	<input type="checkbox"/> F (Variance Ratio)	<input type="checkbox"/> Maxwell (2-parameter)
<input type="checkbox"/> Discrete Uniform	<input type="checkbox"/> Folded Normal	<input type="checkbox"/> Noncentral Chi-Squared
<input type="checkbox"/> Geometric	<input checked="" type="checkbox"/> Gamma	<input type="checkbox"/> Noncentral F
<input type="checkbox"/> Hypergeometric	<input type="checkbox"/> Gamma (3-parameter)	<input type="checkbox"/> Noncentral t
<input type="checkbox"/> Negative Binomial	<input type="checkbox"/> Generalized Gamma	<input checked="" type="checkbox"/> Normal
<input type="checkbox"/> Poisson	<input type="checkbox"/> Generalized Logistic	<input type="checkbox"/> Pareto
<input type="checkbox"/> Beta	<input type="checkbox"/> Half Normal (2-parameter)	<input type="checkbox"/> Pareto (2-parameter)
<input type="checkbox"/> Beta (4-parameter)	<input type="checkbox"/> Inverse Gaussian	<input type="checkbox"/> Rayleigh (2-parameter)
<input type="checkbox"/> Birnbaum-Saunders	<input type="checkbox"/> Laplace	<input type="checkbox"/> Smallest Extreme Value
<input type="checkbox"/> Cauchy	<input type="checkbox"/> Largest Extreme Value	<input type="checkbox"/> Student's t
<input type="checkbox"/> Chi-Squared	<input type="checkbox"/> Logistic	<input type="checkbox"/> Triangular
<input type="checkbox"/> Erlang	<input type="checkbox"/> Loglogistic	<input type="checkbox"/> Uniform
<input type="checkbox"/> Exponential	<input type="checkbox"/> Loglogistic (3-parameter)	<input checked="" type="checkbox"/> Weibull
<input type="checkbox"/> Exponential (2-parameter)	<input checked="" type="checkbox"/> Lognormal	<input type="checkbox"/> Weibull (3-parameter)

**Binomial Trials**

Estimate n  
 Specify n

100

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**Hypergeometric Trials**

Population Size:

1000

Estimate n  
 Specify n

100

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**Negative Binomial Trials**

Estimate k  
 Specify k

10

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**Extended Threshold Parameters**

Estimate  
 Specify lower/upper

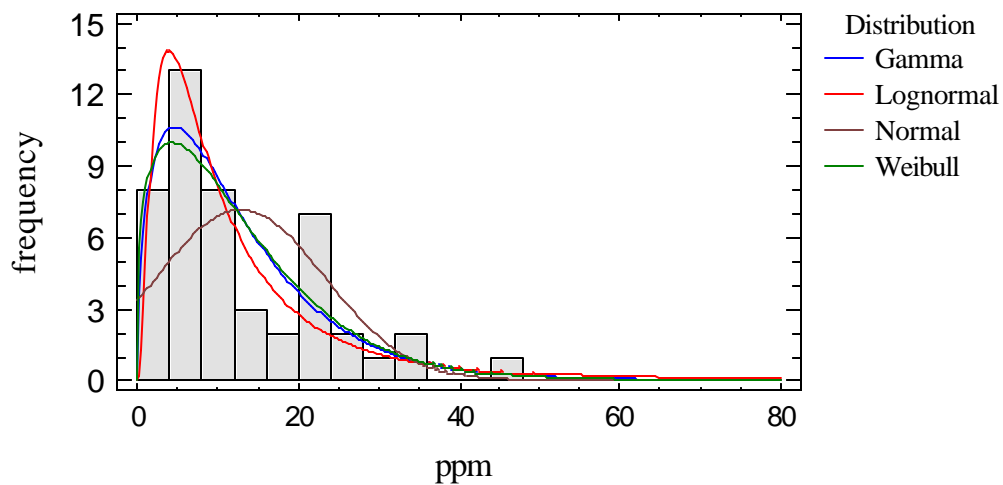
0.     1.

