WordStat 6

Content Analysis Module for QDA Miner & SimStat

User's Guide

Provalis Research

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Introduction to WordStat

WordStat is a text analysis module specifically designed to study textual information such as responses to open-ended questions, interviews, titles, journal articles, public speeches, electronic communications, etc. WordStat may be used for automatic categorization of text using a dictionary approach or various text mining methods. WordStat can apply existing categorization dictionaries to a new text corpus. It also may be used in the development and validation of new categorization dictionaries. When used in conjunction with manual coding, this module can provide assistance for a more systematic application of coding rules, help uncover differences in word usage between subgroups of individuals and assist in the revision of existing coding using KWIC (Keyword-In-Context) tables.

WordStat includes numerous exploratory data analysis and graphical tools that may be used to explore the relationship between the content of documents and information stored in categorical or numeric variables such as the gender or the age of the respondent, year of publication, etc. Relationships among words or categories as well as document similarity may be identified using hierarchical clustering and multidimensional scaling analysis. Correspondence analysis and heatmap plots may be used to explore relationship between keywords and different groups of individuals.

WordStat is a module that **must be run** from either of the following base products:

SimStat -This statistical software provides a wide range of statistical procedures for the analysis of quantitative data. It offers advanced data file management tools such as the ability to merge data files, aggregate cases, perform complex computation of new variables and transformation of existing ones. When used with SimStat, WordStat can analyze textual information stored in any alphanumeric, plain text and rich text memo variable (or field). It includes various tools to explore the relationship between any numeric variable of a data file and the content of alphanumeric ones. Its close integration with SimStat facilitates further quantitative analysis on numerical results obtained from the content analysis (ex.: factor analysis or correspondence analysis on keyword frequencies, multiple regression, etc.).

QDA Miner - The text management and qualitative analysis program allows one to create and edit data files, import documents, and perform manual coding of those documents. Several analysis tools are also available to look at the frequency of manually assigned codes and the relationship between those codes and other categorical or numeric variables. When used with QDA Miner, WordStat can perform content analysis on whole documents or selected segments of those documents tagged with specific user defined codes.

WordStat module may be accessed in both of these programs from the CONTENT ANALYSIS command in the ANALYSIS menu.

A few additional utility programs are also included with WordStat that may be run as standalone applications or be accessed directly through WordStat:

Report Manager - This application has been designed to store, edit and organize documents, notes, quotes, tables of results, graphics and images created by QDA Miner and WordStat or imported from other applications.

Document Conversion Wizard - This utility program provides an easy way to import numerous documents and create a project file. It can also be used to split large files into smaller units and to extract various numeric and alphanumeric data from structured documents.

Dictionary Builder - This tools allows the development of comprehensive categorization dictionary for automatic content analysis. The program may be run as standalone application but also from dictionary page of WordStat by pressing the SUGGEST button. To obtain more information on this software see page 73.

Document Classifier - This utility program is a stand-alone application that may be used to perform content analysis and automatic text classification on a text pasted from the clipboard or stored in a file. For more information on this utility program, see WordStat Document Classifier on page 157.

Chart Editor - The chart editor is a standalone application that may be used to further customize charts created using WordStat.

Program's Capabilities

TEXT PROCESSING CAPABILITIES

- Performs analyses on Rich Text documents stored QDA Miner projects or SimStat data files.
- Perform analyses on alphanumeric variables containing short textual information such as responses to open ended questions, titles, descriptions, etc..
- Automatic lemmatization (English, French, Spanish, and Italian, contact us if you need support of other languages.
- Substitution process for customized lemmatization of words or automatic spell correction of common misspellings.
- Optional exclusion of pronouns, conjunctions, expressions, etc, by the use of existing or user defined exclusion lists.
- Categorization of words or expression using existing or user defined dictionaries.
- Word categorization based on Boolean (AND, OR, NOT) and proximity rules (NEAR, AFTER, BEFORE)
- Word or expression substitution and scoring using wildcards and integer weighting.
- Frequency analysis of words, derived content categories or concepts.
- Phrase finder allows identification of the most recurring phrases.
- Easy identification of technical terms, proper nouns and common misspellings.
- Interactive development and validation of multi-level dictionaries or categorization schema.
- Ability to restrict an analysis to specific portions of a text or to exclude comments and annotations.
- Option to perform a content analysis on a random sample of cases.
- Integrated spell-checking with support for different languages such as English, French, Spanish, etc.
- Integrated thesaurus (English only) to assist the creation of categorization schema.
- Case filtering on any numeric or alphanumeric variable and on keyword occurrence (with AND, OR, and NOT Boolean operators)
- Prints presentation quality tables (frequency, crosstab or KWIC lists)
- Saves any table to HTML, ASCII, Tab separated or comma separated value files.

UNIVARIATE KEYWORD FREQUENCY ANALYSIS

- Univariate keyword frequency analysis (keyword count and case occurrence).
- Keyword co-occurrence matrix (within documents, paragraphs, sentences)
- Integrated clustering and dendrogram display of keyword similarities
- 2-D and 3-D multidimensional scaling on either joint frequency or co-occurrence of words or categories.

KEYWORD RETRIEVAL FUNCTION

- A powerful keyword retrieval function allows identification of text units (documents, paragraphs or sentences) containing one keyword or a combination of keywords with optional filtering of cases.
- Ability to attach QDA Miner codes to retrieved segments.
- Retrieved segments may be exported to disk in tabular format (Excel or delimited text files) or as text reports (Rich Text Format).

MULTIPLE RESPONSES AND COMPARISONS

- Can perform a single frequency analysis on information stored in several alphanumeric variables (memo or string variables).
- Comparison of keyword occurrence between different variables.
- Compute inter-rater agreement measures on codes manually entered in different variables (pct. of agreement, Cohen's Kappa, Scott's Pi, Krippendorf's R and r-bar, free marginal, and intraclass correlation).

KEYWORD CO-OCCURRENCE AND ANALYSIS

- Integrated clustering and dendrogram display of keyword co-occurrence.
- Proximity plot to easily identify all keywords that co-occurs with one or several target keywords.
- 2-D and 3-D multidimensional scaling on co-occurrence of words or content categories.
- Flexible keyword co-occurrence criteria (within a case, a sentence, a paragraph, a window of n words, a user defined segment) as well as clustering methods (first- and second-order proximity, choice of similarity measures).
- Easy text retrieval directly from dendrogram or proximity plots.

ANALYSIS OF CASE OR DOCUMENT SIMILARITY

- Hierarchical clustering, multidimensional scaling and proximity plot may be used to explore the similarity between documents or cases.

NORM CREATION AND COMPARISON

- Ability to create norm files based on frequency analysis of words or content categories.
- Comparison of obtained frequencies to previously saved norm files.

RELATIONSHIP TO NUMERICAL AND CATEGORICAL DATA

- Comparison between any text variable and any nominal or ordinal variable (such as sex of the respondent, specific subgroups, years of publication, etc.).
- Choice between 12 different association measures to assess the relationship between keyword occurrence and nominal or ordinal variables (Chi-square, Likelihood ratio, Student's F, Tau-a, Tau-b, Tau-c, symmetric Somers' D, asymmetric Somers' Dxy and Dyx, Gamma, Pearson's R, and Spearman's Rho)
- Correspondence analysis allows examination of relationships between words or categories and other nominal or ordinal variables.
- Ability to sort keyword matrix in alphabetical order, by keyword frequency or case occurrence, on the obtained statistics or on its probability.

KEYWORD-IN-CONTEXT

- Ability to display a Keyword-In-Context (KWIC) table of any included, leftover or user defined word, word pattern or phrase.
- KWIC tables may be sorted in ascending order of case number, words with context, or on values of independent variables.
- Ability to jump from a specific occurrence in the KWIC table to the original text variable in order to view or edit the selected word.
- KWIC tables may be saved in data files for further processing.
- Customizable KWIC and report function to display all hits as lists of paragraphs, sentences or user defined segments.

AUTOMATED TEXT CLASSIFICATION

- Machine learning algorithms (Naive Bayes and K-Nearest Neighbors) for document classification.
- Flexible feature selection for automatic selection of best subsets of attributes.
- Numerous validation methods (leave-but-one, n-fold crossvalidation, split sample).
- Experimentation module allows easy comparison of predictive models and fine-tuning of classification models.
- Classification models may be saved to disk and applied later using either a standalone document classification utility program, a command line program or a programming library. Note: The command line and the programming library are part of WordStat Software Developer's kit (SDK) which is sold separately.

FULL INTEGRATION WITH A SIMTAT & QDA MINER

- Document and alphanumeric variables are stored in the same file as all other numeric variables.
- The same data file format is used by SimStat, QDA Miner and WordStat.
- Variable selection and analysis are performed within SimStat using a simple 3-step operation:
    1. Open the existing data file.
    2. Select one or several alphanumeric variables as dependent variables and, optionally, other nominal or ordinal variables to be treated as independent.
    3. Execute the CONTENT ANALYSIS command from the STATISTICS drop-down menu.
- New variables representing frequency or occurrence of words, keywords or concepts can be added to the existing data file or exported to a new data file in order to be submitted to more advanced analysis (such as cluster analysis, correspondence analysis, multiple regression, etc.).
- Data can be imported from and exported to different file format including dBase, Paradox, Excel, Quattro Pro, Lotus 1-2-3, SPSS for DOS, SPSS for Windows, comma or tab separated text files, etc.
- Ability to perform numeric and alphanumeric transformation or to apply filters on cases of the data file to restrict the analysis to specific subgroups.

The Content Analysis & Categorization Process

The most basic form of content analysis that WordStat can perform is a simple frequency analysis of all words contained in one or several text variables of a data file. However, WordStat offers several features that permit the user to accomplish more advanced forms of content analysis that may involve automatic categorization, different weighting of words, inclusion or exclusion of words based on frequency criteria, etc. To fully understand the possibilities offered by the program, one first needs to understand the various underlying processes involved in a typical WordStat frequency analysis and how these processes may be combined to achieve various kinds of content analysis tasks.

WordStat's categorization involves up to five successive processes:

1- TEXT PREPROCESSING (including stemming, n-grams, etc.)

The preprocessing option allows users to access external text preprocessing routines that are not part of the WordStat program. This option is useful to perform custom transformation on the text to be analyzed. WordStat includes a few sample text processing routines, such as a Porter stemmer which remove common English suffixes and prefixes as well as a a character n-grams routine which decomposes every word into sequences of 3, 4 or 5 characters.

2. SUBSTITUTION PROCESS (including lemmatization and automatic spell correction)

The substitution process takes individual words and replace them with another word form or with a sequence of words. Such a process is typically used for lemmatization, a procedure by which all plurals are transformed into singular forms and past-tense verbs are replaced with present-tense versions. It may also be used for derivational stemming in which different nouns, verbs, adjectives and adverbs derived from the same root word are transformed into this single word. Custom substitution process may also be created to perform automatic spelling corrections of common misspellings.

3- EXCLUSION PROCESS

An exclusion process may be applied to remove words that you do not want to be included in the content analysis. This process requires the specification of an exclusion list. Such a process is used mainly to remove words with little semantic value such as pronouns, conjunctions, etc., but may also be used to remove some words or phrases used too frequently or with little discriminative value.

4- CATEGORIZATION PROCESS

The categorization process allows one to change specific words, word patterns or phrases to other words, keywords or content categories and/or to extract a list or specific words or codes. This process requires the specification of an inclusion dictionary. This dictionary may be used to remove variant forms of a word in order to treat all of them as a single word. It may also be used as a thesaurus to perform automatic coding of words into categories or concepts. For example, words such as "good", "excellent" or "satisfied" may all be coded as instances of a single category named "positive evaluation", while words like "bad", "unsatisfied" or expressions like "not satisfied" may be categorized as "negative evaluation".

5- ADDITION OF FREQUENT WORDS

The fifth process is the application of a frequency criterion that is used to add to the included words or categories words that are used more than a specific number time or that are found in more than a specific number of cases. When an inclusion dictionary is used, this option will append to this list of included words or categories, all words that meet the minimum frequency criterion. If no inclusion or categorization dictionary is used, all words that meet this minimum requirement and that have not been excluded (see process #3) will be added to the final word/category list. Note that this process can only be used to add new words to the actual list of words and categories found in this inclusion dictionary. It cannot be used to remove any of those items (see process #6).

6- REMOVAL OF WORDS OR CATEGORIES

When this process is applied, all words or categories that do not meet a minimum frequency or case occurrence criterion will be removed from the final word/category list. It can also remove items occurring in too many cases. This process may be combined with the categorization process (#4) to remove infrequent categories. It may also be used in conjunction with the addition criterion (see process #5) to provide a composite criterion of inclusion that involves both a minimum keyword frequency and a minimum case occurrence.

Since the application of each process is optional, numerous combinations are possible, each combination allowing the researcher to perform different types of content analysis. For example, here are the minimal requirements for different forms of content analysis:

TYPE OF ANALYSIS	LEMMATIZATION OR STEMMING	EXCLUSIONDICTIONARY	INCLUSIONDICTIONARY	ADD WORDS	REMOVE WORDS	COMMENT
Simple word frequency analysis (most frequent words)				√*		
Simple frequency analysis of semantically significant words		√		√*		
Word count with lemmatization	√	√	√	√*	√	
Word count of specific words			√			
Automatic categorization of texts			√			
Frequency analysis on the most frequent categories.			√		√	
Frequency analysis of manually entered codes or keywords			√			Codes may optionally be inserted between brackets.
Rating of texts on specific attributes			√			Different weights may be assigned to different words

* recommended to restrict the analysis to the most frequent words or categories.

A Quick Tour

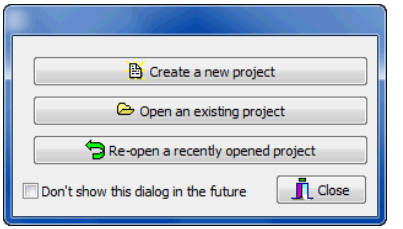
A CONTENT ANALYSIS OF PERSONAL ADS

For this example, we will produce a content analysis on personal ads published in a Montreal cultural newspaper on January 22 and January 29, 1998, and we will examine whether there is a relationship between words used and the gender and age of the person who wrote the ad. The required data has been stored in a data file named SEEKING.DBF.

From QDA Miner

Step #1 - Open the data file

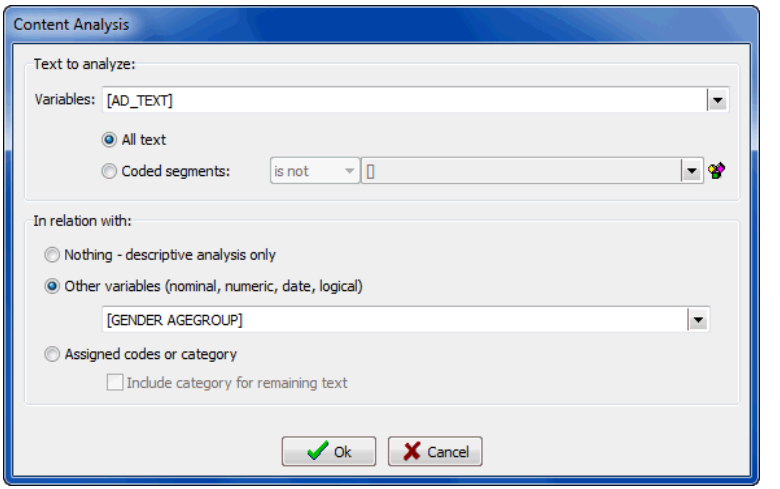
- Start the QDA Miner program. One will be presented with a dialog box like this:



- Click the OPEN AN EXISTING PROJECT button and select the SEEKING.WPJ file located in the default folder.
- If you closed or disabled this introductory dialog box, then from the main screen select the OPEN PROJECT command from the file menu and select the SEEKING.WPJ file located in the default folder.

Step #2 - Select the variables

- Execute the CONTENT ANALYSIS command from the ANALYZE menu. A dialog box similar to this one will appear:



- Set the text to analyze to ALL TEXT.
- In the IN RELATION WITH group box, select the OTHER VARIABLES radio button.
- Click the drop down list and select GENDER and AGEGROUP.

Move to Step #4

From Simstat

Step #1 - Open the data file

- From within SimStat, select the FILE | DATA | OPEN command sequence and select the SEEKING.DBF file

Step #2 - Select the variables

- Execute the STATISTICS | CHOOSE X-Y command
- Set the Variable List box to ALL to view all variable types.
- Move the GENDER and AGEGROUP variables to the INDEPENDENT list box
- Move the AD_TEXT variable to the DEPENDENT list box
- Press the OK button

Step #3 - Run the content analysis module

- Execute the STATISTICS | CONTENT ANALYSIS command.

Step #4 - Choose the proper dictionaries

WordStat consists of an application window with six pages. The first page allows one to select, view, and edit the dictionaries used in this specific content analysis. Set the dictionaries to the following values:

Exclusion: DEFAULT
Categorization: SEEKING

and make both of them are enabled (see check boxes to the left side of the dictionaries edit boxes).

Step #5 - Setting the proper options

The second page allows you to specify various options such as whether numeric values should be included, whether frequent words should be added, etc. Disable all options by removing any check mark in the various check boxes.

Step #6 - Perform an univariate frequency analysis on categories

- Click the third tab (Frequencies). The program will perform a categorization of words found in the ads and compute a frequency analysis on those categories.
- To sort the frequency matrix in alphabetical order, set the SORT BY option to Words. You can also display those words in descending order of Keyword Frequency or Case Occurrence.
- By default, the words displayed in the matrix are those specified in the Inclusion list. To display words that have been left out, click the Leftover words tab.
- To move a word to the inclusion or the exclusion list, you can click it in the frequency table and drag it to the desired location, or press the right button of the mouse.

Step #7 - Examining the relationship between included categories and the gender of the author.

- Press on the fifh tab (Crosstab).
- Click the WITH drop-down list box and select GENDER. to display a contingency table of categories frequency by gender.

  The TABULATE option allows one to choose whether the table should be based on the total frequency of included words or on the total number of cases containing those words.

  The SORT BY option allows one to sort the table on the word or category name (alphabetical order) or by descending order of keyword frequency. You may also click any column header to sort the grid in ascending or descending order of the values found in this column.

  The DISPLAY option allows one to specify the information displayed:

  - Count
  - Row percent
  - Column percent
  - Total percent
  - Category percent (for case occurrences)
  - Percent of total words (for keyword frequency)

Step #8 - Estimating the strength of the relationship

- Use the STATISTIC drop-down list box to select an association measure, such as a Chi-square or a Pearson's R statistic.

  To sort the table on the chosen statistic or on its probability, use the SORT BY drop-down list box.

Step #9 - Visualizing the relationship between categories and the age of the author.

- Use the mouse to highlight cells of the categories you would like to compare.
- Click the  button or press the right button of the mouse and select the **Chart Selected Rows** menu item.

Step #10 - Performing correspondence analysis on age groups

- Click the WITH drop-down list box and select AGEGROUP to display keyword counts by age group.
- Click the  button to access the correspondence analysis dialog box.
- Press on the 2-D Map or 3-D Map tabs to examine a 2 axis or a 3 axis solution or on the STATISTICS tab to browse through the correspondence analysis statistics.
- Click the  button to close this dialog box and return to WordStat main window.

Step #11 - Displaying a keyword by keyword matrix or a keyword by case matrix

- Click the WITH drop-down list box and select <other words> to display a keyword by keyword matrix or on <case no> to view a keyword by case matrix.

Step #12 - Viewing a Keyword-In-Context (KWIC) list of specific words or categories

- Press on the Keyword-In-Context tab to access the KWIC table.
- Set the LIST option to Included and select the word or category for which you would like to obtain a KWIC table.
- Click the GO button to display the KWIC table for this word or category.

  To sort the table on the case number, on the keyword along with the prior or subsequent words, or on the sex of the respondent, use the SORT BY drop-down list box.
- To display KWIC tables of any user defined word or word pattern, set the LIST option to "User defined", enter your word pattern (with or without wildcards) in the WORD edit box and click the GO button.

Step #13 - Editing a text from the KWIC list

- To modify the word or keyword or the text surrounding it, select it from the KWIC list and click the EDIT button. (You may also double-click the specific line you wish to edit).
- To save the modified text, click the OK button. Clicking the CANCEL button restores the original text.

Step #14 - Creating a concordance report

- Make sure the Keyword-In-Context page is active and that the KWIC table displays the proper information.
- Set the amount of context that should be displayed around each word by setting the CONTEXT DELIMITER option.
- Press on the REPORT button. Note: If this button is inactive, click the GO button to refresh the content of the KWIC table and then click the REPORT button.

Step #15 - Examining relationship between words or content categories

- Click the third tab to activate the Frequencies page.
- Press on the  button to display the Dendrogram & Concept Maps dialog box.
- Press on the Dendrogram tab to perform a hierarchical cluster analysis on included categories. You may change the number of partitions displayed using the No Clusters option.
- Press on the 2-D Map or 3-D Map tabs to perform a multidimensional scaling and display a plot in 2 or 3 dimensions.
- Press on the  button to close this dialog box and return to WordStat main window.

For more information see Hierarchical Clustering and Multidimensional Scaling (page 100).

Step #15 - Saving the keyword frequencies on disk

- Press on the SAVE button and choose the data from the Save Information box to export to the existing data file or a new one.

Step #16 - Quitting the module and returning to QDA Miner or SimStat

- Click the  button in the upper left-hand corner of WordStat and select the EXIT command or click the X mark in the upper right-hand corner.

Preparing and Importing Data

This section provides general information on how to prepare textual data or specific instruction on how to import data into QDA Miner and SimStat.

Preliminary Text Preparation

While interview transcripts, responses to open-ended questions, or any other kind of textual information may be typed directly within SimStat or QDA Miner, there are many situations where electronic versions already exist either in the form of text files or as data files accessible only through specific applications such as word processor, spreadsheet or database programs. All this information must be transferred into a QDA Miner project or SimStat data file for further processing. However, prior to using WordStat for content analysis, some modification or adjustments may need to be made.

Uppercase and lowercase letters

WordStat is case-insensitive and therefore accepts files in either upper- or lowercase.

Check spelling of documents

The automatic content analysis feature of WordStat involved numerous operations of word recognition and generally requires each word to be spelled correctly. Any misspelled word may be left uncoded and leads to imprecise or invalid conclusions. Two strategies may be used to deal with misspellings:

1. One may run documents through a spell-checker to make sure all words are spelled correctly. WordStat provides spell checking for more than 20 human languages. The spell-checking may be performed in QDA Miner or through the **Text Editor** feature of WordStat. An even more efficient approach is to use the **Unknown Words** feature of WordStat to quickly retrieve all potentially misspelled words and to replace them all at the same time.

2. An alternative approach would be to build a content analysis process that would take into account the misspelling of words. To achieve this, one may use the **Substitution** feature to automatically replace those misspelled words with their correct forms or add the most commonly misspelled keywords into the content analysis dictionary.

Remove hyphenation

While WordStat can be configured to accept compound words with dashes, it cannot differentiate dashes and hyphens. As a consequence, a hyphenated word will often be treated as two separate words. It is thus recommended to revise the text to ensure no hyphenation is present.

Add or remove square brackets ([ ]) and braces ({ })

Square brackets and braces have special meanings for WordStat. For example, braces are often used to remove a section of the text that you don't want to process while square brackets may be used to restrict the analysis to specific portions of text. If these symbols are used in a text for other purposes, they should be replaced with other symbols.

If there are specific parts of your text that you do not what to process, such as some explanation notes, interviewer questions and probes, comments, etc.), enclose them in braces (ex. {comment}). Also, if you want to perform a content analysis on only a small portion of the entire text, such as on manually entered codes, enclose this portion of text in square brackets. QDA Miner's coding feature may also be used to restrict the analysis to some sections or exclude specific text segments from the content analysis process. Once those text segments have been manually tagged in QDA Miner, one could then specify, when calling WordStat, to ignore sections tagged with specific codes or to only analyze segments associated with one or several codes.

Importing Spreadsheet Files

Most spreadsheet programs allow for entry of both numeric and alphanumeric data into cells of a data grid. SimStat as well as QDA Miner can import spreadsheet files produced by LOTUS 1-2-3 (v1.1 to v5.0), SYMPHONY (v1.0 and v1.1), EXCEL (*.xls; *.xlsx), and QUATTRO PRO (v1.0 to v6.0). To import data from any of these applications:

- From SimStat, choose the DATA | IMPORT command from the FILE menu.
- From QDA Miner, choose the NEW command from the PROJECT menu and then select IMPORT FROM AN EXISTING DATA FILE.
- Select the file format using the List File of Type drop down list.
- Select the file you want to import and click the OK button.

The program displays a dialog box where one can specify the spreadsheet page and the range of cells where the data are located. You must specify a valid range name or provide upper left and lower right cells, separated by two periods (such as A1..H20). If you set the Range Name list box to ALL, the program attempts to read the whole page.

Formatting spreadsheet data

The selected range must be formatted such that the columns of the spreadsheet represent variables (or fields) while the rows represent cases. Also, the first row should preferably contain the variable names while the remaining rows hold the data, one case per row. QDA Miner and SimStat will automatically determine the most appropriate format based on the data it finds in the worksheet columns. Cells in the first row of the selected range are treated as variable names. If no variable name is encountered, QDA Miner and SimStat will automatically provide one for each column in the defined range.

When reading the data for analysis, all blank cells and all cells that do not correspond to the variable type (e.g., alphanumeric entries under a numeric variable, or a numeric value under a string variable) are treated as missing values.

Importing Database Files

MS Access, dBase and Paradox files

QDA Miner as well a SimStat can directly import MS Access, dBase and Paradox data files.

Other database files

Most database applications provide exporting capabilities that allow the user to save a copy of the data file in several file formats. The recommended file formats are, in descending order of preference, FoxPro 2.x data file and Tab separated text files. However, if your data file contains no memo variables and no alphanumeric variables larger than 256 characters you may also export your file to a dBase, a Paradox, or any supported spreadsheet data file.

Importing memo variables

Memo variables that have not been successfully imported may be transferred to the data file either by using cut and paste operations or by retrieving text files from disk. For more information on this topic, see Importing Plain Text and Word Processor Files (page 19)

Importing Plain Text or Word Processor Files into SimStat

QDA Miner provides an easy way to import documents stored in various formats, including MS Word, WordPerfect, Rich Text, HTML, PDF and plain-text files. When using SimStat as the base module, such a task is not as obvious. One way to transfer data from a word processor document into SimStat is to open simultaneously both applications and use cut and paste operations to transfer data through the clipboard. However, this may not be the most efficient way, especially when one needs to import a large amount of information. The following section presents four additional methods to transfer text information into memo variables:

- Using the Document Conversion Wizard program
- Retrieving a text file into a memo variable
- Importing comma or tab delimited text file
- Importing page delimited memo files

While the first method can read textual data stored in word processor documents, the last three methods require the data to be stored on disk in plain ASCII files without any formatting or typesetting code. Most word processors offer an option to save a document as a plain text file. If you don't know how to create such a text file, please refer to your word processor manual.

Using the Document Conversion Wizard program

WordStat includes a conversion utility program that can assist you in the importation of text files stored in either word processor documents such as MS Word, MS Write, WordPerfect, RTF, or Acrobat PDF files, but also of text stored in ASCII (plain text), HTML or even Excel spreadsheet files. To run this program:

- Point to the Programs folder in the Windows' Start menu, then select Provalis Research and then click Document Conversion Wizard.

This utility program will guide you through the process of importing one or numerous text files.

Retrieving a text file into a memo variable

This method should be used to retrieve a single unit of text into a memo variable for a specific case. If textual data for several cases need to be retrieved, they should be stored in different text files. To retrieve the text file from SimStat:

- Open the data file where the information should be stored.
- Position the cursor on cell in which you would like to store the text. A memo editor should appear at the bottom of the data sheet.
- Click inside the memo editor or press F2.
- Click the Import Text Into Memo button, select the text file you wish to retrieve and click OK.

Importing comma or tab delimited text files

If you wish to retrieve a text file containing several numeric and alphanumeric variables, you may have to transform this file into a comma or tab delimited text file. There are, however, several limitations to this transfer method. If commas are used as delimiters, then all existing commas within text variables should ideally be removed. If a tab delimited format is chosen, all tab characters already present in a text variable should be removed. Another important limitation is that all the information of a single case must be stored in a single line. For this reason, hard returns in long texts should be removed so that the entire text is stored on a single line. (There is no limitation on the total number of columns per line, so it is possible to store very long texts on a single line).

QDA Miner as well as SimStat can read up to 2000 numeric and alphanumeric variables from a plain ASCII file (text file). The file must have the following format:

- Every line must end with a carriage-return.
- The first line must include the variable names, separated by tabs or commas.
- Variable names may have a length of not more than 10 characters. Longer strings are truncated to 10 characters.
- The remaining lines must include the numeric or alphanumeric values, separated by tabs or commas.
- Each line must contain data for one case and variables must be in the same order for all cases. All invalid data and all blanks encountered between commas or tabs are treated as missing values. A single dot can also be use to represent a missing numeric value.
- Comments can be inserted anywhere in the file by putting a * at the beginning of the line.
- Blank lines can also be inserted anywhere in the file.
- Comma delimited text files require a .CSV extension while tab delimited files require a .TAB extension.

Importing page delimited memo files

SimStat provides a simple method to import numerous texts by the use of page delimited memo files. This file format consists of a plain text file which contains the textual data of numerous individuals for a single memo variable. The text for each case must be separated by page break characters (ASCII 12). The file name extension of this text file should be .MMO. To import such a file:

- Choose the DATA | IMPORT command from the FILE menu.
- Set the file format to Page Delimited Memo using the List File of Type drop down list.
- Select the file you want to import and click the OK button.

The resulting file consists of a SimStat data file with two variables: RECNO, a numeric variable containing a sequential number going from 1 up to the total number of cases encountered in the input file, and TEXT, a memo variable containing the textual data for this case.

Note: Importation of numerous text variables may be achieved by performing successive importations of page delimited memo files and then using the APPEND VARIABLES command to merge the resulting files into a single one. In order to achieve this, great care should be taken to give unique names to the various TEXT variables and to assure that the case sequence of the various text files is identical.

The WordStat User Interface

WordStat's user interface is built around a six pages workspace that provides an integrated environment for developing, testing, validating and applying content analysis dictionary and to perform various text mining tasks.

Dictionaries – This page allows one to adjust various text analysis processes, create and modify dictionaries, exclusion and substitution lists, as well as add, remove and edit existing entries in those dictionaries.

Options – This page contains various options controlling how the text data will be processed. It also includes options affecting linguistic tools as well as program appearance.

Frequencies – This page displays a table of the frequency of keywords or content categories. It may be used to modify active dictionaries and word lists, to assess co-occurrence or document similarities using clustering, multidimensional scaling and proximity plots, to compare frequencies with those computed on other collections of text, and to export data to disk.

Phrase Finder – This page allows one to extract the most common phrases and idioms and to easily add them to the current dictionaries. Co-occurrence and comparison techniques such as clustering, multidimensional scaling and correspondence analysis are also available from this page.

Crosstab – This page allows one to compare keyword frequencies across values of numerical, categorical or date variables. Along with a table of frequencies, several statistics and graphical techniques may be applied including correspondence analysis, heatmaps, bubble charts, bar charts and line charts. The automatic document classification feature can also be accessed from this page.

Keyword-in-Context – This page allows one to display a concordance table word patterns or phrases, or of all items related to a content category. Such a table is very useful to validate a dictionary by allowing one to examine in context how words are being used.

Two additional pull down menus can be accessed to perform various tasks:

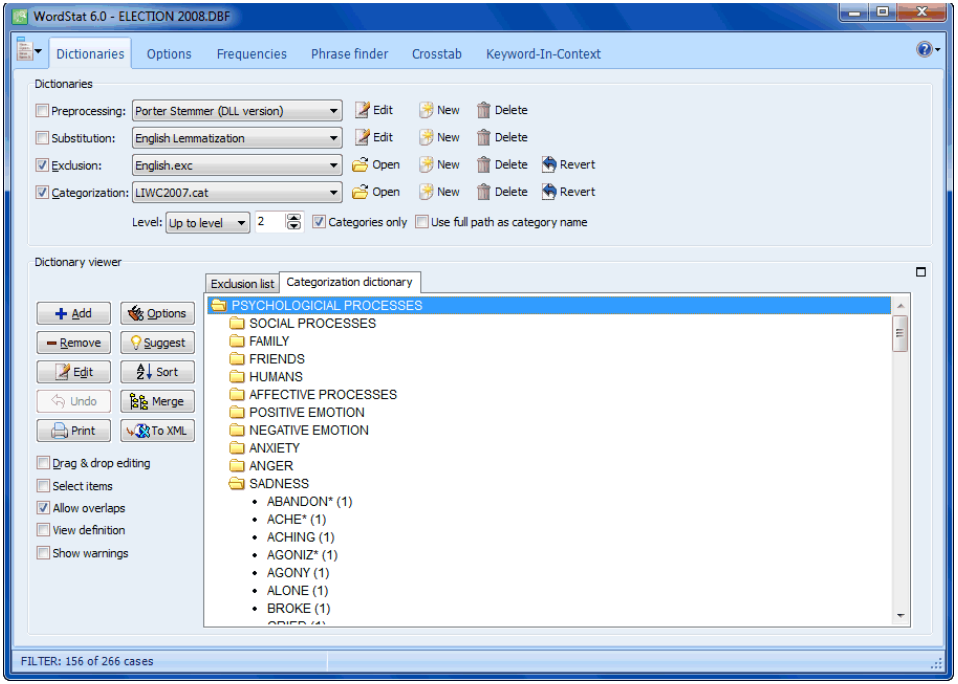
Clicking the  button in the upper left-hand corner of the main window displays a menu that allows one to leave WordStat and return to the calling application as well as to perform various tasks such as editing case descriptors (page 139), filtering cases (page 140), accessing the Report Manager (page 164), or accessing the text editor (page 87).

The  button in the upper right-hand corner provides access to this help file, which can also be accessed at any time by pressing the F1 key. In addition, this menu allows you to check whether you are using the latest version of WordStat and also gives access to specific important information and some useful links to the Provalis Research website.

Dictionaries Page

Without further information, WordStat can perform a frequency analysis on each of the words encountered in the chosen document or alphanumeric variables. However, it is also possible to apply various transformations on the words before performing the frequency analysis. The first two pages of the main window (see below) allow one to specify how the textual information should be processed. For example, one can tell the program to lemmatize words, to ignore words found in an exclusion list (also known as a stop list) or categorize them using a categorization dictionary. The Dictionaries page allows using or creating dictionaries, exclusion and substitution lists, add, remove or edit existing entries in those dictionaries.

(For more information of other analysis options available see Options Page on page 29)



The following section provides a description of the four processing steps involved in the transformation of textual data into keywords or content categories. Additional information about dictionary creation and maintenance can be found on page 61.

STEP #1 - PREPROCESSING

The preprocessing option allows for the custom transformation of the text to be analyzed prior to, or in place of the execution of the other three standard processes provided by WordStat: lemmatization, exclusion and categorization. This transformation is accomplished by the execution of specially designed external routines accessible in the form of an external EXE file or a function in a DLL library. This feature is provided to offer greater flexibility by allowing any user with programming skills or resources to customize the processing of textual information. For more information on this feature see Configuring External Preprocessing Routines on page 84.

STEP #2 - SUBSTITUTION

The substitution process may be used to automatically replace specific words with other word forms. It may be used to substitute common misspellings or perform lemmatization. One could also use this process to perform a simple type of categorization where specific words are replaced with keywords. WordStat provides four predefined substitution processes to perform lemmatization on documents in English, French, Italian and Spanish. Lemmatization is a process by which various forms of words are reduced to a more limited number of canonical forms. A typical example of lemmatization would be the conversion of plurals to singulars and past tense verbs to present tense verbs. The lemmatization algorithm implemented in WordStat is a dictionary-moderated method, partly inspired by Krovetz's KSTEM suffix substitution algorithm. Since the lemmatization algorithm does not rely on a prior part-of-speech tagging of words, it is much faster than traditional lemmatization routines. It may, however, result in a few invalid word substitutions, but usually, those errors will have no major consequences on the result of an analysis. WordStat offers a way to monitor all substitutions performed by this routine and to override any by creating a list of custom substitutions. For more information on such a feature, see Monitoring and Customizing Substitutions on page 80.

STEP #3 - EXCLUSION OF WORDS

The exclusion dictionary (also known as a stop list) is used to remove all words that are not to be included in the content analysis. It is used mainly to remove words with little semantic value such as pronouns, conjunctions, etc. Wildcards such as * and ? are supported.

For example, the following expression:

REPORT*

will exclude all words beginning with REPORT (such as REPORT, REPORTS, and REPORTER).

The next example:

EXP?RT

will remove both EXPORT and EXPERT.

An expression that includes several words may also be excluded by joining the various words with underline characters. For example:

NOT_*

Will exclude all words preceded by the word "not".

The currently opened exclusion dictionary may be deactivated by removing the check mark in the check box at the left of the exclusion dictionary name.

STEP #4 - CATEGORIZATION OF WORDS AND PHRASES

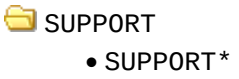
The inclusion dictionary allows one to change specific words, word patterns (such as REPORT* or EXP?RT), or expressions, to another word, category or concept. This feature may be used to remove variant forms of a word in order to treat them as a single instance or to group related words under meaningful categories. Inclusion dictionaries may also be used to perform a frequency analysis on manually entered codes. By manually entering specific keywords (such as "EVAL_POS" , or "EVAL_NEG") in a text variable and by entering those same keywords in the inclusion list, it becomes possible to extract those codes and perform frequency and contingency analysis on them.

A categorization dictionary may also contain rules delineating the conditions under which specific words or phrases should be categorized. Those rules may consist of complex expressions involving Boolean (AND, OR, NOT) and proximity operators (NEAR, BEFORE, AFTER). Those kinds of rules allow one to eliminate basic ambiguity in words by taking into account the presence of other words that may alter the meaning. A good example would be the presence of a negative word form (such as "rarely" or "never") close to an adjective. Another example would be the differentiation of the various meanings of the word BANK by identifying other words like "river", "money" and "deposit" surrounding "bank". For more information on rules, see section Working with Rules, page 69.

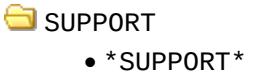
The inclusion dictionary is structured as a hierarchical tree where words, word patterns, phrases, and rules are grouped in a folder that represents a category name. Categories and individual words may also be included in a higher order category, allowing one to create multi-level dictionaries like the following one:

In the above example, words like `CANADA, USA`, or `MEXICO` may be coded as either `NORTH-AMERICA` or `COUNTRY`, depending on whether the categorization is performed up to the first or second level of the dictionary (see Level of Analysis, page 26).

Wildcards such as `*` and **`?`** are supported. For example, the following item under the support category:

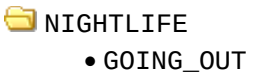


will change SUPPORT, SUPPORTS, SUPPORTING, SUPPORTIVE, SUPPORTER, etc. into a single word SUPPORT, while the following word pattern:

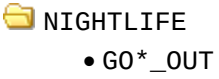


will also substitute all words with the substring "SUPPORT" in it, such as UNSUPPORTEDLY, UNSUPPORTED, etc.

An expression that includes several words may also be substituted by joining the various words with underline characters. For example, you may change the expression "going out" with the category "NIGHTLIFE" by specifying the following item:



You may also use wildcards in expressions such as:



to substitute several forms of an expression at once.

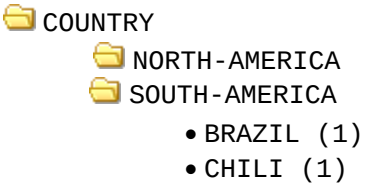
Integer weights can also be assigned to specific items so that a specific word or word pattern may count for more than one instance of the category. For example, in order to compute an aggressiveness score on specific texts, you may choose to assign a weight of 5 points to word patterns such as KILL* or MURDER* but only a single point to word patterns like INSULT*.

CATEGORIZATION SETTINGS

LEVEL OF ANALYSIS - This option allows one to specify up to which level the coding should be performed. For example, in the following dictionary:

if a level of 1 is specified, all words that are stored at a higher level than the root level will be coded as the parent category at this first level. For example, words like CANADA and MEXICO will be coded as COUNTRY along with other country names like BRAZIL. Setting the level of analysis to a numeric value of 2 will results in the coding of those two words as NORTH-AMERICA, while BRAZIL will be coded as SOUTH-AMERICA. Items stored at the same or at a lower level than this option will remain unchanged.

Setting the LEVEL option to **AS SHOWN** instructs WordStat to match the level of categorization performed to the level of details currently displayed in the tree view of the categorization dictionary. This option allows one to set different levels of categorization by expanding broad categories that should be broken down and by collapsing categories for which finer details are not needed. For example, if we modify the above tree by collapsing the NORTH-AMERICA category, WordStat will display it the following way:



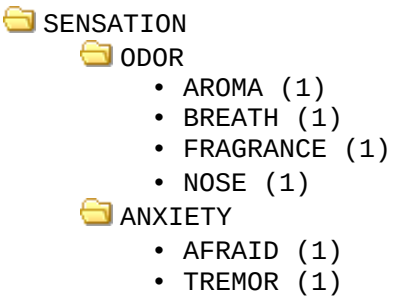
The program will report frequencies of individual countries like BRAZIL or CHILI but will categorize every instance of CANADA, UNITED-STATES, USA and MEXICO as NORTH-AMERICA.

Please note that it is possible to prevent a category from being broken down into subcategories or items, even if the level of analysis is set to a higher setting, or if it is set to AS SHOWN and the items contained in this category are visible. Such a feature is useful when the content of a category consists of different ways of referring to the exact same thing (for example UNITED_STATES, UNITED_STATES_OF_AMERICA, US and USA) or consists of various misspellings.

To make a category unbreakable, select the category in the dictionary tree, click the 

button, and put a check mark in the Unbreakable box. The folder icon normally used to represent categories will be transformed into a folder icon  with a key inside. You may also select the category, right click, and then select UNBREAKABLE | YES from the pop-up menu. To unlock the folder, follow the previously described steps for editing the category and remove the check mark in the Unbreakable box or select UNBREAKABLE | NO from the pop-up menu.

CATEGORIES ONLY - When the LEVEL OF ANALYSIS option is set to a value higher than one, this option instructs WordStat to limit the level increase to the coding of the last category at or below the specified level. This option is especially useful when working with unbalanced hierarchical categorization systems where individual words are stored at different levels. For example, in the following dictionary:



setting the level of analysis to 2 without enabling this option would code words like AROMA or BREATH as ODOR, but would include in the final results individual words like TREMOR or AFRAID. Enabling the CATEGORIES ONLY option ensures that individual words won't be included but will be coded as their parent category.

USE FULL PATH AS CATEGORY NAME - When the LEVEL OF ANALYSIS option is set to a value higher than one, this option instructs WordStat to substitute the full path of an item as the category name. The slash (/) character is used to separate the various levels. For example, in the above example, setting this option to true and the level analysis to 2 will code the word AROMA as SENSATION/ODOR. Increasing the level of analysis up to 3 will return SENSATION/ODOR/AROMA.

ALLOW OVERLAP - By default, categories are mutually exclusive such that a word can only be entered in a single category. Enabling this option allows one to create overlapping categories

where words can be classified simultaneously into two or more categories. However, please take note that current multivariate techniques available in WordStat such as clustering, correspondence analysis and multidimensional scaling as well as other multivariate statistical procedures make the assumption that categories are statistically independent. Using overlapping categories creates data that clearly violate this assumption and may yield dubious results.

