IBM SPSS Modeler Text Analytics 18.1.1 User's Guide

Note
Before using this information and the product it supports, read the information in "Notices" on page 213.

Product Information

This edition applies to version 18.1.1, release 0, modification 0 of IBM SPSS Modeler Text Analytics and to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

Preface

IBM® SPSS® Modeler Text Analytics offers powerful text analytic capabilities, which use advanced linguistic technologies and Natural Language Processing (NLP) to rapidly process a large variety of unstructured text data and, from this text, extract and organize the key concepts. Furthermore, IBM SPSS Modeler Text Analytics can group these concepts into categories.

Around 80% of data held within an organization is in the form of text documents—for example, reports, Web pages, e-mails, and call center notes. Text is a key factor in enabling an organization to gain a better understanding of their customers' behavior. A system that incorporates NLP can intelligently extract concepts, including compound phrases. Moreover, knowledge of the underlying language allows classification of terms into related groups, such as products, organizations, or people, using meaning and context. As a result, you can quickly determine the relevance of the information to your needs. These extracted concepts and categories can be combined with existing structured data, such as demographics, and applied to modeling in IBM SPSS Modeler's full suite of data mining tools to yield better and more-focused decisions.

Linguistic systems are knowledge sensitive—the more information contained in their dictionaries, the higher the quality of the results. IBM SPSS Modeler Text Analytics is delivered with a set of linguistic resources, such as dictionaries for terms and synonyms, libraries, and templates. This product further allows you to develop and refine these linguistic resources to your context. Fine-tuning of the linguistic resources is often an iterative process and is necessary for accurate concept retrieval and categorization. Custom templates, libraries, and dictionaries for specific domains, such as CRM and genomics, are also included.

About IBM Business Analytics

IBM Business Analytics software delivers complete, consistent and accurate information that decision-makers trust to improve business performance. A comprehensive portfolio of business intelligence, predictive analytics, financial performance and strategy management, and analytic applications provides clear, immediate and actionable insights into current performance and the ability to predict future outcomes. Combined with rich industry solutions, proven practices and professional services, organizations of every size can drive the highest productivity, confidently automate decisions and deliver better results.

As part of this portfolio, IBM SPSS Predictive Analytics software helps organizations predict future events and proactively act upon that insight to drive better business outcomes. Commercial, government and academic customers worldwide rely on IBM SPSS technology as a competitive advantage in attracting, retaining and growing customers, while reducing fraud and mitigating risk. By incorporating IBM SPSS software into their daily operations, organizations become predictive enterprises – able to direct and automate decisions to meet business goals and achieve measurable competitive advantage. For further information or to reach a representative visit http://www.ibm.com/spss.

Technical support

Technical support is available to maintenance customers. Customers may contact Technical Support for assistance in using IBM Corp. products or for installation help for one of the supported hardware environments. To reach Technical Support, see the IBM Corp. web site at http://www.ibm.com/support. Be prepared to identify yourself, your organization, and your support agreement when requesting assistance.

Chapter 1. About IBM SPSS Modeler Text Analytics

IBM SPSS Modeler Text Analytics offers powerful text analytic capabilities, which use advanced linguistic technologies and Natural Language Processing (NLP) to rapidly process a large variety of unstructured text data and, from this text, extract and organize the key concepts. Furthermore, IBM SPSS Modeler Text Analytics can group these concepts into categories.

Around 80% of data held within an organization is in the form of text documents—for example, reports, Web pages, e-mails, and call center notes. Text is a key factor in enabling an organization to gain a better understanding of their customers' behavior. A system that incorporates NLP can intelligently extract concepts, including compound phrases. Moreover, knowledge of the underlying language allows classification of terms into related groups, such as products, organizations, or people, using meaning and context. As a result, you can quickly determine the relevance of the information to your needs. These extracted concepts and categories can be combined with existing structured data, such as demographics, and applied to modeling in IBM SPSS Modeler's full suite of data mining tools to yield better and more-focused decisions.

Linguistic systems are knowledge sensitive—the more information contained in their dictionaries, the higher the quality of the results. IBM SPSS Modeler Text Analytics is delivered with a set of linguistic resources, such as dictionaries for terms and synonyms, libraries, and templates. This product further allows you to develop and refine these linguistic resources to your context. Fine-tuning of the linguistic resources is often an iterative process and is necessary for accurate concept retrieval and categorization. Custom templates, libraries, and dictionaries for specific domains, such as CRM and genomics, are also included.

Deployment. You can deploy text mining streams using the IBM SPSS Modeler Solution Publisher for real-time scoring of unstructured data. The ability to deploy these streams ensures successful, closed-loop text mining implementations. For example, your organization can now analyze scratch-pad notes from inbound or outbound callers by applying your predictive models to increase the accuracy of your marketing message in real time.

To run IBM SPSS Modeler Text Analytics with IBM SPSS Modeler Solution Publisher, add the directory `<install_directory>/ext/bin/spss.TMWBServer` to the `$LD_LIBRARY_PATH` environment variable.

Note: The Japanese adapter for IBM SPSS Modeler Text Analytics has been deprecated starting with version 18.1.

Upgrading to IBM SPSS Modeler Text Analytics Version 18.1.1

Upgrading from previous versions of PASW Text Analytics or Text Mining for Clementine.

Before installing IBM SPSS Modeler Text Analytics version 18.1.1 you should save and export any TAPs, templates, and libraries from your current version that you want to use in the new version. We recommend that you save these files to a directory that will not get deleted or overwritten when you install the latest version.

After you install the latest version of IBM SPSS Modeler Text Analytics you can load the saved TAP file, add any saved libraries, or import and load any saved templates to use them in the latest version.

Important: If you uninstall your current version without saving and exporting the files you require first, any TAP, template, and public library work performed in the previous version will be lost and unable to be used in IBM SPSS Modeler Text Analytics version 18.1.1.

About text mining

Today an increasing amount of information is being held in unstructured and semistructured formats, such as customer e-mails, call center notes, open-ended survey responses, news feeds, Web forms, etc. This abundance of information poses a problem to many organizations that ask themselves, "How can we collect, explore, and leverage this information?"

Text mining is the process of analyzing collections of textual materials in order to capture key concepts and themes and uncover hidden relationships and trends without requiring that you know the precise words or terms that authors have used to express those concepts. Although they are quite different, text mining is sometimes confused with information retrieval. While the accurate retrieval and storage of information is an enormous challenge, the extraction and management of quality content, terminology, and relationships contained within the information are crucial and critical processes.

Text mining and data mining

For each article of text, linguistic-based text mining returns an index of concepts, as well as information about those concepts. This distilled, structured information can be combined with other data sources to address questions such as:

- Which concepts occur together?
- What else are they linked to?
- What higher level categories can be made from extracted information?
- What do the concepts or categories predict?
- How do the concepts or categories predict behavior?