OK

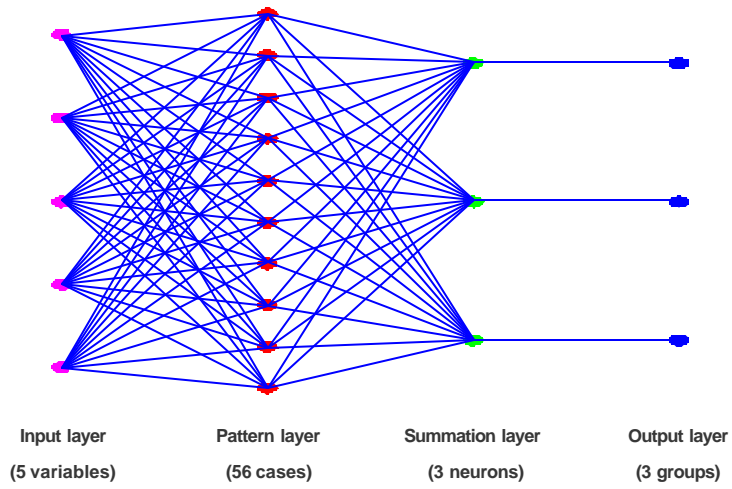
Cancel

Help

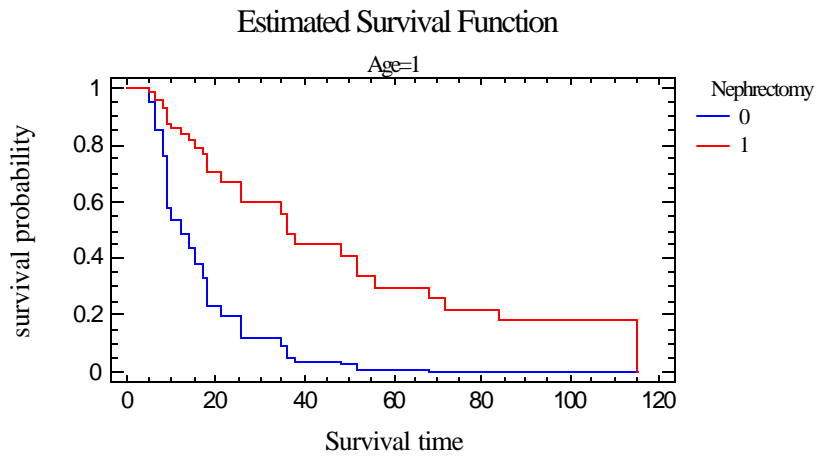
### Histogram for ppm



## New Bayesian neural network classifier



## New Cox proportional hazards models



## New DataBook

93cars.sf6

	Mid Price	Max Price	MPG City	MPG Highway	
	average of min and max prices in	price for a premium version in	miles per gallon in city driving	miles per gallon in highway driving	0=
1	15.9	18.8	25	31	0
2	33.9	38.7	18	25	2
3	29.1	32.3	20	26	1
4	37.7	44.6	19	26	2
5	30	36.2	22	30	1
6	15.7	17.3	22	31	1
7	20.8	21.7	19	28	1
8	23.7	24.9	16	25	1
9	26.3	26.3	19	27	1
10	34.7	36.3	16	25	1
11	40.1	42.7	16	25	2
12	13.4	18.3	25	36	0
13	11.4	11.4	25	34	1

DataBook Properties

Sheet	Data Source	Read Only	Poll
<input checked="" type="radio"/> A	C:\DocData\93cars.sf6	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> B	<untitled>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> C	<untitled>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> D	<untitled>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> E	<untitled>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> F	<untitled>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> G	<untitled>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> H	<untitled>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> I	<untitled>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> J	<untitled>	<input type="checkbox"/>	<input type="checkbox"/>

Run script
  seconds
  minutes
  hours

Polling:  Off,  On (Update every: 60)

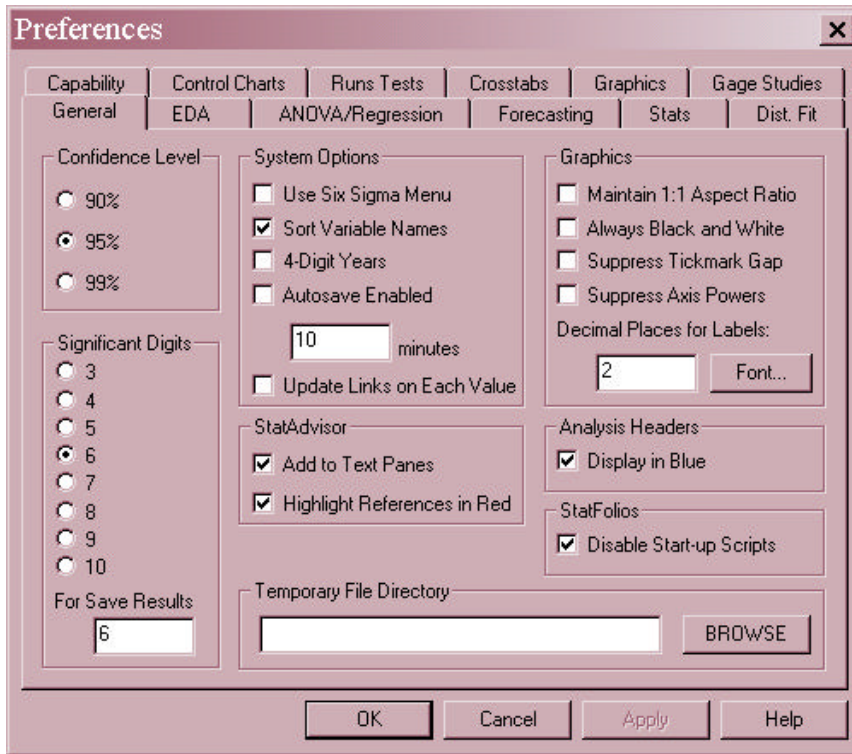
Update every:

Run script
  seconds
  minutes
  hours

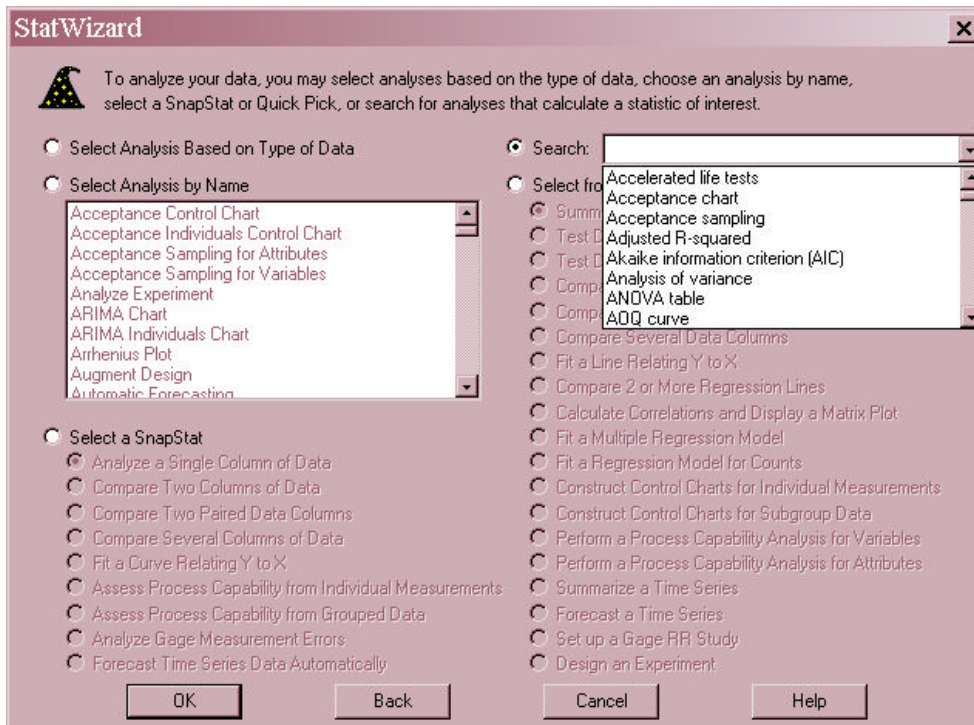
Display variable comments

Buttons: Open, Save, OK, Close, Save As, Help, Update, Requery

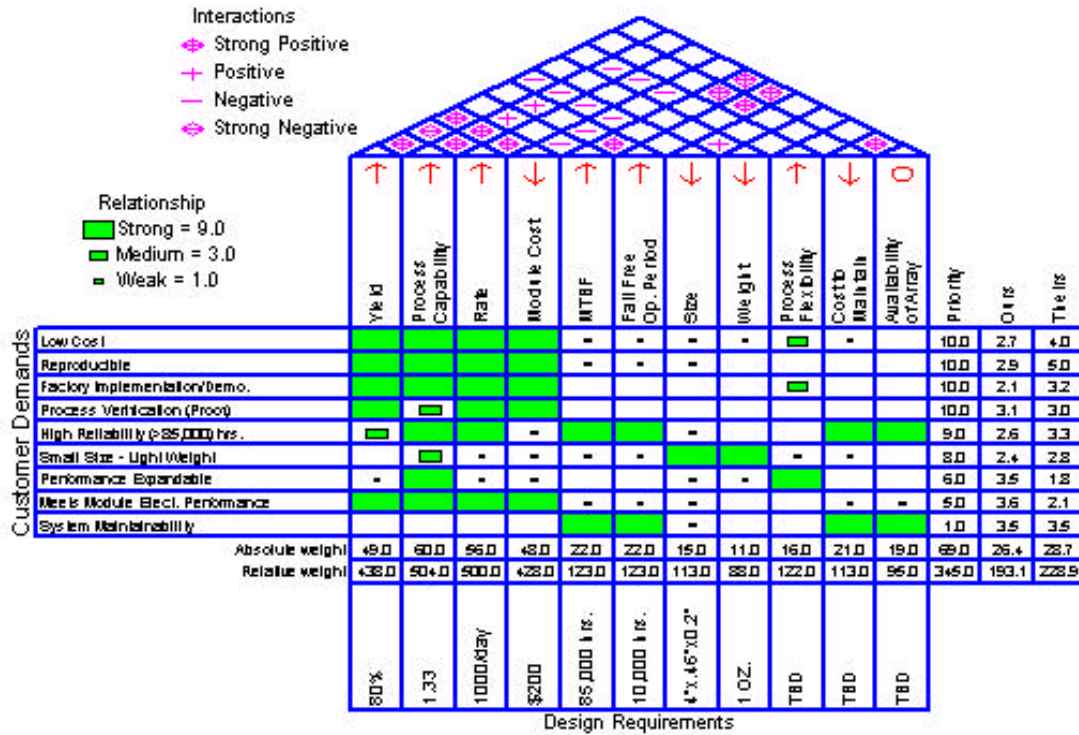
## New system preferences dialog box



## New search option in StatWizard



## New Quality Function Deployment procedure



## New Six Sigma calculator

**Six Sigma Calculator** ✕

Input

Z-Score:

DPM:

Defects (%):

Yield (%):

Cpk:

Sigma level:

Sigma shift:   two-sided

Calculate

Results

Z-Score: 3.0

DPM: 1349.97

Defects (%): 0.134997

Yield (%): 99.865

Cpk: 1.5

Sigma level: 4.5

OK    Cancel    Help

## New capability indices

**Capability Indices Options** [X]

Display

<input checked="" type="checkbox"/> Cp/Pp	<input type="checkbox"/> Cpk/Ppk (lower)
<input checked="" type="checkbox"/> CR/PR	<input type="checkbox"/> CCpk
<input checked="" type="checkbox"/> CM/PM	<input type="checkbox"/> Cpm
<input checked="" type="checkbox"/> Zusi	<input type="checkbox"/> K
<input type="checkbox"/> Zlsi	<input type="checkbox"/> % Beyond Specs
<input type="checkbox"/> Zmin	<input checked="" type="checkbox"/> Defects per Million
<input checked="" type="checkbox"/> Cpk/Ppk	<input type="checkbox"/> Sigma quality level
<input type="checkbox"/> Cpk/Ppk (upper)	<input checked="" type="checkbox"/> 1.5 sigma shift

Confidence Limits:

Two-sided intervals

Lower Confidence Bounds

None

Based on:  sigma

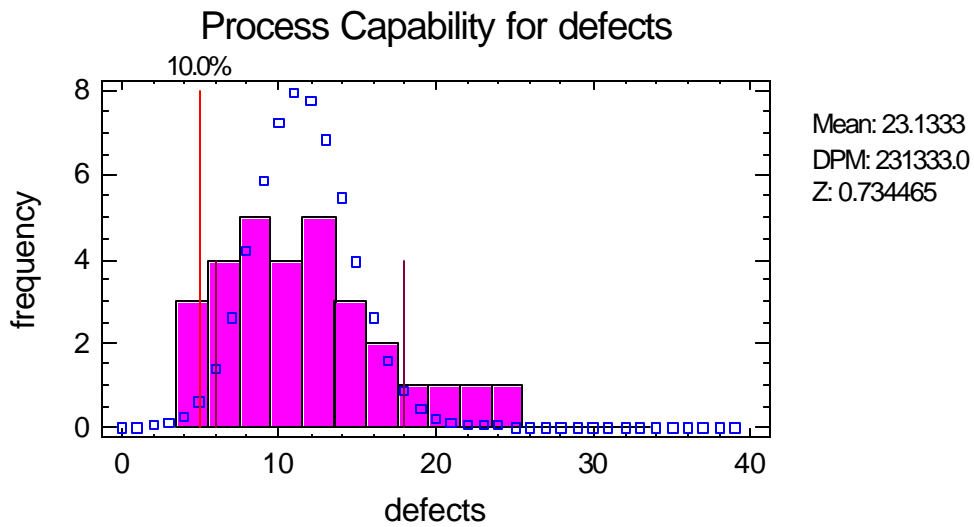
Confidence Level:  %

OK

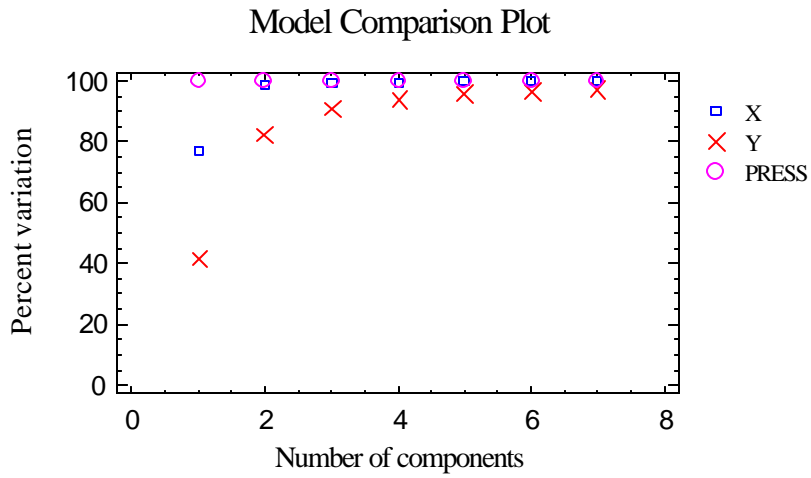
Cancel

Help

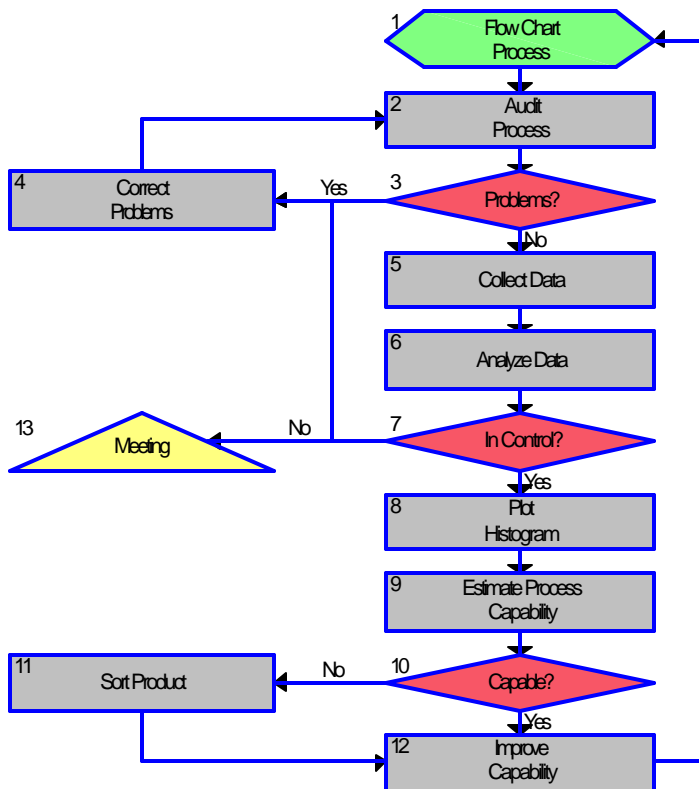
## New capability analysis for attribute data



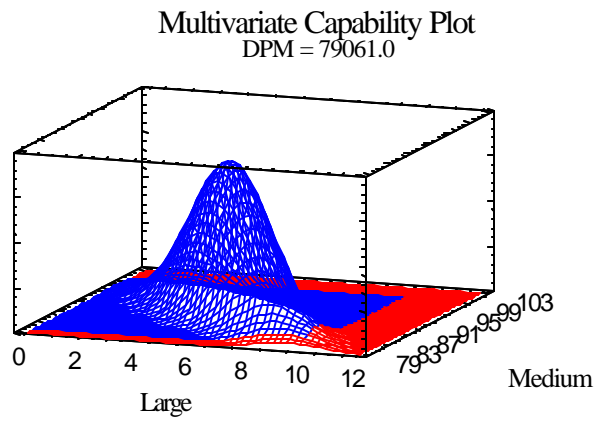
## New partial least squares procedure



## New process maps



## New multivariate capability analysis procedure



## New spline plots



## Modified graphics options dialog box