SHOW WARNINGS - Some items in an exclusion list or categorization dictionary may remain undetected in documents because of their incompatibility with some analysis options. This occurs, for example, when an item is found both in the categorization dictionary and the exclusion list, or when this item includes non-alphabetic characters that have not been specified as valid. The following table displays the various types of problems that may be identified by WordStat:

TYPE	DESCRIPTION
Item includes invalid characters	WordStat identifies individual words using alphabetic characters and other special characters specified by the user in the Valid Characters option. So, to make sure any item containing non-alphabetic characters is properly recognized, this special character must be added to the list of valid characters.
Item includes numeric characters	An item in the categorization dictionary or the exclusion list that includes numeric characters cannot be recognized since the Accept Numeric Characters option is currently disabled.
Item also in the exclusion list	An item found in a categorization dictionary cannot be recognized if it matches an item found in the exclusion list.
Phrase starts with an excluded word	In order to be recognized, a phrase cannot start with a word found in the exclusion list. Therefore, this excluded word should preferably be removed from the exclusion list in order for the phrase to be recognized.

Enabling the Show Warnings option instructs WordStat to display potential incompatibility problems affecting items in a dictionary, and to display a list of these problems in a special dialog box. This dialog box is displayed prior to the application of dictionaries for prospective analysis.

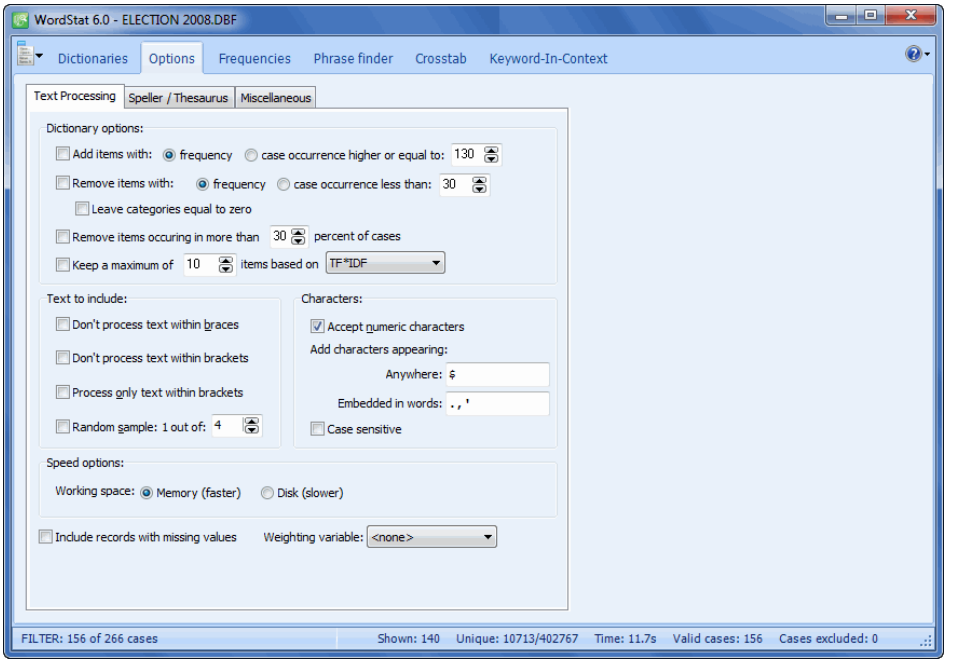
For more information on how to open, activate or deactivate a dictionary or how to add, edit or remove an entry in a dictionary, see Creating and Maintaining Dictionaries, page 61)

WWW.FOREX-WAREZ.COM
ANDREYBBRV@GMAIL.COM SKYPE: ANDREYBBRV

Options Page

This page offers different options that control how the textual information should be processed. The options are grouped under three different pages:

1) Analysis
2) Speller/Thesaurus
3) Miscellaneous



ANALYSIS OPTIONS

ADD WORDS - When the inclusion dictionary is disabled, all words that are not found in the exclusion list will be included in the final keyword frequency analysis. This option allows one to restrict the number of words included to the most frequent ones by setting a minimum **Frequency** or **Case Occurrence** criterion for inclusion. This option may also be used while the inclusion list is active to add to this list, other words that are used at a high frequency. However, this option can only be used to add new words to the list of words and categories found in this inclusion dictionary and cannot be used to remove any of those items. To remove items in this inclusion dictionary based on a frequency or case occurrence criterion see the REMOVE WORDS option below.

REMOVE WORDS - This option allows one to restrict the number of included words or categories to the most frequent ones by setting a minimum **Frequency** or **Case Occurrence** criterion for inclusion. This criterion is applied both to items in the inclusion dictionary and words that meet the criterion specified with the ADD WORDS option.

Examples:

- If no inclusion dictionary is used and you want to include any word that appears at least 10 times, but in no less than 5 different cases, you need to activate the ADD WORDS option and set its criterion to a minimum FREQUENCY of 10. You then have to set the REMOVE WORDS criterion to a minimum Case Occurrence of 5. Only words that meet both criteria will be included.

- When an inclusion list is used to lemmatize words, but you only want to obtain frequency information on those words that appear a specific number of times, you have to activate the inclusion dictionary and set the minimum frequency criterion of both the ADD WORDS and REMOVE WORDS options to the required frequency.

- When an inclusion list is used to categorize words, but you only want to analyze the most frequent categories, you have to activate the inclusion dictionary and set the REMOVE WORDS option to the required frequency. In this situation, the ADD WORDS option should be deactivated.

LEAVE CATEGORIES EQUAL TO ZERO - By default, WordStat removes from the frequency table any keyword or category in the categorization dictionary that had not been encountered in the analyzed text. Enabling this option instructs the program to leave those items with a zero frequency in the table. Such an option is especially useful when comparing obtained frequencies to normative data or to other samples. This option should also be enabled when creating norm files (see Creating and Using Norm Files on page 93).

REMOVE ITEMS OCCURRING IN MORE THAN ? PERCENT OF CASES - This option allows one to remove keywords or categories appearing in more than a specified percentage of cases. This criterion is applied both to items in the categorization dictionary and to words that meet the criterion specified in the ADD WORDS option. Such an option is especially useful to remove words that are too common to have any informative or discriminative value.

KEEP A MAXIMUM OF n ITEMS - This option allows one to restrict the number of included words or categories to a maximum number of items, based either on their total **frequency**, number of **case occurrences**, or on the computed **TFxIDF** index. This selection occurs only after all the previous frequency options have been assessed and only if the total number of remaining items is higher than the specified maximum. If the cutting point falls on a frequency or a case occurrence shared by many items, those with the highest **TFxIDF** values will be selected.

DON'T PROCESS TEXT WITHIN BRACES - This option can be used to instruct the program to skip all text found between braces (i.e. **{** and **}**). This option is especially useful when you want to insert comments or annotations in the text variable without affecting the content analysis. It can also be used to ignore in an interview transcript all questions, prompts, and other verbal interventions made by the interviewer.

DON'T PROCESS TEXT WITHIN BRACKETS - This option can be used to instruct the program to skip all text found between brackets (i.e. **[** and **]**). Since WordStat can also be configured to analyze only text found between such brackets (see option below), these two options may be used to toggle between an analysis of keywords entered manually between those brackets and of the surrounding text.

PROCESS ONLY TEXT WITHIN BRACKETS - This option can be used to instruct the program to process only the text found between brackets (i.e. **[** and **]**). This option may be used to perform an analysis on keywords entered manually in the text by one or several coders.

ACCEPT NUMERIC CHARACTERS - By default, every word consisting of numeric values or of a mix of letters and numbers is excluded from the analysis. This option can be used to include those words.

ADD CHARACTERS APPEARING - This set of options allows one to specify which characters, besides letters of the alphabet, should be considered as an integral part of a word. For example, the word "ex-wife" can be treated as a single word or as two separate words ("ex" and "wife") if the hyphen is included in the list of valid characters. Two edit boxes may be used to specify additional characters. The **ANYWHERE** option is used to specify special characters that will be considered as part of a word, no matter where they appear, while the **EMBEDDED IN WORDS** option should be used to specify characters that should be enclosed within other valid characters and not at the beginning or the end of a word. For example, adding the period and comma to the list of characters embedded in words, will allow one to retrieve numeric values such as 97.5 or 1,000,000 or domain names like www.google.com as a single token without the risk of retrieving words immediately followed by commas or periods.

CASE SENSITIVE - By default, WordStat internally converts all text to uppercase letters so that processing of words is cases insensitive. This may be inappropriate if one wants to identify proper nouns or analyze text written in some European languages like German where differences in letter cases may denote different meaning. Enabling this option prevent the internal conversion to uppercase letters and will treat two instances of the same word different in their case (lower or upper case) as two distinct words.

RANDOM SAMPLE - When this option is activated, the program will randomly select a fraction of all cases and performs the content analysis on this subsample. The proportion of cases can be specified using the spin button located at the right of the checkbox. This option reduces the processing time for large files and is especially useful during the initial phase of an analysis where dictionaries are constructed and categorization schema are developed and revised. It also allows one to preview the kind of results that would be obtained on very large data files.

WORKING SPACE - By default, WordStat uses available computer memory to stores all temporary lists and data. This option speeds up computation, but you might run out of memory on very large projects. Selecting the DISK option frees up memory and allows you to analyze larger projects, at the cost of slower computation.

INCLUDE RECORDS WITH MISSING VALUES - When examining the relationship between textual data and categorical or numerical variables, WordStat will skip any cases with a missing value on any one of these variables. Enabling this option instructs WordStat to include all cases, whether or not values are missing. All missing values are assigned to an additional class labeled as "MISSING." Any analysis involving comparisons between classes of categorical variables (cross-tabulation, correspondence analysis, etc.) will include this additional class.

WEIGHTING VARIABLE - This option allows the selection of a variable that will be used to apply weight to the cases. When the program reads a case, the value of the weighting variable for this case is truncated to an integer. This integer value specifies how many times the case will be duplicated. If the value is less than one, the case is excluded from the analysis. This option is especially useful when the textual data to be analyzed have already been reduced to a frequency list, such as when analyzing a list of the most frequent queries on a search engine.

SPELLER / THESAURUS PAGE

ACTIVE DICTIONARIES - WordStat makes use of language dictionaries in order to spell-check existing textual data and to suggest inflected forms of words found in the user dictionary. This group of options let you specify the dictionary to use with the current data file.

SPELLER OPTIONS

CONFIRM ADDITION TO USER DICTIONARY - When this option is activated, you will be prompted after clicking the Add button of the spell-checking dialog box to confirm word additions to the custom dictionary.

IGNORE WORDS CONTAINING NUMBERS - Enabling this option instructs WordStat to ignore any word that contains one or more numeric characters,.

IGNORE WORDS IN UPPER CASES - Enabling this option instructs WordStat to ignore all words fully in uppercase.

THESAURUS

DISABLE ENGLISH THESAURUS - WordStat's Suggest feature uses several English thesauri to suggest synonyms of existing words in the user directory. This option allows one to disable this feature. This may be especially useful when developing a dictionary in another language than English or when one only want the program to suggest inflected forms. (for more information on this feature, see Using Lexical Tools for Dictionary Building, page 72)

OTHERS PAGE

COLOR SCHEME - A color scheme is a set of colors used for background, page tabs, borders and buttons. WordStat comes with several color schemes. To choose a desired color scheme, simply select one from the drop-down list. To disable this feature and use the default Windows theme, set this option to System Default.

FLAT TABLES (WITHOUT GRID LINES) - When this option is unchecked, tables in WordStat are displayed with grid lines while column and row headers are displayed in 3-D. Enabling it, removes grid lines and flattens row and column headers.

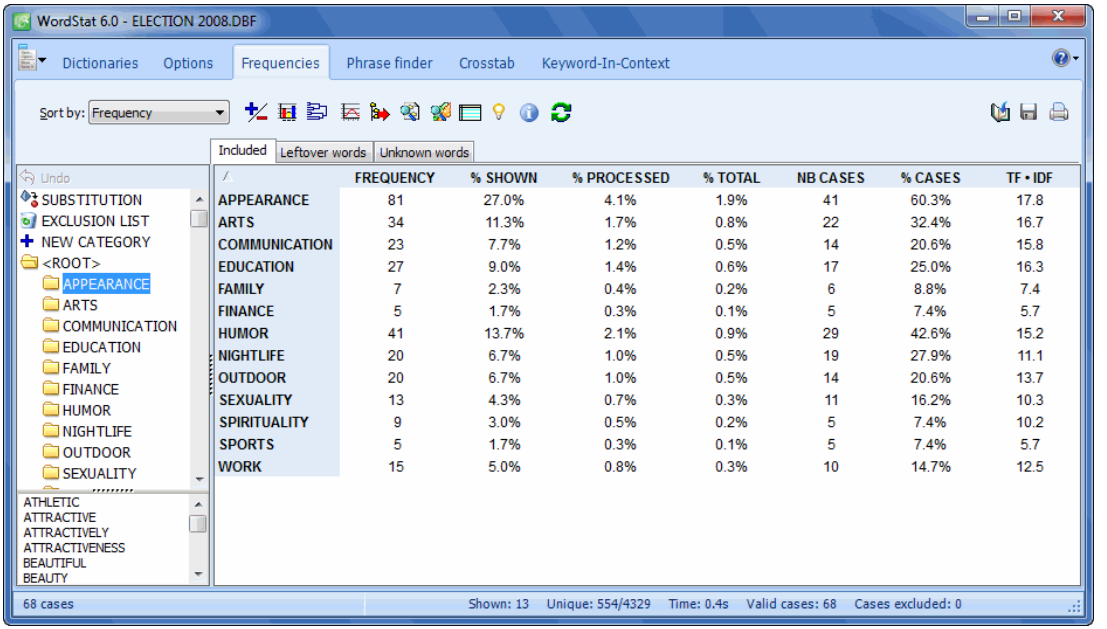
PERCENT DECIMAL PLACES - Use this option to modify the number of decimal places used to display percentages in frequency tables and in crosstabulation tables.

SHOW HARD RETURNS AS ¶ - In KWIC lists and reports, hard returns normally used to mark the beginning of a new paragraph are represented by a ¶ symbol. This option allows toggling on and off the display of this symbol.

TREATMENT OF ITEMS NOT FOUND IN NORM FILES - When comparing keyword frequencies with normative data, a specific word in the frequency list may be absent from the normative data file. This may occur for neologisms, technical terms, proper nouns, low frequency words as well as misspelled words. This option allows one to choose whether, in such a situation, the cells for expected frequency and comparison statistics should be left empty or if those statistics should be extrapolated by setting the expected frequency to the lowest possible frequency (based on the size of the normative body of text that was used to compute the normative data).

Frequencies Page

The Frequencies page is used to display a frequency table of words or category names. This can be used to perform a univariate frequency analysis on words or categories and also to modify any of the active dictionaries or word lists.



	FREQUENCY	% SHOWN	% PROCESSED	% TOTAL	NB CASES	% CASES	TF • IDF
APPEARANCE	81	27.0%	4.1%	1.9%	41	60.3%	17.8
ARTS	34	11.3%	1.7%	0.8%	22	32.4%	16.7
COMMUNICATION	23	7.7%	1.2%	0.5%	14	20.6%	15.8
EDUCATION	27	9.0%	1.4%	0.6%	17	25.0%	16.3
FAMILY	7	2.3%	0.4%	0.2%	6	8.8%	7.4
FINANCE	5	1.7%	0.3%	0.1%	5	7.4%	5.7
HUMOR	41	13.7%	2.1%	0.9%	29	42.6%	15.2
NIGHTLIFE	20	6.7%	1.0%	0.5%	19	27.9%	11.1
OUTDOOR	20	6.7%	1.0%	0.5%	14	20.6%	13.7
SEXUALITY	13	4.3%	0.7%	0.3%	11	16.2%	10.3
SPIRITUALITY	9	3.0%	0.5%	0.2%	5	7.4%	10.2
SPORTS	5	1.7%	0.3%	0.1%	5	7.4%	5.7
WORK	15	5.0%	0.8%	0.3%	10	14.7%	12.5

By default, the table shows the included words in descending order of frequency. The table includes the following statistics:

FREQUENCY	Number of occurrences of the word or category names.
% SHOWN	Percentage based on the total number of words displayed in the table
% PROCESSED	Percentage based on the total number of words encountered during the analysis.
% TOTAL	Percent based on the total number of words less those excluded by list.
NO CASES	Number of cases where this keyword appears.
% CASES	Percentage of cases where this keyword appears.
TF*IDF	Term frequency weighted by inverse document frequency. Such a weighting is based on the assumption that the more often a term occurs in a document, the more it is representative of its content yet, the more documents in which the term occurs, the less discriminating it is.

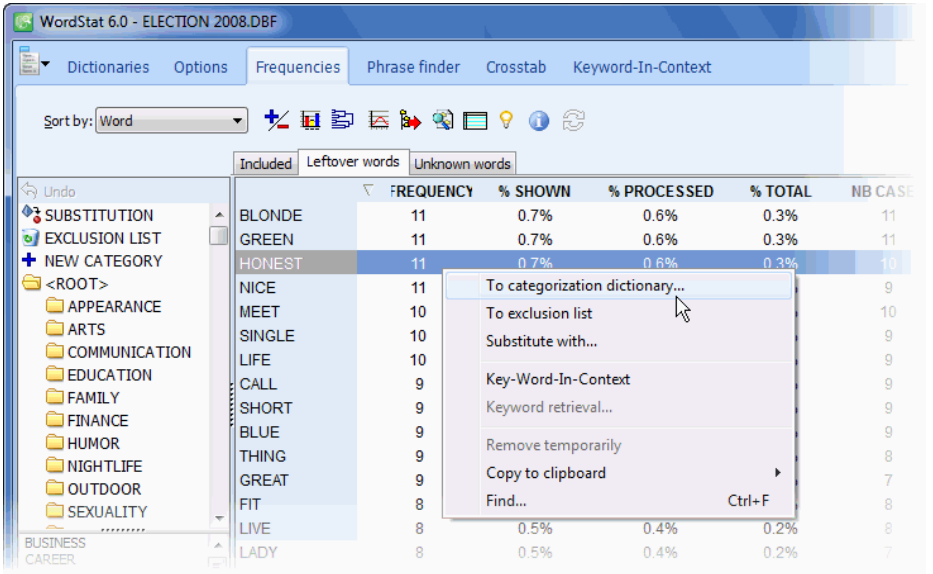
Tabs at the top of the table allow you to access (1) a frequency table of all **Included** content categories or keywords, (2) a frequency table of **Leftover Words** consisting of individual words that have not been categorized or included in the analysis, or (3) a tool to extract from those leftover words any **Unknown Words** (including misspelled ones, proper nouns, abbreviations, technical terms). For more information on this feature see Identification of Unknown Words on page 39.

To the left of the main grid, a panel lists the content categories of the current dictionary following additional entries representing the substitution and exclusion processes. This panel may be used to quickly assign items in the table to any one of these locations using the drag-and-drop operation (For more information on how to use this panel, see Using the Dictionary Panel on page 37).

SORT BY - This option allows a display of words in the frequency table in alphabetical order, on keyword endings, or by descending order of keyword frequency (NO WORDS column) or case occurrence (NO CASES column). Sorting the table by keyword endings facilitates the identification of plural form of words that should be substituted by their singular form or the substitution of verbs by their infinitive form. One may also sort on any column in ascending order on any column values by clicking this column header. Clicking a second time on the same column header sorts the rows again in descending order.

The  button can **be** used to move one or several words to the exclusion or substitution list or to add or remove a word from the inclusion list. The permitted moves depend on the words currently displayed. If you want to remove a word from the inclusion list, the DISPLAY option should be set to INCLUDED or ALL. To add a word to the inclusion list, the DISPLAY should be set to LEFTOVER or ALL. This button is also used to display a Keyword-In-Context table of the selected keyword.

It is also possible to quickly access the pop-up menu invoked by this button by pressing the right button of the mouse anywhere on the grid (see below).



The  button allows one to produce barcharts or pie charts to visually display the distribution of specific keywords or categories. To produce such charts:

- Set the Sort By option to the order in which you wish the values be shown graphically.

- Select the rows you would like to plot (multiple but separate rows can be selected by clicking while holding down the CTRL key)
- Click the  button.

For further information see Displaying Distribution Using Barcharts or Pie Charts on page 90.

The  button allows one to perform cluster analysis and multidimensional scaling on all included words or categories and display a dendrogram or concept map of those items based on their proximity. For further information see Hierarchical Clustering and Multidimensional Scaling page 100).

The  button allows one to create normative frequency data from the current file, to store them on disk and to compare currently displayed frequencies with previously saved norms. See Creating and Using Norm Files on page 93 for more information on this topic.

The  button may be used to append frequency information to the current data file, save to disk a matrix of word or keyword frequency by cases or export the current categorization model. For more information on one of these topics see Exporting Frequency Data (page 154) or Exporting Categorization Models (page 156).

The  button allows one to access a keyword retrieval feature to retrieve all documents, paragraphs or sentences containing a specific keyword or a combination of keywords. See Keyword Retrieval (page 95) for more information on this topic.

The  button allows one to automatically attach QDA Miner tags to all paragraphs or sentences associated with currently displayed content categories or keywords. When clicked, a dialog box asks whether the coding should be applied to whole paragraphs or to individual sentences. If some WordStat keywords have no corresponding QDA Miner codes, new codes will be created under a special codebook category before the autocoding process begins.

The  button is used to draw color guidelines on alternate rows in order to facilitate the reading of large tables. When clicking this button color guidelines are shown. Clicking this button again removes the color guidelines.

The  button allows one to view an automatic suggestion panel displaying leftover words potentially related to the currently selected item. For more information on the auto-suggest panel, see Working with the **Auto-Suggest** Panel on page 38.

The  button displays various statistics on the text categorization process, such as the total number of words processed, the number and proportion of words that have been excluded that have been categorized. The dialog box also displays document statistics - such as the average number of word per sentence, paragraph and document as well as several coverage statistics, including the percentage of cases, paragraphs and sentences containing at least one keyword and the proportion of words that have been categorized or included. The coverage statistics are especially useful when one applies a content analysis dictionary developed to describe a specific

data set on new data sets. A significant decrease in coverage may indicate the need to update a dictionary in order to better reflect changes over time or specific differences in this new data set.

The  button is used to reapply the content analysis process on the current data set. This button is disabled by default and becomes enabled when changes are made to any one of the currently active text analysis processes (such as the categorization dictionary, the exclusion list or the substitution process). Clicking this button will instruct WordStat to reprocess the text collection and update the current table.

To export the frequency table to disk:

- Click the  button. A **Save File** dialog box will appear.
- In the **Save as Type** list box select the file format in which to save the table. The following formats are supported: ASCII file (*.TXT), Tab delimited file (*.TAB), Comma delimited file (*.CSV), HTML file (*.HTM;*.HTML), and Excel spreadsheet file (*.XLS).
- Type a valid file name with the proper file extension.
- Click the **Save** button.

To copy the entire table to the clipboard:

- Right-click anywhere in the frequency table.
- Select the COPY TO CLIPBOARD | TABLE command from the pop-up menu

To copy selected rows to the clipboard:

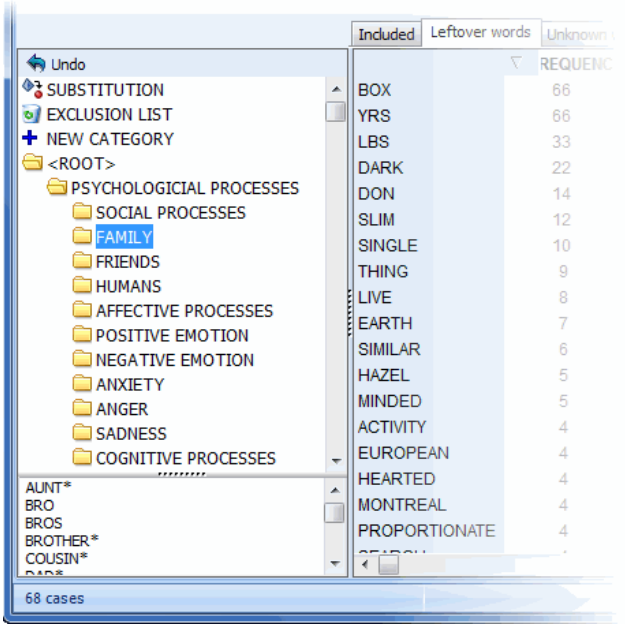
- Select the rows you would like to copy (multiple but separate rows can be selected by clicking while holding down the CTRL key).
- Right-click anywhere in the frequency table.
- Select the COPY TO CLIPBOARD | SELECTED ROWS command from the pop-up menu.

To search for a specific item:

- Right-click anywhere in the frequency table.
- Select the FIND command from the pop-up menu. A search dialog box will appear.
- Type the search string in the **Find What** edit box. To restrict the search to items starting with the search string, enable the **Match Beginning of Item** option. To restrict the search to whole words matching the search string, enable the **Match Whole Word Only**.
- Click the **Find** button to search the first item matching the typed string. Clicking this button again finds the next occurrence of the search string, starting at the currently selected item.

Using the Dictionary Panel

The dictionary panel provides an easy way to assign words or phrases to the current categorization dictionary and to the exclusion or substitution lists. It may also be used to remove or edit existing items. This panel is located to the left of the **Frequencies**, **Crosstab** and **Phrase Finder** pages and looks like the one shown below.



The main section of this panel is a "tree" representing the structure of the current content analysis along with the substitution and exclusion processes (if active). When an item on this list is selected, its content is listed in a resizable window below the tree structure. At the top of the panel, a button allows one to undo the last change made to any one of those lists.

To move items to a list or to an existing content category:

- In the table to the right of this panel, click the word or phrase you wish to assign to a list or content category. To select a group of adjacent entries, move the mouse cursor over the first item in the list, click and hold the mouse button, drag the mouse to the last entry to highlight the block of rows you want to assign, and then release the mouse button. To select disjointed items, hold down the CTRL key while clicking each one of the items.
- Once the words or phrases have been highlighted, drag and drop them on the category of your choice. To add an item to the root folder of a categorization dictionary, simply drop it into the **< ROOT >** folder.

To move items to a new category:

- Select the words or phrases you would like to assign to this new category.

- Drag and drop those items on the + NEW CATEGORY item. An dialog box will appear, allowing you to type the name of this new category.

To rename or delete an existing content category:

- In the tree representation of the dictionary, right-click the category you would like to rename or delete.
- Select the appropriate command.

To rename, delete or move an item in a list or in a content category:

- In the window below the tree display, right-click the item you would like to modify.
- Select the appropriate command.

To cancel a modification:

- If you want to undo the last assignment, deletion or modification made using this panel, click the Undo button. Note: If you leave the mouse cursor over this button, a hint window will appear showing you which modification will be canceled by clicking this button.

Working with the Auto-Suggest Panel

One of the biggest challenges of quantitative content analysis lies in the fact that a single idea may be expressed in many different ways, like using synonyms, paraphrases, or idioms. When one needs to identify all instances of such an idea, a critical task becomes identifying those numerous forms. WordStat provides several tools to support this task such as the **Suggest** feature (see page 72) that can be used to retrieve a list of all known synonyms, related words and inflected forms of the items already in a dictionary from another source such as a thesaurus or a lexical database. The **Auto-Suggest** feature is an optional panel on the **Frequencies** page that also lists suggestions. It differs however, from the **Suggest** feature in several ways. First, it only displays suggested words that were found in the current text collection and that are not already in the categorization dictionary (leftover words). It may also be used not only on content categories but also on any word extracted by WordStat and displayed in the **Included** words and **Leftover Words** lists. It may thus be used from the very beginning of the dictionary construction process to quickly identify potential groupings of words and assign the relevant ones to existing or new content categories.

To display this panel, push down the  button. A panel to the right of the frequency table will appear. To display suggestions, simply select the appropriate row in the frequency grid. When the selected item is a word, the panel will display synonyms, antonyms, related items and words with a similar beginning (potentially related items, inflected and misspelled forms). When the selected row consists of a content category, then the panel displays the same information but for all words currently in this content category. Selecting more than one row will also result in a compound view of suggestions of all selected items.

At the top of the panel, radio buttons allow you to choose the extent of the suggestions. By default, the panel returns the most likely synonyms, while related words consist of hypernyms, hyponyms, holonyms and meronyms. Choosing the **More** option retrieves other potential synonyms, as well as coordinate terms and possible attributes of the selected item.

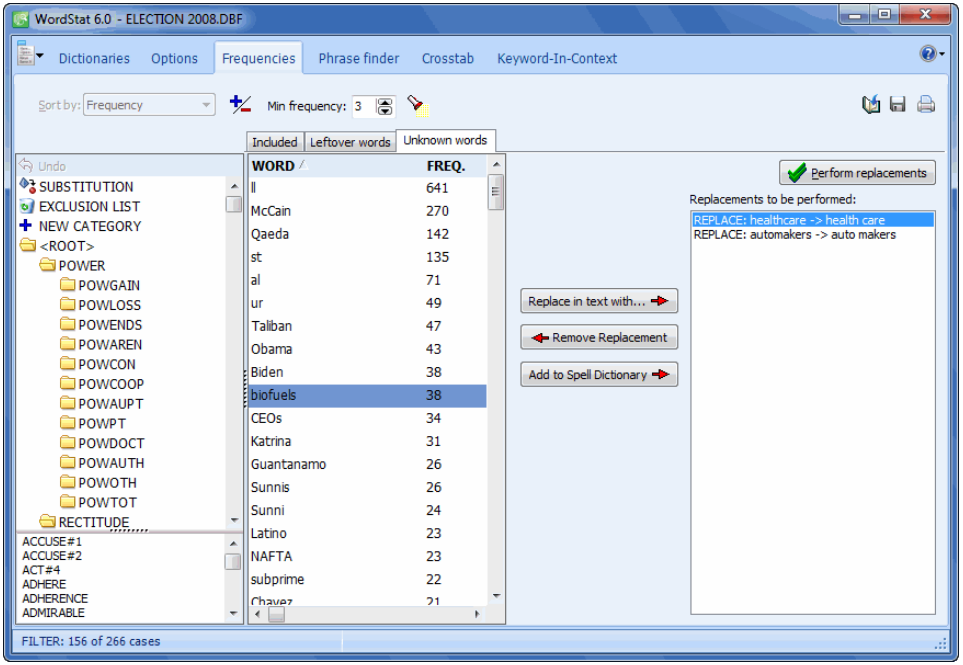
Assigning suggestions to a dictionary

There are two methods to assign suggested words to the categorization dictionary or to the exclusion list. The first method will perform these operations on items in this panel only, while the second method will also include selected items in the main frequency list.

- To perform one of the above mentioned operations on the suggested items only, select one or several suggestions, right-click anywhere in this panel and choose the appropriate command.
- To include with those suggestions, selected words in the frequency table, click the  button on the tool bar and choose the appropriate command. You may also drag and drop words from the frequency table to the appropriate location in the Dictionary panel to the left. When dropping items from the frequency table, all selected suggestions will also be moved to the selected location.

Identification of Unknown Words

The **Unknown Words** feature of WordStat provides a tool to extract single words representing technical terms, company and product names, as well as abbreviations that are specific to the current collection of documents. The feature will also identify common misspellings by comparing the list of word forms encountered in the entire text collection against a list of common words. By default, the extraction is performed in reference to common English words. To identify unknown words in documents written in another language or to exclude technical terms from a specific domain set the Active Dictionaries option on the Speller/Thesaurus Option Page (see page 32) to the desired language.



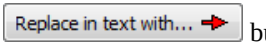
The Min Frequency option allows one to eliminate from the list all words appearing only a few times by setting a minimum frequency criterion.

Once this option has been set, click the  button to start searching for vocabulary words. The list of words retrieved are then listed in a frequency table on the left of the screen and presented in descending order of frequency. To sort this list in alphabetical order, click the top of the first column.

Three types of operations are allowed on these words: 1) You can replace all instances of a selected word in the original document by another word or phrase; 2) You can add this word to a custom list of valid words causing the program to ignore those words the next time there is a search for vocabulary words; or 3) You can assign the words to an existing text analytic process. You may also obtain a keyword-in-context list associated with a specific word in order to decide how that word should be treated.

Replacing words in the original documents or adding items to the list of valid words that should, from now on, be ignored are not performed immediately. Instead they are added to an action list allowing you to review, modify or cancel previously defined actions prior to the application of all the specified changes.

To replace words in the original documents:

- Select the word to be replaced.
- Click the  button. A dialog box similar to this one will appear.

- Type the new replacement word or phrase or choose from the **Suggestions** list box on the left side of the dialog box.
- Click the **OK** button to confirm this replacement and add this operation to the list of actions to perform.

To add a word to the custom list of words to ignore:

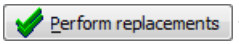
- Select the word you would like to add to the custom dictionary.
- Click the  button.

To remove operations previously defined:

- Select the operations that you would like to remove.
- Click the 

button. All words associated with the removed actions are moved back to the list of unknown words and positioned at the bottom of the list.

To perform all the defined word replacements:

- Click the 

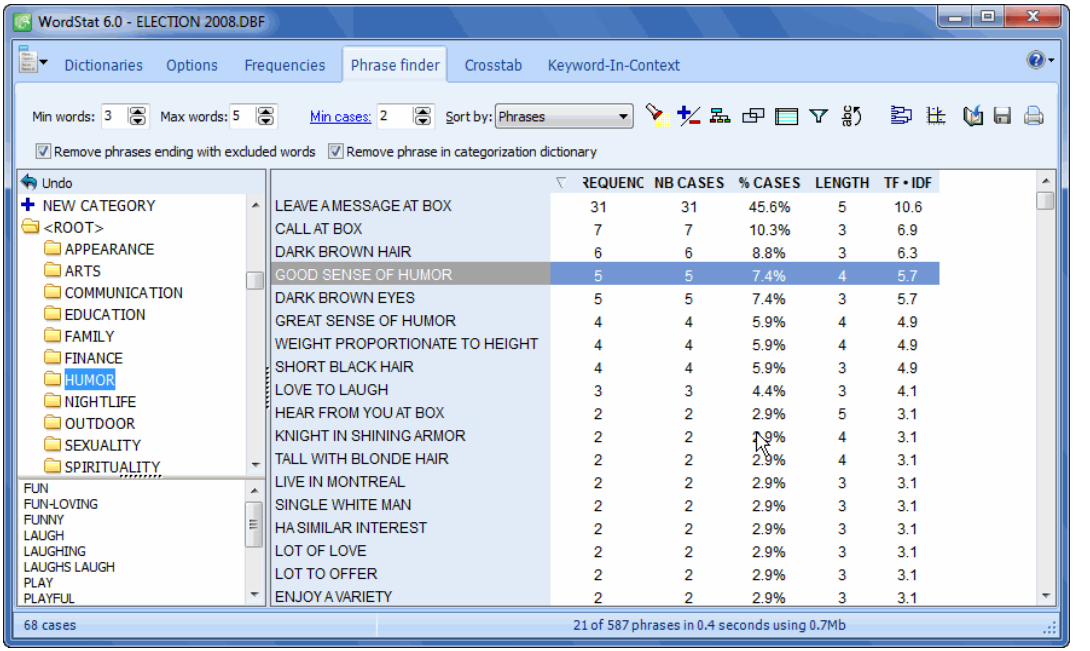
button.

You may add words from this list to the current categorization dictionary or to the exclusion list or assign it to the substitution process in order to have it replaced automatically by another word. To perform any one of those assignments, simply select and drag the item into the proper location in the dictionary panel to the left of the table (see the Using the Dictionary Panel section on page 37).

It is also possible to perform those actions or to produce a keyword-in-context table by selecting the word and either clicking the  button or right-clicking.

The Phrase Finder page

To accurately represent the meaning of a document, it is sometimes not good enough to rely on words alone but one should look at idioms and phrases. While obtaining comprehensive list of words is easy, finding common phrases in a specific text corpus is often much more difficult. The phrase finder feature of WordStat provides such a tool. It will scan an entire text corpus and identify the most frequent phrases and idioms and allow one to easily add them to the currently active categorization dictionary. In order to reduce redundancy in such a table, short phrases that are part of larger ones are automatically removed from the list, provided that their frequency is lower than or equal to the frequency of a longer version.



Before scanning for phrases, one has to set various options that will be used to determine the extent of the scanning process. The first two options that need to be set are the minimum and maximum number of words a phrase can have (**Min words** and **Max words**). These two values determine both the processing time, the memory requirement as well as the number of resulting phrases. The larger the range between those minimum and maximum values, the longer it will take to collect all possible sequences of words. The **Min. Frequency** or **Min. Cases** options allow one to eliminate from the list phrases that appear only a few times by setting a minimum frequency criterion. When set to **Min. Frequency**, the criterion specifies the minimum number of times a phrase must appear regardless of whether it comes from a single document or from multiple documents. Setting it to **Min. Cases** allows one to require those occurrences to appear in a minimum specified number of cases.

When these options have been set properly, click the  button to perform the search.

By default, found phrases are presented in descending order of frequency. The **Sort By** list box can be used to reorder the obtained list in descending order of frequency, in alphabetical order or in descending order of phrase length (number of words in the phrase). One can also sort on any column of the table by clicking its

header once to sort the rows in ascending order and a second time to sort these rows on the same column but in descending order.

To add a phrase or idiom to the currently selected categorization dictionary or to the exclusion dictionary simply drag it to the proper location in the Dictionary Panel located to the left of the screen (see Working with the Dictionary Panel). You may also press the  button on the tool bar or right-click and select the desired location.

Please note that because of the processing sequence used by WordStat, a phrase added to a categorization dictionary may still not be recognized if it starts with a word currently in the exclusion list. When WordStat encounters a word to be excluded, it automatically ignores further processing and moves to the next word. For this reason, a phrase should never begin with a word in the exclusion list. However, WordStat will recognize any other phrases containing but not starting with a word in this list. To prevent the identification of phrases that would be normally ignored by WordStat, the phrase finder deliberately ignores any phrase that starts with one of the words found in the active exclusion list. To override this and identify all possible phrases, go back to the Dictionary page and disable temporarily this exclusion list. If important phrases or idioms are found to start with words in the exclusion list, it may then be justified to remove those starting words from the exclusion list or simply disable this list when performing content analysis.

Another important fact that one should keep in mind is that phrases in a dictionary are always treated as a single token (or unit) and always have precedence over single words or word patterns. This means that if a word is included in one content category (“A”) and some phrases containing this word have been added to another category (“B”), the word will only be categorized into “A” if it is not part of a phrase found in “B”. This feature is essential to perform disambiguation of words, since it allows one to remove some false positives associated with a word by identifying phrases associated with those false positives. For example, if a content category measuring references to money contains the word "BILL", then adding phrases like "BILL OF RIGHTS" or "BILL CLINTON" to another category will prevent those instances of "BILL" being categorized as "money". Note: When two phrases start with the same words, longer phrases have precedence over shorter ones, since they are likely more specific. However, when two phrases partially overlap, the first one encountered in the text will be categorized, preventing the second one from being recognized.

Finding overlaps

While WordStat tries to reduce redundancy in the list of phrases by automatically removing short phrases that are part of larger ones, the resulting list may still contain items that are not independent of each other such as phrases that sometimes overlap. In order to allow users to take into account potential overlaps when selecting phrases, WordStat provides a display option that allows one to see when a selected phrase includes a shorter one, is part of a larger one, or sometimes overlaps other phrases. Such information is especially useful when one needs to identify idioms that are more specific, often found in longer phrases, or more generic ones, usually composed of shorter phrases.

To enable the display of information regarding overlaps, simply click the  button. A window appears to the right of the table. Selecting a phrase in the table automatically shows all other items that overlap this selected item. Each phrase is accompanied by a ratio indicating the total number of times this other phrase occurs and how many times it overlaps with the selected item. For example, if one selects the phrase I'M LOOKING FOR in the table showing it occurs 26 times in a document collection, one may notice that it overlaps with another phrase, LOOKING FOR SOMEONE, with a ratio of 11 out of 12. This suggests that

LOOKING FOR SOMEONE occurs 12 times, but on 11 occasions, both phrases overlap (I'M LOOKING FOR SOMEONE). This ratio also indicates that on one other occasion, this second phrase occurs without overlapping the first one. It is also useful to compare the total number of overlaps with the total frequency of the target phrase. In the above example, we can conclude that the phrase I'M LOOKING FOR - occurring 26 times - is followed by SOMEONE on 11 occasions. Thus, on 15 other occasions, it is followed by something else.

To hide information about overlaps, click the button  again to raise it up.

Assigning overlapping phrases to a dictionary or obtaining a KWIC table

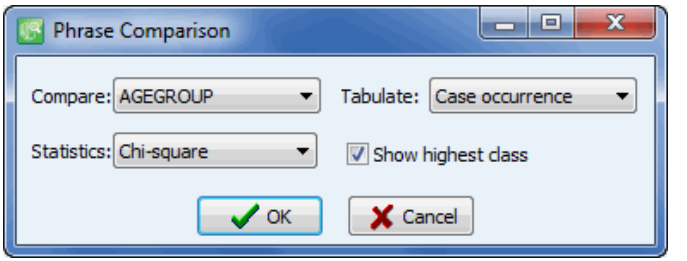
There are two methods of assigning phrases listed in the overlap panel to the categorization dictionary or the exclusion list or of producing a keyword-in-context table. The first method performs these operations on items in this panel only, while the second method also includes selected items in the main phrase list. To perform one of the above-mentioned operations on the overlapping items only, select one or several overlapping phrases, right-click anywhere in this panel and choose the appropriate command. To include phrases in the main table, select one or several phrases in the main table, then the overlapping phrases listed in the overlap panel and then click the  button. You may also drag and drop phrases from the main table to the appropriate location in the Dictionary panel to the left. All selected overlapping phrases will be added.

Comparing frequencies or case occurrences of phrases

The distribution of a phrase among classes of a categorical variable may be quite useful when choosing whether or not to include it in a categorization dictionary. For example, one may want to identify phrases that are typical of some topics in order to better describe them or to differentiate them from other topics. While the Crosstab page in WordStat is normally used for such a purpose, it can only be used for items already included in a categorization dictionary or selected by the content analysis process. In other words, one way to compare the frequency of phrases identified by the phrase finder among classes of a categorical variable is to move all those phrases to a categorization dictionary, and then use this dictionary to obtain the cross frequency of those phrases. However, the phrase finder page offers a convenient way to obtain such information without the need to move those phrases to the categorization dictionary.

To compare frequencies or case occurrences of phrases:

Once phrases have been extracted, click the  button. A dialog box similar to the following one will appear:



The **Compare** list box shows all categorical variables that are available for comparison. Select the variable on which the comparison will be performed.

Use the **Tabulate** list box to specify whether the comparison will be based on the frequency or case occurrence of those phrases and to specify whether data will be presented using absolute or relative frequencies. Four options are currently available:

FREQUENCY	Total number of times this phrase occurs
CASE OCCURRENCE	Total number of cases in which this phrase occurs
FREQ PER 100 cases	Number of times this phrases occurs per 100 cases
% OF CASES	Percentage of cases in which this phrase occurs

Choose the **Statistic** that should be used to assess the relationship between the frequency or case occurrence of the phrases and classes of the categorical variable. The **Chi-square** is the overall chi-square value computed on all classes of the categorical variable, while the **Max Chi²** option is the chi-square value computed on the class with the highest case occurrence or frequency against all the other classes. Select **None** if you don't want to display any comparison statistic.

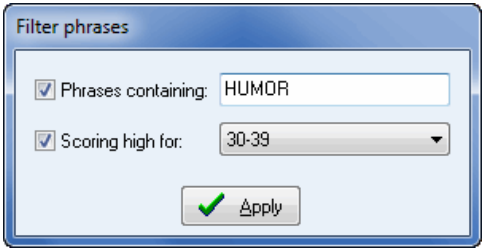
Check the **Show highest class** option to display a column indicating the label of the class with the highest relative frequency or case occurrence. In the event that two or more classes obtain the same high percentage, the cell will list all the labels associated with each of those classes.

Click the **OK** button to perform the computation.

Once the computation is completed, several additional columns are added to the right side of the table. To sort rows based on values in any of the newly created columns, click the appropriate column heading. Clicking several times on the same column heading toggles between ascending and descending order.