Combining text mining with data mining offers greater insight than is available from either structured or unstructured data alone. This process typically includes the following steps:

1. **Identify the text to be mined.** Prepare the text for mining. If the text exists in multiple files, save the files to a single location. For databases, determine the field containing the text.
2. **Mine the text and extract structured data.** Apply the text mining algorithms to the source text.
3. **Build concept and category models.** Identify the key concepts and/or create categories. The number of concepts returned from the unstructured data is typically very large. Identify the best concepts and categories for scoring.
4. **Analyze the structured data.** Employ traditional data mining techniques, such as clustering, classification, and predictive modeling, to discover relationships between the concepts. Merge the extracted concepts with other structured data to predict future behavior based on the concepts.

Text analysis and categorization

Text analysis, a form of qualitative analysis, is the extraction of useful information from text so that the key ideas or concepts contained within this text can be grouped into an appropriate number of categories. Text analysis can be performed on all types and lengths of text, although the approach to the analysis will vary somewhat.

Shorter records or documents are most easily categorized, since they are not as complex and usually contain fewer ambiguous words and responses. For example, with short, open-ended survey questions, if we ask people to name their three favorite vacation activities, we might expect to see many short answers, such as *going to the beach*, *visiting national parks*, or *doing nothing*. Longer, open-ended responses, on the other hand, can be quite complex and very lengthy, especially if respondents are educated, motivated, and have enough time to complete a questionnaire. If we ask people to tell us about their political beliefs in a survey or have a blog feed about politics, we might expect some lengthy comments about all sorts of issues and positions.

The ability to extract key concepts and create insightful categories from these longer text sources in a very short period of time is a key advantage of using IBM SPSS Modeler Text Analytics. This advantage is obtained through the combination of automated linguistic and statistical techniques to yield the most reliable results for each stage of the text analysis process.

Linguistic processing and NLP

The primary problem with the management of all of this unstructured text data is that there are no standard rules for writing text so that a computer can understand it. The language, and consequently the meaning, varies for every document and every piece of text. The only way to accurately retrieve and organize such unstructured data is to analyze the language and thus uncover its meaning. There are several different automated approaches to the extraction of concepts from unstructured information. These approaches can be broken down into two kinds, linguistic and nonlinguistic.

Some organizations have tried to employ automated nonlinguistic solutions based on statistics and neural networks. Using computer technology, these solutions can scan and categorize key concepts more quickly than human readers can. Unfortunately, the accuracy of such solutions is fairly low. Most statistics-based systems simply count the number of times words occur and calculate their statistical proximity to related concepts. They produce many irrelevant results, or noise, and miss results they should have found, referred to as silence.

To compensate for their limited accuracy, some solutions incorporate complex nonlinguistic rules that help to distinguish between relevant and irrelevant results. This is referred to as *rule-based text mining*.

Linguistics-based text mining, on the other hand, applies the principles of natural language processing (NLP)—the computer-assisted analysis of human languages—to the analysis of words, phrases, and syntax, or structure, of text. A system that incorporates NLP can intelligently extract concepts, including compound phrases. Moreover, knowledge of the underlying language allows classification of concepts into related groups, such as products, organizations, or people, using meaning and context.

Linguistics-based text mining finds meaning in text much as people do—by recognizing a variety of word forms as having similar meanings and by analyzing sentence structure to provide a framework for understanding the text. This approach offers the speed and cost-effectiveness of statistics-based systems, but it offers a far higher degree of accuracy while requiring far less human intervention.

To illustrate the difference between statistics-based and linguistics-based approaches during the extraction process, consider how each would respond to a query about `reproduction of documents`. Both statistics-based and linguistics-based solutions would have to expand the word `reproduction` to include synonyms, such as `copy` and `duplication`. Otherwise, relevant information will be overlooked. But if a statistics-based solution attempts to do this type of synonymy—searching for other terms with the same meaning—it is likely to include the term `birth` as well, generating a number of irrelevant results. The understanding of language cuts through the ambiguity of text, making linguistics-based text mining, by definition, the more reliable approach.

Understanding how the extraction process works can help you make key decisions when fine-tuning your linguistic resources (libraries, types, synonyms, and more). Steps in the extraction process include:

- Converting source data to a standard format
- Identifying candidate terms
- Identifying equivalence classes and integration of synonyms
- Assigning a type
- Indexing and, when requested, pattern matching with a secondary analyzer

Step 1. Converting source data to a standard format

In this first step, the data you import is converted to a uniform format that can be used for further analysis. This conversion is performed internally and does not change your original data.

Step 2. Identifying candidate terms

It is important to understand the role of linguistic resources in the identification of candidate terms during linguistic extraction. Linguistic resources are used every time an extraction is run. They exist in the form of templates, libraries, and compiled resources. Libraries include lists of words, relationships, and other information used to specify or tune the extraction. The compiled resources cannot be viewed or edited. However, the remaining resources can be edited in the Template Editor or, if you are in an interactive workbench session, in the Resource Editor.

Compiled resources are core, internal components of the extraction engine within IBM SPSS Modeler Text Analytics. These resources include a general dictionary containing a list of base forms with a part-of-speech code (noun, verb, adjective, and so on).

In addition to those compiled resources, several libraries are delivered with the product and can be used to complement the types and concept definitions in the compiled resources, as well as to offer synonyms. These libraries—and any custom ones you create—are made up of several dictionaries. These include type dictionaries, synonym dictionaries, and exclude dictionaries.

Once the data have been imported and converted, the extraction engine will begin identifying candidate terms for extraction. Candidate terms are words or groups of words that are used to identify concepts in the text. During the processing of the text, single words (*uniterms*) and compound words (*multiterms*) are identified using part-of-speech pattern extractors. Then, candidate sentiment keywords are identified using sentiment text link analysis.

Note: The terms in the aforementioned compiled general dictionary represent a list of all of the words that are likely to be uninteresting or linguistically ambiguous as uniterms. These words are excluded from extraction when you are identifying the uniterms. However, they are reevaluated when you are determining parts of speech or looking at longer candidate compound words (multiterms).

Step 3. Identifying equivalence classes and integration of synonyms

After candidate uniterms and multiterms are identified, the software uses a normalization dictionary to identify equivalence classes. An equivalence class is a base form of a phrase or a single form of two variants of the same phrase. To determine which concept to use for the equivalence class the extraction engine applies the following rules in the order listed:

- The user-specified form in a library.
- The most frequent form, as defined by precompiled resources.

Step 4. Assigning type

Next, types are assigned to extracted concepts. A type is a semantic grouping of concepts. Both compiled resources and the libraries are used in this step. Types include such things as higher-level concepts, positive and negative words, first names, places, organizations, and more. See the topic "Type dictionaries" on page 169 for more information.

Linguistic systems are knowledge sensitive—the more information contained in their dictionaries, the higher the quality of the results. Modification of the dictionary content, such as synonym definitions, can simplify the resulting information. This is often an iterative process and is necessary for accurate concept retrieval. NLP is a core element of IBM SPSS Modeler Text Analytics.