Filtering the table

Extracting phrases from a large collection of documents can result in a very large table containing thousands of phrases. Clicking the  button brings a dialog box offering filtering options that allow one to view only phrases containing either a key word or phrases that are characteristic of a specific class. Filtering conditions are specified in a dialog box similar to this one:



Enabling the **Phrase containing** option and entering a string in the edit box allows one to display only phrases containing the specified string. If a comparison has been performed between classes of a

categorical variable, one may also view phrases that are characteristic of a class by enabling the **Scoring high for** option and selecting the value associated with this class. In the above example, both filtering options were used, restricting the phrases displayed in the table to those containing the string HUMOUR and found to be characteristic of the 30-39 age group.

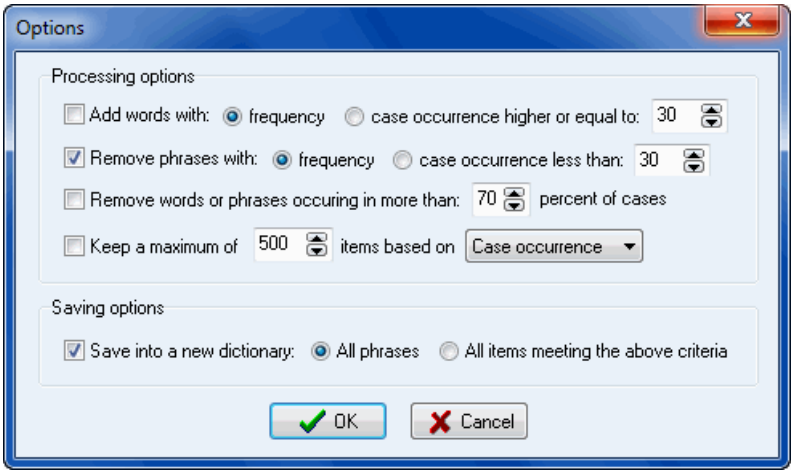
To apply the filtering condition, click the **Apply** button. When a filtering condition is active, the  button is down. To remove filtering conditions and display all extracted phrases, click this button.

Phrase co-occurrences and correspondence analysis

WordStat offers the possibility to perform co-occurrence analysis (clustering, multidimensional scaling, proximity plot) and correspondence analysis on defined content categories as well as to words meeting specific frequency criteria. To apply those operations on phrases, one could add them to a user-defined dictionary, enable this dictionary and then move to the Frequencies or Crosstab page in order to access the appropriate command. The Phrase Finder page allows one to perform those operations on extracted phrases without the need to assign them to a dictionary. Special dialog boxes also allow one to add frequent words, define additional selection criteria or analysis options and save the resulting list of items into a new content analysis dictionary.

To perform a co-occurrence analysis on phrases:

Click the  button. A dialog box similar to this one will appear:



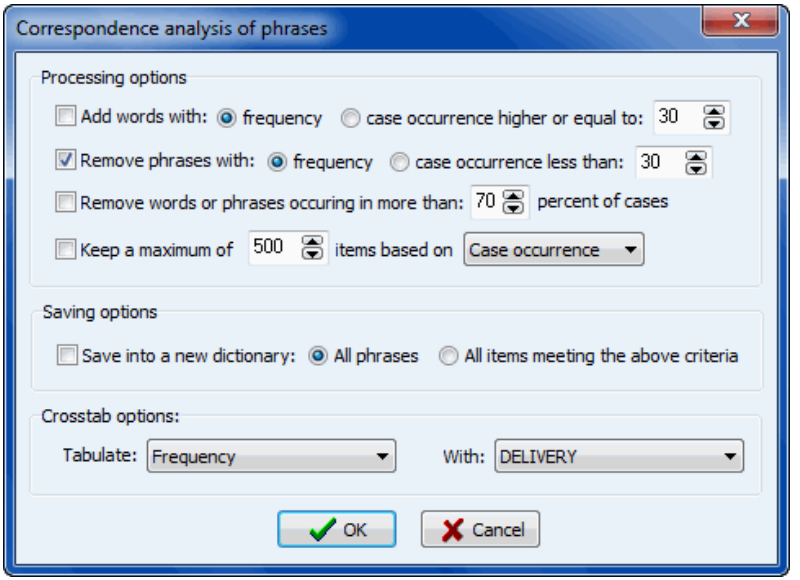
The Processing options are almost identical to those found at the top of the **Options page** (see page 29), allowing one to add to the extracted phrases, to single words occurring more than a specific number of times or in a specific number of cases, or to remove items too frequent or not frequent enough. One may also restrict the analysis to a specific number of items.

The **Saving into a new dictionary** options may be used to store phrases and words into a new dictionary file. Enabling this option and selecting **All Phrases** will allow the opportunity to store all phrases extracted using the **Phrase Finder** page, whether or not they meet the specified frequency criteria. Selecting the other option will store only phrases meeting those criteria as well as all words that were also included in the analysis.

For further information on the various tools available for annualizing co-occurrences, see **Hierarchical Clustering and Multidimensional Scaling** (page 100)

To perform a correspondence analysis:

- Click the  button. A dialog box similar to this one will appear:



The **Processing** and **Saving** options are identical to the ones available when performing co-occurrence analysis on phrases (see previous page). Two additional options are displayed to select the base statistic for the correspondence analysis (**Frequency** or **Case Occurrence**) as well as the categorical variable containing the classes to be compared.

For more information on correspondence analysis, see **Correspondence Analysis** (page 118)

Other table operations

To copy the entire table to the clipboard:

- Right-click anywhere in the frequency table.
- Select the COPY TO CLIPBOARD | TABLE command from the pop-up menu.

To copy selected rows to the clipboard:

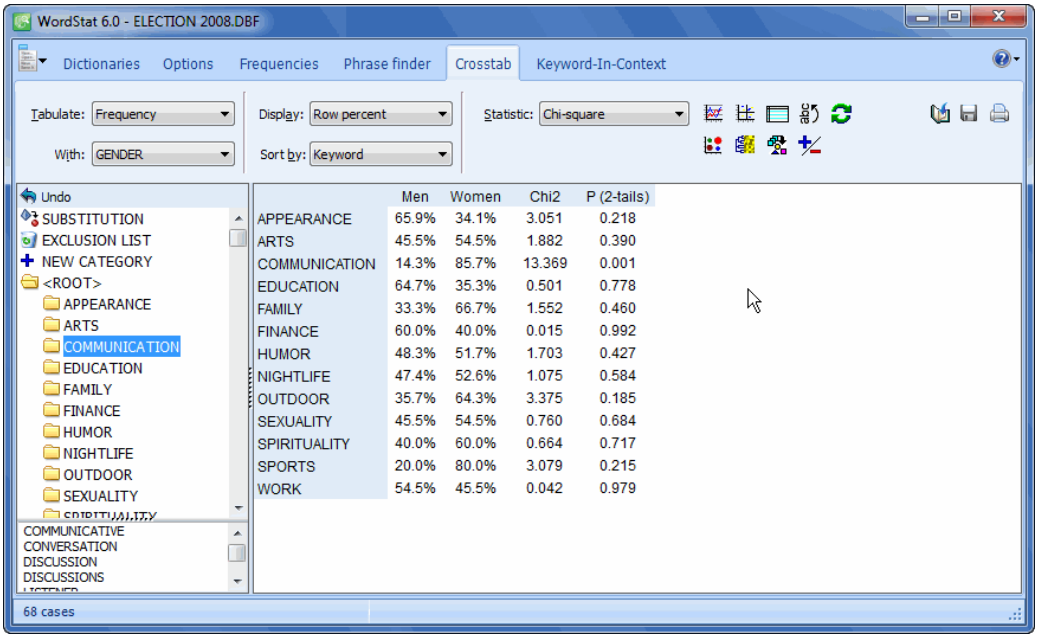
- Select the rows you would like to copy (multiple but separate rows can be selected by clicking while holding down the CTRL key).
- Right-click anywhere in the frequency table.
- Select the COPY TO CLIPBOARD | SELECTED ROWS command from the pop-up menu.

To search for a specific item:

- Right-click anywhere in the table.
- Select the FIND command from the pop-up menu. A search dialog box will appear.
- Type the desired search string in the **Find What** edit box. To restrict the search to items starting with the search string, enable the **Match Beginning of Item** option and to restrict it to whole words matching the search string, enable the **Match Whole Word Only** option.
- Click the **Find** button to search the first item matching the typed string. Clicking this button again finds the next occurrence of the search string, starting at the currently selected item.

Crosstab Page

The Crosstab page is used to display a contingency table of words or categories. This contingency table is computed only on items that have been included. If an inclusion dictionary has been specified, this grid will display only the words or keywords in this list. If no inclusion list has been specified, the grid will display all words that have not been explicitly excluded. Along with absolute and relative frequency of keyword occurrence or keyword frequency, several statistics may be displayed to assess the relationship between independent variables and word usage or to assess the reliability of coding made by several human coders or a single coder at different times.

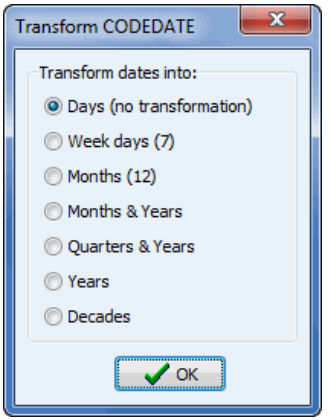


Options

TABULATE - The TABULATE option allows choosing whether the values in the table should be based on the total frequency of keywords or the number of cases containing those keywords.

WITH - The WITH drop down list allows choices on how the keyword count should be broken down. The following options are available:

- **<other keywords> -** display a square table showing the number of co-occurrence of words in the same case.
- **<case number> -** display the keyword occurrence or frequency for each individual cases.
- **ANY INDEPENDENT VARIABLE -** If numeric, categorical or date variables were selected as independent variables, their names will appear in this list box. Selecting any of those variable names will display a contingency table allowing for the assessment of the relationship between this variable and the keywords or content categories. When a date variable is selected, a dialog box like the one below will appear allowing one to automatically recode those dates into various time periods or date units like week days or months.



- **<variables>** - When the content analysis is performed on several alphanumeric variables, this option will allow for comparison of the occurrence of words according to variable name.
- **Select variables...** By default, the variables listed in the **With** list box are the independent variables that have been selected when calling WordStat. Choosing this option displays a dialog box that allows one to select other numeric, categorical or date variables.
- **Combine variables...** This option allows one to compare the frequency of keywords or content categories among the combined values of two variables. When this item is selected, a dialog box appears allowing one to choose the two variables whose values will be combined.

SORT BY - The SORT BY option presents the opportunity to sort the table by keyword or category names (alphabetical order) or by descending order of frequency or case occurrence. When a statistic is displayed (see option STATISTICS), the table can also be sorted based on the value of this statistic or on its statistical probability. It is also possible to sort on the values of any specific column by clicking this column heading. Clicking several times of the same column heading toggles between ascending and descending sort orders.

DISPLAY - The DISPLAY list box allows one to specify the information displayed in the table. The following options are available:

- Count
- Row percent
- Column percent
- Total percent

When the TABULATE option is set to Case Occurrence, two additional statistics are also available:

- Percent of cases (percentage of all cases or individuals)
- Category percent (percentage of cases or individuals in this subgroup)

STATISTIC - When keyword frequency or occurrence is broken down by an independent variable (see WITH option), a drop down list box will appear. This list box allows one to choose among 12 association measures to assess the relationship between this independent variable and the utilization of each word or category.

Nominal level statistics

- Chi-square
- Likelihood ratio
- Student's F

Ordinal or internal level statistics

- Tau-a
- Tau-b
- Tau-c
- Somers' D (symmetric)
- Somers' Dxy (asymmetric)
- Somers' Dyx (asymmetric)
- Gamma
- Spearman's Rho
- Pearson's R

PROBABILITY - The probability option allows one to select whether the probability value should be computed using a 1-tailed or 2-tailed test. Probabilities of Chi-square, Likelihood ratio, and Student's F are always computed using a 2-tailed test.

AGREEMENT - When comparing word or category usage between different alphanumeric variables, a drop down list box will appear. This list box allows one to choose among 8 different inter-rater agreement measures to assess the reliability of coding.

Nominal level agreement statistics

- Percentage of agreement
- Cohen's Kappa
- Scott's pi
- Free marginal (nominal)

Ordinal or internal level agreement statistics

- Krippendorf's R
- Krippendorf's r-bar
- Free marginal (nominal)
- Intraclass correlation

For more information on how to assess reliability with those statistics see Computing Inter-Rater Agreement Statistics (page 151).

To display column labels vertically, click the  button located to the right of the **Tabulate With** list box.

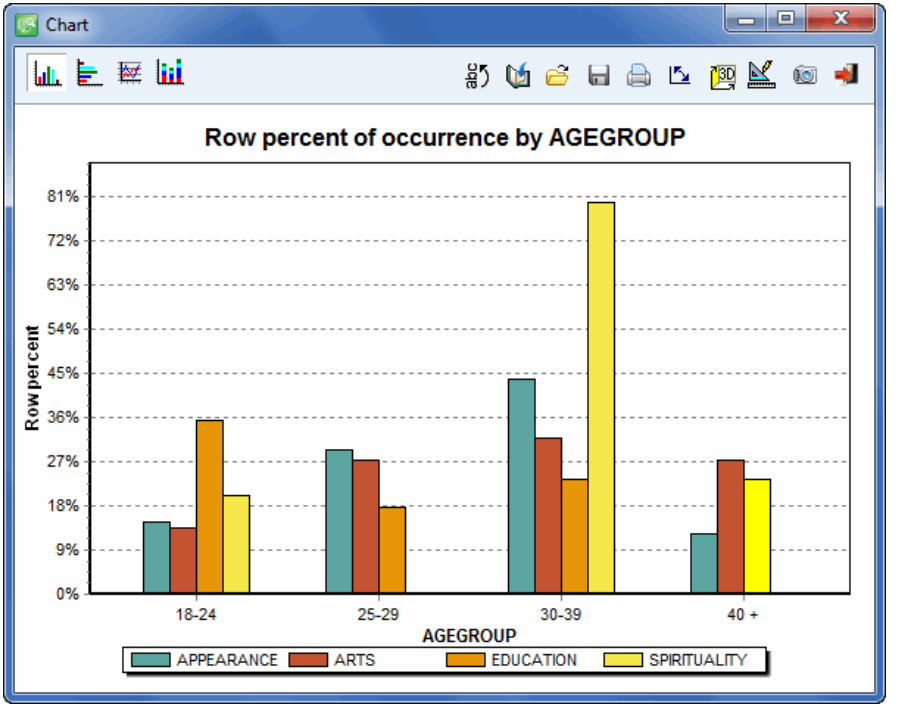
The  button is used to reapply the content analysis process to the current data set. This button is disabled by default and becomes enabled when changes are made to any one of the currently active text analysis processes, such as the categorization dictionary, the exclusion list or the substitution process. Clicking this button will instruct WordStat to reprocess the text collection and update the current table.

Creating barcharts or line charts

The Crosstab page also allows one to produce barcharts or line charts to visually compare the distribution of specific words or categories among values of an independent variable such as subgroups of individuals (male vs. female) or time periods. To produce such charts:

- Set the TABULATE and DISPLAY options so that the information you want to visualize is displayed in the table.
- Using the mouse, select the rows you would like to display. Multiple disjoint rows can be selected through clicking while holding down the CTRL key.
- Click the  button or press the right button of the mouse and select the Chart Selected Rows command.

A dialog box like this one will appear:



This window allows one to graphically examine the relationship between codes and values of an independent variable. The bar chart should preferably be used to display the distribution of various categories within subgroups as defined by a nominal independent variable, while the line chart should preferably be used to examine the relationship between those categories and an ordinal or quantitative variable.

A quick way to retrieve documents, paragraphs or sentences associated with a specific bar or pie slice is by right-clicking and selecting the keyword retrieval command.

The following table provides a short description of available buttons and controls:

Controls	Description
	Press this button to vertically display the labels on the bottom axis
	Press this button to append a copy of the graphic in the Report Manager. A descriptive title will be provided automatically. To edit this title or to enter a new one, hold down the SHIFT keyboard key while clicking this button. For more information on the Report Manager, see the **Report Management Feature** (page 164).
	Press this button to retrieve a chart previously saved on disk.
	Press this button to save a chart on disk. Charts are saved in a proprietary format and may be edited and customized using the Chart Editor.
	Pressing this button allows you to print a copy of the displayed chart.
	Pressing this button causes the values represented on the bottom axis to be exchanged with those of represented by different lines or bars (legend).
	Click this button to turn on/off the 3-D perspective for the current chart.
	This button allows you to edit various features of the chart such as the left and bottom axis , the chart and axis titles, the location of the legend, etc.
	This button is used to create a copy of the chart to the clipboard. When this button is clicked, a pop-up menu appears allowing you to select whether the chart should be copied as a bitmap or as a metafile.
	Pressing this button closes the chart dialog box and returns to WordStat's main screen.

Customizing barcharts and line charts

Clicking the  button on the chart dialog box gives access to a dialog box to customize the appearance of barcharts and line charts. The options available in this dialog box represent only a small portion of all settings available.

To further customize the chart, modify data points, value labels, or series order, click the  button located to the right-hand side of the dialog box.

LEFT AXIS

Minimum / Maximum - WordStat automatically adjusts the vertical axis scale to fit the range of values plotted against it. To manually set these values, type the desired minimum and maximum.

Increment - Increasing or decreasing this value affects the distance between numbers as well as tick marks. Horizontal grid lines are also affected by modification of this value.

Horizontal Grid - This option turns horizontal grid lines on and off. Grid lines extend from each tick mark on an axis to the opposite side of the graph. To increase or decrease the number of grid lines or the distance between those lines, change the Increment value of the axis. A list box also allows a choice among five different line styles to draw those grid lines.

LEGEND

Location - This option positions the legend. Legends may be placed at Top, Left, Right and Bottom side of the chart.

From top - When the legend is displayed on the left or the right side of the chart, this option specifies the legend's top position in percent of total chart height.

From left - When the legend is displayed on the top or the bottom chart, this option specifies the legend's top position in percent of total chart width.

TITLES

Proper titles and axis labels are of utmost importance when describing the information displayed in a chart. By default, WordStat uses variable names and labels as well as other predefined settings to provide such descriptions.

The title page allows one to modify the top title, as well as the labels on the left, bottom and right axis. To edit the title, select the proper radio button. Enter several lines of text for each title by pressing the <Enter> key at the end of a line before entering the next line.

The Font button to the right-hand side of the edit box allows changing the font size or style of the related title.

3-D VIEW

Orthogonal - Turning this option off disables the free elevation and rotation of the 3-D chart.

Zoom - This option zooms the whole chart. Expressed as a percentage, increasing the value positively will bring the chart towards the viewer, increasing the overall chart size as the Zoom value increases.

3-D Percent - The 3-D Percent property indicates the size ratio between chart dimensions and chart depth by specifying a percent number from 1 to 100.

Perspective - Use this property with Orthogonal unchecked to modify the 3-D perspective of the Chart. Larger values add more depth perspective.

Bar shadow - Enabling this option adds dark shades to the sides of 3-D bars. Turning it off will color the sides of the bar the same as the front.

Bar width - This option determines the percent of total bar width used. Setting this value to 100 makes joined bars.

Bar depth - Use this property to limit the depth that each bar series uses. By default, bars will take up the part proportional to the number of bar series in the chart so that the back of a bar will join the front of the bar immediately behind it. To insert a gap between series of bars, decrease this value.

Creating Bubble Charts

Bubble charts are graphic representations of contingency tables where relative frequencies are represented by circles of different diameters.

- Set the TABULATE, COUNT and DISPLAY options so that the information to view is displayed in the table.
- Click the  button.

For more information, see **Creating Bubble Charts** (page 111).

Creating heatmaps with clustering of rows and columns

A heatmap plot is a graphic representation of crosstab tables where cell frequencies are represented by different color brightness or tones. When combined with clustering of rows and/or columns, this exploratory tool allows one to identify functional relationships between specific keywords and subgroups defined by values of the independent variable. To create a heatmap:

- Set the WITH option to an independent variable.
- Set the TABULATE option to either CASE OCCURRENCE or KEYWORD FREQUENCY.
- Click the  button to access the heatmap dialog box.

For more information on heatmaps, see **Using Heatmap Plot** (page 118).

Performing correspondence analysis

Correspondence analysis is an exploratory technique that provides a graphic overview of relationships in large crosstabulation tables of frequency. To perform a correspondence analysis:

- Set the WITH option to an independent variable.
- Click the  button to access the correspondence analysis dialog box.

For more information on correspondence analysis, see **Performing Correspondence Analysis** (page 118).

Automated text classification

The automated text classification module allows one to apply a machine-learning approach to the existing textual database in order to develop a classification model that can later be used to accurately classify uncategorized documents into predefined classes. To access this feature:

- Set the WITH option to the desired categorical variable.
- Click the  button to access the automated text classification dialog box.

For more information on this feature, see **Automated Text Classification** (page 122).

To export the table to disk:

- Click the  button. A **Save File** dialog box will appear.
- In the Save as Type list box, select the file format in which to save the table. The following formats are supported: ASCII file (*.TXT), Tab delimited file (*.TAB), Comma delimited file (*.CSV), HTML file (*.HTM;*.HTML), and Excel spreadsheet file (*.XLS).
- Type a valid file name with the proper file extension.
- Click the Save button.

To append the table to the Report Manager:

- Click the  button. A descriptive title will be provided automatically for the table.
- To edit this title or to enter a new one, hold down the SHIFT keyboard key while clicking this button.

(for more information, see the **Report Management Feature** topic on page 164).

To copy the entire table to the clipboard:

- Right-click anywhere in the frequency table.
- Select the COPY TO CLIPBOARD | TABLE command from the pop-up menu.

To copy selected rows to the clipboard:

- Select the rows you would like to copy (multiple but separate rows can be selected by clicking while holding down the CTRL key).
- Right-click anywhere in the frequency table.
- Select the COPY TO CLIPBOARD | SELECTED ROWS command from the pop-up menu.

To search for a specific item:

- Right-click anywhere in the table.
- Select the **FIND** command from the pop-up menu. A search dialog box will appear.
- Type the desired search string in the **Find What** edit box. To restrict the search to items starting with the search string, enable the M**atch Beginning of Item** option and to restrict it to whole words matching the search string, enable the **Match Whole Word Only** option.
- Click the **Find** button to search the first item matching the typed string. Clicking this button again finds the next occurrence of the search string, starting at the currently selected item.

Keyword-In-Context Page

The Keyword-In-Context (KWIC) technique allows one to display in a table the occurrences of either a specific word, or of all words related to a category, with the textual environment in which they occur. The text is aligned so that all keywords appear aligned in the middle of the table. This technique is useful to assess the consistency (or lack of consistency) of meanings associated with a word, word pattern or category. In the example below, we can see that the word pattern KILL*, which may have been assigned to a category like "aggressiveness", refers to words with different meanings, some of them quite distant from the concept of "aggressiveness":

```
                  I have decided to  KILL     a few hours before...
             He said that he would   KILL     me if I call the police.
                   Too much garlic   KILL     the taste of the meat.
The Black Death was a disease that   KILLED   millions.
                       My shoes are  KILLING  me
       The French skier Jean Claude  KILLY    won 3 gold medals.
```

When displaying rules, only the keywords or key phrases associated with the first item of those rules are displayed. For example, in a rule like:

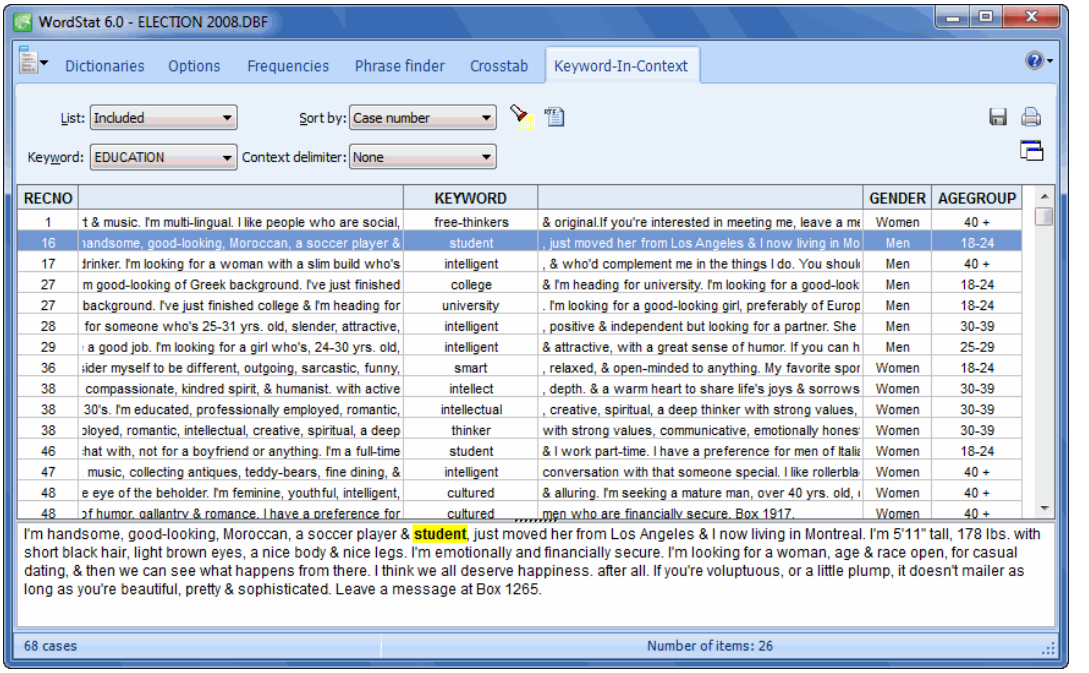
#SATISFACTION before #TEACHER and not near #NEGATION

the KWIC list will contain only items in the SATISFACTION category meeting the conditions specified by this rule.

Once an nconsistency has been detected, it becomes possible to reduce it by making changes to the textual data or to the dictionaries. For example, the researcher may change all occurrences of the word KILL in the original text for either KILL1 or KILL2 in order to differentiate the different meanings and then add only one of these modified words (say KILL1) to the substitution or inclusion dictionary. The word KILLY may also be added to the dictionary of excluded words. The categorization of phases may also be used to distinguish various meanings of a word. For example, the use of KIND to refer to the adjective ("considerate and helpful nature") may be reliably differentiate from the use of KIND as a noun ("category of things") or as an adverb by categorizing the phrase "KIND OF" as instances of this word used as a noun or as an adverb and by categorizing the remaining instances of KIND as the adjective. Disambiguation may also be performed by identifying words in close proximity that are associated with specific meanings and by creating categorization rules (see **Working with Rules** on page 69).

The KWIC technique is also useful to highlight syntactical or semantic differences in word usage between individuals or subgroup of individuals. For example, candidates from two different political parties may use the word "rights" in their discourses at the same relative frequency, but we may find that these two groups use this word with quite different meanings. We may also find that the meaning of a word like "moral" evolves with the age of a child.

The Keyword-In-Context page has been designed to facilitate the various tasks involved in content analysis. The page looks like this:



The upper part of the screen provides a list of all instances of keywords associated with a dictionary category along with its surrounding text. The lower part of the screen provides a full text view of the currently selected document in which every instance of the chosen keyword is highlighted. The text panel below the KWIC table displays the full document from which the selected keyword comes and highlights it. The text panel can be used to examine the full context of a keyword, but may also be used to add words and phrases to the current categorization dictionary or to the exclusion list. To assign a word or a phrase to a list or content category, position the text cursor on the word you want to assign, or select one or several words with the mouse and right-click to display a contextual menu. Select the **To Categorization Dictionary** or the To **Exclusion List** menu item.

LIST - This option allows for specifying whether the words for display in the KWIC table either should be selected from the list of included words or from the list of all remaining words that have not been explicitly excluded. The option User Specified allows one to enter a word or word pattern at the keyboard and search for all instances of this expression.

WORD - This option allows one to choose among all keywords belonging to the list of Included or Leftover words (see above). When the LIST option is set to User Specified, this option becomes an edit box where one can type a word or word pattern. (Wildcards such as * and ? are supported).

SORT BY - This option allows for sorting the keyword-in-context table in either ascending order on any of the following options:

Case number - The KWIC table is sorted in ascending order of case position.

Keyword & Before - The KWIC table is sorted on the keyword as well as the words appearing immediately before it.

Keyword & After - The KWIC table is sorted on the keyword and the words appearing immediately after it.

Keyword & Variable - When several text variables have been selected, the KWIC table includes a column indicating in which variable the keyword was found. When this option is selected, the KWIC table is sorted so that all words associated with a category or matching a word pattern are displayed in alphabetical order. Lines with identical words are sorted on the variable name from which they come. This display is useful to examine whether specific words are used with the same meaning in different variables.

Variable & Keyword - When several text variables have been selected, the KWIC table includes a column indicating in which variable the keyword was found. This option displays a KWIC table where all lines are sorted on the variable name from which they originate. Lines extracted from a single variable are sorted by keywords. This display is useful to establish whether different variables contain different information. For a more detailed analysis of difference in usage of specific words, use the **Keyword & Variable** sort order.

Keyword & VARNAME - This option displays a KWIC table where lines are sorted by words. Lines with identical words are sorted on the value of the selected independent variable. This display is useful to highlight differences between subgroups in the meanings associated with a specific word.

VARNAME & Keyword - This option displays a KWIC table where lines are sorted by the values of the selected independent variable. Lines with identical values on this variable are sorted by keywords. This display is useful to establish whether subgroups differ on the use of words associated with a category. For a more detailed comparison of usage of specific word, use the Keyword & VARNAME sort order**.**

CONTEXT DELIMITER - This option allows one to select the amount of context displayed in the KWIC table as well as in the concordance report. In the KWIC table, context strings, either before or after the keyword, are limited to 255 characters.

None - This option instructs WordStat to display as much context as possible, up to a limit of 255 characters.

Paragraph - When this option is selected, the program will limit the context displayed to the paragraph in which a specific keyword appears.

Sentence - When this option is selected, the program will limit the context displayed to the sentence in which a specific keyword appears. A sentence must end with a period followed by a space or a hard return, or by an exclamation or a question mark.

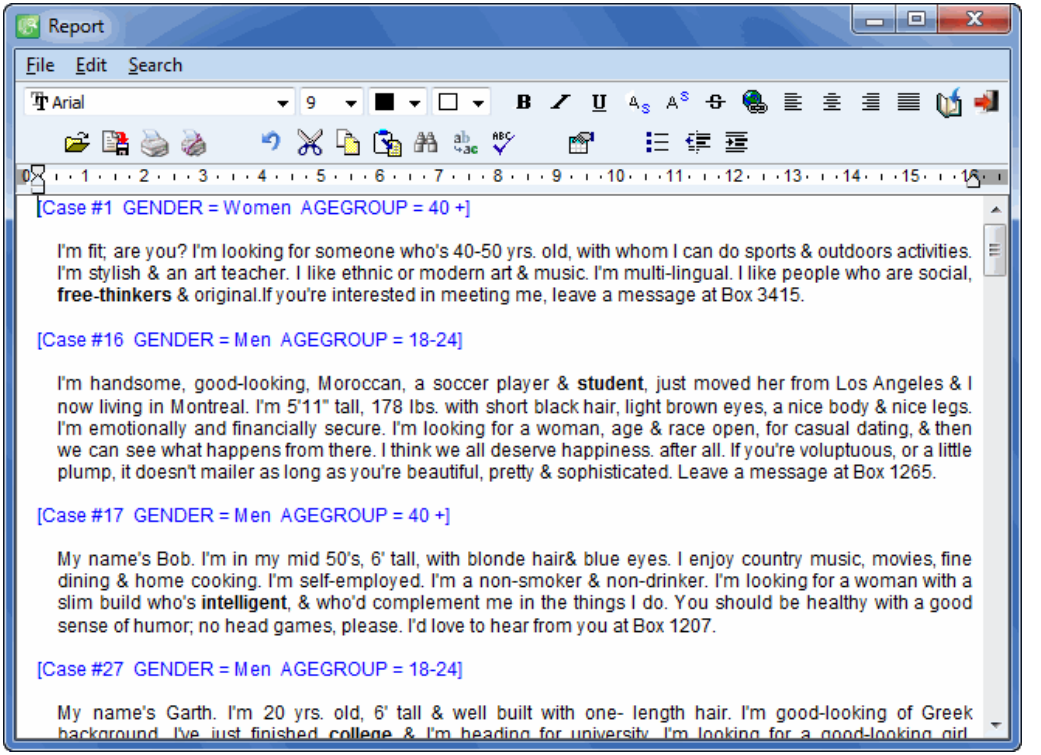
User defined - When this option is selected, the program will retrieve text found before and after the keyword until a slash character is encountered.

Once the settings have been set, click the  button to start searching all instances of the selected keyword.

Any KWIC table may be saved to disk in Excel, plain ASCII, text delimited, or HTML format by clicking the  button. To export the content of the table to a new SimStat/QDA Miner data file, press the Export button located at the top of the Frequencies page.

To print the KWIC table, click the  button.

Clicking the  button produces a concordance report on the keywords currently displayed in the KWIC table. The sort order and context delimiter of the current KWIC table are used to determine the display order and the amount of context displayed in this concordance report. This report is displayed in a text editor dialog box (see below) and may be modified, stored on disk in RTF, HTML or plain text format, printed, or cut and pasted to another application. Graphics may also be pasted anywhere in this report.



Creating and Maintaining Dictionaries

Please note that in the instructions below the exclusion list and the categorization dictionary are both referred to as "dictionary".

To open an existing dictionary

- Select the dictionary from the Categorization drop down list. If the dictionary is not listed, click the 

button to display a dialog box that will let you browse through folders and select the dictionary.

To create or copy a dictionary

- Click the 

button located to the right of the exclusion list or of the categorization dictionary. A dialog box enables specifying the name and location of the new dictionary file. If a dictionary file is already active, it will ask whether existing entries should be copied to the new dictionary file. If you answer Yes, all entries in the previously opened dictionary will be retrieved and stored in the new one. Answering No will result in an empty dictionary.

To add new words to the dictionary

From the Dictionaries page

- In the Dictionary Viewer group box, select the dictionary to which you would like to add new words.
- Press on the 

button and select **Words/Phrases**...

From the Frequencies page

- Select the rows containing the words you would like to add.
- Press on the  button or press the right button of the mouse.
- Select the dictionary to with you would like to add the selected words**.**

From the Crosstab page

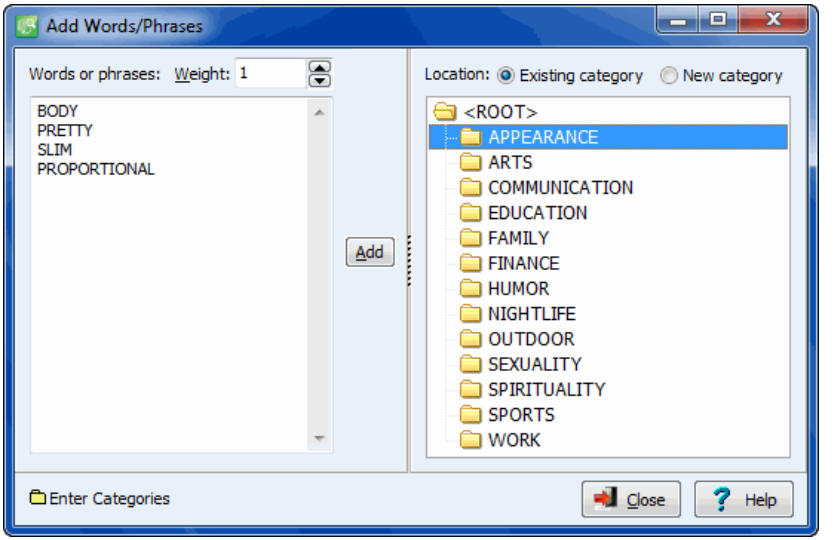
- Select the rows containing the words you would like to add.
- Press the right button of the mouse to display a pop-up menu.
- Select the dictionary to with you would like to add the selected words.

Note: You may also drag and drop a word into the dictionary panel to the right of the frequency table (see **Using the Dictionary Panel**, page 37).

From the text editor

- Select the word you would like to add.
- Click the  button or press the right button of the mouse to display a pop-up menu.
- Select the dictionary to with you would like to add the selected words.

If you choose to add a word to the exclusion list, the word will automatically be stored in this file without any dialog box. If the Inclusion dictionary is selected, the program will display a dialog box similar to the following:



To add new items to an existing category:

- Type de words or phrases you would like to add in the edit box, one item per line. Spaces are automatically replaced by an underscore character.
- Select the proper category from the right panel.
- Click the **Add** button.

To add new items to a new content category:

- Type the words or phrases you would like to add in the edit box, one item per line. Spaces are automatically replaced by an underscore character.
- Set the check box on the right panel to **New Category**.
- Type the name of the new category as select the existing category under which this new category should be stored. To create a main category, select the **< ROOT >** item.
- Click the **Add** button.

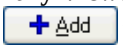
Wildcards such as * and ? are supported.

Weights can also be assigned to specific categorization, so that a specific word, word pattern, or expression may count for more than one instance of the concept. The default value for this option is 1. To use a lower or higher value, edit the Weight option either by entering a new numeric value in the edit box or by clicking the spin buttons to increase or decrease this value. Valid weight can be any floating point value higher than zero.

If you want to add a word to a non existing category, you first need to create such a category (see below) and then follow the above steps to add the word to this new category.

To add categories to the inclusion dictionary:

From the Dictionaries page

- In the **Dictionary Viewer** group box, select the Inclusion radio button.
- Press on the 

button and select **Category**. The **Add Categories** dialog box will appear.
- Select the **Main Category** or the **Subcategory** radio button depending on whether you want this new category to appear at the main level or whether you want it to be created under an existing category. If you choose to create a sub-category, you then need to select from the Location outline the category under which you would like to store it.
- Type the category names you would like to add in the edit box, one item per line, and click the **Add** button.

To remove an entry or a category from a dictionary:

- Select the **Dictionaries** page by clicking the first tab at the top of the dialog box.
- In the **Dictionary Viewer** group box, select the dictionary from which you would like to remove words or categories.
- Select the words or categories you would like to delete and click the 

button. If a non-empty category is selected, you will be asked to confirm its deletion. If you answer **Yes**, all words and subcategories belonging to this category will also be erased.

To edit an entry in a dictionary:

- Select the **Dictionaries** page by clicking the first tab at the top of the dialog box.
- In the **Dictionary Viewer** group box, select the dictionary containing the words or categories you would like to edit.
- Select the item you want to modify and click the 

button.

To search for an entry in a dictionary:

- Right-click anywhere in the categorization dictionary.
- Select the **FIND** command from the pop-up menu. A search dialog box will appear.
- Type the desired search string in the **Find What** edit box. To restrict the search to items starting with the search string, enable the **Match Beginning of Item** option and to restrict it to whole words matching the search string, enable the **Match Whole Word Only**.
- Click the **Find** button to search the first item matching the entry. Clicking this button again finds the next occurrence of the search string, starting at the currently selected item.

Moving words or categories using drag and drop

The easiest way to change the structure of an inclusion dictionary is by using drag and drop operations. Using the mouse, you can move a word to a different category, move an existing category or sub-category to another location on the main level or under an existing category. To perform such operations, you first need to enable the drag & drop editing feature:

- Select the Dictionaries page by clicking the first tab at the top of the dialog box.
- In the Dictionary Viewer group box, select the Inclusion dictionary.
- Check the Drag & Drop Editing checkbox.

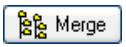
Once activated, you just have to click the item you want to move, and hold the mouse button down. Then, simply drag the item over its new location and release the mouse button. By default, the dragged item is stored under the category at the cursor position. To move a word or a category to the main level or to the same level as the category under the cursor, simply hold the ALT key while dropping the dragged item.

Moving a word to a distant category

- Select the item you would like to move.
- Click the right button of the mouse to display the contextual menu.
- Select the **Move To** command.
- Choose the category where the selected item should be moved and click OK.

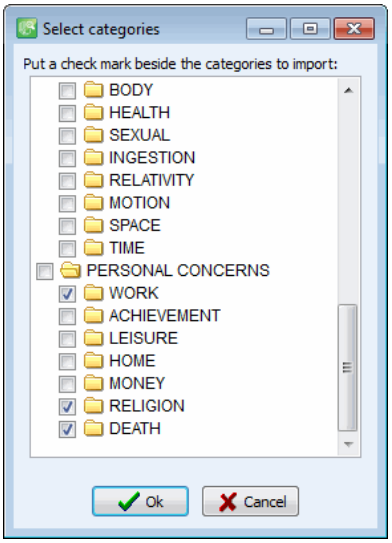
Merging dictionaries

The WordStat Merge feature allows one to append categories and items contained in one categorization dictionary into another dictionary. To merge dictionaries:

- From the dictionary page of WordStat, open the dictionary into which you would like to import new categories.
- Click the 

button. An Open dialog box is displayed.

- Locate the dictionary containing the items that you would like to import and click OK. A dialog box similar to the one below is displayed:

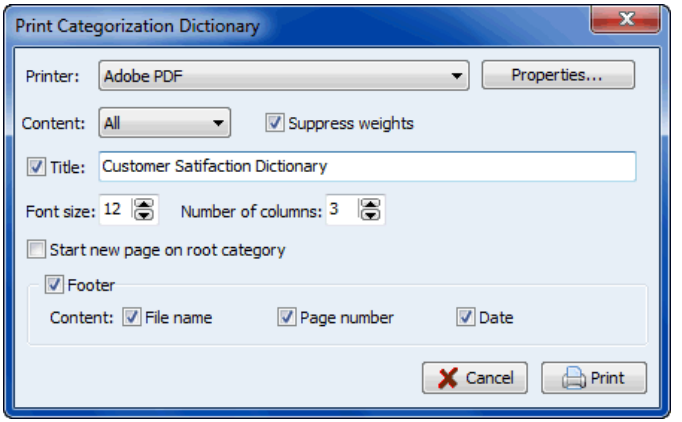


- Select the categories you would like to import by clicking in the box beside the desired category(ies) and clicking OK. To select all items, right click anywhere on the list of categories and select Check All. Choosing Uncheck All removes all check marks previously entered.

If an imported category already exists in the currently active dictionary, WordStat ignores duplicate items and only imports new items not already found in the original category. New categories are appended to the existing structure along with all their items.

Printing the dictionary

To create a printed version of the categorization dictionary, go to the Dictionaries page and click the Print button. A print dialog box like the one below will appear, allowing you to set various options of what and how the dictionary should be printed.



PRINTER - Select the desired printer. To adjust the printer settings, such as the page size and orientation or printer resolution, select the PROPERTIES button.

CONTENT - This option allows you to specify what should be printed. Selecting **All** prints the entire dictionary along with all its items. Selecting **As Shown** will print only currently visible items. When the Select Items option on the dictionaries page is enabled, a third option Selected Items becomes available allowing one to restrict the printing to previously selected categories and items.

SUPPRESS WEIGHTS - When this option is disabled, weights of each item are printed within parentheses. Enabling this option prevents those weights from being printed.

TITLE - Use this option to specify a particular line of text that will appear at the top of each page.

FONT SIZE - This option may be used to adjust the font size used to print dictionary items.

NUMBER OF COLUMNS - Dictionaries may be printed with up to seven columns per page, allowing one to print large dictionaries on fewer pages. Please note that when increasing the number of columns per page, it may be necessary to decrease the font size to prevent the overlapping of items in adjacent columns.

START NEW PAGE ON ROOT CATEGORY - Root categories are the dictionary categories still visible when the dictionary is fully collapsed. Selecting this option instructs the program to start the printing of all items starting from this root category at the top of a new page.

FOOTER - Enable this option to print a footer at the bottom of each page. A footer can consist of up to three items: The Filename (printed on the left margin of the footer), the Page Number (located at the bottom center of the page), and the Date (printed on the right margin of the footer).