How extraction works

During the extraction of key concepts and ideas from your responses, IBM SPSS Modeler Text Analytics relies on linguistics-based text analysis. This approach offers the speed and cost effectiveness of statistics-based systems. But it offers a far higher degree of accuracy, while requiring far less human intervention. Linguistics-based text analysis is based on the field of study known as natural language processing, also known as computational linguistics.

Understanding how the extraction process works can help you make key decisions when fine-tuning your linguistic resources (libraries, types, synonyms, and more). Steps in the extraction process include:

- Converting source data to a standard format
- Identifying candidate terms
- Identifying equivalence classes and integration of synonyms
- Assigning a type
- Indexing
- Matching patterns and events extraction

Step 1. Converting source data to a standard format

In this first step, the data you import is converted to a uniform format that can be used for further analysis. This conversion is performed internally and does not change your original data.

Step 2. Identifying candidate terms

It is important to understand the role of linguistic resources in the identification of candidate terms during linguistic extraction. Linguistic resources are used every time an extraction is run. They exist in the form of templates, libraries, and compiled resources. Libraries include lists of words, relationships, and other information used to specify or tune the extraction. The compiled resources cannot be viewed or edited. However, the remaining resources (templates) can be edited in the Template Editor or, if you are in an interactive workbench session, in the Resource Editor.

Compiled resources are core, internal components of the extraction engine within IBM SPSS Modeler Text Analytics. These resources include a general dictionary containing a list of base forms with a part-of-speech code (noun, verb, adjective, adverb, participle, coordinator, determiner, or preposition). The resources also include reserved, built-in types used to assign many extracted terms to the following types, `<Location>`, `<Organization>`, or `<Person>`. See the topic "Built-in types" on page 170 for more information.

In addition to those compiled resources, several libraries are delivered with the product and can be used to complement the types and concept definitions in the compiled resources, as well as to offer other types and synonyms. These libraries—and any custom ones you create—are made up of several dictionaries. These include type dictionaries, substitution dictionaries (synonyms and optional elements), and exclude dictionaries. See the topic Chapter 15, "Working with Libraries," on page 161 for more information.

Once the data have been imported and converted, the extraction engine will begin identifying candidate terms for extraction. Candidate terms are words or groups of words that are used to identify concepts in the text. During the processing of the text, single words (*uniterms*) that are not in the compiled resources are considered as candidate term extractions. Candidate compound words (*multiterms*) are identified using part-of-speech pattern extractors. For example, the multiterm `sports car`, which follows the "adjective noun" part-of-speech pattern, has two components. The multiterm `fast sports car`, which follows the "adjective adjective noun" part-of-speech pattern, has three components.

Note: The terms in the aforementioned compiled general dictionary represent a list of all of the words that are likely to be uninteresting or linguistically ambiguous as uniterms. These words are excluded from extraction when you are identifying the uniterms. However, they are reevaluated when you are determining parts of speech or looking at longer candidate compound words (multiterms).

Finally, a special algorithm is used to handle uppercase letter strings, such as job titles, so that these special patterns can be extracted.

Step 3. Identifying equivalence classes and integration of synonyms

After candidate uniterms and multiterms are identified, the software uses a set of algorithms to compare them and identify equivalence classes. An equivalence class is a base form of a phrase or a single form of two variants of the same phrase. The purpose of assigning phrases to equivalence classes is to ensure that, for example, `president of the company` and `company president` are not treated as separate concepts. To determine which concept to use for the equivalence class—that is, whether `president of the company` or `company president` is used as the lead term, the extraction engine applies the following rules in the order listed:

- The user-specified form in a library.
- The most frequent form in the full body of text.
- The shortest form in the full body of text (which usually corresponds to the base form).

Step 4. Assigning type

Next, types are assigned to extracted concepts. A type is a semantic grouping of concepts. Both compiled resources and the libraries are used in this step. Types include such things as higher-level concepts, positive and negative words, first names, places, organizations, and more. Additional types can be defined by the user. See the topic “Type dictionaries” on page 169 for more information.

Step 5. Indexing

The entire set of records or documents is indexed by establishing a pointer between a text position and the representative term for each equivalence class. This assumes that all of the inflected form instances of a candidate concept are indexed as a candidate base form. The global frequency is calculated for each base form.

Step 6. Matching patterns and events extraction

IBM SPSS Modeler Text Analytics can discover not only types and concepts but also relationships among them. Several algorithms and libraries are available with this product and provide the ability to extract relationship patterns between types and concepts. They are particularly useful when attempting to discover specific opinions (for example, product reactions) or the relational links between people or objects (for example, links between political groups or genomes).

How categorization works

When creating category models in IBM SPSS Modeler Text Analytics, there are several different techniques you can choose to create categories. Because every dataset is unique, the number of techniques and the order in which you apply them may change. Since your interpretation of the results may be different from someone else's, you may need to experiment with the different techniques to see which one produces the best results for your text data. In IBM SPSS Modeler Text Analytics, you can create category models in a workbench session in which you can explore and fine-tune your categories further.

In this guide, **category building** refers to the generation of category definitions and classification through the use of one or more built-in techniques, and **categorization** refers to the scoring, or labeling, process whereby unique identifiers (name/ID/value) are assigned to the category definitions for each record or document.

During category building, the concepts and types that were extracted are used as the building blocks for your categories. When you build categories, the records or documents are automatically assigned to categories if they contain text that matches an element of a category's definition.

IBM SPSS Modeler Text Analytics offers you several automated category building techniques to help you categorize your documents or records quickly.

Grouping Techniques

Each of the techniques available is well suited to certain types of data and situations, but often it is helpful to combine techniques in the same analysis to capture the full range of documents or records. You may see a concept in multiple categories or find redundant categories.

Concept Root Derivation. This technique creates categories by taking a concept and finding other concepts that are related to it by analyzing whether any of the concept components are morphologically related, or share roots. This technique is very useful for identifying synonymous compound word concepts, since the concepts in each category generated are synonyms or closely related in meaning. It works with data of varying lengths and generates a smaller number of compact categories. For example, the concept `opportunities to advance` would be grouped with the concepts `opportunity for advancement` and `advancement opportunity`. See the topic "Concept root derivation" on page 101 for more information.

Semantic Network. This technique begins by identifying the possible senses of each concept from its extensive index of word relationships and then creates categories by grouping related concepts. This technique is best when the concepts are known to the semantic network and are not too ambiguous. It is less helpful when text contains specialized terminology or jargon unknown to the network. In one example, the concept `granny smith apple` could be grouped with `gala apple` and `winesap apple` since they are siblings of the granny smith. In another example, the concept `animal` might be grouped with `cat` and `kangaroo` since they are hyponyms of `animal`. This technique is available for English text only in this release. See the topic "Semantic Networks" on page 103 for more information.

Concept Inclusion. This technique builds categories by grouping multiterm concepts (compound words) based on whether they contain words that are subsets or supersets of a word in the other. For example, the concept `seat` would be grouped with `safety seat`, `seat belt`, and `seat belt buckle`. See the topic "Concept Inclusion" on page 102 for more information.