Setting dictionary options

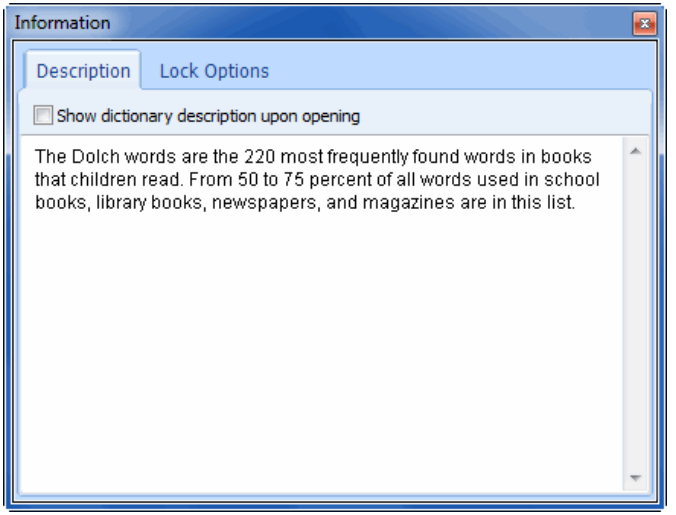
The dictionary options dialog box allows one to assign a description to a categorization dictionary and some options to be set automatically set upon its opening. This dialog box may also be used to prevent modification to the dictionaries or to some analysis options that are needed for the categorization to be performed accurately.

To access the dictionary options of the currently active dictionary, click the 

button located on the Dictionary page.

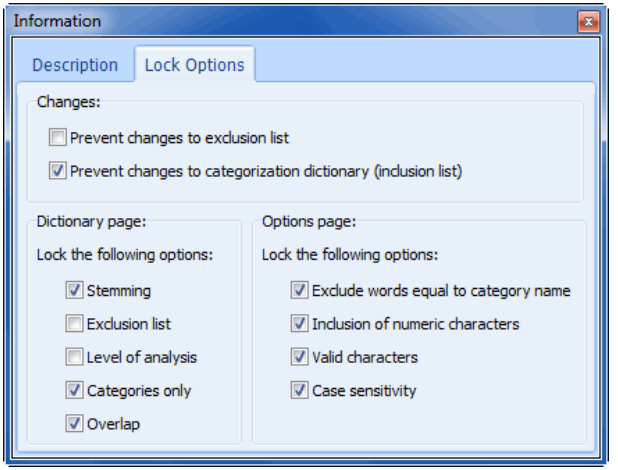
Description page

The first page of this dialog box allows one to enter text to describe the dictionary. Use this description to inform other users about the intended use of a created dictionary, its assumptions, its strengths and limitations, etc. Such an option may also be used to document for personal use how the dictionary was created, what remain to be done, etc. A check box located on the upper left-hand corner of this page can be used to automatically display this description in a dialog box when a user opens it.



Lock Options

Once a categorization dictionary has been developed and validated, one may want to restrict further changes to the dictionary or prevent other users from setting content analysis options that would be incompatible with this dictionary. For example, a categorization dictionary may require the presence of a specific exclusion list to handle exceptions or may assume that the program accepts specific characters or requires prior lemmatization of the documents. The Lock Options page allows one to restrict operations and changes in analysis options for the currently active dictionary. However, please note that those restrictions are neither permanent nor password protected. They may be overridden at any time by accessing the Dictionary Options dialog box again and by removing any of the restrictions that has been set previously.



The first set of options (**Changes**) contains two check boxes that allow one to prevent the addition of new entries or the deletion and editing of existing ones. When those options are enabled, all buttons or command on the dictionary page or elsewhere that give access to editing operations are disabled.

To regain access to those editing operations, click the 

button and disable the items that correspond to the dictionary to edit.

All the remaining options on this dialog box are used to prevent further changes to various options found on the Dictionary or the Options page. Before locking any item, you have to make sure the corresponding option is properly set. For example, if the categorization dictionary is not compatible with prior stemming and requires some special characters to be treated as valid, you first need to disable the **Stemming** option on the dictionary page, move to the Options page and enter all those special characters in the **Valid Characters** edit box prior to locking those options in the Lock Options page.

Please note that the dictionary description as well as any restriction applied to a dictionary are automatically saved in a file with the same name as the categorization dictionary file but with an .NFO file extension. To make sure the description and the various options follow the dictionary, always make sure to include this .NFO file along with the .CAT categorization dictionary file.

Working with Rules

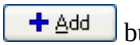
The WordStat Rules editor may be used to define complex coding rules allowing one to specify under which conditions a particular item or category of items should be coded. Such a feature may be useful to differentiate between numerous meanings of a single word (disambiguation). For example, one may limit the coding of the word "bank" to situations where the word refers to the financial institution. This can be done by restricting the coding of "bank" to documents containing vocabulary related to monetary or financial transactions ("cash," "money," "mortgage," "investment," etc.) or by excluding alternate meanings such as when "bank" appears in close proximity to words like "river" or "canoe." Rules may also be used to measure various forms of a phrase. For example, the idiom "TURN OFF" may be expressed in many different ways ("turn it off," "turned off," "turned this off," "turned his radio off"). While figuring out all the possible forms of such an idiom may be very difficult, if not impossible, a single coding rule to look for the word pattern "TURN*" followed by "OFF" within the same sentence could very well cover most of those situations. Rules can also take into account the presence of words that may alter the power of an adjective, such as negations or qualifiers like "rarely," "numerous," "few," etc. Rules may even be used to identify sequences of events or complex actions.

In WordStat, a rule can refer to individual words, word patterns, or phrases or it may also refer to several items belonging to a content category of the current dictionary. A reference to a category is always preceded by the number or pound ('#') character. For example, in the rule:

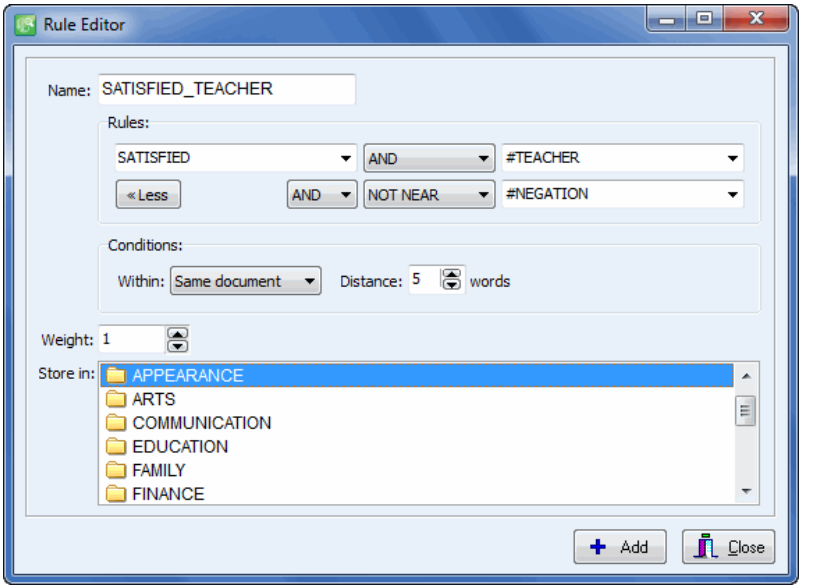
SATISFIED NEAR #TEACHER

the first item, SATISFIED, refers to a single word while #TEACHER will match any item found in the TEACHER content category.

Just like other types of items, rules may be stored anywhere in a categorization dictionary. A rule consists of a target item and up to two statements, each statement consisting of another item linked to the first item using a Boolean (AND, OR, NOT) or a proximity operator (NEAR, BEFORE and AFTER, or their negative forms, NOT NEAR, NOT BEFORE, NOT AFTER). The context in which those rules will be tested also needs to be specified, allowing one to either consider the content of the entire document or restrict the test to a single paragraph or a single sentence. When a proximity operation is used, one also has to specify the maximum distance in number of words that must separate the two items in order for this proximity rule to be tested as true or false.

To create a rule, click the 

button and select the RULES menu item. A dialog box similar to the one below will appear:



The minimum requirements for a rule to be valid are:

- A unique name
- At least one statement consisting of a target item, a Boolean or proximity operation and a second item.
- The conditions under which this rule should be tested
- The weight given to items meeting those conditions
- The content category where the rule will be stored be stored

The ampersand ("@") is used as a prefix to denote the presence of a rule and will be added automatically to the rule name. In the above dialog box, the rule item @STATISFACTION_TEACHER will be stored under the content category POSITIVE_FEELING and will be considered as true if the word SATISFIED occurs in the same sentence as one of the items in the content category #TEACHER and if there is no item in the #NEGATIONS category in the same sentence and within five words of the target word (i.e. SATISFIED).

To enter a specific word, word pattern or phase, simply type the desired item. Spaces between words are automatically converted to underscore characters. To enter a content category, type the number or pound ('#') character immediately followed by the name of the category. An existing category may also be selected from a drop-down list by clicking the down arrow located to the right of the edit box and clicking the appropriate category name, listed in alphabetical order.

The following operators may be used in a rule:

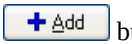
RULE CONDITION	IS TRUE IF...
item1 **AND** item2	...both items occur in the same document, paragraph or sentence.
item1 **OR** item2	...at least one of the items occurs in the document, paragraph or sentence.
item1 **NOT** item2	...the first item occurs in the document, paragraph or sentence but not the second one.
item1 **NEAR** item2	...both items occur in the same document, paragraph or sentence, and are no more than n words apart.
item1 **BEFORE** item2	...both items occur in the same document, paragraph or sentence, and the second item appears after the first one within the next n words.
item1 **AFTER** item2	...both items occur in the same document, paragraph or sentence and the first item appears after the second one within the next n words.
item1 **NOT NEAR** item2	...the first item occurs in a document, paragraph or sentence, and is not found within n words of the second item.
item1 **NOT BEFORE** item2	...the first item occurs in a document, paragraph or sentence, and is not followed within n words by the second item.
item1 **NOT AFTER** item2	...the first item occurs in a document, paragraph or sentence, and does not occur within n words after the second item.

To specify a second rule statement, click the 

button. You can select to join the two statements using an AND or an OR Boolean operator. Choosing AND will result in a coding if both criteria are true while selecting OR will result in a coding if either the first or the second statement is true.

To limit the rule definition to a single statement, click the 

button.

Once the rule has been properly defined, click the 

button located in the lower right-hand corner of the dialog box to append the rule definition to the selected content category and to clear the form. Once you have finished entering rules, click the close button to quit this dialog box and return to the WordStat main screen.

Please note that, in order to prevent any recursive or cross-reference problems in rules, content categories can only refer to words, word patterns or phrases stored in categories and will thus ignore the presence of other rules. For example, if a category named #SATISFACTION contains 10 word patterns and three rules, any reference to this category in a rule will take into account those 10 words and will ignore instances where any one of the three rules have been found to be true.

Using Lexical Tools for Dictionary-Building

Creating a comprehensive categorization dictionary is quite often a difficult, time-consuming and subjective task. WordStat can assist you in finding words that may be related to existing words in your categories by the use of several lexical tools:

- A spelling dictionary is used to propose inflected forms of existing words already in your dictionary. Several dictionaries are currently available for different human languages such as English, French, Italian, Dutch, etc.
- Two English thesauri are also used to propose synonyms of words already in your dictionary.
- A WordNet based lexical database is used to find synonyms, antonyms as well as hypernyms, hyponyms, coordinate terms, holonyms, meronyms, etc. This database contains over 150,000 root words (including many proper nouns) and offers over 120,000 synonym sets. The availability of word sense definitions allows for manual as well as automatic filtering of proper word senses.

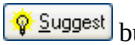
These three tools are available through the auto suggest panel on the frequency list (see page 38) as well a through two dictionary-building commands.

- The **Suggest | Basic** command uses the selected spelling dictionaries and the two thesauri to identify related synonyms and inflected forms.
- The **Suggest | Advanced** command gives you access to a more powerful dictionary-building tool that uses a WordNet based lexical database to find, not only synonyms, but all related words such as hypernyms, hyponyms, holonyms, meronyms, coordinate terms as well as the selected spell-checking dictionaries to find inflected forms of those words.

You will find below a description of these two dictionary-building tools:

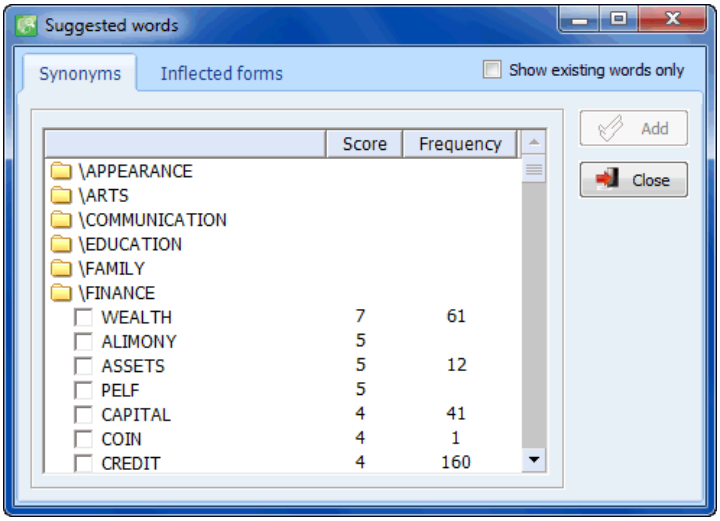
Basic Dictionary-building Tools

To access the basic dictionary-building tool:

- Select the **Dictionaries** page by clicking the first tab at the top of the main WordStat screen.
- Press on the 

button.
- Select the **Basic** command.

WordStat will immediately start looking for synonyms and inflected forms of all words in your inclusion dictionary and will report them in a dialog box like this one:



This dialog box displays on the first page a list of synonyms that were found to be related to existing words in the various categories. Synonyms for a specific category are sorted so that those that were related to several existing words in this category are located at the top of the list while synonyms related to only a single word are located at the bottom. The numeric value under the Score column indicates the number of existing dictionary entries to which it was related, while the value under the Frequency column indicates how often this word has been found in the current text collection.

The second page lists all words whose spelling begins with the same letters as existing words and that were not already included in the actual dictionary. For example, if the word "understanding" is found in the dictionary, the program will suggest words like "understandings", "understandingly", "understands", "understanded", "understandable", and "understandably". The frequency score indicates how often this word has been found in the current text collection.

To display only words existing in the current text collection, select the Show Existing Words Only option, in the upper right order of the dialog box. Please note that if this dialog is accessed prior to any WordStat text analysis, this option will be grayed out. Running a simple frequency analysis on the current text collection will collect the frequency information needed to allow this option to be used.

To add suggested words to the dictionary, place a check mark beside the words you would like to add and click the **Add** button.

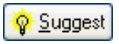
Click the **Close** button to return to WordStat.

Advanced Dictionary-Building Tools

The advanced dictionary-building tool can be accessed either as a stand-alone application of from within WordStat. To run the stand-alone version:

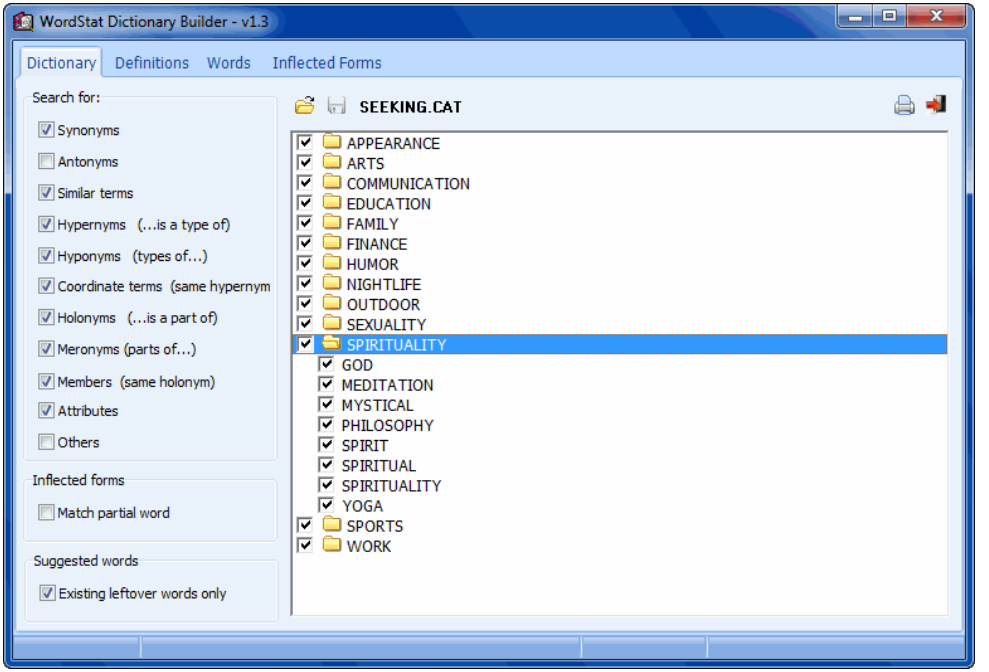
Point to the Programs folder in the Windows' Start menu, then select Provalis Research and then click Dictionary Builder.

To access the advanced dictionary-building tool from within WordStat:

- Select the **Dictionaries** page by clicking the first tab at the top of the main WordStat screen.
- Press on the 

button.
- Select the **Advanced** command.

A dialog box like this one will appear:



The first page is used to set various dictionary and search options. The second and third pages are used to find words and idioms semantically related to existing entries in the dictionary, while the last page is used to find derived form of those entries.

DICTIONARY PAGE

The first page of the dictionary builder program allows you to select or change the WordStat dictionary, specify the words and categories you want to work with, along with the type of relationship to look for. It also allows you to specify how the program will search for inflected forms of existing words in your dictionary.

To select a dictionary

- Click the  button. A standard Open dialog box will appear.
- Select the WordStat dictionary file you want to work with.

Selecting words and/or categories

By default, the dictionary-building program will search for related words and idioms for all existing words and categories in your WordStat dictionary. To restrict the search to specific categories or words within a category, simply deselect the words and categories you want to exclude by removing the check marks beside them. Clicking a category check box to change its state also changes the check box state of all words and subcategories within this category.

Specifying the type of relationship to look for

The Search for group box allows you to specify what type of relationship the program will look for. For example, you may choose to search only for synonyms and similar terms or decide to also search for hypernyms, hyponyms, coordinate terms, etc.

Setting how Inflected forms will be retrieved

The Match Partial Word option affects how inflected forms are found. When this option is deactivated, the program only retrieves words that start with the whole word. For example, if the dictionary includes the word INTELLIGENT, the program will suggest words like INTELLIGENTLY and INTELLIGENTSIA. If the Match Partial Word option is activated, the program will also suggest words like INTELLIGENCE, INTELLIGENCES, INTELLIGIBLE, and INTELLIGIBLY.

Showing existing words only

By default, suggested words and phrases are presented whether or not they were found in the current text collection. Selecting the Existing Leftover Words Only option restricts the list of suggestions to those present in the text collection and not yet captured by the dictionary. This option will be greyed out if no text processing has been done yet in WordStat. Running a simple frequency analysis in WordStat prior to running this program will collect the frequency information needed to allow this option to be available.

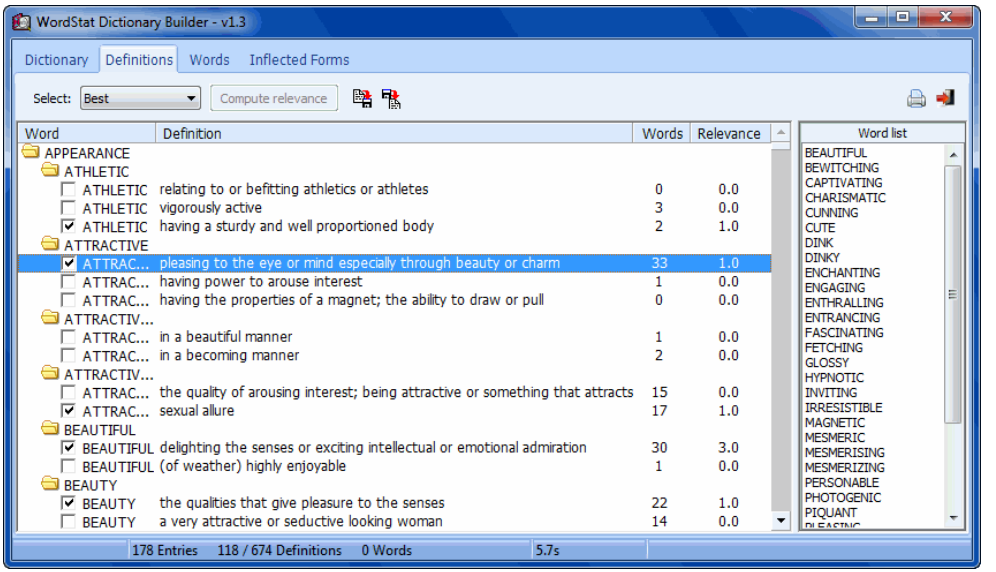
DEFINITIONS PAGE

Using a comprehensive lexical database such as WordNet to find related words and phrases has one major drawback. Searching for numerous types of relationship for even small WordStat dictionaries can yield a huge number of suggested words. For example, when searching for suggested words for a dictionary containing 129 words grouped under 13 categories, more than 12,000 new words and phrases were obtained, many of them unrelated to the existing categories. Browsing through such a huge number of suggestions to find the most relevant ones can be an overwhelming task. The Definitions page was created to somewhat reduce this burden by providing an intermediary step where the user can select, for each of the words, the word senses that are the most relevant to the containing category. The program offers both manual and automatic selections of word senses and also allows one to combine both methods.

Automatic selection of word senses

WordStat dictionary builder uses a basic disambiguation algorithm to try to identify, among all word senses, those that are the most likely to be related to the containing category. This algorithm involves the computation for each word sense of a relevance score. The higher is this score, the more likely the word sense will be related to the category, while a score equal to zero suggests that this word

sense is unrelated to the category. Once those relevance scores have been computed, the program can use one of three different rules to select proper word senses.



- **Best** - This rule instructs the program to select for each word, the sense that has obtained the highest relevance score. When selecting the highest score, a 20% tolerance is used so that, on some occasions, more than one word sense will be selected. This selection rule is the most conservative one and ensures that relevant word senses are the most likely to be selected. However, we have also found that this selection method may lack some sensitivity and may fail to select other relevant word senses (false negatives).
- **Relevance > 0** - This rule instructs the program to select all word senses that have been found to be related, even slightly, to the category. This selection rule is very liberal in that it is the most likely to select most relevant word senses at the cost of a lack of specificity (too much false positives).
- **Relevance > 0.1** - This rule is slightly more conservative that the previous one, in that it also rejects all word senses that have obtained a score of 0.1. Besides a score of zero, 0.1 is the lowest score that may be obtained. Experiences have shown that, very often, word senses with such a low score are unrelated to the category. Removing those word senses thus results in an increase in specificity along with only a marginal decrease in sensitivity.

The application of any of these three rules is performed by selecting the proper rule from the Select drop down list. This list box may also be used to select or unselect all definitions.

Manual selection of word senses

Manual selection of word senses can be carried out either alone or after an automatic selection has been made by the program. Manual selection is performed simply by browsing through the list of all definitions and selecting those that are related to the current category while making sure unrelated definitions are unselected. The decision to include or exclude a specific word sense may rely on the displayed definition, on the relevance score, and also on the examination of all words that have been

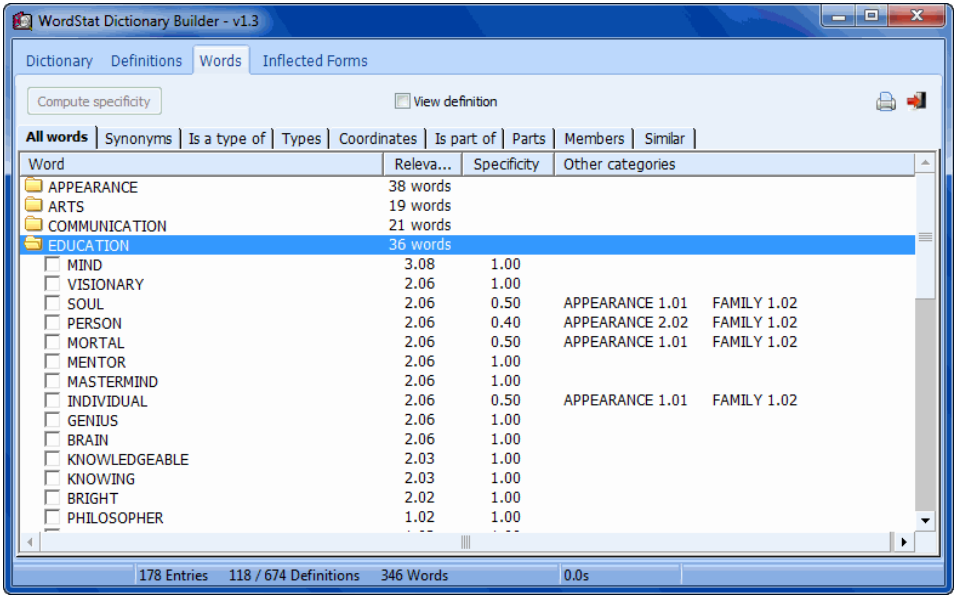
found to be related to this specific word sense. Those suggested words are automatically displayed in the right panel of the Definition page when the word definition is highlighted.

Selected word senses may be saved on disk by clicking the  button, and later retrieve by clicking the  button.

Once the word senses have been chosen, activating the Words page will start the search, extract all words and phrases related to the selected word senses, and will display them by categories and by the type of relationship (synonyms, antonyms, etc.)

WORDS PAGE

The Words page displays a list of suggested words and idioms that were found to be related to existing words in the various categories and allows you to select suggestions and add them to the existing dictionary. The "All words" page includes a list of all words and idioms that were suggested, irrespective of their relationship with the existing entries. The remaining pages allow one to examine those same words by the nature of their relationship with existing entries.



Relevance ranking and sorting

For each suggestion, a Word relevance score is computed that takes into account the number of times an item has been suggested as well as the relevance score obtained by the word senses from which it was derived. Those suggestions are presented in descending order of relevance so that the suggestions that are the most likely related to the containing category are located at the top of the list while suggestions that are less likely to be relevant are found at the bottom of this list.

Specificity index

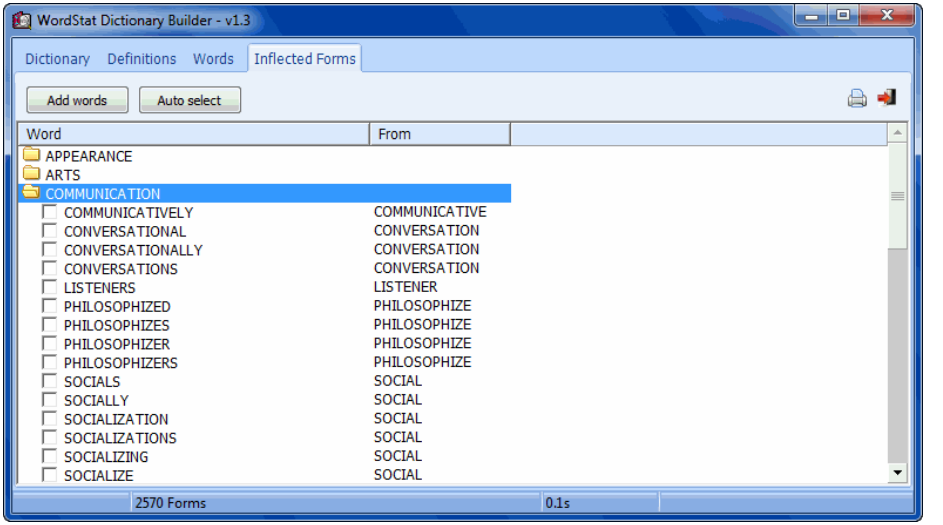
Very often, a word is suggested in more than one category. This is especially true when the dictionary includes categories that are semantically close each other. One good example of such a categorization system is the Lasswell dictionary that tries to differentiate ten different forms of power relations (power gain, power loss, cooperation, authoritative, conflict, doctrine, etc.). When making a decision on whether a word should be added to a given category, it is important to consider whether this word is specific to this category or whether it has also been suggested in other categories. The Compute Specificity button allows one to obtain a specificity index as well as a list of all the other categories in which this item also appears. This specificity index is computed by making the sum of all relevance scores obtained by this word in the various categories and computing the proportion of this total score that is related to the current category. A specificity of 1.0 indicates that this item has only been suggested for this category. When the item has been found to be related to more than one category, a list of all other categories in which it also appears is displayed in the Other Categories column along with the relevance score obtained in each of those categories. You can use this information to decide to which category this word should be added.

To add words or idioms to categories

- Place check marks beside the item you would like to add.
- Click the **Add** button.

INFLECTED FORMS PAGE

The Inflected Form page lists all words whose spelling begins with the same letters as existing words and that were not already included in the actual dictionary. For example, if the word "understanding" is found in the dictionary, the program will suggest words like "understandings", "understandingly". If the Match Partial Word option is enabled (see Dictionary page), this same word will also yield words like "understands", "understandable", and "understandably". The From column displays the original word from which the inflected form has been derived.



To add suggested words to the dictionary, place a check mark beside the words you would like to add and click the Add button.

The **Auto Select** button allows one to automatically select from all the suggested forms those with specific suffixes such as all suggested forms ending with 's' or 'ed'. When searching inflected forms of English words, it is also possible to use WordNet to automatically select words that share the same meaning as the original word from which it was derived. As an example, the program will automatically select words like BEHAVIORS and BEHAVIOURS as valid forms derived from BEHAVIOR since all three forms will yield the same WordNet definitions. One can also set this feature to accept any new word form for which there is at least one WordNet definition containing the original word. For example, when enabling this option the word COMPETING would be automatically selected as a valid inflected or derived form of COMPETITION since one of WordNet definitions associated with COMPETING (i.e. "Being in competition") contains the original word from which it was derived.

Click the  button to return to quit the dictionary builder program and return to WordStat.

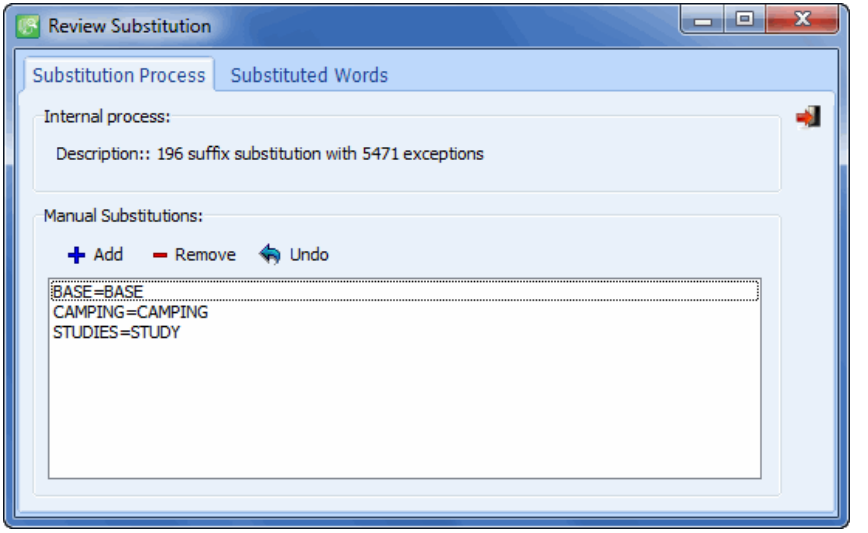
Monitoring and Customizing Substitutions

The substitution process may be used for automatic spelling correction or for lemmatization. Since WordStat does not rely on a prior part-of-speech tagging of words to perform lemmatization, but rather on some suffix substitution rules and lists, some improper word substitutions may occur. In specific situations, substitution may be linguistically conceivable yet semantically invalid. For example, the noun "ground," referring to the solid part of the earth's surface, may be erroneously taken as the passive form of the verb "grind" and be replaced with this infinitive form. WordStat offers a way to monitor all substitutions performed by this substitution routine and to override those deemed necessary by creating a list of custom substitutions, or exceptions. Such a tool may also be used to review and edit previously entered entries in the substitution process.

To review or edit manually defined substitutions:

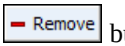
- Enable the substitution process on the Dictionary page by putting a check mark in the box found to the left of the Substitution list box.
- Apply it to your text collection by moving to the Frequencies page.
- Move back to the Dictionary page.
- Click the 

to the right of the substitution list to review all substitutions performed. A dialog box similar to this one will appear:



The **Substitution Process** page of this dialog box provides information about the internal process (if any) involved in the lemmatization or substitution routine as well as a list of all manual substitutions.

To remove a substitution rule:

- Select the rule and click the 

button.

To add a new substitution rule:

- Click the Add button. The following dialog box appears:

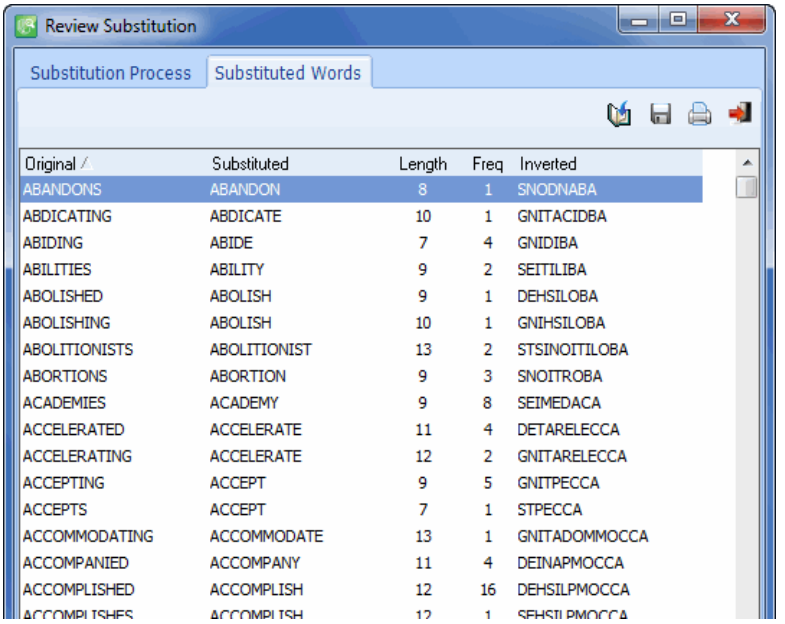
- Type in the **Original** edit box the word you would like to replace, then type the replacement word in the **Replace with** edit box and click **OK** to create the new substitution rule. This new rule is automatically added to the substitution process.

To cancel a modification:

- All changes are automatically saved to disk. To cancel any change made to the list of manual substitutions during the current WordStat session, click the Undo button. A list of all changes performed in this substitution process will be displayed.
- Select the modification you would like to cancel and click the **Undo** button.

To review all performed substitutions:

- Move to the **Substituted Words** page of the dialog box.



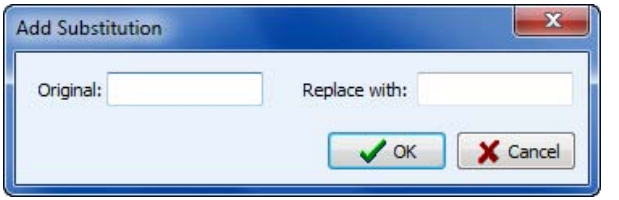
Original	Substituted	Length	Freq	Inverted
ABANDONS	ABANDON	8	1	SNODNABA
ABDICATING	ABDICATE	10	1	GNITACIDBA
ABIDING	ABIDE	7	4	GNIDIBA
ABILITIES	ABILITY	9	2	SEITILIBA
ABOLISHED	ABOLISH	9	1	DEHSILOBA
ABOLISHING	ABOLISH	10	1	GNIHSILOBA
ABOLITIONISTS	ABOLITIONIST	13	2	STSINOITILOBA
ABORTIONS	ABORTION	9	3	SNOITROBA
ACADEMIES	ACADEMY	9	8	SEIMEDACA
ACCELERATED	ACCELERATE	11	4	DETARELECCA
ACCELERATING	ACCELERATE	12	2	GNITARELECCA
ACCEPTING	ACCEPT	9	5	GNITPECCA
ACCEPTS	ACCEPT	7	1	STPECCA
ACCOMMODATING	ACCOMMODATE	13	1	GNITADOMMOCCA
ACCOMPANIED	ACCOMPANY	11	4	DEINAPMOCCA
ACCOMPLISHED	ACCOMPLISH	12	16	DEHSILPMOCCA
ACCOMPLISHES	ACCOMPLISH	12	1	SEHSILPMOCCA

The table presents all performed substitutions in alphabetical order as well as other information (such as the substituted word, how frequent the substitution has been made, the length of the original word as well as the inverted version of the original word). Clicking any column header sorts the table in ascending order of the data in that column. Clicking the same column header a second time will sort its content in descending order.

Because of the algorithm used, lemmatization errors are more likely to occur on shorter words. Sorting on the **Length** column allows one to focus more specifically on those short words. Also, suffix substitution may be more problematic for some suffixes. For example, lemmatizing words ending with "ING" may introduce confusion between noun, adjective and verb forms. Sorting on the **Inverted** column allows one to quickly review all substitutions made to words sharing the same ending.

To correct an invalid substitution:

- Select the row with the substitution you would like to override.
- Press the right button of the mouse and select either **Keep Invariant** to instruct WordStat to keep the word in its original form or **Substitute With** to specify what word will be substituted with the selected word. When this last option is selected, the following dialog box appears:



- The initial word is automatically entered in the **Original** edit box. Then type the replacement word and click **OK** to create the rule. This new substitution rule is automatically added to a list of exceptions and will automatically be accessed when using the currently selected lemmatization routine.

To export the table to disk:

- Click the  button. A Save File dialog box will appear.
- In the Save As Type list box, select the file format under which to save the table. The following formats are supported: ASCII file (*.TXT), Tab delimited file (*.TAB), Comma delimited file (*.CSV), MS Word (*.DOC), HTML file (*.HTM; *.HTML), XML files (*.XML) and Excel spreadsheet file (*.XLS) and SPSS data files (*.SAV).
- Type a valid file name with the proper file extension.
- Click the SAVE button.

To append a copy of the table in the Report Manager:

- Click the  button. A descriptive title will be provided automatically for the table. To edit this title or to enter a new one, hold down the SHIFT keyboard key while clicking this button (for more information on the **Report Manager**, see page 164).

To print the table:

- Click the  button.

To leave this dialog box

- Click the  button. If modifications have been made to the list but have not been saved, you will be prompted whether those modifications need to be saved. Choosing **NO** will result in the loss of all changes made to the list since you entered this dialog box or since the last time those modifications had been saved. .

Configuring External Preprocessing Routines

The preprocessing option allows users to access external text preprocessing routines that are not part of the WordStat program. This option is useful to perform custom transformations on the text to be analyzed. For example, a routine may be created to remove all foreign accents, to segment a document in a particular way, to perform part-of-speech tagging, word disambiguation, stemming or transforming words into n-grams (sequences of letters). Those transformations are not applied to the original documents stored in the database but are instead performed live immediately after the textual information has been read into memory and prior to any text processing available in WordStat (lemmatization, exclusion of words, categorization, etc.).

Such external routines may be written in any programming language that can create or be called from a stand-alone EXE file or a DLL. The programmer is responsible for matching the formal parameters and result type of the conventions used by WordStat for data interchanges. Technical information on those programming conventions is available on request from Provalis Research. The following section describes how to configure WordStat to call an already existing text a preprocessing routine.

Calling an Executable program

The first method by which an external routine may be integrated within WordStat is through the calling of an executable program (typically a console application with an EXE file extension). With such a method, information is transferred between the two programs by way of temporary files generated on the fly and stored in a default temporary folder. WordStat first creates a text file (WORDSTAT.IN) in the temporary folder containing the text to be processed. It then calls the external routine, with optional parameters (which may or may not include the input and output file name and their locations). Once the external program ends, WordStat retrieves another text file (WORDSTAT.OUT) created by the external program and containing the text to be processed in place of the original one. The two temporary files are then deleted.

To configure WordStat to call an EXE file:

- Click the 

button located to the right of the **Preprocessing** list box.
- Type the name you would like to give to this preprocessing routine and click **OK**. This name will be added to the list box of available routines.
- Enter the name of the program file including the full path or click the  button to display a dialog box that will allows browsing through folders and then select the appropriate program file.
- In the **Working Dir** edit box, specify the working directory for the program if necessary. Specifying $TEMP as the working directory instructs the program to set the working directory to the temporary folder.
- Enter the **parameters** to transfer to the program at start-up. Typically, you will transfer the input and output file names, as well as any command line options needed for the external routine, to perform

the required transformation. You can specify multiple parameters and can use any one of these three string constants:

CONSTANT	STANDS FOR
$TEMP	The system temporary folder.
$IN	The temporary text file created by WordStat and to be processed by the external routine (the actual file name used is WORDSTAT.IN)
$OUT	The name of the text file created by the external routine and retrieved by WordStat (the actual file name used is WORDSTAT.OUT).

Calling a function in a DLL

The second method used to call a preprocessing routine is to execute an external function stored in a dynamic library (DLL). This will manipulate the text stored in the computer memory at a specific memory address. Since no file input and output operations are necessary to transfer information, this method is often much faster than running an EXE file. However, because this external routine has access to the same memory space as WordStat, great care should be taken when running or creating such a routine. To minimize the risks involved in calling external functions, a programming convention has been imposed where the name of the function to be called must begin with the two uppercase letters 'WS', thus reducing the risk of calling a function that has not been written specifically for WordStat.

To configure WordStat to call a DLL function:

- Click the 

button located to the right of the **Preprocessing** list box.
- Type the desired name for this preprocessing routine and click **OK**. This name will be added to the list box of available routines.
- Enter the name of the DLL file including the full path or click the  button to display a dialog box that allows browsing through folders and then select a DLL.
- Once a DLL file has been entered, the dialog box will provide a list of functions that are likely to be compatible with WordStat (with names starting with "WS"). Select the function containing the transformation routine needed.
- WordStat must set apart in advance a "buffer size" that will contain the transformed text. By default, the memory space is equal to the length of the original document. For many text transformation routines, such as stemming or lemmatization, which often result in shorter text, this space should be large enough. However, for other types of text preprocessing (e.g., part-of-speech tagging or transformation of words into n-grams), the size of the transformed text may be twice or three times larger than the original. The **Buffer Size** option allows you to specify how much larger the memory space should be in order to hold the transformed text. A numerical value between 1 and 10 can be used to represent the value by which the original text should be multiplied. For example, if this

option is set to 3 and the size of the original text into memory is 10 kilobytes, then 30 kilobytes of memory will be reserved for holding the transformed text. The calling routine should run a test to see whether the reserved space is sufficient and should return an error message if not, allowing WordStat to respond with an error message to the user.

- Once all the options have been set, click the **OK** button.

Other tasks

To edit the settings of an external routine:

- Select the preprocessing routine you would like to edit from the dropdown list.
- Click the 

icon to edit the external routine settings.

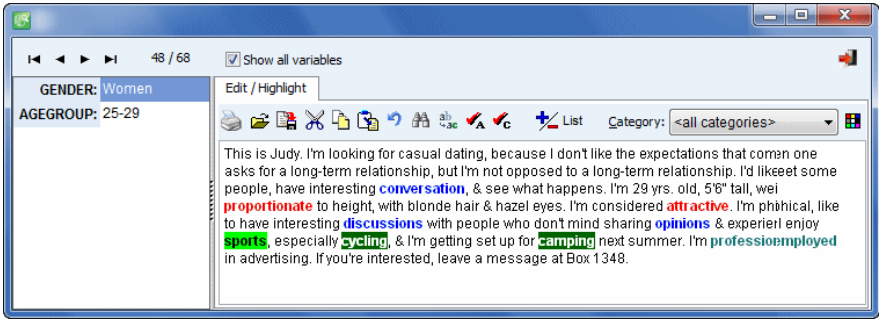
To remove an external routine:

- Select the preprocessing routine you would like to remove from the dropdown list.
- Click the 

button.