Co-occurrence. This technique creates categories from co-occurrences found in the text. The idea is that when concepts or concept patterns are often found together in documents and records, that co-occurrence reflects an underlying relationship that is probably of value in your category definitions. When words co-occur significantly, a co-occurrence rule is created and can be used as a category descriptor for a new subcategory. For example, if many records contain the words `price` and `availability` (but few records contain one without the other), then these concepts could be grouped into a co-occurrence rule, (`price & available`) and assigned to a subcategory of the category `price` for instance. See the topic "Co-occurrence Rules" on page 104 for more information.

Minimum number of documents. To help determine how interesting co-occurrences are, define the minimum number of documents or records that must contain a given co-occurrence for it to be used as a descriptor in a category.

IBM SPSS Modeler Text Analytics nodes

Along with the many standard nodes delivered with IBM SPSS Modeler, you can also work with text mining nodes to incorporate the power of text analysis into your streams. IBM SPSS Modeler Text Analytics offers you several text mining nodes to do just that. These nodes are stored in the IBM SPSS Modeler Text Analytics tab of the node palette.

The following nodes are included:

- The **File List source node** generates a list of document names as input to the text mining process. This is useful when the text resides in external documents rather than in a database or other structured file.

The node outputs a single field with one record for each document or folder listed, which can be selected as input in a subsequent Text Mining node. See the topic "File List node" on page 9 for more information.

- The **Web Feed source node** makes it possible to read in text from Web feeds, such as blogs or news feeds in RSS or HTML formats, and use this data in the text mining process. The node outputs one or more fields for each record found in the feeds, which can be selected as input in a subsequent Text Mining node. See the topic "Web Feed node" on page 11 for more information.
- The **Language Identifier node** is a process node that scans source text to determine which human language it is written in and then marks that up in a new field. Primarily designed to be used with large amounts of data, this node is particularly useful when you have more than one language in your data sources and want to process just one language. See the topic "Language Node" on page 15 for more information.
- The **Text Mining node** uses linguistic methods to extract key concepts from the text, allows you to create categories with these concepts and other data, and offers the ability to identify relationships and associations between concepts based on known patterns (called text link analysis). The node can be used to explore the text data contents or to produce either a concept model or category model. The concepts and categories can be combined with existing structured data, such as demographics, and applied to modeling. See the topic "Text Mining modeling node" on page 18 for more information.
- The **Text Link Analysis node** extracts concepts and also identifies relationships between concepts based on known patterns within the text. Pattern extraction can be used to discover relationships between your concepts, as well as any opinions or qualifiers attached to these concepts. The Text Link Analysis node offers a more direct way to identify and extract patterns from your text and then add the pattern results to the dataset in the stream. But you can also perform TLA using an interactive workbench session in the Text Mining modeling node. See the topic "Text Link Analysis node" on page 43 for more information.
- When mining text from external documents, the **Text Mining Output node** can be used to generate an HTML page that contains links to the documents from which concepts were extracted. See the topic "File Viewer node" on page 49 for more information.

Applications

In general, anyone who routinely needs to review large volumes of documents to identify key elements for further exploration can benefit from IBM SPSS Modeler Text Analytics.

Some specific applications include:

- **Scientific and medical research.** Explore secondary research materials, such as patent reports, journal articles, and protocol publications. Identify associations that were previously unknown (such as a doctor associated with a particular product), presenting avenues for further exploration. Minimize the time spent in the drug discovery process. Use as an aid in genomics research.
- **Investment research.** Review daily analyst reports, news articles, and company press releases to identify key strategy points or market shifts. Trend analysis of such information reveals emerging issues or opportunities for a firm or industry over a period of time.
- **Fraud detection.** Use in banking and health-care fraud to detect anomalies and discover red flags in large amounts of text.
- **Market research.** Use in market research endeavors to identify key topics in open-ended survey responses.
- **Blog and Web feed analysis.** Explore and build models using the key ideas found in news feeds, blogs, etc.
- **CRM.** Build models using data from all customer touch points, such as e-mail, transactions, and surveys.

Chapter 2. Reading in Source Text

Data for text mining can be in any of the standard formats that are used by IBM SPSS Modeler, including databases or other "rectangular" formats that represent data in rows and columns, or in document formats, such as Microsoft Word, Adobe PDF, or HTML, that do not conform to this structure.

- To read in text from documents that do not conform to standard data structure, including Microsoft Word, Microsoft Excel, and Microsoft PowerPoint, in addition to Adobe PDF, XML, HTML, and others, the File List node can be used to generate a list of documents or folders as input to the text mining process. For more information, see "File List node."
- To read in text from web feeds, such as blogs or news feeds in RSS or HTML formats, the Web Feed node can be used to format web feed data for input into the text mining process. For more information, see "Web Feed node" on page 11.
- To read in text from any of the standard data formats used by SPSS Modeler, such as a database with one or more text fields for customer comments, you can use any of the SPSS Modeler source nodes. For more information, see the SPSS Modeler node documentation.
- When you are processing large amounts of data, which might include text in several different languages, use the Language node to identify the language used in a specific field. For more information, see "Language Node" on page 15.

File List node

To read in text from unstructured documents saved in formats such as Microsoft Word, Microsoft Excel, and Microsoft PowerPoint, as well as Adobe PDF, XML, HTML, and others, the File List node can be used to generate a list of documents or folders as input to the text mining process. This is necessary because unstructured text documents cannot be represented by fields and records—rows and columns—in the same manner as other data used by IBM SPSS Modeler.

The File List node functions as a source node.

You can find this node on the IBM SPSS Modeler Text Analytics tab of nodes palette at the bottom of the IBM SPSS Modeler window. See the topic "IBM SPSS Modeler Text Analytics nodes" on page 7 for more information.

Important: Any directory names and file names containing characters that are not included in the machine local encoding are not supported. When attempting to execute a stream containing a File List node, any file or directory names containing these characters will cause the stream execution to fail. This can happen with foreign language directory names or file names, such as a German filename on a French locale.

Local data support. If you are connected to a remote IBM SPSS Modeler Text Analytics Server and have a stream with a File List node, the data should reside on the same machine as the IBM SPSS Modeler Text Analytics Server – or ensure that the server machine has access to the folder where the source data in the File List node is stored.

Note: You cannot use the File List node for scoring within an IBM SPSS Collaboration and Deployment Services - Scoring configuration.

File List node: Settings tab

On this tab you define the directories, file extensions, and input for this node.

Note: Text mining extraction cannot process Microsoft Office and Adobe PDF files under non-Microsoft Windows platforms. However, XML, HTML or text files can always be processed.

Any directory names and file names containing characters that are not included in the machine local encoding are not supported. When attempting to execute a stream containing a File List node, any file or directory names containing these characters will cause the stream execution to fail. This can happen with foreign language directory names or file names, such as a German filename on a French locale.

Directory Specifies the root folder containing the documents that you want to list.