Viewing and Editing Text

WordStat's integrated text editor allows browsing and editing alphanumeric variables and documents submitted to content analysis, as well as spell checking of text found in a specific case or in the entire data file. When viewing plain text documents, the editing window consists of a single editing view where text can be edited and keywords are highlighted. When viewing rich text documents, the editing and keyword highlighting features are accessed through two separate views. The keyword highlighting feature allows one to identify all words or phrases that have been coded as well as those belonging to specific coding categories. The text editor can also be used for dictionary maintenance tasks by allowing the addition of words or expressions to active dictionaries. One can also jump directly from a selected word to a keyword-in-context table of all instances of this word.



It is also possible from this dialog box to examine and edit all numeric and alpha numeric values stored in other variables of the data file. To view and edit those values for the current case, the **Show all variables** check box should be selected. When enabled, the screen will split vertically. On the left side, a panel with a list of all variables with their values for this case will be shown. To edit any of those values, press the F2 key or double-click the value to edit.

The following table provides a short description of available buttons and controls:

CONTROL	DESCRIPTION
	This button allows the importation of text from various file formats including plain text file, RTF, MS Word, WordPerfect, MS Write or HTML. If the variable containing the document supports only plain text documents then all formatting options and unsupported features, such as bullets, graphics or headers are removed.
	Export the current document to disk. Plain text document may only be saved as plain ANSI document while RTF documents may be saved in plain text or RTF format.
	Print the current document.
	Cut the selected text to the clipboard.

Copy the selected text to the clipboard.

Paste text from the clipboard at the current cursor position.

Reverse the last action made to the text.

Search for a specified word or phrase.

Search for and replace a specified word or phrase.

Spell-check all cases.

Spell check only the current text.

Pressing this button allows you to add the selected word to an active dictionary. It may also be used to produce a KWIC table of the currently selected word or expression.

Variable: When more than one text variable is analyzed, this drop-down list box allows selecting the variable to display in the edit box.

Highlight: WordStat's text editor displays all words that have been coded using bold characters while words belonging to the active category are showed in blue. To change the active category and highlight all words that belong to a selected category, simply choose the proper category from this list box. To highlight all categories using different colors, set this option to <**all categories**>.

This button allows you to access the color coding dialog box that lets you to assign to each specific category in the dictionary specific font and background colors (see below).

Move to the first case of the data file.

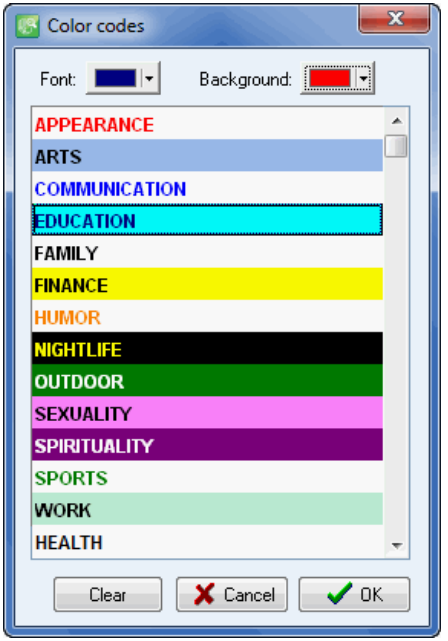
Move to the last case of the data file.

Move to the previous case.

Move to the next case.

Assigning color codes to categories

The color code dialog box allows you to assign specific font and background colors to each category of the current inclusion dictionary.



To access the color code dialog box

- Set the Highlight drop down list to <all categories>.
- Click the  button.

To change the colors of a category

- Select the category in the categories list box
- Use the Font and Background color selectors to choose from a list of predefined colors or click the Other button to define a custom color.

Information on color codes are automatically saved with the project options

Displaying distribution using Barcharts or Pie Charts

WordStat allows one to produce barcharts or pie charts to visually display the distribution of specific keywords or categories. To produce such charts:

- Move to the Frequencies page.
- Set the Sort By option to the desired graphic order of the values.
- Select the rows you would like to plot (multiple but separate rows can be selected by clicking while holding down the CTRL key)
- Click the  button.

Three types of charts may be used to depict the distribution of keywords or content categories:

The vertical bar chart is the default chart used to display absolute or relative frequencies of keywords or content categories.

The horizontal bar chart displays the same information as the vertical one but is especially useful when the number of keywords is high and their labels cannot be displayed entirely on the bottom axis.

The pie chart is useful to display the relative frequency of each keyword and compare individual values to other values and to the whole. Numerical values displayed in pie charts are always expressed in percentages of either the total frequency or case occurrences.

The **Plot** option allows one to select the values that will be used as the scale for the length of bars in barcharts or as the percentage base for pie charts. For barcharts the options are:

FREQUENCY	Number of occurrences of the keyword
% SHOWN	Percentage based on the total number of keywords displayed in the table
% PROCESSED	Percentage based on the total number of words encountered during the analysis
% TOTAL	Percentage based on the total number of words that have not been excluded
NO OF CASES	Number of cases where this keyword appears
% CASES	Percentage of cases where this keyword appears

For pie charts, two options are available to specify how percentages will be computed:

FREQUENCY	Percentage based on the total frequency of keywords
NO OF CASES	Percentage based on the total number of case occurrences

The **View Others** option displays an additional bar or slice representing all items in the frequency table that have not been selected.

The following table provides a short description of available buttons and controls:

Controls	Description
	Press this button to vertically display the labels on the bottom axis.
	Press this button to append a copy of the graphic in the Report Manager. A descriptive title will be provided automatically. To edit this title or to enter a new one, hold down the SHIFT keyboard key while clicking this button (for more information on the **Report Manager**, see page 164).
	Press this button to retrieve a chart previously saved on disk.
	Press this button to save a chart on disk. Charts are saved in a proprietary format and may be edited and customized using the Chart Editor.
	Pressing this button allows you to print a copy of the displayed chart.
	Click this button to turn on/off the 3-D perspective for the current chart.
	This button allows you to edit various features of the chart such as the left and bottom axis , the chart and axis titles, the location of the legend, etc.
	This button is used to create a copy of the chart to the clipboard. When this button is clicked, a pop-up menu appears allowing you to select whether the chart should be copied as a bitmap or as a metafile.
	Pressing this button closes the chart dialog box and returns to WordStat's main screen.

Customizing barcharts and pie charts

Clicking the  button on the chart dialog box gives access to a dialog box to customize the appearance of barcharts and line charts. The options available in this dialog box represent only a small portion of all settings available.

To further customize the chart, modify data points, value labels, or series order, click the  button located to the right-hand side of the dialog box.

LEFT OR BOTTOM AXIS

Minimum / Maximum - WordStat automatically adjusts the vertical axis scale to fit the range of values plotted against it. To manually set these values, type the desired minimum and maximum.

Increment - Increasing or decreasing this value affects the distance between numbers as well as tick marks. Horizontal grid lines are also affected by modification of this value.

Horizontal Grid - This option turns horizontal grid lines on and off. Grid lines extend from each tick mark on an axis to the opposite side of the graph. To increase or decrease the number of grid lines

or the distance between those lines, change the Increment value of the axis. A list box also allows a choice among five different line styles to draw those grid lines.

LEGEND

Location - This option positions the legend. Legends may be placed at Top, Left, Right and Bottom side of the chart.

From top - When the legend is displayed on the left or the right side of the chart, this option specifies the legend's top position in percent of total chart height.

From left - When the legend is displayed on the top or the bottom chart, this option specifies the legend's top position in percent of total chart width.

TITLES

Proper titles and axis labels are of utmost importance when describing the information displayed in a chart. By default, WordStat uses variable names and labels as well as other predefined settings to provide such descriptions.

The title page allows one to modify the top title, as well as the labels on the left, bottom and right axis. To edit the title, select the proper radio button. Enter several lines of text for each title by pressing the **<Enter>** key at the end of a line before entering the next line.

The Font button to the right-hand side of the edit box allows changing the font size or style of the related title.

3-D VIEW

Orthogonal - Turning this option off disables the free elevation and rotation of the 3-D chart.

Zoom - This option zooms the whole chart. Expressed as a percentage, increasing the value positively will bring the chart towards the viewer, increasing the overall chart size as the Zoom value increases.

3-D Percent - The 3-D Percent property indicates the size ratio between chart dimensions and chart depth by specifying a percent number from 1 to 100.

Perspective - Use this property with Orthogonal unchecked to modify the 3-D perspective of the Chart. Larger values add more depth perspective.

Bar shadow - Enabling this option adds dark shades to the sides of 3-D bars. Turning it off will color the sides of the bar the same as the front.

Bar width - This option determines the percent of total bar width used. Setting this value to 100 makes joined bars.

Bar depth - Use this property to limit the depth that each bar series uses. By default, bars will take up the part proportional to the number of bar series in the chart so that the back of a bar will join the front of the bar immediately behind it. To insert a gap between series of bars, decrease this value.

Pie depth - Use this property to change the thickness of the pie chart.

Creating and Using Norm Files

A useful element in interpreting the results of a content analysis is the possibility of comparing the obtained results to some normative data and identifying how similar or dissimilar the observed frequencies are compared to those norms. For example, one may wish to compare the vocabulary of an adult victim of a brain injury to vocabularies of normal adults or the mission statement of a business to a collection of mission statements of Fortune 500 companies. One may also establish the reading level of a school manual by comparing its vocabulary to collections of books read by children of various ages. Normative data are typically computed on a large sample of documents and represent either general norms with data from a wide variety of sources or are computed on a more specific text corpus related to the channel, the domain area or the specific situation being studied. For example, one could compare the speeches of candidates of a presidential election to a large collection of English text from different sources (newspapers, novels, technical documents, etc.) or to a more specific corpus of spoken English or to a collection of political speeches. Comparison of word frequencies to norms established on a general corpus may be especially useful to identify the specific terminology of a set of documents. On the other hand, using a more specific collection may allow one to identify subtler differences or nuances.

WordStat allows one to create normative data on a collection of documents based on either the content of a categorization dictionary or on the frequency of individual words. Those norms may be stored on disk and later be compared to the results of a content analysis performed on other documents. When comparing results to norms established using a categorization dictionary, it is highly recommended to use the same dictionaries and the same analysis options as the ones used to create those norms. Using different settings may result in invalid comparisons. To prevent such a situation, WordStat will detect any difference in settings and issue a warning message, pinpointing all differences in those settings. On the other hand, comparing the results to a norm file based on a comprehensive list of word frequencies may provide a more flexible solution than using a norm established using a categorization dictionary since a single word frequency norm file may be used to compare results obtained using various categorization systems. In such a situation, WordStat automatically computes from the words in the norm file the expected frequencies for each content category. However, it is important to remember that if the categorization dictionary contains phrases or rules, the expected frequency will likely be underestimated and may thus be invalid.

When a comparison to a norm file is performed, WordStat appends four columns to the right of the frequency table and computes each item's expected frequency, the deviation from the observed frequency, the Z value (standardized deviation) and its two-tailed probability.

To create a norm file based on content categories:

- From SimStat or QDA Miner, open the corpus on which the norms will be established.
- Call WordStat.
- Select the categorization dictionary on which the norms should be computed and set the various analysis options (exclusion list, lemmatization, etc.).
- Move to the FREQUENCIES page to force the computation of frequencies on the content categories.
- Click the  button and select the SAVE AS A NORM FILE command. A file-saving dialog box will be displayed.

- Enter the name of the file under which you would like to store the norms (by default, the .wnorm file extension is added to the file name), then click SAVE to create the file.

To create a norm file based on word frequencies:

- From SimStat or QDA Miner, open the text collection on which the norms will be established.
- Call WordStat.
- If a categorization dictionary is active, disable it and set the various analysis options (exclusion list, lemmatization, etc.). It is recommended to set the minimum frequency or record occurrence to "1" and to disable the option to remove words under a specific frequency or occurrence in order to obtain a detailed frequency list of all words in the normative sample.
- Move to the FREQUENCIES page to force the computation of word frequencies.
- Click the  button and select the SAVE AS A WORD FREQUENCIES command. A file-saving dialog box will be displayed.
- Enter the name of the file under which you would like to store the norms (by default, the .wfreq file extension is added to the file name), then click SAVE to create the file.

To compare the obtained frequencies with existing norms:

- Set the required dictionary and options and move to the FREQUENCIES page to instruct WordStat to compute the frequencies of words or of content categories.
- Click the  button and select COMPARE TO NORM FILE or COMPARE TO WORD FREQUENCIES, depending on whether you would like to compare the obtained frequencies to norms established on content categories or on words.
- Select the norm file to which you would like the comparison to be made and click OK.

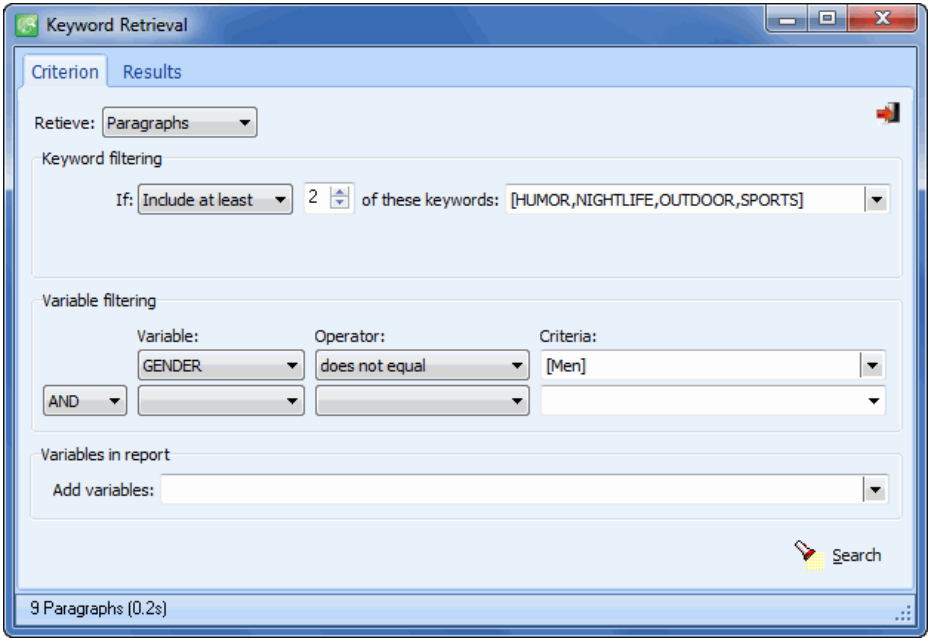
To Remove comparison statistics:

- Click the  button and select the REMOVE NORM STATISTICS command.

Performing Text Retrieval using Keywords

The KEYWORD RETRIEVAL feature can retrieve any document, paragraph or sentence containing a specific keyword, a combination of keywords or no keyword at all. Text units corresponding to the search criteria are returned in a table on the Results page. This table may then be printed or saved to disk. It may also be used to create tabular or text reports as well as to attach QDA Miner codes to the retrieved text segments.

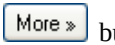
To start the Keyword Retrieval feature, go to the Frequencies page and click the  button. This dialog box can also be accessed from other parts of the program to retrieve text units associated with a cluster or with a specific association. It may also be accessed by selecting an item in the frequency page, right-clicking and selecting KEYWORD RETRIEVAL from the pop-up menu. When calling this function, a dialog box similar to this one appears, allowing you to specify the desired search criteria:



RETRIEVE - This option determines the text unit on which the search will be performed as well as what will be retrieved. You can select three different text units:

- The **Documents** search unit allows WordStat to apply the search expression on each document associated with a specific case and, if a specific document meets the search condition, its location will be displayed.
- Setting this option to Paragraphs allows WordStat to display any paragraph meeting the search condition.
- When selecting **Sentences** as the search unit, WordStat returns sentences meeting the search condition.

KEYWORD FILTERING - This group of options allows one to select the keywords on which the retrieval will be based. Setting the first list box to **No Keyword** will retrieve all text units for which no keyword has been found. This option is especially useful to identify topics or themes that have not been covered by the current categorization dictionary or new keywords that should be added to enhance the coverage of existing categories in the dictionary. Setting the filtering to **Include at least** allows one to retrieve text units containing a minimum number of keywords from a selected list. To select the keywords, click the arrow button to show all available keywords and then click the desired items. The minimum number of keywords a specific unit must contain in order to be retrieved is specified using a small edit box with spin buttons to the right. Setting this numerical value to the total number of keywords selected will force the program to retrieve only those units containing all those keywords. Setting this number to a lower value will retrieve all text units containing at least this number of keywords from the selected list. In the example shown above, any unit containing keywords from two or more of the four categories HUMOR, NIGHTLIFE, OUTDOOR or SPORT will be retrieved.

To enter a second filtering condition, click the 

button. You can choose to link the two filtering conditions using either one of the three Boolean expressions: AND, OR or NOT. Choosing AND will retrieve all text units fulfilling both criteria; selecting OR will result in a retrieval of text units meeting either the first or the second condition, or both, while choosing the NOT Boolean operator will retrieve text units meeting the first condition but not the second one.

To limit the filtering conditions to a single statement, click the 

button.

VARIABLE FILTERING - The second group of options allows one to use other variables restrict the retrieved text units to specific cases selected according to some logical condition. This filtering condition may consist of a simple expression, or may include up to two expressions joined by a logical operator (i.e., AND, OR). In the above screen shot, only text units from cases where the variable GENDER is equal to MEN will be retrieved.

The following table shows the various operators available for each data type:

DATA TYPE	AVAILABLE OPERATORS
NOMINAL / ORDINAL	Equals Does not equal Is empty Is not empty
NUMERIC and DATE	Equals Does not equal Is greater than Is lesser than Is greater than or equal to Is lesser than or equal to Is empty Is not empty

BOOLEAN	Is true Is false
STRING	Contains Does not contain Is empty Is not empty

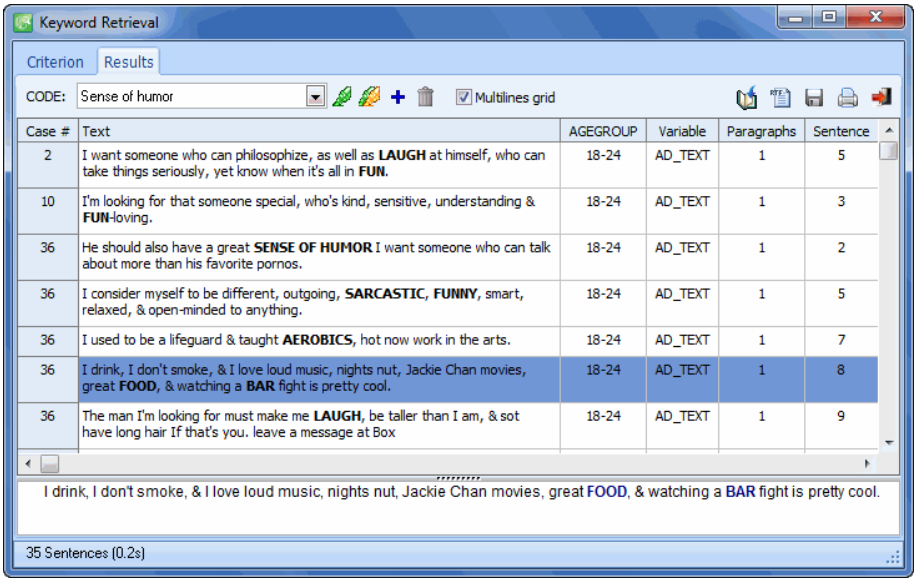
ADD VARIABLES - This dropdown checklist box may optionally be used to add the values stored in one or more variables to the table of retrieved segments for the specific case from which a text segment originated.

Once all the search options have been set properly, simply click the 

button to retrieve the selected text units.

Working with the Retrieved Text Units

The retrieved text units are displayed in a table found on the RESULTS page.



This table contains the case number and the variable from which the segment originates, as well as the value of all additional variables selected by the user (see the ADD VARIABLES option above). When searching for paragraphs or sentences, the table also displays the text associated with the retrieved unit and its location (its paragraph and sentence number). By using arrow keys or by clicking a row the associated text is displayed in a separate window at the bottom of the screen with all keywords in bold. Selecting specific words or phrases in this text window by right-clicking displays a pop-up menu to assign them to a content category, the exclusion list or to obtain a keyword-in-context list.

To sort the table of retrieved units in ascending order by any column, simply click the column header. Clicking the same column header a second time sorts the rows in descending order. Tables may also be printed, stored as a text report, or exported to disk in various file formats such as Excel, ASCII, or HTML.

To remove a search hit from the hit list:

- Select its row and then click the  button.

To assign a QDA Miner code to a specific search hit:

- In the table of search hits, select the row corresponding to the text segment you want to code.
- Use the **CODE** drop-down list located above this table to select the code to assign.
- Click the  button to assign the selected code to the highlighted text segment.

To assign a QDA Miner code to all search hits:

- Use the **CODE** drop-down list located above this table to select the code to assign.
- Click the  button to assign the selected code to all text segments matching the search expression.

NOTE: To automatically attach QDA Miner tags to all paragraphs or sentences associated with all currently displayed content categories or keywords, you may use the autocoding feature available by clicking the  button on the **Frequencies** page (see page 33).

To create a new QDA Miner code:

- Click the  button. A dialog box will appear allowing you to create a new QDA Miner code (for more information see Adding a QDA Miner codes).

To create a report of retrieved segments:

- Click the  button. The sort order of the current table is used to determine the display order in the report. This report is displayed in a text-editing dialog box and may be modified, stored on disk (in RTF, HTML or plain text format), printed, or cut-and-pasted into another application. Graphics and tables may also be inserted anywhere in this report.

To export the table to disk:

- Click the  button. A Save File dialog box will appear.

- In the **Save As Type** list box, select the file format under which to save the table. The following formats are supported: ASCII file (*.TXT), Tab delimited file (*.TAB), Comma delimited file (*.CSV), HTML file (*.HTM; *.HTML) and Excel spreadsheet file (*.XLS).
- Type a valid file name with the proper file extension.
- Click the **SAVE** button.

To print the table:

- Click the  button.

To close the Keyword Retrieval dialog box:

- Click the  button.

Hierarchical Clustering and Multidimensional Scaling

WordStat allows one to further develop categorization by providing various graphic tools to assist the identification of related words or categories. Those tools are obtained by the application of hierarchical cluster analysis and multidimensional scaling on all included words or categories and are displayed in the form of dendrograms and concept maps. The first page of the dialog box is used to set various analyses and display options for both types of analysis.

Clustering Cases/Documents

When the clustering is set to be performed on cases or documents, the distance matrix used for clustering and multidimensional scaling consists of cosine coefficients computed on the relative frequency of the various keywords. The more similar two documents are in term of the distribution of keywords, the higher the coefficient. The case label that is used to identify the various cases can be set by choosing the **Edit Case Descriptors** command from the WordStat main menu (see page 139).

Clustering keywords

When clustering keywords or content categories, several options are available to define co-occurrence and choose which similarity index will be computed from the observed co-occurrences.

CO-OCCURRENCE - This option allows you to specify how a co-occurrence will be defined. By default, a co-occurrence is said to happen every time two words or two categories appear in the same case (by case option). You may also restrict the definition of co-occurrence to entries that appears in the same paragraph or the same sentence, or to words or categories that are located in the same user defined section (delimited by a / character). Finally, you may restrict even further the definition of co-occurrences by limiting the co-occurrence to a small window of words of specified length. Such a small window is especially useful when doing an analysis directly on words (rather than categories) since it allows to identify idioms or phrases that may need to be added to the categorization dictionary. Co-occurrence on larger text segments such as cases or paragraphs may be more appropriate to identify the co-occurrence of themes in individual subjects.

INDEX - The Index option lets you select the similarity measure used in clustering and in multidimensional scaling. Four measures are available. The first three measures are based on the mere occurrences of specific words or categories in a case and do not take into account their frequency. In all those indexes, joint absences are excluded from consideration.

- **Jaccard's coefficient** - This coefficient is computed from a fourfold table as *a/(a+b+c)* where *a* represents cases where both items occur, and *b* and *c* represent cases where one item is found but not the other. In this coefficient equal weight is given to matches and non matches.
- **Sorensen's coefficient** - This coefficient (also known as the Dice coefficient) is similar to Jaccard's but matches are weighted double. Its computing formula is *2a/(2a+b+c)* where *a* represents cases where both items occur, and *b* and *c* represent cases where one item is present but the other one is absent.
- **Ochiai's coefficient -** This index is the binary form of the cosine measure. Its computing formula is *SQRT(a^2/((a+b)(a+c)))* where *a* represents cases where both items occur, and *b* and *c* represent cases where one item is present but not the other one.

The last coefficient takes into account not only the presence of a word or category in a case, but also how often it appears in this case.

- **Cosine theta -** This coefficient measures the cosine of the angle between two vectors of values. It ranges from -1 to +1.

Probabilistic - Traditional co-occurrence measures do not take into account the possibility that two words will sometimes co-occur by chance. As a consequence, clustering solutions obtained using those metrics are biased toward the formation of clusters of high-frequency items. While the problem may remain undetected or negligible when clustering low frequency words or when analyzing co-occurrence within a limited context (such as within a sentence, within a window or within a few words), the problem becomes much more apparent when clustering broad content categories or frequently used words. Enabling this option applies a correction to either the Jaccard or the Sorensen coefficient.

CLUSTERING TYPE - Two broad types of keyword clustering are available. The first method is based on keyword co-occurrences (First Order Clustering) and will group together words appearing near each other or in the same document (depending on the selected co-occurrence window). The second clustering method is based on co-occurrence profiles (Second Order Clustering) and will consider that two keywords are close to each other, not necessarily because they co-occur but because they both occur in similar environments. One of the benefits of this clustering method is its ability to group words that are synonyms or alternate forms of the same word. For example, while TUMOR and TUMOUR will seldom or never occur together in the same document, second order clustering may find them to be pretty close because they both co-occur with words like BRAIN or CANCER. Second order clustering will also group words that are related semantically such as MILK, JUICE, and WINE because of their propensity to be associated with similar verbs like DRINK or POUR or nouns like GLASS (for more information, see Grefenstette, 1994).

REMOVE SINGLE WORD CLUSTERS - One way to extract potentially interesting knowledge from dendrograms is to focus on the aggregation of items at an early stage of the clustering process. However, when clustering hundreds or thousands of items, the identification of those items requires the user to scroll through a very long dendrogram which includes many clusters of isolated items. Enabling this option simplifies the use of the dendrogram by hiding all single item clusters and allowing one to concentrate only on the strongest associations. Setting this option also removes isolated items from multi-dimensional scaling plots, greatly enhancing their value when analyzing a large number of items. Please note, however, that when this option is enabled, changing the number of clusters while viewing a 2-D or 3-D MDS plot will cause the program to recompute the distance and location of remaining items.

REAL TIME ANIMATION - When this option is enabled, the multidimensional plots are updated after every iteration allowing the user to monitor the progress made during the analysis at the cost of higher computing time.

TOLERANCE - This option specifies the tolerance factor that is used to determine when the algorithm has converged to a solution. Reducing the tolerance value may produce a slightly more accurate result but will increase the number of iterations and the running time.

MAXIMUM ITERATIONS - This option allows one to specify the maximum number of iterations that are to be performed during the fitting procedure. If the solution does not converge to the limit specified by the TOLERANCE option before the maximum number of iterations is reached, the process is stopped and the results are displayed.

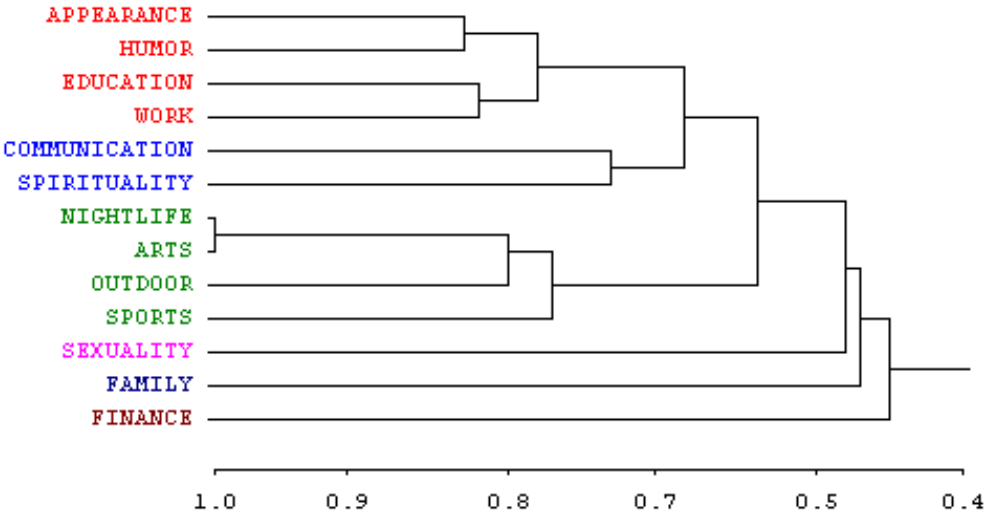
INITIAL CONFIGURATION - This option allows one to specify whether the multidimensional scaling will be applied on a random configuration of points or on the result of a classical scaling.

Selecting the **Classical Scaling** option instructs WordStat to perform a classical scaling first on the similarity matrix, and then use the derived configuration as initial values for the ordinal multidimensional scaling analysis.

Selecting the **Randomized Location** option instructs WordStat to perform the multidimensional scaling analysis on a random configuration of points. By default, WordStat initializes the random routine before each analysis with a new random value. The seed value used for the creation of this initial configuration is stored along with the final stress value in the history list box, located at the bottom of the dialog box. The **Seed** option may be used to specify a starting number that will be used to initialize the randomization process and produce a fixed random sequence. To recall a specific seed value used previously, double-click the proper line in the history list box.

Dendrogram

WordStat uses an average-linkage hierarchical clustering method to create clusters from a similarity matrix. The result is presented in the form of a dendrogram (see below), also known as a tree graph. In such a graph, the vertical axis is made up of the items and the horizontal axis represents the clusters formed at each step of the clustering procedure. Words or categories that tend to appear together are combined at an early stage while those that are independent from one another or those that don't appear together tend to be combined at the end of the agglomeration process.



NO CLUSTERS - This option allows you to set how many clusters the clustering solution should have. Different colors are used both in the dendrogram and in the 2-D and 3-D maps to indicate membership of specific items to different clusters. However, if the option to remove single item clusters is enabled, an increase in the number of clusters may in fact result in a decrease in the number of clusters displayed and in the overall height of the dendrogram since all single item clusters will be hidden.

DISPLAY - This option lets one choose whether the vertical lines of the dendrogram represent the agglomeration schedule or the similarity indices.

When clustering keywords or content categories, clicking this button displays bars beside each dendrogram item to represent their relative frequencies.

Use this button to increase the dendrogram font size and focus on a smaller portion of the tree.

Use this button to reduce the dendrogram font size and view a larger portion of the tree.

This button stores the cluster solution currently displayed into a new categorization dictionary where folders at the first level correspond to different clusters, and where each of those folders contains the associated words or expressions.

Press this button to append a copy of the graphic in the Report Manager. A descriptive title will be provided automatically. To edit this title or to enter a new one, hold down the SHIFT keyboard key while clicking this button (for more information on the **Report Manager**, see page 164).

This button allows storing the displayed dendrogram into a graphic file. WordStat supports three different file formats: .BMP (Windows bitmap files), .PNG (Portable Network Graphic compress files) and .JPG (JPEG compressed files).

To retrieve text segments or documents associated with a specific cluster, click anywhere on a cluster to select it (the selected cluster is displayed using thicker black lines), and then click this button to retrieve the associated documents. When performing first order clustering on keywords, this operation retrieves all text segments containing at least two keywords of the selected cluster .When performing second order clustering of keywords, all text segments containing a single one of those keywords will be retrieved.

The slide ruler provides another way of quickly changing the number of clusters included in the clustering solution. Moving the slider to the left increases the minimum distance required to form a cluster and thus produces a dendrogram with more clusters. Moving the slider to the right aggregates smaller clusters into bigger ones. However, if the option to remove single-item clusters is enabled, an increase in the number of clusters may, in fact, result in a decrease in the number of clusters displayed and in the overall height of the dendrogram.

Note: Clustering using other similarity or distance measures or agglomeration methods may be achieved using the MVSP cluster analysis procedure (see **Performing Multivariate Analysis**, page 162).

2-D and 3-D concept maps

The concept maps are graphic representations of the proximity values computed on all included keywords using multidimensional scaling (MDS). In those maps, a point represents an item (keyword or content category) and the distances between pairs of items indicate how likely those items are to appear together. In other words, items that appear close together on the plot usually tend to occur together, while words or categories that are independent from one other or that don't appear together are located on the chart far from each other. Colors are used to represent membership of specific items to different partitions created using hierarchical clustering. An option also allows one to vary the size of each data point in order to take into account the observed frequency of each item. The resulting maps are useful to detect meaningful underlying dimensions that may explain observed similarities between items.

Please note that since multidimensional scaling attempts to represent the various points into a two- or three-dimensional space, some distortion may result, especially when this analysis is performed on a large number of items. As a consequence, some items that tend to appear together or that are parts of the same cluster may still be plotted far from each other. Also, performing a multidimensional scaling on a large number of items usually produces a cluttered map that is hard to interpret. For these reasons, interpretation of concept maps may be feasible only when applied to a relatively limited number of items.

2-D and 3-D Map buttons and controls

NO CLUSTERS - This option allows the setting of the number of clusters that the clustering solution should have. Different colors are used both in the dendrogram and in the 2-D and 3-D maps to indicate membership of specific items to different clusters. The slide ruler located on the top toolbar of the dialog box may also be used to quickly change the number of clusters. Please note that when the **Remove single word clusters** option is enabled, changing the number of clusters either way often causes the program to recompute MDS maps to take into account the different number of items displayed.

The actual orientation of axes in the final solution is arbitrary. The map may be rotated in any way we want, as long as the distances between items remain the same. The rotating knob can be used to adjust the final orientation of axes in the plane or space in order to obtain an orientation than can be most easily interpreted.

Clicking this button enables to zoom in a plot. To zoom an area of the plot, hold the left mouse button and drag the mouse down/right. You'll see a rectangle around the selected area. Release the left mouse button to zoom

Clicking this button restores the original viewing area of the plot.

Clicking this button performs another multidimensional scaling on a new random configuration of points. This button is visible only when the initial configuration is set to Random Location.

This button is used to create a copy of the chart to the clipboard. When this button is clicked, a pop-up menu appears, allowing you to select whether the chart should be copied as a bitmap or as a metafile.

This button allows editing of various features of multidimensional scaling plots such as the appearance of value labels and data points, the chart and axis titles, the location of the legend, etc. (see Multidimensional Scaling Plot Options)

Pressing down this button creates a constrained multidimensional scaling. This mapping algorithm allows one to preserve the clustering structure in multidimensional scaling plots, making the interpretation of 2-D and 3-D MDS maps a lot easier and more consistent with the clustering solutions. Enabling this option allows one to use the MDS module to create maps of concepts similar to those suggested by Trochim, in its Concept Mapping procedure.

Pressing down this button displays lines to represent relationships between data points of the multidimensional scaling plot. When the button is down, a cursor will appear in a tool panel below the plot, allowing you to select the minimum association strengths to be displayed.

Clicking this button creates a bubble plot where the areas of data points are proportional to the relative frequency of those items. This type of display is especially useful when one needs to take into account a third variable, in this specific case the frequency of items, when interpreting the distance between data points.

Press this button to append a copy of the graphic in the Report Manager. A descriptive title will be provided automatically. To edit this title or to enter a new one, hold down the SHIFT keyboard key while clicking this button (for more information on the Report Manager, see page 164).

This button allows storing the displayed multidimensional scaling plot into a graphic file. WordStat supports four different file formats: .BMP (Windows bitmap files), .PNG (Portable Network Graphic compress files) and .JPG (JPEG compressed files) as well as .WSX a proprietary file format (WordStat Chart file). Charts stored in the latter format may be opened, further edited and customized using the Chart Editor external utility program.

Clicking this button allows you to print a copy of the displayed chart.

Clicking this button closes the Dendrogram & Concept Map dialog box and returns to WordStat's main window.

3-D Map buttons

This button can be used to show or hide left, bottom and back walls.

Clicking this button exchanges the data of the X, Y and Z axis.

Clicking this button draws anchor lines from the floor to the data point to better locate data points in all 3 dimensions.

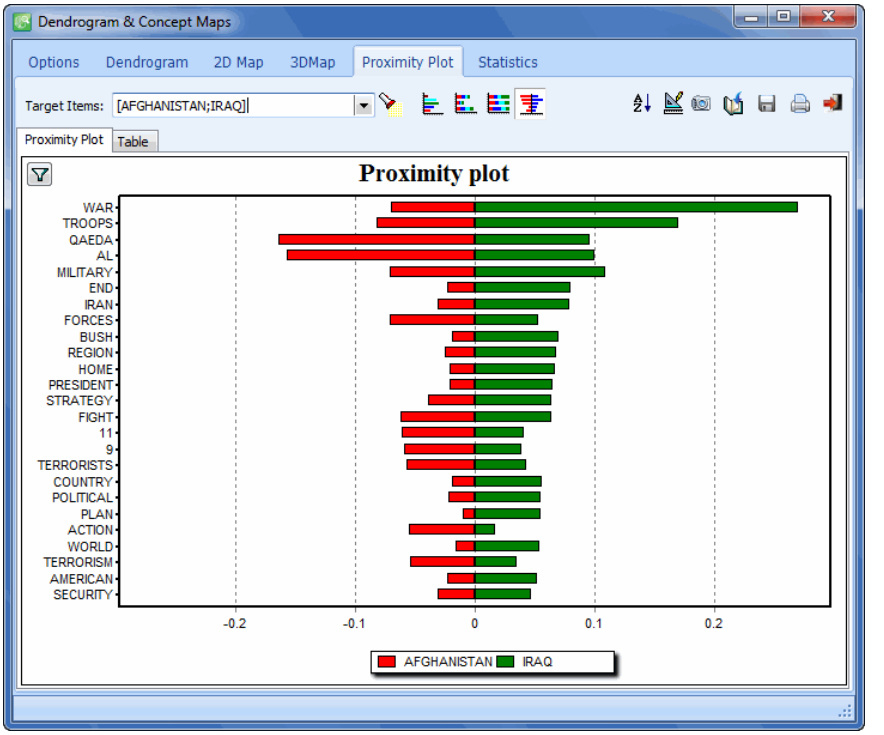
Clicking this button allows you to change the viewing angle of the chart. To rotate the chart, make sure this button is selected, click any area of the chart, hold the mouse button and drag the mouse to apply the desired rotation.

Locating a data point on the depth dimension of a 3-D plot can be very difficult especially when the plot remains static. One often has to rotate this plot constantly on the various axes to get an accurate idea of where the data point is located on this third axis. Clicking this button forces WordStat to rotate the plot automatically. To disable the automatic rotation, click a second time.

Proximity plot

Cluster analysis and multidimensional scaling are both data reduction techniques and may not accurately represent the true proximity of keywords or cases to each other. In a dendrogram, while keywords that co-occurs or cases that are similar tends to appear near each other, one cannot really look at the sequence of keywords as a linear representation of those distances. One has to remember that a dendrogram only specifies the temporal order of the branching sequence. Consequently, any cluster can be rotated around each internal branch on the tree without in any way affecting the meaning of the dendrogram. The best analogy here is to think of a Calder mobile. Different photos of such a mobile will yield different distances between hanging objects. While multidimensional scaling is a more accurate representation of the distance between objects, the fact that it attempts to represent the various points into a two- or three-dimensional space may result in distortion. As a consequence, some items that tend to appear together or be very similar may still be plotted far from each other.

The proximity plot is the most accurate way to graphically represent the distance between objects by displaying the measured from one or several target objects to all other objects. It is not a data reduction technique but a visualization tool to help one extracts information from the huge amount of data stored in the distance matrix at the origin of the dendrogram and the multidimensional scaling plots. In this plot, all measured distances are represented by the distance from the left edge of the plot. The closer an object is to the selected one, the closer it will be to the left.



To select a keyword or a case that will be used as the point of reference, one can choose from the KEYWORD or CASE drop down check list located at the top of the page. One can also freely browse through different keywords or cases by double-clicking its bar in the Proximity Plot. The co-occurrence or similarity to more than one target item may be displayed in a single chart allowing easy comparisons. When

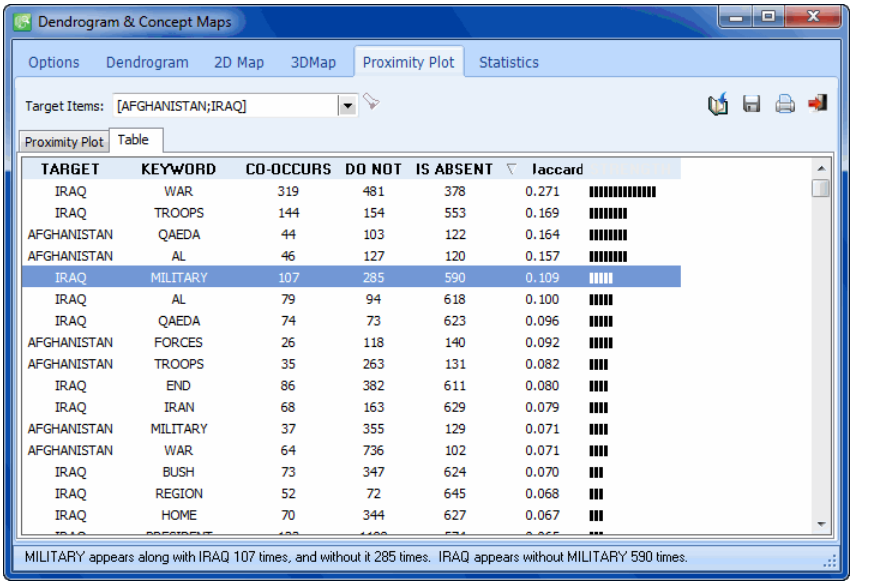
several target items are selected, the proximity plot may consist of bars clustered side by side (clustered bars), or stacked, representing either the total amount (stacked bars), or the relative distribution of scores (100 percent stacked bars). When two target items are selected, it is also possible to display the bars on both sides of a central axis like the sample chart above (mirrored bars).

By default, the chart displays the proximity of the target items to a maximum of 30 related items. Clicking the  button located in the upper left-hand corner of the chart, displays a dialog box that allows one to either manually choose items to be plotted, or to automatically select a specific number of items.

When looking at keyword co-occurrences, selecting a bar enables the  button. Clicking this button retrieves every document or text segment containing both keywords, allowing one to further explore the factors that may explain this co-occurrence. When examining the similarity of documents rather than keywords, clicking this button retrieves both documents and displays them side by side in a dialog box.

Right-clicking any existing bar displays a menu that allows one to remove the selected item, move it to the list of target items either by adding it to the existing bars or replacing one of them. One may also retrieve documents or text segment using this popup menu.

The **Table** page allows one to examine in more detail the numerical values behind the computation of those plots. When the distance measure is based on co-occurrences, the table provides detailed information, such as the number of times a given keyword co-occurs with another one (CO-OCCURS) and the number of times it appears in the absence of this selected keyword (DO NOT). Such a table also includes the number of time the selected keyword appears in the absence of the given keyword (IS ABSENT). In the example below (computed using the paragraph as the frequency criteria), we can see on the highlighted line that the word MILITARY co-occurs 107 times with IRAQ, but this word is encountered in 285 paragraphs without the word IRAQ, while IRAQ is found in 1,182 paragraphs in the absence of MILITARY. The Jaccard coefficient of 0.109 indicates that of all paragraphs containing either one of these words, 10.9 percent contains both words. Note, however, that not all proximity measures can be interpreted as easily. To facilitate the interpretation of this table, the status bar provides a textual interpretation of some of the statistics.



The following list provides a brief description of the buttons found on these two pages

Proximity plot controls

By default items in the proximity plot are sorted in descending order of proximity scores. Clicking this button sorts items in alphabetical order.

This button is used to create a copy of the chart to the clipboard. When this button is clicked, a pop-up menu appears, allowing one to select whether the chart should be copied as a bitmap or as a metafile.

This button allows editing of various features of the proximity plot, such as the appearance of value labels and bars, the chart and axis titles, and the location of the legend.