- **Include subdirectories** Specifies that subdirectories should also be scanned.

File type(s) to include in list: You can select or deselect the file types and extensions you want to use. By deselecting a file extension, the files with that extension are ignored. You can filter by the following extensions:

Table 1. File type filters by file extension.

• *.rtf, .doc, .docx, .docm*	• *.xls, .xlsx, .xlsm*	• *.ppt, .pptx, .pptm*	• *.txt, .text*
• *.htm, .html, .shtml*	• *.xml*	• *.pdf*	• *.$*

Note: For more information, see "File List node" on page 9.

If you have files with either no extension, or a trailing dot extension (for example `File01` or `File01.`), use the **No extension** option to select these.

Input encoding If the output field will contain exact text, choose the relevant value from the following list:

- Automatic (European)
- UTF-8
- UTF-16
- ISO-8859-1
- ISO-8859-2
- Windows-1250
- US ascii

The output is shown as UTF-8 document text.

Important: Since version 14, the **List of directories** option is no longer available and the only output is a list of files.

File List Node: Other Tabs

The Types tab is a standard tab in IBM SPSS Modeler nodes, as is the Annotations tab.

Using the File List node in text mining

The File List node is used when the text data resides in external unstructured documents in formats such as Microsoft Word, Microsoft Excel, and Microsoft PowerPoint, as well as Adobe PDF, XML, HTML, and others.

As an example, suppose we connected a File List node to a Text Mining node in order to supply text that resides in external documents:

1. **File List node (Settings tab).** First, we added this node to the stream to specify where the text documents are stored. We selected the directory containing all of the documents on which we want to perform text mining.
2. **Text Mining node (Fields tab).** Next, we added and connected a Text Mining node to the File List node. In this node, we defined our input format, resource template, and output format. We selected the field name produced from the File List node, the text field, and other settings. See the topic "Using the Text Mining node in a stream" on page 27 for more information.

For more information on using the Text Mining node, see "Text Mining modeling node" on page 18.

Web Feed node

The Web Feed node can be used to prepare text data from Web feeds for the text mining process. This node accepts Web feeds in two formats:

- RSS Format. RSS is a simple XML-based standardized format for Web content. The URL for this format points to a page that has a set of linked articles such as syndicated news sources and blogs. Since RSS is a standardized format, each linked article is automatically identified and treated as a separate record in the resulting data stream. No further input is required for you to be able to identify the important text data and the records from the feed unless you want to apply a filtering technique to the text.
- HTML Format. You can define one or more URLs to HTML pages on the Input tab. Then, in the Records tab, define the record start tag as well as identify the tags that delimit the target content and assign those tags to the output fields of your choice (description, title, modified date, and so on). See the topic "Web Feed Node: Records Tab" on page 12 for more information.

Important! If you are trying to retrieve information over the web through a proxy server, you must enable the proxy server in the `net.properties` file for both the IBM SPSS Modeler Text Analytics Client and Server. Follow the instructions detailed inside this file. This applies when accessing the web through the Web Feed node or retrieving an SDL Software as a Service (SaaS) license since these connections go through Java™. This file is located in *C:\Program Files\IBM\SPSS\Modeler\18.1.1\jre\lib\net.properties* by default.

The output of this node is a set of fields used to describe the records. The **Description** field is most commonly used since it contains the bulk of the text content. However, you may also be interested in other fields, such as the short description of a record (**Short Desc** field) or the record's title (**Title** field). Any of the output fields can be selected as input for a subsequent Text Mining node.

Note: You cannot use the Web Feed node for scoring within an IBM SPSS Collaboration and Deployment Services - Scoring configuration.

You can find this node on the IBM SPSS Modeler Text Analytics tab of nodes palette at the bottom of the IBM SPSS Modeler window. See the topic "IBM SPSS Modeler Text Analytics nodes" on page 7 for more information.

Web Feed Node: Input Tab

The Input tab is used to specify one or more Web addresses, or URLs, in order to capture the text data. In the context of text mining, you could specify URLs for feeds that contain text data.

Important: When working with non RSS data, you may prefer to use a web scraping tool, such as WebQL®, to automate content gathering and then referring the output from that tool using a different source node.

You can set the following parameters:

Enter or paste URLs. In this field, you can type or paste one or more URLs. If you are entering more than one, enter only one per line and use the **Enter/Return** key to separate lines. Enter the full URL path to the file. These URLs can be for feeds in one of two formats:

- `RSS format.` RSS is a simple XML-based standardized format for Web content. The URL for this format points to a page that has a set of linked articles such as syndicated news sources and blogs. Since RSS is a standardized format, each linked article is automatically identified and treated as a separate record in the resulting data stream. No further input is required for you to be able to identify the important text data and the records from the feed unless you want to apply a filtering technique to the text.
- `HTML format.` You can define one or more URLs to HTML pages on the Input tab. Then, in the Records tab, define the record start tag as well as identify the tags that delimit the target content and assign those tags to the output fields of your choice (description, title, modified date, and so on). When working with non RSS data, you may prefer to use a web scraping tool, such as WebQL®, to automate content gathering and then referring the output from that tool using a different source node. See the topic "Web Feed Node: Records Tab" for more information.

Number of most recent entries to read per URL. This field specifies the maximum number of records to read for each URL listed in the field starting with the first record found in the feed. The amount of text impacts the processing speed during extraction downstream in a Text Mining node or Text Link Analysis node.

Save and reuse previous web feeds when possible. With this option, web feeds are scanned and the processed results are cached. Then, upon subsequent stream executions, if the contents of a given feed have not changed or if the feed is inaccessible (an Internet outage, for example), the cached version is used to speed processing time. Any new content discovered in these feeds is also cached for the next time you execute the node.

- **Label**. If you select **Save and reuse previous web feeds when possible**, you must specify a label name for the results. This label is used to describe the cached feeds on the server. If no label is specified or the label is unrecognized, no reuse will be possible. You can manage these web feed caches in the session table of the IBM SPSS Text Analytics Administration Console included in IBM SPSS Deployment Manager. Refer to the Deployment Manager User Guide for more information.

Web Feed Node: Records Tab

The Records tab is used to specify the text content of non-RSS feeds by identifying where each new record begins, as well as other relevant information regarding each record. If you know that a non-RSS feed (HTML) contains text that is in multiple records, you must identify the record start tag here or else the text will be treated as one record. While RSS feeds are standardized and do not require any tag specification on this tab, you can still preview the content in the Preview tab.

Important! When working with non RSS data, you may prefer to use a web scraping tool, such as WebQL®, to automate content gathering and then referring the output from that tool using a different source node.

URL. This drop-down list contains a list of URLs entered on the Input tab. Both HTML and RSS formatted feeds are present. If the URL address is too long for the drop-down list, it will automatically be clipped in the middle using an ellipsis to replace the clipped text, such as *http://www.ibm.com/example/start-of-address...rest-of-address/path.htm*.

- With **HTML formatted feeds**, if the feed contains more than one record (or entry), you can define which HTML tags contain the data corresponding to the field shown in the table. For example, you can define the start tag that indicates a new record has started, a modified date tag, or an author name.
- With **RSS formatted feeds**, you are not prompted to enter any tags since RSS is a standardized format. However, you can view sample results on the Preview tab if desired. All recognized RSS feeds are preceded by the RSS logo image.

Source tab. On this tab, you can view the source code for any HTML feeds. This code is not editable. You can use the Find field to locate specific tags or information on this page that you can then copy and paste into the table below. The Find field is not case sensitive and will match partial strings.

Preview tab. On this tab, you can preview how a record will be read by the Web feed node. This is particularly useful for HTML feeds since you can change how a record will be read by defining HTML tags in the table below the Preview tab.

Non-RSS record start tag. This option only applies to non-RSS feeds. If your HTML feed contains multiple text that you want to break up into multiple records, specify the HTML tag that signals the beginning of a record (such as an article or blog entry) here. If you do not define one for a non-RSS feed, the entire page is treated as one single record, the entire contents are output in the **Description** field, and the node execution date is used as both the **Modified Date** and the **Published Date**.

Field table. This option only applies to non-RSS feeds. In this table, you can break up the text content into specific output fields by entering a start tag for any of the predefined output fields. Enter the start tag only. All matches are done by parsing the HTML and matching the table contents to the tag names and attributes found in the HTML. You can use the buttons at the bottom to copy the tags you have defined and reuse them for other feeds.

Table 2. Possible output fields for non-RSS feeds (HTML formats)

Output Field Name	Expected Tag Content
Title	The tag delimiting the record title. (optional)
Short Desc	The tag delimiting the short description or label. (optional)
Description	The tag delimiting the main text. If left blank, this field will contain all other content in either the `<body>` tag (if there is a single record) or the content found inside the current record (when a record delimiter has been specified).
Author	The tag delimiting the author of the text. (optional)
Contributors	The tag delimiting the names of the contributors. (optional)
Published Date	The tag delimiting the date when the text was published. If left blank, this field will contain the date when the node reads the data.
Modified Date	The tag delimiting the date when the text was modified. If left blank, this field will contain the date when the node reads the data.

When you enter a tag into the table, the feed is scanned using this tag as the minimum tag to match rather than an exact match. That is, if you entered `<div>` for the Title field, this would match any `<div>` tag in the feed, including those with specified attributes (such as `<div class="post three">`), such that `<div>` is equal to the root tag (`<div>`) and any derivative that includes an attribute and use that content for the Title output field. If you enter a root tag, any further attributes are also included.

Table 3. Examples of HTML tags used identify the text for the output fields

If you enter:	It would match:	And also match:	But not match:
`<div>`	`<div>`	`<div class="post">`	any other tag
`<p class="auth">`	`<p class="auth">`	`<p color="black" class="auth" id="85643">`	`<p color="black">`

Web Feed Node: Content Filter Tab

The Content Filter tab is used to apply a filter technique to RSS feed content. This tab does not apply to HTML feeds. You may want to filter if the feed contains a lot of text in the form of headers, footers, menus, advertising and so on. You can use this tab to strip out unwanted HTML tags, JavaScript, and short words or lines from the content.

Content Filtering. If you do not want to apply a cleaning technique, select **None**. Otherwise, select **RSS Content Cleaner**.

RSS Content Cleaner Options. If you select **RSS Content Cleaner**, you can choose to discard lines based on certain criteria. A line is delimited by an HTML tag such as `<p>` and `<li>` but excluding in-line tags such as `<span>`, `<b>`, and `<font>`. Please note that `<br>` tags are processed as line breaks.

- **Discard short lines**. This option ignores lines that do not contain the **minimum number of words** defined here.
- **Discard lines with short words**. This option ignores lines that have more than the **minimum average word length** defined here.
- **Discard lines with many single character words**. This option ignores lines that contain more than a certain **proportion of single character words**.
- **Discard lines containing specific tags**. This option ignores text in lines that contain any of the tags specified in the field.
- **Discard lines containing specific text**. This option ignores lines that contain any of the text specified in the field.

Using the Web Feed Node in Text Mining

The Web Feed node can be used to prepare text data from Internet Web feeds for the text mining process. This node accepts Web feeds in either an HTML or RSS format. These feeds serve as input into the text mining process (a subsequent Text Mining or Text Link Analysis node).

If you use the Web Feed node, you must make sure to specify that the Text field represents **actual text** in the Text Mining or Text Link Analysis node to indicate that these feeds link directly to each article or blog entry.

Important! If you are trying to retrieve information over the web through a proxy server, you must enable the proxy server in the `net.properties` file for both the IBM SPSS Modeler Text Analytics Client and Server. Follow the instructions detailed inside this file. This applies when accessing the web through the Web Feed node or retrieving an SDL Software as a Service (SaaS) license since these connections go through Java. This file is located in *C:\Program Files\IBM\SPSS\Modeler\18.1.1\jre\lib\net.properties* by default.

Example: Web Feed node (RSS Feed) with the Text Mining modeling node

As an example, suppose we connect a Web Feed node to a Text Mining node in order to supply text data from an RSS feed into the text mining process.

1. **Web Feed node (Input tab).** First, we added this node to the stream to specify where the feed contents are located and to verify the content structure. On the first tab, we provided the URL to an RSS feed. Since our example is for an RSS feed, the formatting is already defined, and we do not need to make any changes on the Records tab. An optional content filtering algorithm is available for RSS feeds, however in this case it was not applied.
2. **Text Mining node (Fields tab).** Next, we added and connected a Text Mining node to the Web Feed node. On this tab, we defined the text field output by the Web Feed node. In this case, we wanted to use the **Description** field. We also selected the option Text field represents **actual text**, as well as other settings.
3. **Text Mining node (Model tab).** Next, on the Model tab, we chose the build mode and resources. In this example, we chose to build a concept model directly from this node using the default resource template.

For more information on using the Text Mining node, see "Text Mining modeling node" on page 18.

Language Node

You can use the Language node to identify the natural language of a text field within your source data.

The output of this node is a derived field that contains the detected language code.

Note: You cannot use the Language node for scoring within an IBM SPSS Collaboration and Deployment Services - Scoring configuration.

You can find this node on the IBM SPSS Modeler Text Analytics tab of nodes palette at the bottom of the IBM SPSS Modeler window. See the topic "IBM SPSS Modeler Text Analytics nodes" on page 7 for more information.

Language Node: Settings Tab

On this tab you specify how to output the language details for a selected text field.

Text field Select the text field for which you want to identify the language.

Derive field name Enter a name for the derived field which will contain the detected language code. The default value is *Language*.