Proximity plot and proximity table controls

Press this button to append a copy of the chart or the proximity table in the Report Manager. A descriptive title will be provided automatically. To edit this title or to enter a new one, hold down the SHIFT keyboard key while clicking this button (for more information on the **Report Manager**, see page 164).

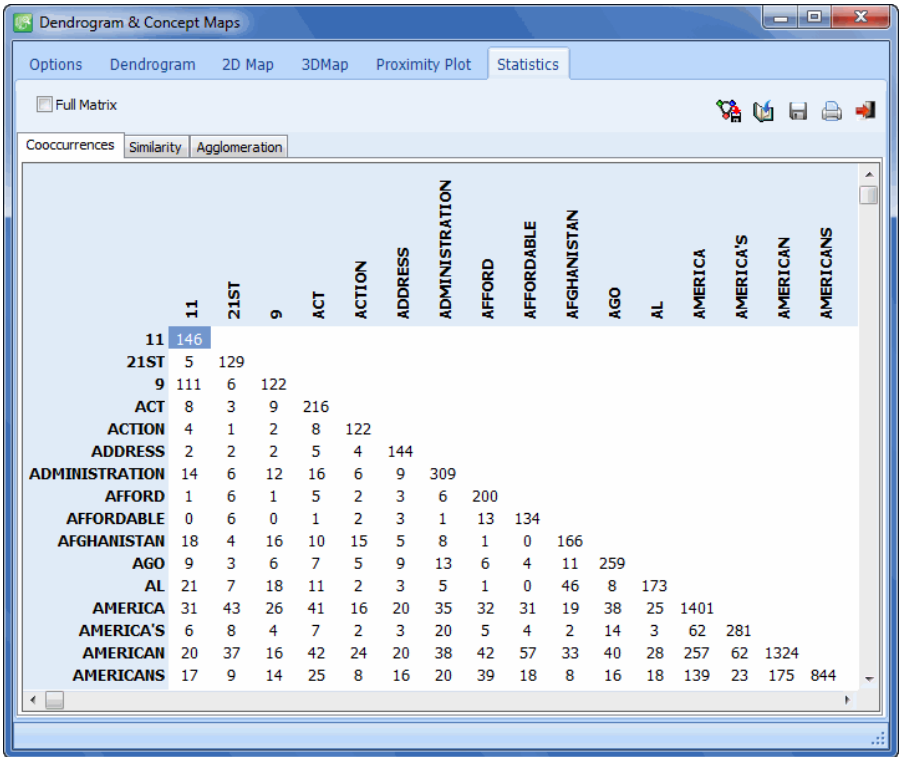
When the proximity plot is displayed, this button allows storing the chart on disk in one of the supported graphic file formats. When the proximity table is shown, the table can be saved to disk in an Excel, text delimited, XML, HTML or SPSS file.

Clicking this button allows you to print a copy of the displayed chart or table.

Clicking this button closes the Dendrogram & Concept Map dialog box and returns to WordStat's main window.

Statistics page

The **Statistics** page displays the co-occurrence and similarity matrices used for building the dendrogram, MDS plots, as well as the proximity plot and table.



	11	21ST	9	ACT	ACTION	ADDRESS	ADMINISTRATION	AFFORD	AFFORDABLE	AFGHANISTAN	AGO	AL	AMERICA	AMERICA'S	AMERICAN	AMERICANS
11	146															
21ST	5	129														
9	111	6	122													
ACT	8	3	9	216												
ACTION	4	1	2	8	122											
ADDRESS	2	2	2	5	4	144										
ADMINISTRATION	14	6	12	16	6	9	309									
AFFORD	1	6	1	5	2	3	6	200								
AFFORDABLE	0	6	0	1	2	3	1	13	134							
AFGHANISTAN	18	4	16	10	15	5	8	1	0	166						
AGO	9	3	6	7	5	9	13	6	4	11	259					
AL	21	7	18	11	2	3	5	1	0	46	8	173				
AMERICA	31	43	26	41	16	20	35	32	31	19	38	25	1401			
AMERICA'S	6	8	4	7	2	3	20	5	4	2	14	3	62	281		
AMERICAN	20	37	16	42	24	20	38	42	57	33	40	28	257	62	1324	
AMERICANS	17	9	14	25	8	16	20	39	18	8	16	18	139	23	175	844

The first two pages displays by default only the lower triangular part of the matrix of co-occurrence and similarity. Selecting the **Full Matrix** option will display data on both sides of the diagonal.

To export a matrix to social network analysis software tools:

- Select the matrix you would like to import by activating either the co-occurrences or the similarity page.
- Click the  button.
- In the **Save As Type** list box, select the file format under which to save the table. The following formats are supported: UCINET file (*.DL), Pajek Network file (*.NET), NetDraw file (*.VNA) and NetMiner file (*.SNF).
- Type a valid file name with the proper file extension.
- Click the **SAVE** button.

To append a copy of the table in the Report Manager:

- Click the  button. A descriptive title will be provided automatically for the table. To edit this title or to enter a new one, hold down the SHIFT keyboard key while clicking this button.

  For more information on the Report Manager, see the **Report Management Feature** (page 164).

To export the table to disk:

- Click the  button. A Save File dialog box will appear.
- In the **Save As Type** list box, select the file format under which to save the table. The following formats are supported: ASCII file (*.TXT), Tab delimited file (*.TAB), Comma delimited file (*.CSV), MS Word (*.DOC), HTML file (*.HTM; *.HTML), XML files (*.XML) and Excel spreadsheet file (*.XLS).
- Type a valid file name with the proper file extension.
- Click the **SAVE** button.

To print the table:

- Click the  button.

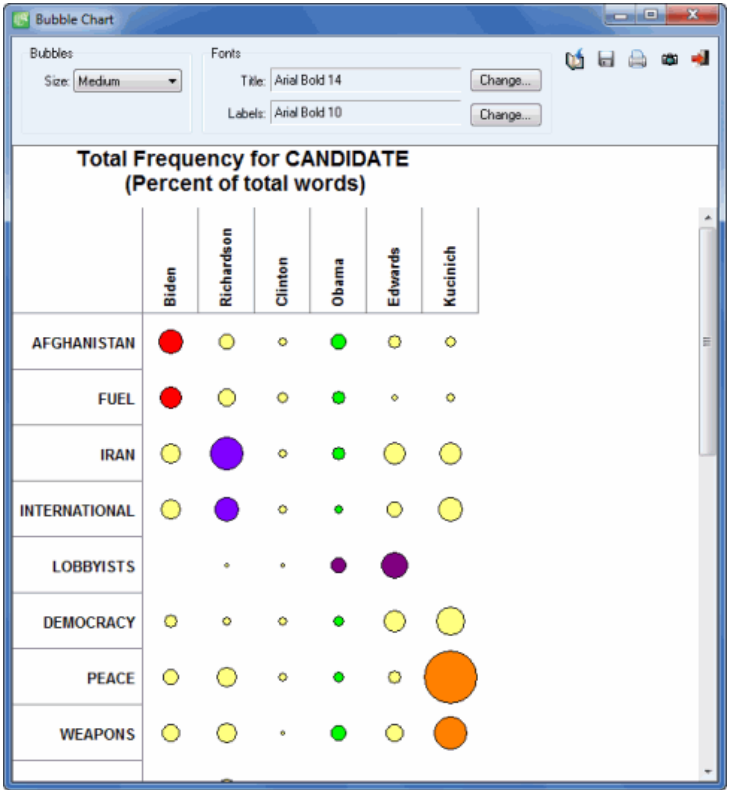
Creating Bubble Chars

Bubble charts are graphic representations of contingency tables where relative frequencies are represented by circles of different diameters. This type of graphic chart allows one to quickly identify high- and low-frequency cells and is thus especially useful for presentation purposes. Many features of the chart can be customized to highlight specific findings. Rows and columns can be moved freely or deleted, and one can adjust the color of each cell as well as the fonts used in the chart.

The bubble chart represents graphically the underlying table and displays the corresponding measure used (code occurrences or frequencies, word counts or percentages) and will also reflect the currently selected display settings (such as count, percentage of rows or columns, etc.).

To create a bubble chart:

- Move to the CROSSTAB page.
- Set the **Tabulate** option to either **Case Occurrence** or **Total Frequency**.
- Set the **With** option to the desired independent variable.
- Set the **Display** option to specify how this information will be displayed.
- Click the  button. A dialog box similar to this one will appear:



To adjust the size of the bubbles

- In the **Bubbles** group box at the top of the window, adjust the Size option to **Small**, **Medium** or **Large**.

To adjust the color of the bubbles

- Select the cell or group of cells you would like to alter.
- Right click and select the SET COLOR command. A dialog box will appear letting you choose a specific color value.

To move a row or a column

- Click anywhere on the cell header containing the row or column label and hold the mouse down.
- Drag the mouse cursor over the desired new location and release the mouse button.

To delete selected rows or columns

- Select a cell range covering the rows or columns you would like to delete.
- Right-click to display a popup menu.
- Select the REMOVE command and then choose SELECTED ROWS or SELECTED COLUMNS depending on your desired action.

To adjust the font size and style of the title and labels

- Click the **Change** button beside the **Title** or **Labels** options. A **Font setting** dialog box will appear, letting you change the font, the font size, style, and color.

To edit the title

- Click anywhere in the title region and type in the new title. The height of the title region is automatically adjusted to the number of lines in the title.

The following table provides a short description of additional buttons:

Press this button to append a copy of the chart in the **Report Manager**. A descriptive title will be provided automatically. To edit this title or to enter a new one, hold down the SHIFT keyboard key while clicking this button (for more information on the **Report Manager**, see page 164).

Click this button to save a chart on disk. Charts may be saved in BMP, JPG or PNG graphic file format or may be saved in a proprietary format (.WSX file extension) that can later be edited and customized using the Chart Editor.

Clicking this button allows you to print a copy of the displayed chart.

This button creates a copy of the chart to the clipboard. When this button is clicked, a shortcut menu appears allowing you to select whether the chart should be copied as a bitmap or as a metafile.

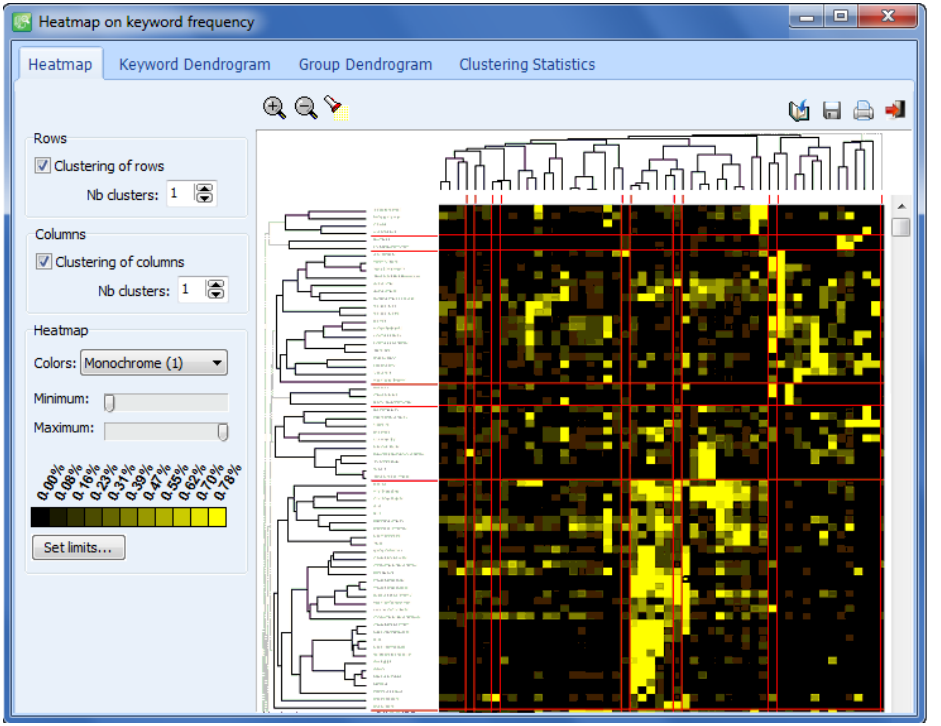
Pressing this button closes the chart dialog box and returns to WordStat's main screen

Using Heatmap Plots

Heatmap plots are graphic representations of crosstab tables where relative frequencies are represented by different color brightness or tones and on which a clustering is applied to reorder rows and/or columns. This type of plot is commonly used in biomedical research to identify gene expressions. When used for text mining, such an exploratory data analysis tool facilitates the identification of functional relationships between related keywords and group of values of an independent variable by allowing the perception of cells clumps of relatively high or low frequencies or of outlier values.

The heatmap plot implemented in WordStat allows one to graphically examine the relationship between keywords (rows) and values of an independent variable (columns). While the clustering available through the WordStat Frequency (see **Hierarchical Clustering and Multidimensional Scaling**, page 100) is performed on individual cases and documents, the clustering analyses used in the heatmap plot are performed directly on the crosstabulation tables. As a consequence, the similarity index computed for two keywords and used for clustering does not represent their co-occurrences within cases but measures the similarity of their distribution among the various groups of the independent variable. Likewise, two subgroups defined by values on the independent variable will be considered near to each other if the distributions of keywords in those two groups are similar.

The heatmap plot can be performed either on keyword frequency or occurrences within cases (present or absent). For both types of analysis, the observed frequency is transformed into a percentage by dividing the frequency by either the total number of words in a specific subgroup (keyword frequency) or by the total number of cases in this subgroup (case occurrences).



To create a heatmap:

In the WordStat main window, move to the crosstab page.

- Set the TABULATE option to either Keyword Frequency or Case Occurrence.
- Set the WITH option to the desired independent variable.
- Click the  button.

HEATMAP PAGE

The main section to the right of this page has shown in the screen shot below, displays the heatmap grid representing the relative frequencies of each cell (row and column intersection) using different brightness or color tones. Optional dendrograms are displayed at the top and to the left margin of this grid. The size of these dendrograms may be adjusted by moving the mouse cursor over the bottom edge (upper dendrogram) or the right edge (dendrogram on the left) of the dendrogram and dragging its limit to the desired size.

The font size used to display the row and column values may also be adjusted by clicking the  or  buttons located on the top toolbar. The size of cells and the distance between dendrogram leaves are automatically adjusted to the new font size.

To identify which specific cases or text documents are associated with a cell or group of cells, simply select the rectangular area for which you would like to obtain such a list, click the  button and select documents, paragraphs or sentences. WordStat locates the documents or text segments associated with those cells and displays them in the **Keyword Retrieval** dialog box (see page 95).

ROWS OPTIONS GROUP

Clustering of rows - Enabling this option reorders the rows according to the result of a cluster analysis and display a dendrogram at the left of the heatmap plot. Keywords that are distributed across the various subgroups in a similar way will tend to be grouped under the same cluster.

Sort by - When the clustering of keywords is disabled, rows may be sorted in alphabetical order, in descending order of frequency or case occurrence or displayed in their original categorization dictionary order.

No Clusters - This option allows setting how many clusters the clustering solution should have. When two clusters or more are selected, horizontal red lines are drawn in the heatmap to delineate those clusters.

COLUMNS OPTIONS GROUP

Clustering of columns - Enabling this option reorders the columns according to the result of a cluster analysis and display a dendrogram at the top of the heatmap. Columns with similar distribution of keywords will tend to be grouped under the same cluster. When the clustering option is disabled, the columns are presented in their ascending order of values. Disabling the clustering of columns is especially useful to preserve the ordinal nature of the values. For example, when looking for a relationship between some words or keywords and publication years, then disabling the clustering of columns will automatically sort those columns in chronological orders allowing the identification of temporal trends.

No Clusters - This option allows setting how many clusters the clustering solution should contain. When two clusters or more are selected, vertical red lines are drawn in the heatmap to delineate those clusters of keywords.

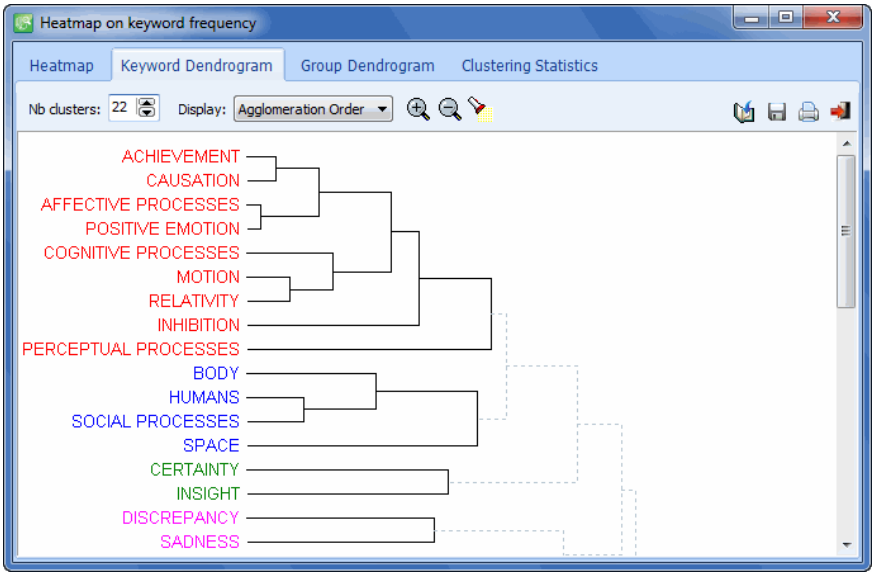
HEATMAP OPTIONS GROUP

Colors - The colors list box allows the selection of various color schemes to represent differences in percentages. Monochrome schemes will express differences using levels of brightness of a single color where black always represents the lower limit of the selected range. Multicolor spectrums may be used to represent greater nuances in the selected range of percentages.

Minimum / Maximum - The minimum and maximum slide bars allows the setting of the range of values that will be used to display variations of color tones or brightness. By default, the minimum value is set to zero while the maximum value is set to the highest observed percentage. To increase the contrast at a specific location of this range, minimum and maximum limits may be adjusted. All cells with values lower than the minimum will be represented with the color located on the left end of the selected color spectrum while cells with percentages higher than the maximum limit will be displayed with the color locate to the right end of this spectrum. Reducing the range of values increases the contrast in a specific region of percentage values.

KEYWORD AND GROUP DENDROGRAM PAGES

The second and third pages of the heatmap dialog box allow a more detailed examination of the clustering of words or categories (Keyword Dendrogram) and of all values on the independent variable (Group Dendrogram). WordStat use an average-linkage hierarchical clustering method to create clusters from a similarity matrix. The result is presented in the form of a dendrogram (see below), also known as a tree graph. In such a graph, the vertical axis is made up of the items and the horizontal axis represents the clusters formed at each step of the clustering procedure. Items that tend to be distributed similarly within the other variable appear together are combined at an early stage while those that have dissimilar distributions tend to be combined at the end of the agglomeration process.



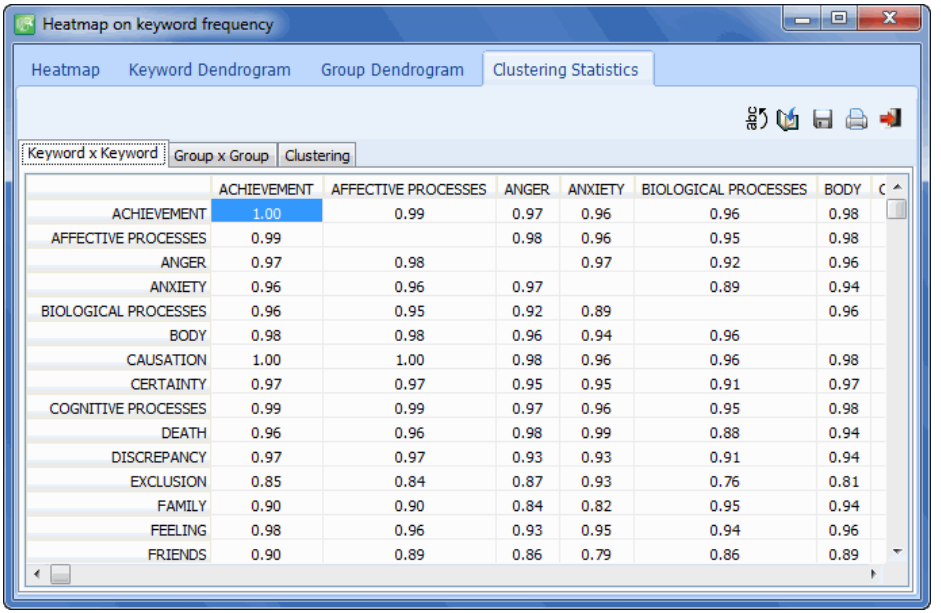
No Clusters - This option sets how many clusters the clustering solution should have. Different colors are used in the dendrogram to indicate membership of specific items in different clusters.

Display - This option sets whether the vertical lines of the dendrogram represents the agglomeration schedule or the similarity indices.

At times, it is desirable to see some areas of a dendrogram. The  and  buttons may be used to zoom in or out of the dendrogram.

CLUSTERING STATISTICS PAGE

The fourth page of the heatmap dialog box allows the close examination of the matrices of similarities among keywords or among groups as well as the statistics associated with the agglomeration processes of both the keywords and the groups.



	ACHIEVEMENT	AFFECTIVE PROCESSES	ANGER	ANXIETY	BIOLOGICAL PROCESSES	BODY
ACHIEVEMENT	1.00	0.99	0.97	0.96	0.96	0.98
AFFECTIVE PROCESSES	0.99		0.98	0.96	0.95	0.98
ANGER	0.97	0.98		0.97	0.92	0.96
ANXIETY	0.96	0.96	0.97		0.89	0.94
BIOLOGICAL PROCESSES	0.96	0.95	0.92	0.89		0.96
BODY	0.98	0.98	0.96	0.94	0.96	
CAUSATION	1.00	1.00	0.98	0.96	0.96	0.98
CERTAINTY	0.97	0.97	0.95	0.95	0.91	0.97
COGNITIVE PROCESSES	0.99	0.99	0.97	0.96	0.95	0.98
DEATH	0.96	0.96	0.98	0.99	0.88	0.94
DISCREPANCY	0.97	0.97	0.93	0.93	0.91	0.94
EXCLUSION	0.85	0.84	0.87	0.93	0.76	0.81
FAMILY	0.90	0.90	0.84	0.82	0.95	0.94
FEELING	0.98	0.96	0.93	0.95	0.94	0.96
FRIENDS	0.90	0.89	0.86	0.79	0.86	0.89

Performing Correspondence Analysis

Correspondence analysis is a descriptive and exploratory technique designed to analyze relationships among entries in large frequency crosstabulation tables. Its objective is to represent the relationship among all entries in the table using a low-dimensional Euclidean space such that the locations of the row and column points are consistent with their associations in the table. The correspondence analysis procedure implemented in WordStat allows one to graphically examine the relationship between words or content categories and subgroups of an independent variable. The results are presented using a 2 or 3-dimensional map. Correspondence analysis statistics are also provided to assess the quality of the solution. WordStat currently restricts the extraction to the first three axes. This insures that the results remain easily interpretable. To further differentiate among some values of the independent variable, we recommend applying a filter to restrict the analysis to a subset of values.

The first two pages of the dialog box, provides graphical displays of correspondence maps. When the number of words or categories or the number of subgroups is less than four, only the 2-D Map page can be accessed. When the comparison is restricted to two groups of individuals, only one axis can be extracted. In this situation, the axis is plotted diagonally in the two-dimensional space. We have done this mainly for readability reasons: plotting all the keywords on a single horizontal axis would have produced a cluttered list of keywords that would have made the graph useless.

The 2-D correspondence plot offers the ability to remove a keyword or a class of the independent variable and to automatically recompute the analysis on the remaining items. It also allows one to obtain a KWIC table or perform a keyword retrieval for a specific keyword. To perform any of these operations, simply click the desired item to display a popup menu and choose the proper command. If more than one item is close by the mouse click, the menu will offer the possibility to choose on which keyword or class the operation should be performed.

You will find immediately below a description of the various controls in the dialog box, followed by some guidelines for interpreting correspondence plots.

2-D Map control

PLOT When more than two axes have been extracted, this control allows you to select all the possible axe combinations that can be graphed on the two axes of the plot.

2-D and 3-D Map Controls

Words This checkbox allows you to display or hide the row points (i.e., words or category names)

Groups This checkbox allows you to display or hide the column points (i.e., subgroup labels).

Clicking this button enables to zoom in a plot. To zoom an area of the plot, hold the left mouse button and drag the mouse down/right. You'll see a rectangle around the selected area. Release the left mouse button to zoom

Clicking this button restores the original viewing area of the plot.

Items distributed in a very similar way among subgroups of the categorical variables may be plotted on top of each other, making them hard to differentiate. Clicking down this button adds some random noises to the location of individual words or keywords, allowing one to clearly identify those that overlap. To remove the random noises, click the button again.

Moving this slider allows the adjustment of the scaling used to plot groups or classes of the categorical variable on the correspondence plot. While the positions of keywords and groups relative to the origin of the axes are significant, it is important to remember that the scaling used for keywords and groups are independent from each other. This slider may thus be used as a reminder of this fact. It may also be used to increase the readability of some plots, by moving group names so that they do not overlap keyword names.

Clicking this button brings up a dialog box to customize the appearance of the correspondence plots (click here to obtain more information on the various settings that may be changed).

Press this button to append a copy of the correspondence plot in the Report Manager. A descriptive title will be provided automatically. To edit this title or to enter a new one, hold down the SHIFT keyboard key while clicking this button (for more information on the **Report Manager**, see page 164).

This button is used to create a copy of the chart to the clipboard. When this button is clicked, a pop-up menu appears, allowing you to select whether the chart should be copied as a bitmap or as a metafile.

Clicking this button allows you to print a copy of the displayed chart.

Clicking this button closes the Dendrogram & Concept Map dialog box and returns to WordStat's main window.

3-D Plot controls

This button can be used to show or hide left, bottom and back walls.

Clicking this button draws anchor lines from the floor to the data point to better locate data points in all 3 dimensions.

Clicking this button allows you to change the viewing angle of the chart. To rotate the chart, make sure this button is selected, click any area of the chart, hold the mouse button and drag the mouse to apply the desired rotation.

Locating a data point on the depth dimension of a 3-D plot can be very difficult especially when the plot remains static. One often has to rotate this plot constantly on the various axes to get an accurate idea of where the data point is located on this third axis. Clicking this button forces WordStat to rotate the plot automatically. To disable the automatic rotation, click a second time.

Interpreting correspondence analysis results

Interpretation of correspondence analysis maps can be somewhat tricky and should be made with great care, especially when examining the relationship between row points and column points. Here are some basic rules that should help you interpret such maps:

Relationship among words or categories (row points):

- The more similar is the distribution of a word or a content category among subgroups to the total distribution of all keywords within subgroups, the closer it will be to the origin. Words or categories that are plotted far from this point of origin have singular distributions.
- If two words or computed categories have similar distributions (or profiles) among subgroups of the independent variable (columns), their points in the correspondence analysis plot will be close together. For example, if the words consist of artist names and the studied subgroups represent different age groups, then if the form of the distribution of two different artists among those age groups is similar, then they will tend to appear near each other. Words with different profiles will be plotted far from each other. Please note however that two points may appear close to each other on a two or three axes solution, but may in fact be far apart when taking into account an additional dimension.

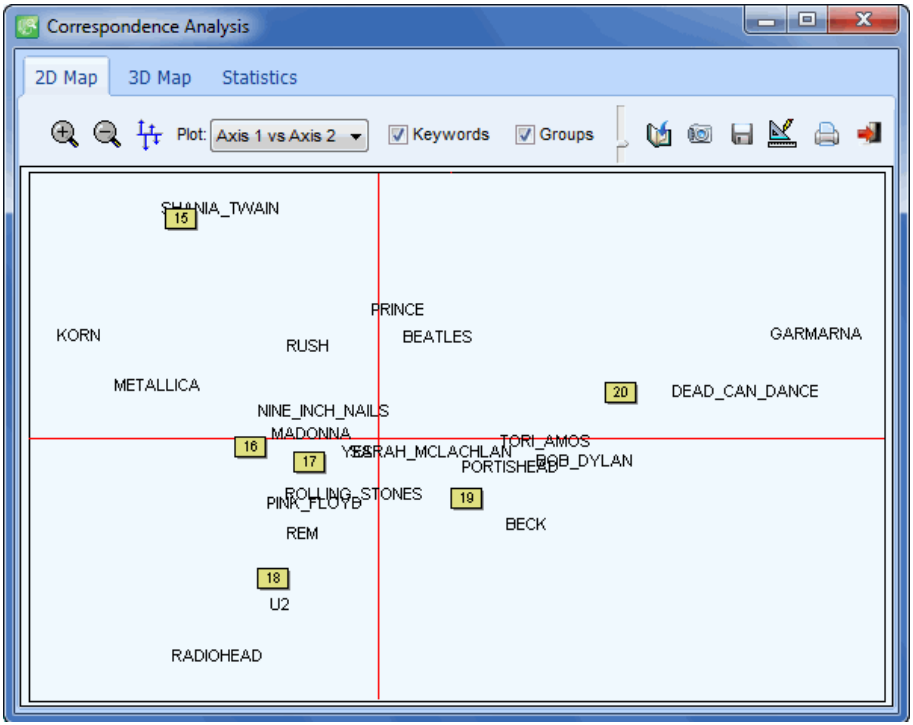
Relationship among subgroups (column points)

- The more singular a profile of words/categories for a subgroup is, compared to the distribution of those words/categories for the entire sample, the farther this subgroup will be from the point of origin.
- If two subgroups of individuals have similar profiles of word usage or content categories, they will be plotted near each other.
- Subgroups with different profiles will be plotted far from each other.

Relationship between words/categories and subgroups (row and column points):

- Great caution should be taken when interpreting the distances between two sets of points (row and column points). The fact that the name of a subgroup is near a specific word or content category should not necessarily be interpreted as an indication that they are closely related.
- While the distance between words or content categories and subgroups has no interpretable meaning, the angle between such a word point and a subgroup point from the origin is meaningful:
- An acute angle indicates that the two characteristics are correlated.
- An obtuse angle, near 180 degrees, indicates that the two characteristics are negatively correlated.

In the example below, REM, U2 and RadioHead could be viewed as related to 18 years old listeners. However, while both REM and U2 points are closer to the 18 years old subgroup, Radiohead should be identified as more characteristic of those listeners since it is farther from the origin.



- Words or categories closely associated with two subgroups will be plotted in an angle from the origin that will lie between those two groups. In the above example, the rock groups Korn and Metallica seem to be characteristics of both 15 and 16 years old listeners.

For a more comprehensive description of this method, its computation and applications, see Greenacre (1984). For an application of correspondence analysis to the analysis of textual data see Lebart, Salem, and Berry (1998).

Automated Text Classification

Automated text categorization is a supervised machine-learning task by which new documents are classified into one or several predefined category labels based on an inductive learning process performed on a set of previously classified documents. This machine-learning approach of classification has been known to achieve comparable if not superior accuracy than classification performed by human coders, yet at a very low cost in manpower. It has been used to automatically classify documents into proper categories or to find relevant keywords describing the content and nature of a document. It has also been used to automatically file or re-route documents or messages to their appropriate destinations, to classify newspaper articles into proper sections or conference papers into relevant sessions, to filter emails or documents (like spam filtering), or to route a specific request in an organization to the appropriate department. Automated text categorization may also be used to identify the author of a document of unknown or disputed authorship. For a good overview of automated text classification, see Sebastiani (1999).

The automated text categorization module in WordStat allows one to apply either Naive Bayes or K-Nearest Neighbors learning algorithms on an existing textual database in order to develop a categorization model (or classifier). The program also provides features to test the accuracy of the classification and to optimize the various parameters. Once optimized, the obtained classification model may be used immediately to classify uncategorized documents or may be saved on disk to be applied later outside WordStat using the WordStat Document Classifier utility program. The classifier may also be incorporated into a desktop or web application or within a document management system using the WordStat Software Developer's Kit.

The development and application of a text classifier often involve the following steps:

1. **Removal** of function words, words that appear in only a few documents and words that appear too often.
2. **Dimension reduction**, through lemmatization, stemming, categorization, word clustering or other dimension-reduction techniques.
3. **Feature selection**, which consists of a selection of terms based on their capability to discriminate between categories of documents.
4. **Training** the classifier on the train set.
5. **Testing** the accuracy of the classification on a test set.
6. **Applying** the classifier to new documents.

While the basic content analysis features of WordStat may be used to deal with the first two steps, the Automated Text Categorization dialog box allows one to accomplish tasks related to the last four steps. This dialog box consists of four pages:

- The **Select Features** page allows one to apply various feature selection methods to select a subset of terms to be used by the classifier.
- The **Learn & Test** page is the location where machine-learning algorithms are set and tested. This page also allows the storing of classification models to disk.
- The **History & Experiment** page keeps track of every learning test performed during a session allowing one to choose the best setting and algorithm for a specific classification task. It also gives access to a batch experiment dialog box that may be used to define numerous tests and perform them all at once.
- The **Apply** page is used to apply a classifier to an external document, a list of documents or to the current data file.

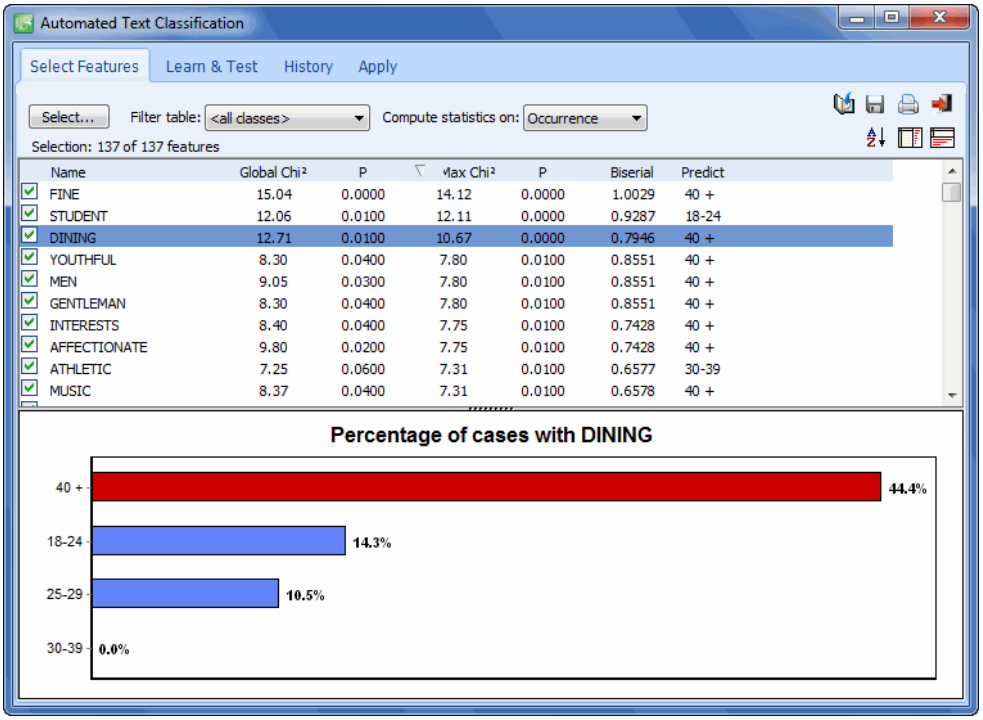
Accessing the Automated Text Classification dialog box

To develop a classifier for a specific categorical variable, first select this variable as the independent variable in SimStat and assign to the dependent list box one or several text variables on which the training will be performed. When running WordStat from QDA Miner, the categorical variable should be specified in the **In relation with** list box. Once in WordStat, set the various text processing options (such as the lemmatization, the exclusion and categorization lists, and all the other analysis options needed) to obtain the desired list of keywords or content categories. Then move to the **Crosstab** page and make sure the desired categorical variable is the one displayed in the **With** list box.

You may then access the Automated Text Classification dialog box by clicking the  button.

Select Features page

The Select Features page allows one to view the strength of the relationship between words, keywords or content categories and classes of the selected categorical variable. It also allows you to select a subset of items based on those statistics.



The strength of the relationship between an item and the classes of the categorical variable can be computed either on the occurrence (present or absent), on the frequency of items in each class, or on the percentage of words. To change the base statistic used for assessing differences among classes, set the Compute statistics on list to the proper option.

The discriminative strength of each item is assessed using three statistics and is presented in a table containing the following information:

Name	The word, keyword or content category.
Global Chi²	The overall chi-square value computed on all classes of the categorical variable.
P	The probability of the above chi-square value.
Max Chi²	The chi-square value computed on the class with the highest case occurrence or frequency against all the other classes.
P	The probability of the Max Chi² value.
Biserial	The biserial correlation computed between the class of the categorical variables with the highest case occurrences and the remaining classes. This coefficient assumes that the presence or absence of a class is determined by a trait normally distributed. Contrary to the standard correlation coefficient, this measure of association may yield a value lower than -1.0 or higher than +1.0.
Predict	Indicates the class in which the item most frequently occurs. When the highest case occurrence appears for more than one class, the column includes the labels of all those classes.

Clicking any column header sorts the table in ascending order of the data in that column. Clicking the same column header a second time sorts its content in descending order. The check boxes in the first column show, by default, that all items are to be included in the classification model. To manually remove an item, simply click in the box to remove the check mark.

The FILTER TABLE option allows one to display only the terms characteristic of a specific class. It may also be set to **<selected>** to display only items that have been selected for inclusion in the categorization model. To display all items set this option to **<all classes>**.

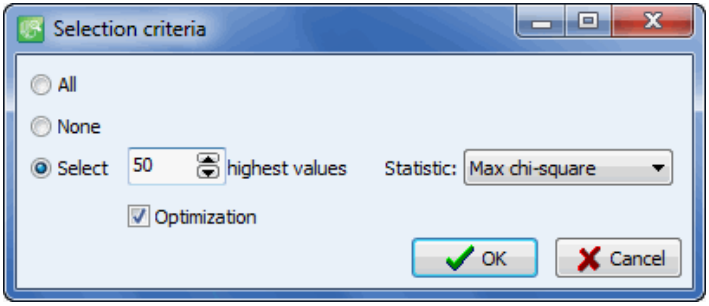
The lower portion of the page displays a bar chart with the percentage of cases in each class of the categorical variable containing the selected item. Classes are presented in descending order of case occurrence. This graph is synchronized with the above table so that changing the selected item in this table results in the display of the corresponding distribution chart.

To display the chart on the right-hand side of the table, click the  button. To bring the bar chart back to the bottom of the table, click the  button.

Performing Automatic Feature Selection

It has been shown that reducing the number of terms in classification models can reduce not only the cost of recognition by reducing the number of features that need to be collected, but also sometimes can improve the classification accuracy and can reduce the risk of overfitting. Several methods have been proposed to select a subset that yields the best performance for a specific classification system. WordStat allows one to apply a filter on available items in order to select a specified number of those based on the computed association with the classes to predict.

To access the feature selection dialog box, click the Select... button. The following dialog box will appear:



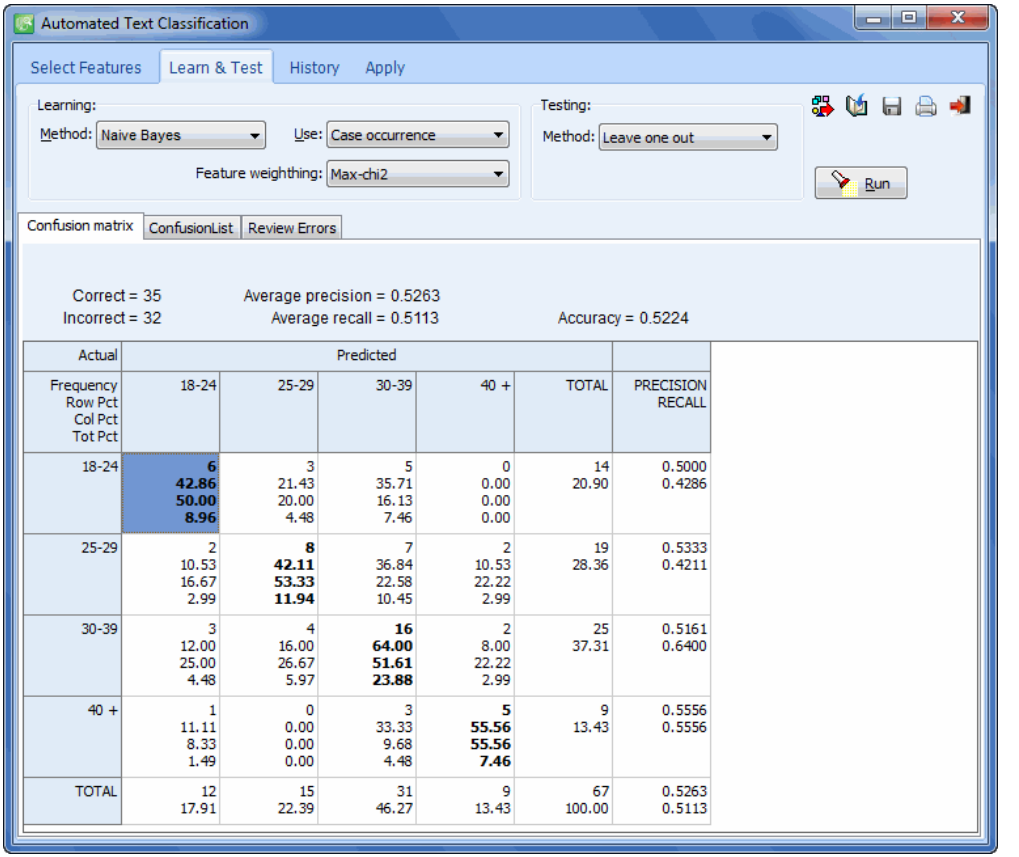
To include all items, set the selection criterion to **All** and click **OK.** To remove all the check marks beside the items, set the selection criterion to **None** and click **OK.** When the **Select** criterion is chosen, specify how many items should be selected and which statistic will be used to select them. Three statistics are available for performing such a selection: The global chi-square value, the max chi-square and the bi-serial correlation (see above for a description of these statistics). By default, the selection is performed by extracting items with the highest values on the selected statistic. Enabling the **Optimization** option instructs the program to apply a special algorithm that will take into account this statistic as well as current contrasts between classes. This option has been found in most situations to improve the performance of the classifier for an equal number of selected features.

To close this dialog box and apply the selection criteria, click **OK.** You may also leave this dialog box without affecting the current selection by clicking the **Cancel** button.

Once features have been selected, move to the Learn & Test page to select a learning algorithm and test it.

Learn & Test Page

The Learn & Test page is where machine-learning algorithms are chosen and tested and from which the classifier may be exported to disk.



Actual	Predicted					
Frequency Row Pct Col Pct Tot Pct	18-24	25-29	30-39	40 +	TOTAL	PRECISION RECALL
18-24	**6** **42.86** **50.00** **8.96**	3 21.43 20.00 4.48	5 35.71 16.13 7.46	0 0.00 0.00 0.00	14 20.90	0.5000 0.4286
25-29	2 10.53 16.67 2.99	**8** **42.11** **53.33** **11.94**	7 36.84 22.58 10.45	2 10.53 22.22 2.99	19 28.36	0.5333 0.4211
30-39	3 12.00 25.00 4.48	4 16.00 26.67 5.97	**16** **64.00** **51.61** **23.88**	2 8.00 22.22 2.99	25 37.31	0.5161 0.6400
40 +	1 11.11 8.33 1.49	0 0.00 0.00 0.00	3 33.33 9.68 4.48	**5** **55.56** **55.56** **7.46**	9 13.43	0.5556 0.5556
TOTAL	12 17.91	15 22.39	31 46.27	9 13.43	67 100.00	0.5263 0.5113

The panel at the top of the page allows one to select the machine-learning algorithm to use, set various analysis options and choose how the classification model will be tested.

Learning options

METHODS - Two machine-learning algorithms are available for text classification:

The **Naive Bayes** algorithm classifies text by estimating the probability of a class, given the presence or absence of specific words or keywords in the document to be classified. It first computes the probability of each term to occur in documents of specific classes in the training set. It then combines the probabilities associated with words found in the document to classify to estimate the probability that this document belongs to different classes. Finally, it assigns the document to the class with the highest probability. A multinomial Naive Bayes model has been chosen to handle both binomial and multinomial classification tasks as well as binary and numerical weights of items.

The **k-Nearest neighbor** classification method compares a document to be classified to all documents in the training set, retrieves the k most similar documents, and then assigns the new document to the most common classes in this retrieved set. This method is usually known to provide accurate classification when the training set is large enough, yet can be very time-consuming because of the need to compare and rank the entire training set for similarity with the test document. It also usually requires a larger storage space since it must keep frequency information for all documents in the training set rather than just a few classification rules or mathematical formulas like many other machine-learning methods. However, WordStat uses a very efficient K-NN algorithm that drastically improves the computing speed and reduces the disk space and memory requirement. When this method is chosen, an **NO** edit box appears below the Method list box, allowing one to set the number of similar documents on which this classification will be based. Values higher than 20 or 30 are typically used in text classification tasks.

USE - This option is used to select the item statistic to be used in training and classification. Choosing **Case Occurrence** results in the use of binary weights, indicating whether or not a word or keyword occurs in the document. Selecting **Keyword Frequency** allows one to use additional information related to how often this item occurs in each document. **Percentage of Words** and **Percentage of Keywords** provide two methods to normalize the obtained frequency to take into account the document length. Such normalization is performed by dividing the frequency either by the total number of words found in the document or the total number of keywords that have been extracted by WordStat.

FEATURE WEIGHTING - Feature weighting has been presented as an alternative to feature selection or as a way to further improve classification accuracy from selected item sets. This method consists of giving more weight to items that are rather good at differentiating documents from distinct classes and negligible weight to those that are distributed evenly among classes. The most frequently used weight in information retrieval is the TF*IDF measure where the frequency of an item is adjusted to take into account the number of documents containing this item. However, such a weighting can be considered to be only a crude approximation of the capacity of the item to differentiate documents from distinct classes. More accurate performance of the classifier can be expected from using a weight based on a more direct indicator of this discriminative capability such as the **Global Chi-square** or the **Max Chi²** described previously.

Testing Option

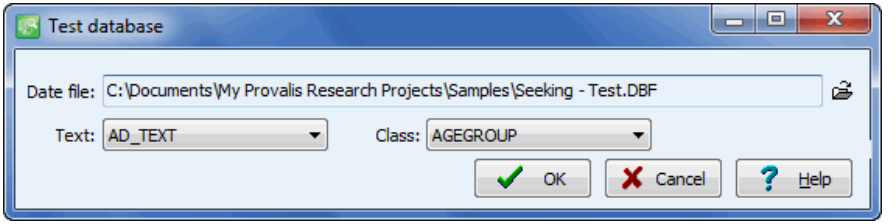
The evaluation of a classifier consists of measuring its effectiveness at classifying documents that have already been classified. Those documents should, however, not be part of the training set used to develop the classification model, since it would likely overestimate the real performance of the classifier. Yet, training a classifier on only a portion of the available training set may result in a less than optimal classifier. Cross-validation methods have been proposed as a compromise solution that allows one to develop a classification model on all the available documents in the training set yet provide a somewhat more realistic estimate of the classifier performance. WordStat offers three broad types of validation methods:

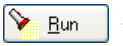
Leave-one-out - This cross-validation method consists of 1) removing a document from the training set, 2) developing a classification model on the remaining documents, 3) applying this model to predict the membership of this single document and 4) comparing the decision made by the classifier to the actual class to which this document belongs. This procedure is then repeated for each

document in the training set and the different decisions are combined to estimate the performance of the classifier. While this method logically involves the computation of a large number of models and may seem to be time consuming, in practice the classification model is computed only once but adjusted analytically to remove the contribution of the test document prior to its classification. This cross-validation method will often overestimate the performance of a classifier if the training set includes duplicate documents or if included documents are not totally independent from one another.

n-folds - This method consists of splitting the training set into smaller partitions and testing each partition on the classification performance obtained by a model developed on the remaining ones. For example, when using a five-fold cross-validation method, the training set is divided randomly into five subsets, each containing approximately 20% of the documents. For each subset, the program tests the accuracy obtained by a classification model developed on the remaining 80% of the original training set. The performances obtained on all five classifiers are then used to estimate the performance of the classifier computed on the full training set. WordStat provides a choice between five-fold, 10-fold and 20-fold cross-validation.

External file - A more conventional method for assessing the performance of a classifier is to test the accuracy of the classifier on an entirely different set of documents that have also been classified but are totally independent of the training set on which the categorization model is based. To perform such a test, WordStat requires the test set to be stored in a different data file. When this option is selected, an Open File dialog box is displayed allowing one to identify the file containing the external set. WordStat then displays a dialog box like the one below allowing one to choose the text variable containing the documents to be used for classification and the numerical variable containing the class to which this document belongs. Once set, click **OK** to return to the classification page.



Once the analysis options and the validation method have been set, click the 

button to perform the training and test the performance of the obtained classifier.

Results

A common way of assessing the accuracy of a classifier is by comparing the accuracy of predicted class membership against actual membership. Such information is provided by the **Confusion Matrix** where each predicted class is plotted against the actual class. Accurate predictions are plotted in the diagonal going from the top left to the bottom right of the table. Values in this diagonal are printed in bold characters for easy identification. Values in cells below or above this diagonal represent classification errors. Besides the actual number of documents in each cell, the table shows the row, column and total percentages. Row percentages represent the number of documents in a class that have been classified in a specific way, while column percentages express the percentage of a specific prediction actually belonging to a known class. This table may be used to identify which classes are the easiest or hardest to predict, as well as which classification errors are the most common. To facilitate comparisons across the classes of the categorical variable, two related statistics are printed on the right

of the table: **Precision** is the probability that documents identified as belonging to a class are correctly classified and **Recall** is the probability of documents in a class to be correctly identified.

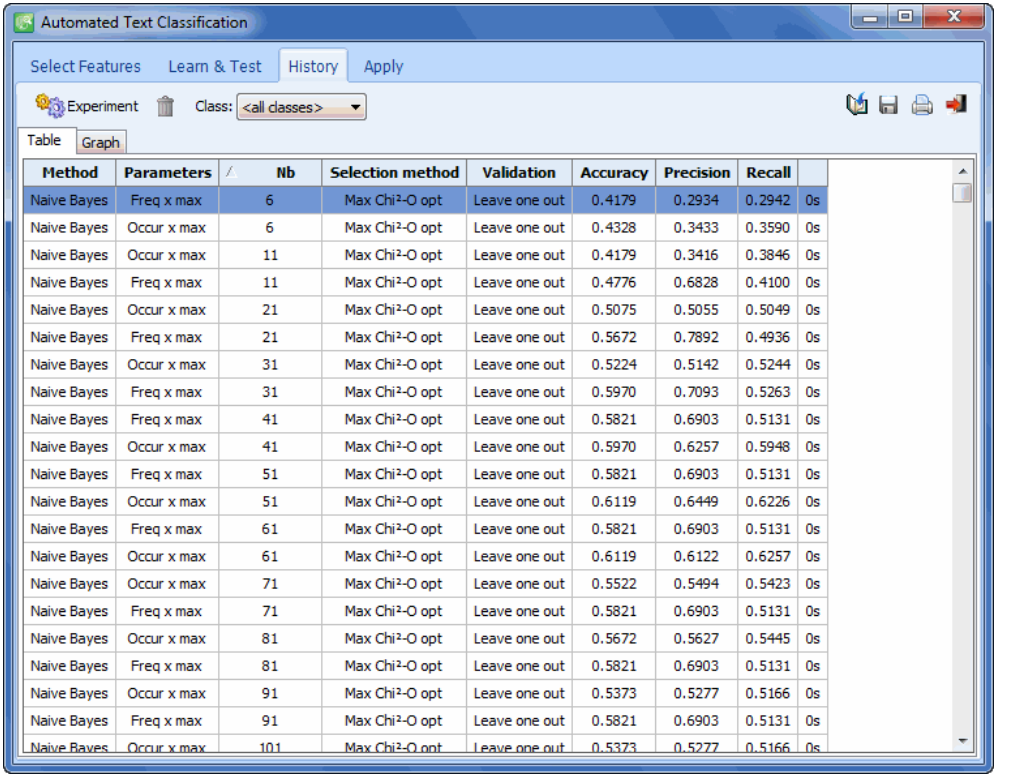
Several statistics are provided to assess the global performance of the classifier. The **Accuracy** measure is the proportion of documents correctly classified. It is considered a micro-average statistic since it gives equal weight to documents regardless of how they are distributed among classes of the categorical variable. The **Average Precision** and **Average Recall** measures are macro-average statistics obtained by computing the mean precision and recall obtained for every class.

The **Confusion List** page presents information already found in the confusion matrix but in the form of a single list that allows one to identify more easily the most common errors. The table may be sorted on the actual class of the documents, the predicted classification, the number of times such a classification error occurred, or the proportion of documents that have been misclassified this specific way. By default, the table is sorted in descending order of frequency. To sort the table on values in another column, simply click this column header. Clicking the same column header a second time sorts its content in descending order.

The **Review Errors** window displays a list of all documents that have been misclassified, allowing one to examine for each document the classification error made by the classifier as well as the computed values associated with every class of the categorical variable. A text window in the bottom of the list also allows one to review the text on which the classification has been made and potentially identify some of the reasons why the document had been misclassified.

History & Experiment Page

There is, unfortunately, no rule or rationale to help one chose a classifier and its options and parameters, nor to indicate how many or which items should be selected for inclusion in the development of a classification model. For this reason, the selection of classifiers and their optimization must rely on experimentation. In other words, in order to obtain the best classifier, one needs to perform numerous tests involving systematic variations of the various settings and compare the results. The **History** page offers a way to keep track of previously performed trials, the options used, as well as the obtained performances. From this page, one can also access an **Experiment** dialog box that provides a convenient way to define and run a large number of classification experiments on the same data set.

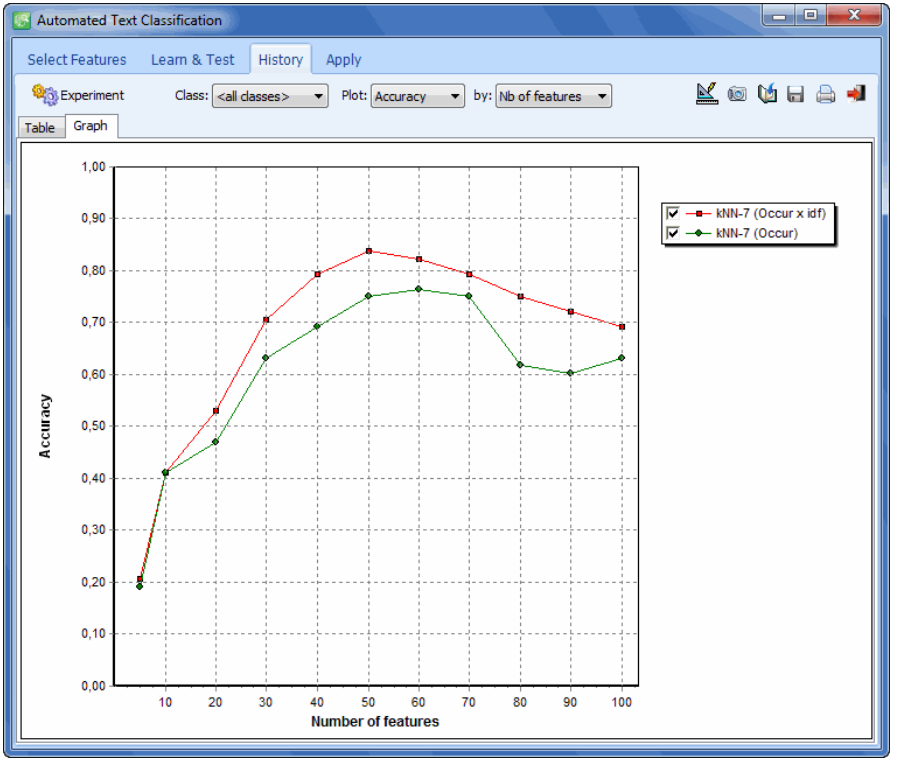


Method	Parameters	Nb	Selection method	Validation	Accuracy	Precision	Recall	
Naive Bayes	Freq x max	6	Max Chi²-O opt	Leave one out	0.4179	0.2934	0.2942	0s
Naive Bayes	Occur x max	6	Max Chi²-O opt	Leave one out	0.4328	0.3433	0.3590	0s
Naive Bayes	Occur x max	11	Max Chi²-O opt	Leave one out	0.4179	0.3416	0.3846	0s
Naive Bayes	Freq x max	11	Max Chi²-O opt	Leave one out	0.4776	0.6828	0.4100	0s
Naive Bayes	Occur x max	21	Max Chi²-O opt	Leave one out	0.5075	0.5055	0.5049	0s
Naive Bayes	Freq x max	21	Max Chi²-O opt	Leave one out	0.5672	0.7892	0.4936	0s
Naive Bayes	Occur x max	31	Max Chi²-O opt	Leave one out	0.5224	0.5142	0.5244	0s
Naive Bayes	Freq x max	31	Max Chi²-O opt	Leave one out	0.5970	0.7093	0.5263	0s
Naive Bayes	Freq x max	41	Max Chi²-O opt	Leave one out	0.5821	0.6903	0.5131	0s
Naive Bayes	Occur x max	41	Max Chi²-O opt	Leave one out	0.5970	0.6257	0.5948	0s
Naive Bayes	Freq x max	51	Max Chi²-O opt	Leave one out	0.5821	0.6903	0.5131	0s
Naive Bayes	Occur x max	51	Max Chi²-O opt	Leave one out	0.6119	0.6449	0.6226	0s
Naive Bayes	Freq x max	61	Max Chi²-O opt	Leave one out	0.5821	0.6903	0.5131	0s
Naive Bayes	Occur x max	61	Max Chi²-O opt	Leave one out	0.6119	0.6122	0.6257	0s
Naive Bayes	Occur x max	71	Max Chi²-O opt	Leave one out	0.5522	0.5494	0.5423	0s
Naive Bayes	Freq x max	71	Max Chi²-O opt	Leave one out	0.5821	0.6903	0.5131	0s
Naive Bayes	Occur x max	81	Max Chi²-O opt	Leave one out	0.5672	0.5627	0.5445	0s
Naive Bayes	Freq x max	81	Max Chi²-O opt	Leave one out	0.5821	0.6903	0.5131	0s
Naive Bayes	Occur x max	91	Max Chi²-O opt	Leave one out	0.5373	0.5277	0.5166	0s
Naive Bayes	Freq x max	91	Max Chi²-O opt	Leave one out	0.5821	0.6903	0.5131	0s
Naive Bayes	Occur x max	101	Max Chi²-O opt	Leave one out	0.5373	0.5277	0.5166	0s

Data from prior trials are presented either in the form of a table (Table page) or as a line chart (Graph page). Clicking any column header of the table sorts it in ascending order of the data in this column. Clicking the same column header a second time sorts its content in descending order. By default, the displayed statistics are computed for all classes of the categorical variable. To restrict the display of either the table or the line chart to statistics related to a single class, set the **Class** list box to the desired class. Setting this option to **<all classes>** brings back the micro- and macro-average statistics computed on all classes.

Data from specific trials may be deleted from the table by selecting their rows and clicking the  button.

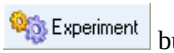
The Graph page allows one to compare the performance of various settings and the relationship between those settings using a line chart like the one shown below.



By default, the chart displays the relationship between accuracy and the number of features in the classification model. One may, however, examine the relationship between other parameters (such as precision versus recall) by changing the information plotted either on the horizontal or the vertical axis of the chart.

The following table provides a short description of buttons available:

Control	Description
	Press this button to save either the table or the chart on disk. The table may be saved to disk in Excel, plain ASCII, text delimited, or HTML Charts may be saved in BMP, JPG or PNG graphic file format or may be stored on disk in a proprietary format (.WSX file extension) that may later be edited and customized using the Chart Editor.
	Pressing this button prints a copy of the displayed table or chart.
	This button allows the editing of various features of the chart such as the left and bottom axis, the chart and axis titles, the location of the legend, etc.
	This button is used to create a copy of the chart to the clipboard. When this button is clicked, a pop-up menu appears allowing one to select whether the chart should be copied as a bitmap or as a metafile.
	Pressing this button closes the chart dialog box and returns to WordStat's main screen.

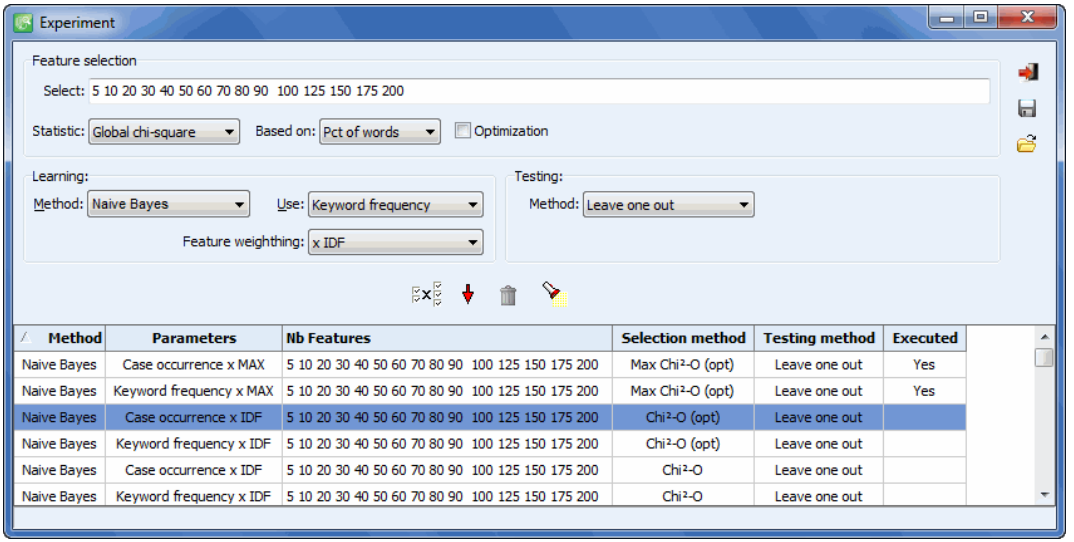
The History page also gives access to the **Experiment** feature where one can quickly perform a series of classification experiments. To access this feature click the 

button.

Classification Experiment Dialog Box

The Classification Experiment feature allows one to quickly perform a series of classification experiments in order to choose among classification methods, analysis settings and selected sets of items (or features).

To access this dialog box click the Experiment button. A dialog box similar to the one below will appear:



Method	Parameters	Nb Features	Selection method	Testing method	Executed
Naive Bayes	Case occurrence x MAX	5 10 20 30 40 50 60 70 80 90 100 125 150 175 200	Max Chi²-O (opt)	Leave one out	Yes
Naive Bayes	Keyword frequency x MAX	5 10 20 30 40 50 60 70 80 90 100 125 150 175 200	Max Chi²-O (opt)	Leave one out	Yes
Naive Bayes	Case occurrence x IDF	5 10 20 30 40 50 60 70 80 90 100 125 150 175 200	Chi²-O (opt)	Leave one out	
Naive Bayes	Keyword frequency x IDF	5 10 20 30 40 50 60 70 80 90 100 125 150 175 200	Chi²-O (opt)	Leave one out	
Naive Bayes	Case occurrence x IDF	5 10 20 30 40 50 60 70 80 90 100 125 150 175 200	Chi²-O	Leave one out	
Naive Bayes	Keyword frequency x IDF	5 10 20 30 40 50 60 70 80 90 100 125 150 175 200	Chi²-O	Leave one out	

The basic principle of this dialog box is to create a list of classification experiments involving different settings and then to instruct WordStat to perform all those experiments one after the other. Experiments first need to be defined in the upper part of the dialog box and then to be moved to the table of experiments located at the bottom of the dialog box. After several experiments have been defined and added to the list, one can execute all of them at once.

The first steps involve setting the experiment options. The Feature Selection option located at the top of the dialog box provides automatic feature selection options similar to those available from the first page of the document classification dialog box with only one exception: while the original dialog box allows one to select only one feature set size at a time, the current dialog box allows one to set numerous feature set sizes at once. For example, by entering the following string in the Select edit box:

50 100 150 200 300

five classification experiments will be performed using the same analysis settings but on features set sizes of 50, 100, 150, 200 and 300, picked out using the chosen selection method. For more information on the **Statistics, Based on** and **Optimization** option, see Performing Automatic Feature Selection (page114).

The Learning and Testing groups of options also provide similar settings as those available on the Learn & Test page. Please refer to this section for information on the available algorithms and options.

To add a classification experiment to the list:

- Set the various classification experiment settings.
- Click the  button to move the defined experiment to the list.

Clicking the  button displays a dialog box that allows one to quickly define numerous variations of the current classifier and to add all those at once to the list of experiments to be performed.

To remove an experiment from the list:

- In the list of previously added experiments, select the one to delete.
- Click the  button.

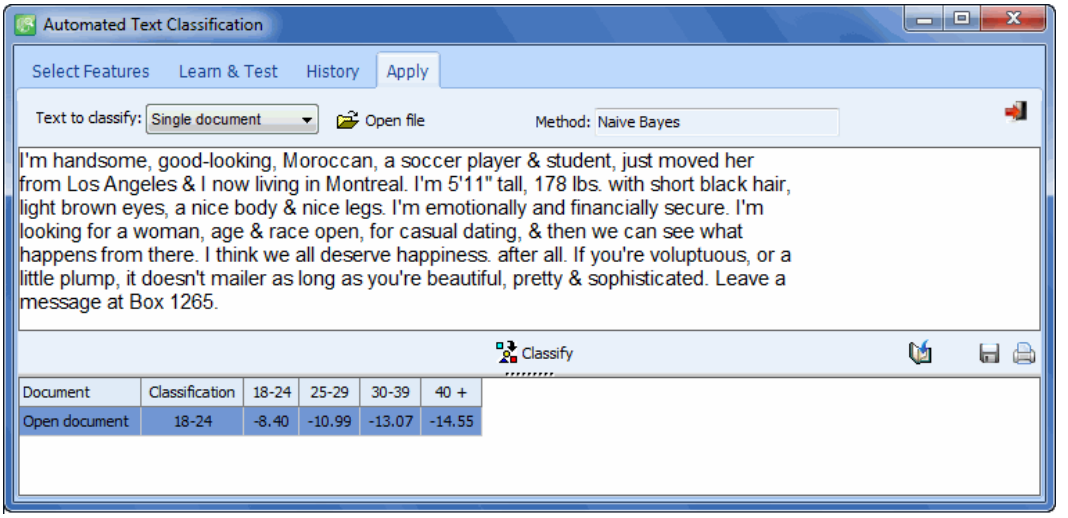
To run experiments in the list:

- Click the  button. The program performs all the experiments in the list that had not been executed before. Once an experiment is completed, the Executed column for this item is set to Yes preventing the program from executing the same experiments twice. Results of every experiment are automatically appended to the History page.

Click the  button to close the dialog box and return to the **History** page of the classification dialog box.

Apply Page

The Apply page allows one to use the most recently tested classifier to categorize either a single document, a list of files or documents stored in the current data file or another SimStat/QDA Miner data file. To perform similar tasks using previously saved classification models, use the WordStat Document Classifier utility program.



The document classification feature supports numerous file formats such as plain ASCII text files as well as HTML, Rich Text, MS Word, WordPerfect, Acrobat PDF files. Detailed results of classifications are displayed in a table at the bottom of the dialog box and may be either saved to disk or printed. When applied to the current database or another database, the automatic classification feature may be useful to categorize unclassified documents or to review existing classifications based on the results of the new classifier.

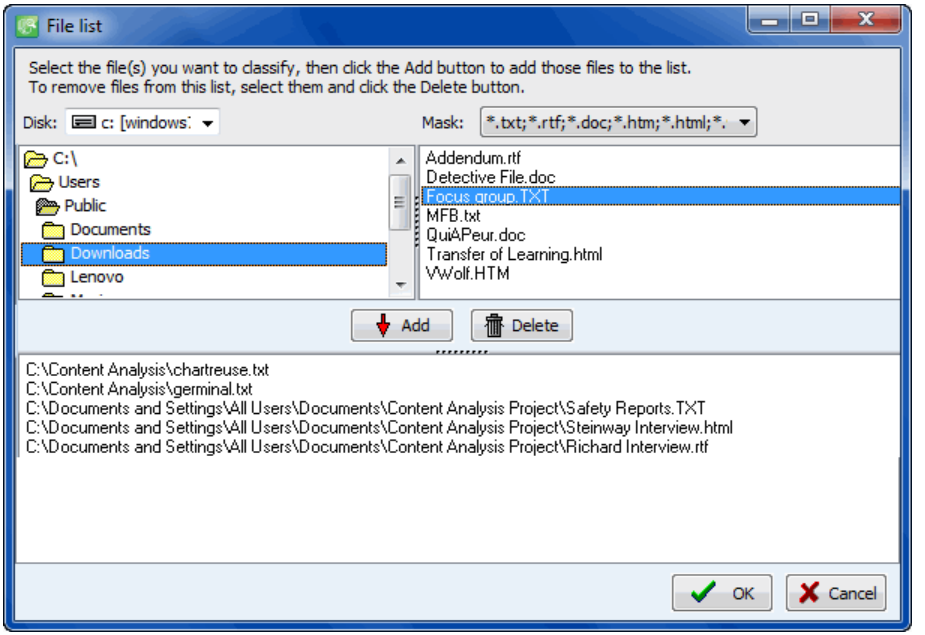
To classify a single document:

- Set the **Text To Classify** list box to **Single Document**.
- Click the **Open File** button to locate and import the file containing the text to be classified. You may also type directly in the text editing window or paste a text previously copied to the clipboard (by moving to the text editing window and pressing Ctrl-V).
- Click the **Classify** button to apply the current classifier to the displayed text.

To classify a list of documents:

- Set the **Text to Classify** list box to **List of Documents**.
- Click the **Edit List** button to display a dialog box like the one below that allows you to browse through your computer and select certain documents. You may add documents located in different folders by successively adding documents located in a specific folder and then moving

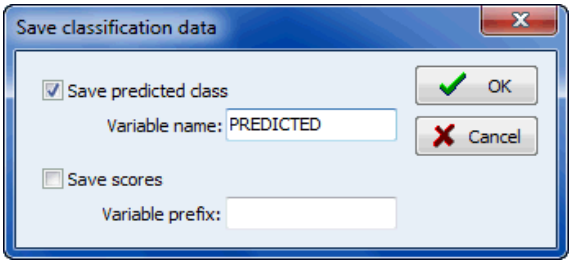
to a new location where the other documents are located. Click **OK** to confirm the changes to the file list.



- Click the **Classify** button to apply the current classifier to all documents in the list.

To classify documents in the current data file:

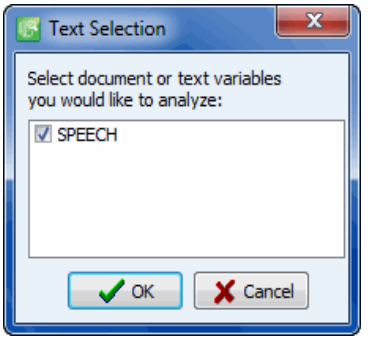
- Set the **Text to Classify** list box to **Current Data File**.
- Click the **Classify** button to apply the current classifier to all documents contained in the selected text variables. Please note that those are the same text variables used for developing the current classifier. However, some documents may have been ignored during the classification phase, either because they had been filtered out or because they had not been classified before and contained missing values in the categorical variable. Those documents, as well as all other previously classified documents, will be categorized by the current classifier and the result of this classification will be displayed in a result table.
- To store the predicted class or the computed score obtained for every class, click the  button. The following dialog box will appear:



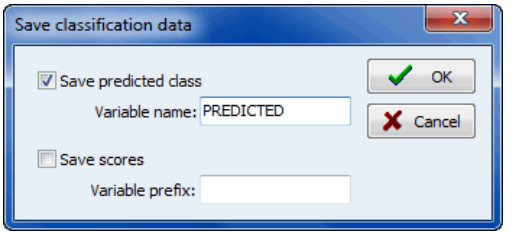
- To save the predicted class, put a check mark beside **Save Predicted Class** and enter a variable name.
- To save the scores associated with each class and upon which the classification has been made, put a check mark beside **Save Scores** and enter a variable prefix (up to 7 characters). Variable names are created by adding successive numeric values to this prefix. For example, if the edit box at the right of the **Variable Prefix** option is set to "CLASS_", the variable names will be CLASS_1, CLASS_2, CLASS_3, etc.
- If any one of the specified variables does not exist, WordStat will create new ones and store the numerical values associated with either the predicted class or the class scores. A confirmation dialog box will ask for confirmation of the creation of those new variables as well as the overwriting of any existing ones.

To classify documents in another data file:

- Set the **Text to Classify** list box to **External Data File**.
- Click **Open File** to locate the SimStat/QDA Miner data file containing the documents to be classified. A dialog box similar to the following one will appear:



- Select one or several text or document variables that will be used for classification purposes and click **OK**. The content of the data file is displayed in a table, while the text to be classified is displayed on its right. You can resize this text window by dragging its left border.
- Click the **Classify** button to apply the current classifier to all documents contained in the selected text variables.
- To store the predicted class or the computed score obtained for every class, click the  button. A dialog box similar to the following will appear:



- To save the predicted class, put a check mark beside **Save Predicted Class** and enter a variable name.
- To save the scores associated with each class and upon which the classification has been made, put a check mark beside **Save scores** and enter a variable prefix (up to 7 characters). Variable names are created by adding successive numeric values to this prefix. For example, if the edit box at the right of the **Variable Prefix** option is set to "CLASS", the variable names will be CLASS1, CLASS2, CLASS3, etc.
- If any one of the specified variables does not exist, WordStat will create new ones and store the numerical values associated with either the predicted class or the class scores. A confirmation dialog box will ask to confirm the creation of those new variables, as well as to overwrite any existing variables.

To export the table to disk:

- Click the  button. A Save File dialog box will appear.
- In the **Save as type** list box select the file format in which to save the table. The following formats are supported: ASCII file (*.TXT), Tab delimited file (*.TAB), Comma delimited file (*.CSV), HTML file (*.HTM;*.HTML), and Excel spreadsheet file (*.XLS).
- Type a valid file name with the proper file extension.
- Click the **Save** button.

Exporting a classifier to disk

Once developed and optimized, a document classification model may be saved to disk and later be used outside the WordStat main program to categorize new documents. The saved categorization model includes all word exclusion, extraction and categorization settings needed to accurately retrieve items used in the classification model as well as either the classification rules (Naive Bayes) or the keyword indexing of documents in the training set (K-Nearest Neighbors) needed to perform document classification.

To save the classifier on disk:

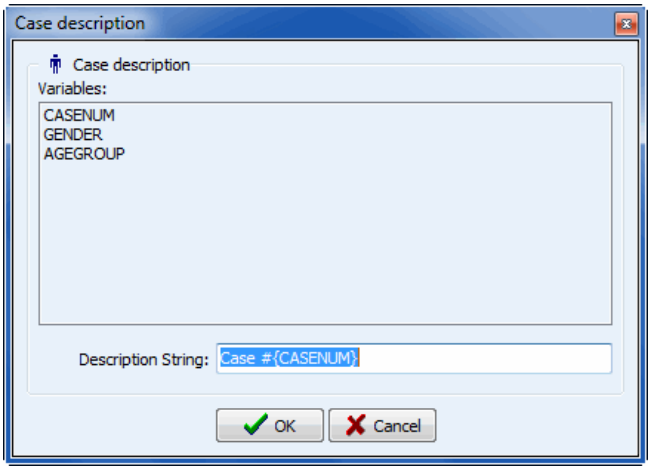
- Click the  button locate on the top of the **Learn & Test** page. A standard Save File dialog box will appear.
- Enter the file name under which you would like to save the classifier and then click the **Save** button. WordStat will automatically provide a .wclas file extension.

Document classifiers may be retrieved and applied to new documents using the **WordStat Document Classifier** utility program (see page 157). A special Software Developer's Kit (SDK) is also available (planned release date: Fall 2010) upon request from Provalis Research allowing any programmer to integrate WordStat categorization and classification technologies into one's own database or document management system (see page 161).

Editing the Case Descriptor

The EDIT CASE DESCRIPTOR command allows you to define a case descriptor that will be used to identify each case based on the values it contains in one or several variables. Such a string is used to identify cases when retrieving segments as well as when analyzing case similarities using clustering, multidimensional scaling or proximity plots.

This command can be accessed by clicking the  button in the upper left-hand corner of the main window. A dialog box similar to this one will appear:



This dialog box allows you to specify a label that will be used to describe each case. The label may be changed by editing the text in the DESCRIPTION STRING edit box. To insert the value stored in a specific variable into the description, simply enter the variable name in uppercase letters and enclose this name between braces. Alternatively, you can insert a variable name at the current caret location by clicking the corresponding item in the VARIABLES list located just above the edit box.

If you enter the following string:

{GENDER} subject - {AGE} years old

The {GENDER} and {AGE} strings will be replaced with their corresponding value for this specific case. If the current case contains information about a seventeen-years-old male, the above string will be displayed as:

Male subject - 17 years old

It is also possible to insert the following string:

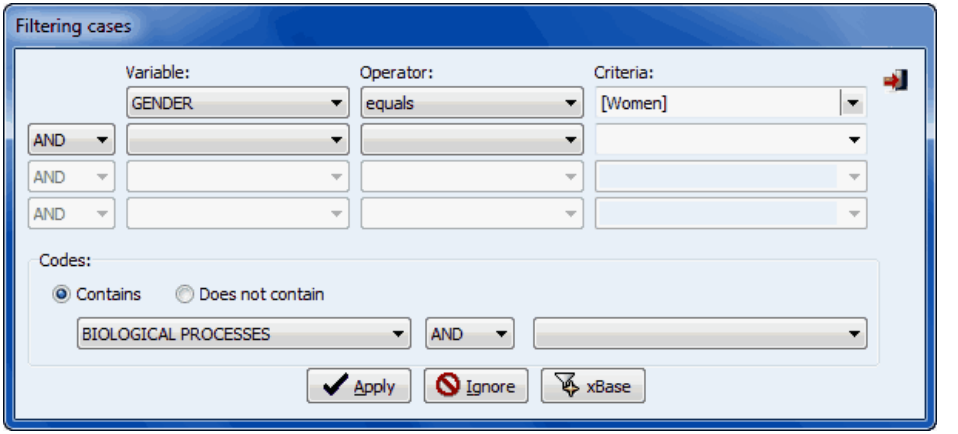
{CASENUM}

This string will display a unique case number, representing the physical order of this case in the project file.

Filtering Cases

The FILTER CASES command temporarily selects cases according to some logical conditions. You can use this command to restrict analyses to a subsample of cases or to temporarily exclude some group of subjects. Two types of filtering are available in WordStat: a basic filtering dialog box that provides some guidance for easily building filters, and a powerful xBase filtering tool that allows one to create more complex filtering expressions that contains more advanced mathematical functions, as well as Boolean and relational operators.

If no filtering expression has been set or if the current filtering condition is relatively simple, a dialog box similar to this one will be displayed:



This dialog box consists of two major sections. The upper section allows one to specify up to four filtering conditions joined by logical operators (such as AND, OR). Each condition consists of a variable, an operator and, if needed, some numerical, categorical or string values. The following table presents the various operators available for each data type.

DATA TYPE	**AVAILABLE OPERATORS**
NOMINAL / ORDINAL	Equals Does not equal Is empty Is not empty
NUMERIC and DATE	Equals Does not equal Is greater than Is lesser than Is greater than or equal to Is lesser than or equal to Is empty Is not empty
BOOLEAN	Is true Is false

STRING	Contains Does not contain Is empty Is not empty
DOCUMENT	Is empty Is not empty Is coded Is uncoded
IMAGE	Is empty Is not empty

The lower section allows one to filter cases based on the presence of words or phrases associated with specific content categories in the document being processed by WordStat. This section is disabled by default and becomes active as soon as a content analysis has been performed. The AND, OR and NOT Boolean operators are used to determine how those two categories should be combined.

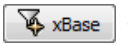
For example:

APPEARANCE AND ART	Selects only cases that contain words in both categories.
APPEARANCE OR ART	Selects cases that contain words in either one of these two categories.
APPEARANCE NOT ART	Selects all cases containing a word in category APPEARANCE but that do not contain any word found in the ART category.

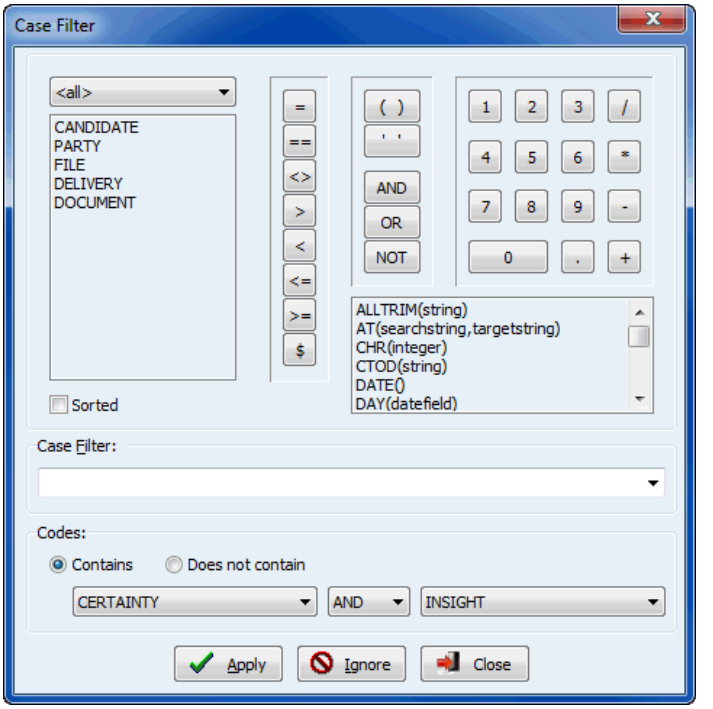
Once a filtering expression has been entered you can apply the filter and leave this dialog box by clicking the **Apply** button. If the filter expression is invalid, an error message will appear and exiting from the dialog box will not occur.

To temporarily deactivate the current filter expression, click the **Ignore** button. The filter expression will be kept in memory and may be reactivated by selecting the FILTER CASES command again and clicking Apply.

To exit from the dialog box and restore the previously active filtering expression, click the Close button.

A more advanced xBase filtering dialog box can be accessed by clicking the 

button. The filtering expression can be typed directly into the Filter edit box using the proper syntax, or one can use any element displayed in the upper part of the dialog box to build a valid expression. To obtain more information on expression operators and evaluation rules and supported xBase functions, see page 143.



You can directly type the filtering expression in the Case Filter edit box using the proper syntax, or use any elements displayed on the upper part of the dialog box to build a valid expression. To restore previously used filtering conditions, click the down arrow button located to the right of the Filter edit box.

The upper part of the Filter dialog box contains various elements to help you build a valid xBase filtering expression:

VARIABLE NAME LIST BOX - Double-clicking a variable name from the list box located to the left of the dialog box inserts that name in the edit box at the current caret position.

FUNCTION LIST BOX - A list of valid xBase expressions is displayed to the right of the dialog box. Double-clicking an xBase function in the list box, inserts that function at the current caret position. When a function requires one or several arguments, the argument section remains highlighted. To replace the highlighted text with a value, an expression or a variable name, simply type the proper text on the keyboard or select a variable name or function.

NUMERIC, BOOLEAN AND RELATIONAL OPERATORS BUTTONS - Clicking any relational or Boolean operation or on any numeric button inserts the corresponding symbol in the edit box at the current caret position.

The following section provides a description of xBase syntax rules used in the FILTER command and a detailed description of each xBase function.

Expression Operators and Rules

Operators used in xBase expressions are standard in every xBase dialect.

String Operators

+	Joins two strings. Trailing spaces in the strings are placed at the end of each string.
-	Joins two strings and removes trailing spaces from the string preceding the operator and places them at the end of the string following the minus sign operator.

Numeric Operators

+	Addition
-	Subtraction
*****	Multiplication
/	Division
^	Exponentiation (or **)

Relational Operators

=	Equal to
==	Exactly equal to
<>	Not equal to
#	Not equal to
!=	Not equal to
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to
$	Is contained in

Logical Operators (Notice the periods surrounding the operator)

AND	both expressions are true
OR	either expression is true
NOT	either expression is false

Evaluation Order

When more than one type of operator appears in an xBase expression, the order of evaluation is as follows: Expressions containing more than one operator are evaluated from left to right. Parentheses are used to change the evaluation order. If parentheses are nested, the innermost set is evaluated first.

Numeric operators are evaluated according to generally accepted arithmetic principles:

operators contained in parentheses
exponentiation
multiplication and division
addition and subtraction

Order of evaluation may be altered with parentheses:

```
3+4*5+6 = 29
(3+4)*5+6 = 41
(3+4)*(5+6) = 77
```

Logical operators are evaluated as NOT first, AND second, and OR last. Logical evaluation order may also be altered with parentheses. In multiple conditional expressions that contain the NOT operator, always use parentheses to enclose the NOT operator with the expression to which it applies.

Supported xBase functions

The following xBase functions are supported in the SORT CASES and FILTER CASES command

NOTE: Memo variable names are not allowed in xBase expressions.

ALIAS()

Returns the Alias name of the current work area as a string.

ALLTRIM (String)

Trims both leading and trailing spaces from a string. The string may be derived from any valid xBase expression.

`ALLTRIM("  Provalis  ")` returns 'Provalis'.

AT (SearchString, TargetString)

Determine whether a search string is contained within a target. If found, the function returns the position of the search string within the target string (relative to 1). If not found, the function returns 0 (zero).

`AT("gh", "defghij")` returns `4`.

CHR (Val)

Converts a decimal value to its ASCII equivalent.

`CHR(83)` returns 'S'

CTOD (String)

Converts a character string into an xBase date. The string must be formatted according to the Windows date format settings.

```
CTOD("12/31/94")
```

DATE ()

Returns the system date (today). Use `DTOC(DATE())` to retrieve today's date formatted according to the Windows settings.

DAY (DateVariable)

Returns the day portion of an xBase date as an integer.

DELETED ()

Returns True if the case is deleted and False if not deleted.

DESCEND (String)

An xBase function that inverts a key value using 2's complement arithmetic. The result of the operation is the arithmetic inverse of the key value. When inverted keys are sorted in ascending sequence, the result is in descending order. A filter expression could be

```
DESCEND(DTOS(billdate)) + CUSTNO
```

DTOC (DateVariable)

Converts an xBase date into a character string formatted according to the Windows settings. For example, if the date format was American and the date variable contained March 21, 1995, `DTOC(datevariable)` would return '03/21/1995'.

DTOS (DateVariable)

Converts an xBase date into a string formatted according to standard xBase storage conventions (CCYYMMDD). For example, December 21, 1993 would be returned as '19931221'. Indexes that contain date elements should use the `DTOS()` function, which naturally collates into oldest date first.

EMPTY (Variable)

Reports the empty status of any xBase variable. Character and date variables are empty if they consist entirely of spaces. Numeric variables are empty if they evaluate to zero. Logical variables are empty if they evaluate to False.

Memo variables that contain no reference to a memo block in the associated memo file are empty.

IF (Logical, True Result, False Result)

This is the immediate if function. If the Logical expression is true, return the True result, otherwise return the False result. The types of the True Result and the False Result must be the same (i.e., both numeric, or both strings, etc.) The logical expression must of course evaluate as True or False.

```
IF(DATE() - CTOD("12/31/93") > 0,"This Year", "Last Year")
```

IIF (Logical, True Result, False Result)

Supported exactly like `IF()` as noted above.