Default value for when language cannot be identified Specify the name of the field to be created if the language cannot be identified. The available choices are:

- **Undefined** If selected, the derived field contains null values.
- **Supported** If selected, you can choose from one of the following supported ISO languages:
  - English (EN)
  - German (DE)
  - Spanish (ES)
  - French (FR)
  - Italian (IT)
  - Dutch (NL)
  - Portuguese (PT)
- **Custom** If no supported language is suitable, use this option to specify that a custom value should be used. Typically this might be a 2 letter ISO language code, but can be any text string that you require.

Chapter 3. Mining for Concepts and Categories

The Text Mining modeling node is used to generate one of two text mining model nuggets:

- *Concept model nuggets* uncover and extract salient concepts from your structured or unstructured text data.
- *Category model nuggets* score and assign documents and records to categories, which are made up of the extracted concepts (and patterns).

The extracted concepts and patterns as well as the categories from your model nuggets can all be combined with existing structured data, such as demographics, and applied using the full suite of tools from IBM SPSS Modeler to yield better and more focused decisions. For example, if customers frequently list login issues as the primary impediment to completing online account management tasks, you might want to incorporate "login issues" into your models.

Additionally, the Text Mining modeling node is fully integrated within IBM SPSS Modeler so that you can deploy text mining streams via IBM SPSS Modeler Solution Publisher for real-time scoring of unstructured data in applications such as PredictiveCallCenter. The ability to deploy these streams ensures successful closed-loop text mining implementations. For example, your organization can now analyze scratch-pad notes from inbound or outbound callers by applying your predictive models to increase the accuracy of your marketing message in real time. Using text mining model results in streams has been shown to improve the accuracy of predictive data models.

To run IBM SPSS Modeler Text Analytics with IBM SPSS Modeler Solution Publisher, add the directory `<install_directory>/ext/bin/spss.TMWBServer` to the `$LD_LIBRARY_PATH` environment variable.

In IBM SPSS Modeler Text Analytics, we often refer to extracted concepts and categories. It is important to understand the meaning of concepts and categories since they can help you make more informed decisions during your exploratory work and model building.

Concepts and Concept Model Nuggets

During the extraction process, the text data is scanned and analyzed in order to identify interesting or relevant single words, such as `election` or `peace`, and word phrases. such as `presidential election`, `election of the president`, or `peace treaties`. These words and phrases are collectively referred to as *terms*. Using the linguistic resources, the relevant terms are extracted, and similar terms are grouped together under a lead term called a **concept**.

In this way, a concept could represent multiple underlying terms depending on your text and the set of linguistic resources you are using. For example, let's say we have a employee satisfaction survey and the concept `salary` was extracted. Let's also say that when you looked at the records associated with `salary`, you noticed that `salary` isn't always present in the text but instead certain records contained something similar, such as the terms `wage`, `wages`, and `salaries`. These terms are grouped under `salary` since the extraction engine deemed them as similar or determined they were synonyms based on processing rules or linguistic resources. In this case, any documents or records containing any of those terms would be treated as if they contained the word `salary`.

If you want to see what terms are grouped under a concept, you can explore the concept within an interactive workbench or look at which synonyms are shown in the concept model. See the topic "Underlying Terms in Concept Models" on page 30 for more information.

A **concept model nugget** contains a set of concepts that can be used to identify records or documents that also contain the concept (including any of its synonyms or grouped terms). A concept model can be used

in two ways. The first would be to explore and analyze the concepts that were discovered in the original source text or to quickly identify documents of interest. The second would be to apply this model to new text records or documents to quickly identify the same key concepts in the new documents/records, such as the real-time discovery of key concepts in scratch-pad data from a call center.

See the topic "Text Mining Nugget: Concept Model" on page 28 for more information.

Categories and Category Model Nuggets

You can create **categories** that represent, in essence, higher-level concepts or topics to capture the key ideas, knowledge, and attitudes expressed in the text. Categories are made up of set of descriptors, such as *concepts*, *types*, and *rules*. Together, these descriptors are used to identify whether or not a record or document belongs in a given category. A document or record can be scanned to see whether any of its text matches a descriptor. If a match is found, the document/record is assigned to that category. This process is called **categorization**.

Categories can be built automatically using the product's robust set of automated techniques, manually using additional insight you may have regarding the data, or a combination of both. You can also load a set of prebuilt categories from a text analysis package through the Model tab of this node. Manual creation of categories or refining categories can only be done through the interactive workbench. See the topic "Text Mining Node: Model Tab" on page 21 for more information.

A **category model nugget** contains a set of categories along with its descriptors. The model can be used to categorize a set of documents or records based on the text in each document/record. Every document or record is read and then assigned to each category for which a descriptor match was found. In this way, a document or record could be assigned to more than one category. You can use category model nuggets to see the essential ideas in open-ended survey responses or in a set of blog entries, for example.

See the topic "Text Mining Nugget: Category Model" on page 36 for more information.

Text Mining modeling node

The Text Mining node uses linguistic and frequency techniques to extract key concepts from the text and create categories with these concepts and other data. The node can be used to explore the text data contents or to produce either a concept model nugget or category model nugget. When you execute this modeling node, an internal linguistic extraction engine extracts and organizes the concepts, patterns, and/or categories using natural language processing methods.

You can execute the Text Mining node and automatically produce a concept or category model nugget using the **Generate directly** option. Alternatively, you can use a more hands-on, exploratory approach using the **Build interactively** mode in which not only can you extract concepts, create categories, and refine your linguistic resources, but also perform text link analysis and explore clusters. See the topic "Text Mining Node: Model Tab" on page 21 for more information.

You can find this node on the IBM SPSS Modeler Text Analytics tab of nodes palette at the bottom of the IBM SPSS Modeler window. See the topic "IBM SPSS Modeler Text Analytics nodes" on page 7 for more information.

Requirements. Text Mining modeling nodes accept text data from a Web Feed node, File List node, or any of the standard source nodes. This node is installed with IBM SPSS Modeler Text Analytics and can be accessed on the IBM SPSS Modeler Text Analytics palette.

Note: This node replaces the Text Extraction node, which was offered in old versions of the product. If you have older streams that use the old nodes or model nuggets, you must rebuild your streams using the Text Mining node.

Text Mining Node: Fields Tab

Use the Fields tab to specify the field settings for the data from which you will be extracting concepts. Consider using a Sample node upstream from this node when working with larger datasets to speed processing times. See the topic "Sampling Upstream to Save Time" on page 27 for more information.

You can set the following parameters:

ID field Select the field containing the identifier for the text records. Identifiers must be integers. The ID field serves as an index for the individual text records. Use an ID field if the text field represents the text to be mined.

Text field. Select the field containing the text to be mined. This field depends on the data source.

Language field Select the field that contains the two letter ISO language identifier. If you do not select a field, the language of each document is assumed to be that of the supplied template.

Document type. The document type specifies the structure of the text. Select one of the following types:

- **Full text.** Use for most documents or text sources. The entire set of text is scanned for extraction. Unlike the other options, there are no additional settings for this option.
- **Structured text.** Use for bibliographic forms, patents, and any files that contain regular structures that can be identified and analyzed. This document type is used to skip all or part of the extraction process. It allows you to define term separators, assign types, and impose a minimum frequency value. If you select this option, you must click the **Settings** button and enter text separators in the **Structured Text Formatting.** area of the Document Settings dialog box. See the topic "Document Settings for Fields Tab" for more information.