INDEXKEY ()

Returns the current index key as a string. (Same as `ORDKEY()`).

LEFT (String, Length)

Returns the leftmost characters of the expression for the defined length.

`LEFT("xyzabc", 3)` returns 'xyz'.

LEN (Expression)

Returns the length of the expression result as an integer.

LOWER (String)

Converts the string expression into lower case.

MONTH (DateVariable)

Returns the month portion of an xBase date as an integer.

ORDER ()

Returns the current index order as an integer.

ORDKEY ()

Returns the current index key as a string. (Same as `INDEXKEY()`)

PADC (String, Length, Character)

Centers the passed string between a number of the passed character to make the string the specified length.

```
'[' + PADC("Smith", 9 ,"-") + ']' returns '[--Smith--]'.
```

PADL (String, Length, Character)

Pads the passed string to the specified length with the specified characters. If the string is longer than the value specified by Length, the string is truncated to this length.

```
'[' + PADL("Smith", 8, "*" ) + ']' returns '[***Smith]'.
'[' + PADL("John Smith", 8, " " ) + ']' returns '[John Sc]'.
```

PADR (String, Length, Character)

Pads the passed string to the specified length using the specified character. If the string is longer than the value specified by Length, the string is truncated to this length.

```
'[' + PADR("Smith", 8, " " ) + ']' returns '[Smith   ]'.
'[' + PADR("John Smith", 8, " " ) + ']'  returns '[John Sc]'.
```

RAT (SearchString, TargetString)

Determine whether a search string is contained within a target, starting from the right side of the target string. If found, the function returns the position of the search string within the target string (relative to 1). If not found, the function returns 0 (zero).

`RAT( "ab", "abzaba" )` returns 4.

RECCOUNT ()

Returns the number of cases in the table as a long integer.

RECNO ()

Returns the current physical record number as a long integer.

RIGHT (String, Length)

Returns the rightmost characters of the expression for the defined length.

`RIGHT("xyzabc", 3)` returns `'abc'.`

SELECT ()

Returns the workarea number for the current work area as a long integer.

SPACE (Length)

Returns a string consisting entirely of spaces for the defined length.

STOD (String)

The inverse of `DTOS(). STOD()` converts a string formatted according to standard xBase storage conventions (CCYYMMDD) to an xBase Date formatted according to the Windows settings.

STR (Number, Length, Decimals)

Converts a number into a right-justified string with decimal digits following the decimal point. The total length of the string is defined by the length parameter. `STR(RECNO(), 5, 0)` is a common indexing element that ensures creation of unique keys if appended to another variable element.

An index key using this expression could be built with `NAME + STR(RECNO(),5,0)`

If the decimals parameter is omitted, the function defaults to zero decimal places. If the length parameter is omitted as well, the length of the result is the length of the variable.

STRZERO (Number, Length, Decimals)

Converts a number into a, zero-padded right justified string with decimals digits following the decimal point. The total length of the string is defined by the length parameter.

`STRZERO( 1234, 10, 2 )` returns `'0001234.00'`

If the decimals parameter is omitted, the function defaults to zero decimals. If the length parameter is omitted as well, the length of the result is the length of the variable.

SUBSTR (String, Start, Length)

Returns a portion of the string expression starting at the defined start location for the defined length.

`SUBSTR('xyzabcd', 3, 4)` returns `'zabc'`.

TIME ()

Returns the system time as a string in the form HH:MM:SS.

TRANSFORM (Expression, Picture)

Transform converts strings and numeric values into formatted character strings. The function transforms the result of the first expression in accordance with the second picture string.

The picture string is made up of two parts. The first part is the Function string and it is optional for both strings and numeric values (as long as the second Template string is present).

A character string transformation picture may consist of only a Function string or only a Template or both.

A numeric picture must contain a Template string; the Function string is optional.

A logical value must contain only a Template string with Template characters L or Y.

The Function string consists of a leading @ character followed by one or more formatting characters. If the Function string is present, the @ character must be the first character in the picture string with its formatting characters immediately following and it may not contain spaces.

If a Template string exists as well, it follows the Function string. A single space separates the Function string and the Template string.

Function string characters allowed for numeric values are:

- **B** left justify;
- **C** display CR after positive numbers;
- **X** display DR after negative numbers;
- **Z** blank a zero value;
- **(** enclose negative numbers in parentheses.

Function string characters allowed for strings are:

- **R** inserts unassigned template characters;

! converts all alpha characters to upper case.

The @R Function requires a Template; the ! Function does not.

The Template string describes the format on a character by character basis. The Template string is made up of special characters which have specific results and optional unassigned characters which either replace characters or are inserted in the formatted string depending upon the absence or presence of the @R Function string.

Template assigned characters are as follows:

A,N,X,(,# are place holders and are interchangeable;

L displays logical values as T or F;

Y displays logical values as Y or N;

! converts the corresponding character to upper case;

, (comma) or a space (in Europe) in a numeric template separate the elements of a number;

. (period) or , (comma - in Europe) in a numeric template specify the decimal position;

***** fills leading spaces with asterisks in a numeric template;

$ as the leading character in a numeric template results in a floating dollar sign being placed in front of the formatted number.

Example: Where "phone" is a character variable holding a phone number with no formatting characters.

`'transform(phone, "@R (###) ###-####")'` returns '(909) 699-6776'.

If the formatting characters were actually present in the variable, the "@R" function would be omitted

For numeric variables,

`'transform(123456.78, "$9,999,999.99")'` returns ' $123,456.78'.

TRIM (String)

Removes trailing spaces from the string expression.

UPPER (String)

Converts the string expression into upper case. Character variables used in index expressions should always be converted to upper case to insure correct collating sequence.

VAL (String)

Converts a string of numeric characters into its equivalent numeric value. The conversion stops at the first non-numeric character encountered (or the end of the string).

`VAL("123ABC")` returns a value of 123.

YEAR (DateVariable)

Returns the year portion of an xBase date as an integer.

Performing Analysis on Manually Entered Codes

The QDA Miner software is a computer-assisted qualitative coding tool specifically designed to manually code documents. While WordStat was designed mainly to perform automatic content analysis of textual data, one may also use this module to manually assign codes to text. When used for such a purpose, codes need to be manually typed into the text itself. WordStat may then be used to extract those codes and perform various types of analyses (frequency, cross-tabulation, co-occurrences). At least two approaches of coding may be used to achieve this:

Unique Keywords

Unique keywords or code name may be inserted anywhere in the text. Those keywords should preferably not be an existing dictionary word. For example, it may consist of an abbreviation of one or several words, includes special symbols (such as #, & ^, _ etc.) or numeric digits. The retrieval of those codes can then be achieved by adding all those keywords to the inclusion list . If special symbols have been used, they should also be specified as valid characters on the options page.

Codes in square brackets

WordStat provides an option to process only the text found between square brackets (i.e. [and]). Codes corresponding to categories may be typed directly in the text and placed within square brackets. By disabling all dictionaries and setting this option, the program simply ignores all text outside those brackets and performs a frequency count of all words found inside square brackets. This method has several advantages over the other method. First, there is no need to enter all existing codes in the inclusion dictionary since they will be processed automatically. Misspelled keywords will always be extracted and may thus be easily identified and changed. Also, the processing time and memory requirement can be much lower than the other approach since WordStat won't process any text found outside those brackets.

Besides the possibility to extract manually entered codes and perform frequency and comparison on those codes, there are several other ways in which the program may be used to assist the work of human coders. Here are just a few examples of possible uses:

- During the exploratory phase of the analysis, word frequency and crosstabulation may be used to identify differences between subgroups in word usages, differences that may have remained unidentified.
- The KWIC list may be used to locate and visualize text associated with specific codes either to validate the coding or identify associated themes. The KWIC list may also be used to perform a systematic search of words frequently found along with a specific code. The examination of all cases containing those words may then help identify instances where the code should have been used.
- A dendrogram of keyword co-occurrences or a crosstabulation of manually entered codes against all words in a text may allow identification of specific words associated with codes and permit the development of dictionaries. Such dictionaries may then be used either to ensure a more systematic application of manually entered codes or to develop and validate a dictionary that will later be used for automatic content analysis.
- Reliability of coding made by a single coder at different times or by several coders may also be assessed using inter-rater agreement statistics. **See Computing Inter-Rater Agreement Statistics** (page 151) for more information on how to compute those statistics.

Computing Inter-Rater Agreement Statistics

The reliability problem in manual coding

When coding of a text is performed automatically using dictionaries, the reliability of the coding is irrelevant since the rules used for coding are explicit and are applied systematically on the entire corpus of texts. However, when the coding is performed manually by human coders, individual differences in interpretation of codes between human coders often occur no matter how explicit, unambiguous and precise the coding rules are. Even a single coder is often unable to apply the same coding rules systematically across time. One way to ensure the reliability of the application of coding rules is to ask different raters to code the same content or to ask a single coder to code the same content at different times. The comparison of codes is then used to identify differences in interpretation, clarify ambiguous rules, identify ambiguity in the text, and ultimately quantify the final level of agreement obtained by those raters.

Inter-rater agreement measures

WordStat provides eight different inter-rater agreement measures to assess the reliability in coding. The assessment made by WordStat is based on the presence or absence of a specific code and is performed on each code individually. WordStat cannot assess the reliability of multinomial coding. However, this type of assessment can be achieved within SimStat by storing those codes into numeric variables and using the TABLES | INTER-RATER command.

The simplest measure of agreement for nominal level variables is the proportion of concordant coding out of the total number of codings made. Unfortunately, this measure often yields spuriously high values because it does not take into account chance agreements that occur from guessing. Several adjustment techniques have been proposed in the literature to correct for the chance factor, three of which are available in the WordStat. The following are the assumptions made by each of these correction techniques:

Free marginal adjustment assumes that all categories on a given scale have equal probability of being observed. It assumes that coders' decisions were not influenced by information about the distribution of the codes. This coefficient is equivalent to the Bennett, Alpert and Goldstein's (1954) S coefficient, Jason and Vegelius's (1979) C Coefficient, and Brennan and Prediger's (1981) kn Index (Zwick, 1988).

Scott's pi adjustment does not assume that all categories have equal probability of being observed, but does assume that the distributions of the categories observed by the coders are equal.

Cohen's kappa adjustment also does not assume that all categories have equal probability of being observed. Contrary to the pi measure, it does not assume that the distribution of the various categories is equal for all coders. In the computation of the chance factor, Kappa takes into account the differential tendencies or preferences of coders.

WordStat also offers three additional adjustments for ordinal level variables. These are similar to the previous measures except that they also take into account the ordinal nature of the scales by weighting the various levels of agreement. They apply the same tree model of chance agreement used in the previous measures for nominal data.

Free marginal adjustment for ordinal level variables also assumes that all categories on a given scale have equal probability of being observed.

Krippendorf's R-bar adjustment is the ordinal extension of Scott's pi and assumes that the distributions of the categories are equal for the two sets of ratings.

Krippendorf's r adjustment is the ordinal extension of Cohen's Kappa in that it adjusts for the differential tendencies of the judges in the computation of the chance factor. The following table illustrates the difference between those six inter-rater measures:

	LEVEL OF MEASUREMENT	
DISTRIBUTION ASSUMPTION	**Nominal Level**	**Ordinal Level**
Theoretical uniform distribution	Free marginal	Free marginal
Observed distribution of each rater	Cohen's Kappa	Krippendorf's r
Observed distribution of all raters	Scott's pi	Krippendorf's R-bar

WARNING: When the computation is based on keyword frequencies (rather than case occurrences) and when codes can be used more than one time per case, it is usually recommended to use ordinal or interval level agreement measures. Otherwise a difference in frequency for a specific code will be treated as a single disagreement. For example, if for a single case a coder assigns a code twice and another coder uses this same code three times, nominal level agreement measures will treat this difference as a single disagreement and will ignore the fact that the both raters may be in agreement in two instances. As a result, the overall agreement level will be underestimated. However, nominal level measures may still be used in those situations if the researcher wishes to treat any difference in frequency as a disagreement.

How to compute inter-rater agreement statistics

In order to compute inter-rater agreement measures within WordStat, codes assigned by each coder should be stored in different alphanumeric variables (character or memo variables). For example, in four different raters are assessed, four text variables should be created, each one containing the codes of a single coder. Two different methods can be used to achieve this. The text variable where the content to be analyzed is stored, may be replicated as many times as there are raters. Coders are then asked to insert their codes directly in the text variable. The second method requires the creation of empty alphanumeric variables which will contain the codes assigned by coders. Coders then read the content to be analyzed and write down all their codes in this empty variable.

To compare the codes of different raters

In the SimStat program, use the CHOOSE X1-Y command from the STATISTICS menu to assign all variables containing codes of different coders to the list of dependent variables.

- Select the CONTENT ANALYSIS command from the STATISTICS menu.

- Set the various options in the DICTIONARIES page so that all codes are extracted from the text variables.
- Click the CROSSTAB page.
- Set the WITH list box to <variables>. The AGREEMENT list box should appear.
- Set the TABULATE list box to either Keyword Frequency or Case Occurrence.
- Select the appropriate measure of agreement. (Tables based on keyword frequency should preferably be assessed using ordinal or interval level inter-rater agreement measures while tables based on case occurrence can be analyzed using either nominal or ordinal level measures).

To identify the source of disagreement

When codes are inserted directly in the original text, it becomes possible to verify the source of disagreement by extracting the content in which those codes appear. To perform such a task:

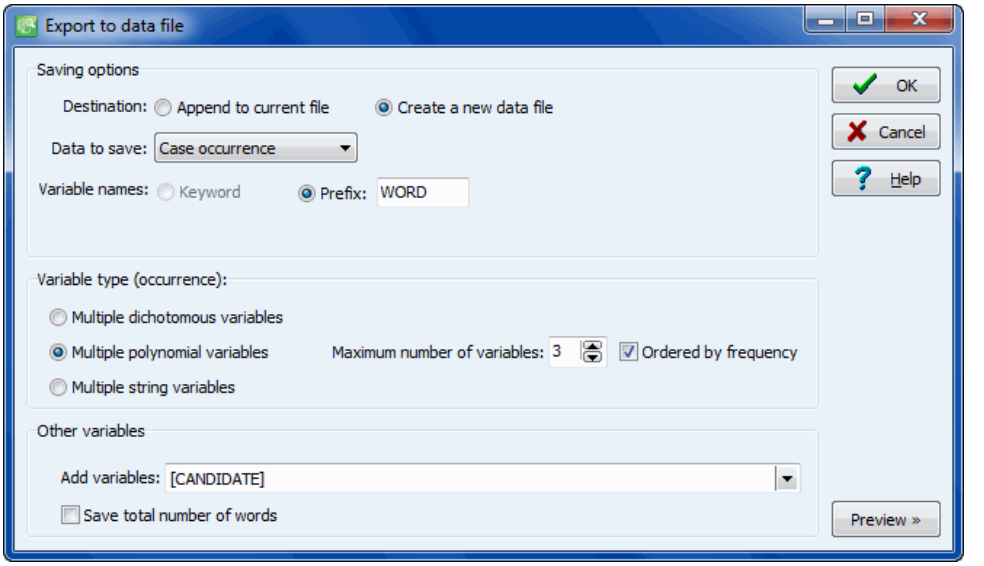
- Click the KEYWORD-IN-CONTEXT page.
- Set the LIST option to Included Keywords and set the keyword to the category you would like to examine.
- Set the SORT BY option to Case Number.

You can then use the KWIC table to identify specific contents that were associated with a code by a specific coder but not by other coders.

Exporting Frequency Data

Various case statistics may be appended to the existing data file or exported to disk in different file formats including SPSS for Windows, Excel, HTML, XML, and tab or comma delimited text files, allowing those data to be further analyzed. The resulting data consist of a matrix where each row represents a case and where the statistics on content categories will be stored in columns along with a few additional variables.

To append or export to disk content category statistics, click the  button located at the top of the **Frequencies** page is used to access the following dialog box:



DESTINATION - This option allows you to choose whether the new variables should be appended to the current data file or written into a new file. If this last option is selected, a dialog box will appear allowing you to specify the name and location of the new file. When data are saved to a new data file, additional variables are created to store the case number and the numerical values of each independent variable.

DATA TO SAVE - This option allows one to choose among four different kinds of data that may be saved:

- Keyword frequencies
- Case Occurrences (i.e., a dummy variable with 0 when absent or 1 when present)
- Percentage of words (i.e., the frequency of the keyword divided by the total number of words in the case)
- TF*IDF (i.e., the keyword frequency weighted by inverse document frequency).

VARIABLE NAMES - This option lets you determine what method should be used by WordStat to create new variable names. When set to KEYWORD, the program will attempt to use each keyword

as the name of a new variable. Illegal characters are automatically removed and long names are truncated to the first 10 characters. Duplicated variable names are distinguished by the substitution of numerical digits at the end of the name. When this option is set to PREFIX, variable names are created by adding successive numeric values to a user-defined prefix. For example, if the edit box at the right of the prefix option is set to "WORD_", the variable names will be WORD_1, WORD_2, WORD_3, etc. The order of creation of the variables corresponds to the sort order used in the FREQUENCIES page.

VARIABLE TYPE - By default, WordStat saves keyword statistics in as many variables as there are keywords or content categories listed on the frequency page. For example, if the frequency table contains 100 items, then 100 variables will be necessary to store the statistics associated with each item. When you choose to store the **occurrence** of codes, WordStat offers you the possibility of storing the observed occurrences in a limited number of polynomial (or multinomial) variables. For example, if the maximum number of different content categories per case is no more than 10, then you may instruct WordStat to create 10 numeric variables and store, in each of those, a numeric value representing one of the content categories. If less than 10 categories are found in a specific case, then the remaining variables are left empty. To store values in a limited set of nominal variables, choose the **Multiple Polynomial Variables** option and enter the **Maximum Number of Variables** that should be used for storing the values representing the content categories. To store the name of those categories rather than their numerical values, select **Multiple String Variables** instead. If the maximum number of content categories found in a single case is higher than the specified number of variables, then a warning message will appear to let you know that some information has been lost and to indicate the maximum number of content categories encountered in the project. To export occurrences as zeros and ones in as many variables as there are codes, select the **Multiple Dichotomous Variables** option.

ADD VARIABLES - This drop-down checklist box may be used to add the values stored in one or more variables to the exported data file along with the statistics.

SAVE TOTAL NUMBER OF WORDS - This option appends a numeric variable named TOTWORDS that contains the total number of words processed in each case.

Clicking the **PREVIEW** button displays a grid allowing one to see what the data file will look like.

Exporting Categorization Models

A typical text categorization process may involve any one of the following steps:

- User defined text preprocessing
- Automatic lemmatization
- Exclusion of words and phrases
- Categorization of words, word patterns, phrases and coding rules into content categories using a categorization dictionary

Specific settings, such as the inclusion of special characters or numerical digits, may also need to be set in order to collect relevant information.

In order to apply such a process to external documents, one should normally import the documents into a SimStat data file or QDA Miner project file, run WordStat and replicate the exact same settings as those originally used. An alternate solution is to export the categorization model to disk, which would include all the relevant information and settings, and then use either the WordStat Document Classifier utility program or functions of the Software Developer's Kit (release date Summer 2005) to retrieve the saved model and apply it to the new documents.

To save a categorization model to disk:

- Set the various analysis options on the Dictionaries and Options pages necessary to reproduce the required categorization process.
- Go to the **Frequency** page and click the  button located at the top of the page.
- Select the **Export Categorization Model** command. A dialog box should appear asking you for a file name.
- Enter the file name of the model you want to create and click **Save**.

By default, categorization model files are saved with a .wcat file extension in the **\Models** subfolder under the program folder. NOTE: While the information in the exclusion list and categorization dictionary is all stored in the categorization file, running a categorization model from outside WordStat may still require the availability of some resource files such as language dictionaries or preprocessing libraries (EXE or DLL). This should not cause an inconvenience when applying those models on the same computer as the one used to create the model, since information about the original locations of those resource files is always stored within the model file. However, when attempting to apply those categorization models on another computer, the calling application may have some difficulty locating the needed resource files. Those files should be stored either under paths identical to those on the original computer, in the application folder or under specific subfolders. When an attempt is made to apply a saved categorization or classification model for which some resource files are missing, an error message will be displayed providing the list of all missing files, their original location and alternate locations where they might be.

For information on how to apply the saved categorization model, please refer to the WordStat Document Classifier section or to the WordStat Software Developer's kit.

WordStat Document Classifier

The WordStat Document Classifier utility program is a stand-alone application that may be used to perform content analysis and automatic text classification on a text pasted from the clipboard or stored in a file. It may also be used to analyze a collection of documents stored in a SimStat or QDA Miner data file.

Performing a content analysis or a text classification on an existing document is quite simple and involves three easy steps: 1) loading the document in the main editing window, 2) opening the classification or categorization model previously saved on disk and 3) applying the model. Detailed results of the content analysis or classification are displayed in tables at the bottom of the dialog box.

Analyzing a single document

The document classifier supports several document file formats such as ASCII text files, HTML, Rich Text, MS Word, WordPerfect and Acrobat PDF files.

Step #1 - Opening the document

- To load the document to be analyzed, select the OPEN command from the DOCUMENT menu or click the  button. An Open File dialog box will be displayed. In the **File of Type** list box, select the format of the file you would like to read, locate the file, select it and click the **Open** button.
- You may also type directly in the text editing window or paste a text previously copied to the clipboard by moving to the text editor and then selecting the PASTE command from the DOCUMENT windows or by clicking the  button.

Step #2 - Opening the model

- To open the categorization or the text classification model:, select the OPEN command from the MODEL menu or click the  button. Content analysis models are stored in files with a .wcat file extension, while document classification models are stored in files with a .wclas file extension.
- Select the model you would like to use and click the **Open** button.

Step #3 - Applying the model

- Select the APPLY command from the MODEL menu or click the  button.

  When a categorization dictionary is applied, a single frequency table is displayed at the bottom of the page with the following statistics:

FREQUENCY	Number of occurrences of the keyword.
% SHOWN	Percentage based on the total number of keywords displayed in the table.
% TOTAL	Percent based on the total number of words that have not been explicitly excluded.
TF*IDF	Term frequency weighted by inverse document frequency. Such a weighting is based on the assumption that the more often a term occurs in a document, the more it is representative of its content, yet, the more documents the term occurs in, the less discriminating it is. The inverse document frequency term used for weighing items in the document classifier program is based on the observed frequency and the number of documents in the original data file used when the model was created.

When a classifier is used, a second table is shown allowing you to examine the classification decision made by the classifier as well as the computed values associated with each class of the categorical variable. When the k-Nearest Neighbors algorithm is used for classification and the database containing the training set can be located, a third table is shown, displaying the "k" most similar documents, their ranking and their similarity scores.

Analyzing a collection of documents

The Document Classifier can perform content analysis and automatic text classification on a collection of documents stored in a SimStat or QDA Miner data file. Categorization and classification results, as well as scores per class, may then be stored back into the data file or exported to another file.

Step #1 - Opening the collection of documents

- Select the OPEN DATA FILE command from the DOCUMENT menu, or click the  button. An Open File dialog box will be displayed. Locate the data file containing the documents to analyze, select it and click the Open button.

  The content of the data file is displayed in a table while the text to be categorized or classified is displayed on its right.

Step #2 - Opening the model

- To open the categorization or the text classification model, select the OPEN command from the MODEL menu, or click the  button. Content analysis models are stored in files with a .wcat file extension, while document classification models are stored in files with a .wclas file extension.

- Select the model you would like to use and click the **Open** button.

Step #3 - Applying the model

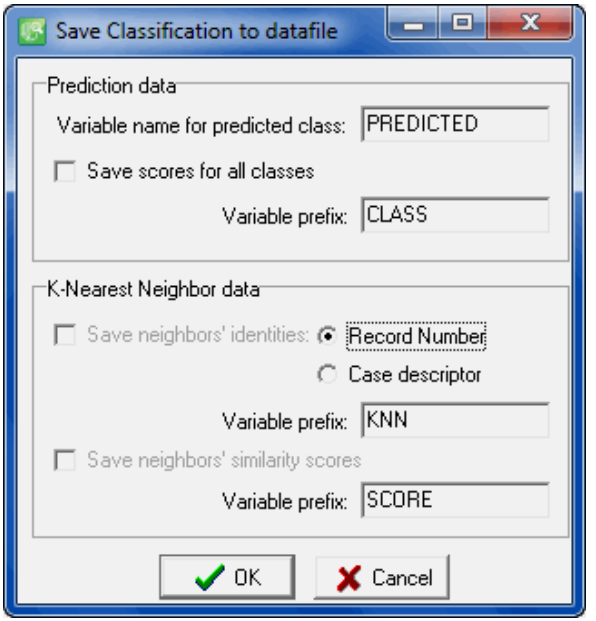
- Select the APPLY command from the MODEL menu, or click the  button.

  When a categorization dictionary is applied, a single frequency table is displayed at the bottom of the screen with the number of occurrences of each keyword included in the model, as well as the total number of words.

  When a classifier is used, a second table is shown, allowing one to examine the classification decision made by the classifier as well as the computed values associated with each class of the categorical variable. This table is synchronized with the database shown at the top of the screen, so that moving from one row to another - either in the database or this classification table - moves to the corresponding row in the other table.

  If the k-Nearest Neighbors algorithm is used for classification and the database containing the training set can be located, a third table is shown, displaying the "k" most similar documents, their ranking and their similarity scores.

  To store in the opened data file either the predicted class or the computed score obtained for every class, click the  button. A dialog box similar to this one will appear:



- Enter the variable name that will contain the predicted class.

- To save the scores associated with each class and upon which the classification has been made, put a check mark beside **Save scores for all classes** and enter a variable prefix (up to 7 characters). Variable names are created by adding successive numeric values to this prefix. For example, if the

edit box at the right of the **Variable Prefix** option is set to "CLASS", the variable names will be CLASS1, CLASS2, CLASS3, etc.

If any one of the specified variables does not exist, WordStat will create new ones and store the numerical values associated with either the predicted class or the class scores. A confirmation dialog box will ask to confirm the creation of those new variables, as well as to overwrite any existing variables.

To export any table to disk:

- Click the  button. A Save File dialog box will appear.
- In the **Save as type** list box, select the file format under which you would like to save the table. The following formats are supported: ASCII file (*.TXT), Tab delimited file (*.TAB), Comma delimited file (*.CSV), HTML file (*.HTM; *.HTML), Excel spreadsheet file (*.XLS).
- Type a valid file name with the proper file extension.
- Click the **Save** button.

To print a table:

- Click the  button.

WordStat Software Developer’s Kit

The WordStat Software Developer's Kit (SDK) consists of a library of functions that may be called from numerous programming languages, including some database programming environments, in order to use WordStat categorization and classification technologies for tasks like:

- Automatic assignments of tags or index terms to documents.
- Classification of documents for automatic classification or routing.
- Identification of documents meeting specific content criterion.

A first version of this SDK, scheduled to be released during 2010, will be available as a DLL for Windows and .NET application. Other versions designed specifically for other platforms will be made available at a later date, depending on the number of requests. For more information on this Software Developer's Kit, please contact support@provalisresearch.com.

Performing Multivariate Analysis

One benefit of the integration of a content analysis module within an existing statistical program is the ability to easily perform on numerical results of content analysis, various statistical analyses such as frequency, crosstabulation, multiple regressions, reliability analysis, etc. Among the various multivariate analysis techniques used in content analysis, cluster analysis, factor analysis, and, to a lesser degree, correspondence analysis are often used to establish the relationship existing between different words or categories of words. The table below illustrates some types of analysis that may be performed with SimStat and, if needed, the required module to perform those analyses.

TYPE OF ANALYSIS	REQUIRED MODULE
Multiple regression analysis	None
n-way ANOVA/ANCOVA	None
Reliability analysis	None
Inter-rater agreement	None
Factor Analysis (with or without varimax rotation)	None
Principal Component Analysis (without rotation)	MVSP
Correspondence analysis	MVSP
Advanced cluster analysis	MVSP

First step - Saving numerical results into a data file

In order to perform a statistical analysis on categories or words, you first need to create new numeric variables that will contain, for each case in the data file, the occurrence or frequency of specific words or categories. To create those variables:

- Set the various options of the DICTIONARIES page.
- Perform the content analysis by clicking the FREQUENCIES page.
- Click the  button to access the Save Data dialog box.
- Activate the SAVE KEYWORD COUNT checkbox.
- Set the DESTINATION option to Append to Current File.
- Set the DATA TO SAVE list box to Keyword Frequency.
- Set the VARIABLE NAMES option to Keyword to instruct WordStat to use the names of the categories (or included words) as the names for the new variables.
- Click the OK button to proceed to the saving of those data and return to WordStat.
- Click the OK button of the WordStat window to return to SimStat.

For more information on how to store numeric or textual results into the current data file or into a new data file see **Exporting Frequency Data** (page 154).

Performing a Cluster Analysis of words or categories

- Select the CHOOSE X-Y command from the STATISTICS menu and assign all the newly created variables to the list of independent or dependent variables. (The distinction between dependent and independent variables is not relevant for this kind of analysis. However, all variables assigned to a single category will be processed together.)
- Choose the OTHER | CLUSTER ANALYSIS command from the statistics menu to display the option dialog box.
- Set the various analysis options to one's preferences. (Please take note that in order to perform a cluster analysis on keywords rather than on cases, the Transpose Data option should be left deactivated).
- Click the OK button to perform the statistical analysis.

Performing a Factor Analysis of words or categories

- Select the CHOOSE X-Y command from the STATISTICS menu and assign all the newly created variables to the list of independent or dependent variables. (The distinction between dependent and independent variables is not relevant for this kind of analysis. However, all variables assigned to a single category will be processed together.)
- Choose the OTHER | FACTOR ANALYSIS command from the statistics menu.
- Set the various options to one's preferences.
- Click the OK button to perform the statistical analysis.

Managing Outputs wih the Report Manager

The Report Manager is a separate application that has been designed to store, edit and organize documents, notes, quotes, tables of results, graphics and images created by QDA Miner or imported from other applications. Items can be added to the Report Manager directly from QDA Miner without needing to run the Report Manager.

The  button, found in many locations in QDA Miner, may be used to copy entire documents, tables and charts to the Report Manager.

Selected text segments or image areas may also be appended by clicking the  button.

To access the Report Manager from QDA Miner, run the REPORT MANAGER command from the PROJECT menu.

The program presents its information as an outline, allowing a hierarchical organization of miscellaneous pieces of information that is ideal for project management, organizing ideas, structuring information, or designing and writing a research report.

The workspace emulates the appearance of Windows Explorer or of a standard Help file with the Table of Contents (TOC) on the left and the Editor on the right.

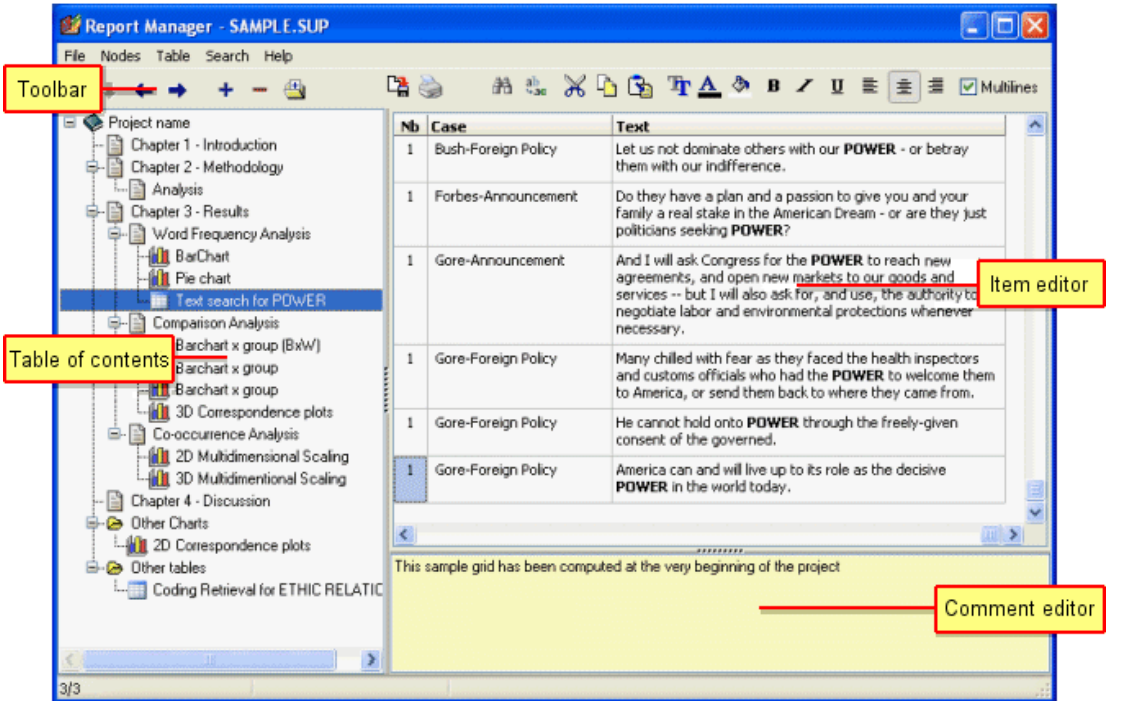


Table of Contents panel

Report Manager files are made up of items or topics that are like chapters in a book. Each item can be thought of as a separate word processor, a table or a graphic file editor or viewer, all of which are stored together in the QDA Miner project file. This panel provides powerful functions for organizing items and structuring the information in a hierarchical manner.

Item Editor

The largest panel on the right of the program window is the Item Editor, which is like a built-in word processor. This is where the item selected in the Table of Contents can be edited. Clicking a Table of Contents item displays its contents for editing.

Toolbar

The Toolbar provides quick access to the most frequently-used functions. Just position the mouse over a tool button and wait for the display of a brief text describing its function.

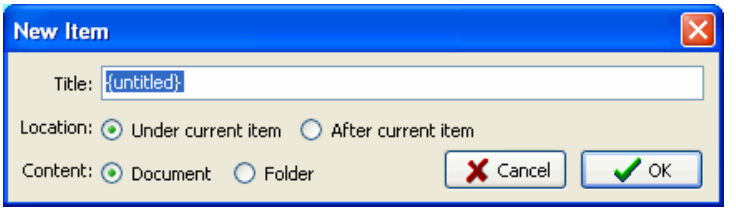
Comment panel

The Comment panel below the Item Editor allows the insertion and editing of comments related to the selected topic. When new items are added to the Report Manager from QDA Miner, a default comment is often already present, providing useful information about the origin of this item.

Working with the Table of Contents

To create a new item:

- Select the Table of Contents entry that will be the "parent" or "sibling" of the new item.
- Select the NEW command from the ITEMS menu or click the  button. A dialog box like this one will appear:



- Enter the title for the new item.
- If the new item should be a "child" of the selected item, click **Under Current Item;** if the item should be positioned after the current item, then set it to **After Current Item**.
- Select whether the new item will be a **Document** or a **Folder.** Folders are empty items that are used as containers for other items.
- Click **OK**. The new item will become the current one.

To import items from files:

- Select the item under which the imported items will be stored.
- Select the IMPORT FILES command from the ITEMS menu or click the  toolbar button. An Open dialog box will appear.
- Select the type of data you would like to import by selecting the appropriate Files of Type list box option. The Report Manager can import the following data types:
  - DOCUMENTS - Plain text (.TXT), MS Word (.DOC), WordPerfect (.WPD), Rich Text (.RTF) or HTML files (.HTM or .HTML)
  - GRAPHICS - Windows Bitmap (.BMP), Windows Metafile (.WMF), JPEG files (.JPG or .JPEG) and Portable Network Graphic files (.PNG)
  - CHARTS - QDA Miner or WordStat Charts (.WSX)
  - DELIMITED DATA - Tab delimited (.TAB) or Comma Separated Value (.CSV) data files.
- Select one or several files to be imported and click the OPEN button.

To rename an item:

- Select the item to be renamed.
- Select the RENAME command from the ITEMS menu or click the 

toolbar button.
  In the Item Title Dialog, change the title.
- Click **OK**.

To delete an item:

- Select the item to delete in the Table on Contents.
- Select the DELIMITED command from the FILE menu or click the  toolbar button.
- You will be asked to confirm that you really want to delete the item. If you're sure, then click **Yes**.

NOTE: Be aware that you cannot undo this if you make a mistake.

Moving Items

As more items are created and the Report Manager hierarchy grows, it is inevitable that you will want to move items around, either to place one item under another, or to promote one to a higher level.

The easiest way to move items in the Table of Contents is by using drag-and-drop operations. Using the mouse, you can move an item to a different location or move a group of items stored under a "parent" item by dragging this "parent" item to its new location.

- Select the item to move by clicking and holding down the left mouse button. (Keep the mouse pressed until the drag-and-drop operation is completed.)
- Drag the item to its new location and, only then, release the mouse button.

- The dragged item will now become a "child" of the destination item.
- To move the item to the same level as the item under the cursor, simply hold the ALT key while dropping the dragged item.

You can also use menu commands and toolbar buttons to move items. To promote an item is to move it to a higher level in the hierarchy, making the item a "sibling" to its former "parent". To demote an item is to move it to a lower level and make it a "child" of its previous "sibling". After selecting the item you want to move, use one of the following four commands:

- To promote the selected item, click the  button, or select the PROMOTE command from the ITEMS menu.
- To demote the selected item, click the  button, or select the DEMOTE command from the ITEMS menu.
- To move the selected item up relative to its siblings, click the  button or select the MOVE UP command from the ITEMS menu.
- To move an item down relative to its siblings, click the  button or select the MOVE DOWN command from the ITEMS menu.

Adding or Editing Item Comments

The Comment panel below the Item Editor allows one to insert a new comment or edit an existing one related to a selected topic.

To type a new comment or to edit one, simply click in the yellow region of this panel and start to type. The comment is automatically saved as soon as you move to another item or leave the Comment panel. While there is no menu item or toolbar icon associated with this feature, standard clipboard operations are supported for copy and pasting text. A popup menu with standard editing features can also be obtained by clicking the right mouse button.

To search for text in comments, see the information on the **Global Search** command.

Editing Documents

The Report Manager offers many editing features to create and edit both simple text documents and documents with complex formatting, as well as tables and graphics. When a document item is selected in the Table of Contents, a DOCUMENT menu appears, displaying all available formatting and editing options. A similar menu can also be obtained by right-clicking anywhere in this document. The toolbar portion directly over the editing area also displays buttons to access the most often-used editing and formatting functions.

Individual documents may also be printed or exported to disk in various file formats such as plain text, Rich Text or HTML format. An IMPORT command is also available to read a document file stored in plain text, Rich Text, MS Word, WordPerfect, HTML and a few additional formats. Executing such a command will replace the existing content with the content of the imported file.

Editing Tables

The Report Manager offers many editing features to customize the appearance of a table, to change the text alignment or font setting, to set the cell background color, or to delete entire rows or columns. When a table item is selected in the Table of Contents, a TABLE menu become visible displaying all available formatting and editing options. A similar menu can also be obtained by right-clicking anywhere in this table. The toolbar portion above the editing area also displays buttons to access the most often-used table editing and formatting functions.

Individual tables may also be printed or exported to disk in various file formats such as ASCII (*.TXT), tab delimited file (*.TAB), comma delimited (*.CSV), MS Word (*.DOC), HTML (*.HTM; *.HTML), XML (*.XML) and Excel spreadsheet file (*.XLS).

Editing Charts

Many charts saved in the Report Manager may be edited using many of the same options as those available in QDA Miner, such as the multidimensional scaling plot obtained through the CODE CO-OCCURRENCE analysis command, the correspondence analysis plots, and the bar charts and line charts created by the CODING BY VARIABLES command, as well as the bar charts and pie charts produced by the CODING FREQUENCY command. To obtain information on the display options available for those charts, see their corresponding page in this manual. Other charts - such as dendrograms and heatmaps - are stored as image files, so cannot be modified. However, just like other charts, they may be exported to disk in various file formats such BMP, JPG or PNG graphic files.

Searching and Replacing Text

Two broad types of text search are available in the Report Manager. A local, item-based search-and-replace feature allows one to perform text searches and replacements on individual documents or tables, and a global search engine for searching text patterns in several or all documents, tables and comments in the Report Manager.

To perform a search in a single document or a table:

- Select the document or table you would like to search, by selecting its entry in the Table of Contents.
- Position the editing cursor in the document or select the cell in the table where you want the search to begin.
- Select the FIND command from the SEARCH menu, or click the  button.
- Enter a search expression, set the desired search options and then click **Find Next**.
- To find additional instances of the same text, continue to click **Find Next.**

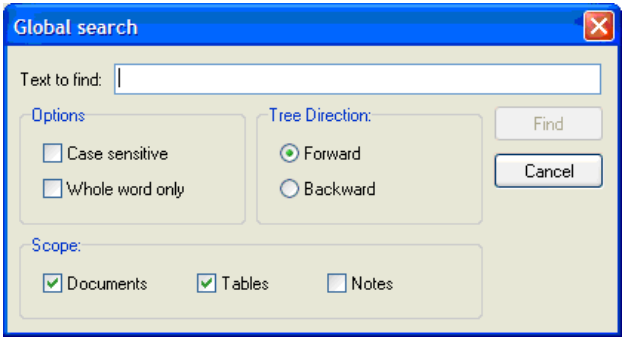
To replace text in a single document or table:

- Select the document or table in which you would like to perform the text replacement by selecting its entry in the Table of Contents.

- Position the editing cursor in the document or select the cell in the table where you want the search to begin.
- Select the REPLACE command from the SEARCH menu, or click the  button.
- In **Find What**, type the characters or words you want to find. In **Replace With**, type the text you want to replace it with. Set the desired search options and then click **Find Next**. Click **Replace** to change the selected text. To replace all instances of the text, click **Replace All**.

To perform a global search:

- Select the GLOBAL FIND method from the SEARCH menu. A dialog box similar to this one will appear:



The **Text to Find** edit box allows you to specify the text you want to find. The **Case Sensitive** and **Whole Word Only** options function in the same way as in a standard word processor.

The search starts at the current topic item. Select **Forward** to continue searching items below the current one, or **Backward** to move up and search items above the current document or table in reverse order. To search all items, select the top item in the Table of Contents before using the Global Search dialog box.

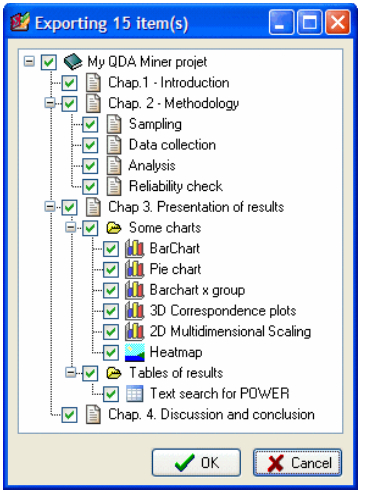
The **Scope** option box is used to specify what is to be searched. You can restrict the search to **Documents**, **Tables**, or **Comments** attached to items, or any combination of these three.

Once the search options have been set, click the **Find** button to start the search as well as to continue searching for additional instances of this text.

Exporting items to HTML or Word

Individual documents, tables, graphics and images may be exported to disk in numerous formats. Such exportation can be achieved by clicking the  toolbar button or by selecting the EXPORT command from the associated menu.

The Report Manager also offers the possibility of exporting the entire content or selected items into a single HTML or MS Word document. The exportation is achieved by selecting the proper command from the FILE | EXPORT menu. For example, to export items to HTML, select the HTML command. A dialog box similar to this one will appear.



By default, all items are marked for export. To prevent some items from being included in the exported file, simply remove the check marks beside them. Clicking a "parent" item affects all "children" items in the same way. To unselect all items, uncheck the project item located at the very top of the tree.

Once the selection process is completed, click the **OK** button. A Save File dialog box will be displayed, allowing you to enter a file name and select the location where the file should be saved. After the file is created, you will be asked if you want to view this file. Clicking **Yes** will open a web browser if the exported file is an HTML document or either MS Word or Wordpad if the exported file is a Word document.

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