Textual unity. Select the extraction mode from the following:

- **Document mode.** Use for documents that are short and semantically homogenous, such as articles from news agencies.
- **Paragraph mode.** Use for Web pages and nontagged documents. The extraction process semantically divides the documents, taking advantage of characteristics such as internal tags and syntax. If this mode is selected, scoring is applied paragraph by paragraph. Therefore, for example, the rule `apple & orange` is true only if `apple` and `orange` are found in the same paragraph.

  Note: Due to the way text is extracted from PDF documents, **Paragraph mode** does not work on these documents. This is because the extraction suppresses the carriage return marker.

Paragraph mode settings. This option is available only if you set the textual unity option to **Paragraph mode**. Specify the character thresholds to be used in any extraction. The actual size is rounded up or down to the nearest period. To ensure that the word associations produced from the text of the document collection are representative, avoid specifying an extraction size that is too small.

- **Minimum.** Specify the minimum number of characters to be used in any extraction.
- **Maximum.** Specify the maximum number of characters to be used in any extraction.

Partition mode Use the partition mode to choose whether to partition based on the type node settings or to select another partition. Partitioning separates the data into training and test samples.

Document Settings for Fields Tab

Structured Text Formatting

If you want to skip all or part of the extraction process because you have structured data or want to impose rules on how to handle the text, use the **Structured text** document type option and declare the fields or tags containing the text in the **Structured Text Formatting** section of the Document Settings

dialog box. Extracted terms are derived only from the text contained within the declared fields or tags (and child tags). Any undeclared field or tag will be ignored.

In certain contexts, linguistic processing is not required, and the linguistic extraction engine can be replaced by explicit declarations. In a bibliography file where keyword fields are separated by separators such as a semicolon (;) or comma (,), it is sufficient to extract the string between two separators. For this reason, you can suspend the full extraction process and instead define special handling rules to declare term separators, assign types to the extracted text, or impose a minimum frequency count for extraction.

Use the following rules when declaring structured text elements:

- Only one field, tag, or element per line can be declared. They do not have to be present in the data.
- Declarations are case sensitive.
- If declaring a tag that has attributes, such as `<title id="1234">`, and you want to include all variations or, in this case, all IDs, add the tag without the attribute or the ending angle bracket (>), such as `<title`
- Add a colon after the field or tag name to indicate that this is structured text. Add this colon directly after the field or tag but before any separators, types, or frequency values, such as `author:` or `<place>:`.
- To indicate that multiple terms are contained in the field or tag and that a separator is being used to designate the individual terms, declare the separator after the colon, such as `author:,` or `<section>:;`.
- To assign a type to the content found in the tag, declare the type name after the colon and a separator, such as `author:,Person` or `<place>:;Location`. Declare type using the names as they appear in the Resource Editor.
- To define a minimum frequency count for a field or tag, declare a number at the end of the line, such as `author:,Person1` or `<place>:;Location5`. Where `n` is the frequency count you defined, terms found in the field or tag must occur at least `n` times in the entire set of documents or records to be extracted. This also requires you to define a separator.
- If you have a tag that contains a colon, you must precede the colon with a backslash character so that the declaration is not ignored. For example, if you have a field called `<topic:source>`, enter it as `<topic\:source>`.

To illustrate the syntax, let's assume you have the following recurring bibliographic fields:

```
author:Morel, Kawashima
abstract:This article describes how fields are declared.
publication:Text Mining Documentation
datepub:March 2010
```

For this example, if we wanted the extraction process to focus on author and abstract but ignore the rest of the content, we would declare only the following fields:

```
author:,Person1
abstract:
```

In this example, the `author:,Person1` field declaration states that linguistic processing was suspended on the field contents. Instead, it states that the author field contains more than one name, which is separated from the next by a comma separator, and these names should be assigned to the Person type and that if the name occurs at least once in the entire set of documents or records, it should be extracted. Since the field `abstract:` is listed without any other declarations, the field will be scanned during extraction and standard linguistic processing and typing will be applied.

XML Text Formatting

If you want to limit the extraction process to only the text within specific XML tags, use the **XML text** document type option and declare the tags containing the text in the **XML Text Formatting** section of the Document Settings dialog box. Extracted terms are derived only from the text contained within these tags or their child tags.

Important! If you want to skip the extraction process and impose rules on term separators, assign types to the extracted text, or impose a frequency count for extracted terms, use the **Structured text** option described next.

Use the following rules when declaring tags for XML text formatting:

- Only one XML tag per line can be declared.
- Tag elements are case sensitive.
- If a tag has attributes, such as `<title id="1234">`, and you want to include all variations or, in this case, all IDs, add the tag without the attribute or the ending angle bracket (>), such as `<title`

To illustrate the syntax, let's assume you have the following XML document:

```
<section>Rules of the Road
     <title id="01234">Traffic Signals</title>
     <p>Road signs are helpful.</p>
</section>
<p>Learning the rules is important.</p>
```

For this example, we will declare the following tags:

```
<section>
<title
```

In this example, since you have declared the tag `<section>`, the text in this tag and its nested tags, `Traffic Signals` and `Road signs are helpful`, are scanned during the extraction process. However, `Learning the rules is important` is ignored since the tag `<p>` was not explicitly declared nor was the tag nested within a declared tag.

Text Mining Node: Model Tab

The Model tab is used to specify the build method and general model settings for the node output.

You can set the following parameters:

Model name You can generate the model name automatically based on the target or ID field (or model type in cases where no such field is specified) or specify a custom name.

Use partitioned data. If a partition field is defined, this option ensures that data from only the training partition is used to build the model.

Build mode Specifies how the model nuggets will be produced when a stream with this Text Mining node is executed. Alternatively, you can use a more hands-on, exploratory approach using the **Build interactively** mode in which not only can you extract concepts, create categories, and refine your linguistic resources but you can also perform text link analysis and explore clusters.

- **Build interactively** When a stream is executed, this option launches an interactive interface in which you can extract concepts and patterns, explore and fine-tune the extracted results, build and refine categories, fine-tune the linguistic resources (templates, synonyms, types, libraries, etc.), and build category model nuggets. See the topic "Build Interactively" on page 22 for more information.
- **Generate directly** This option indicates that, when the stream is executed, a model automatically should be created and added to the Models palette. Unlike the interactive workbench, no additional manipulation is needed from you at execution time besides the settings defined in the node. If you select this option, model specific options appear with which you can define the type of model you want to produce. See the topic "Generate Directly" on page 23 for more information.

Store large models in AS If you have a connection to IBM SPSS Analytic Server, select this option to store your models remotely on the server.

Note: Any model that is built and stored on a server can only be scored on that server. To resume an interactive workbench session that contains such a model, you need a connection to the original server that was used to create the session.

Copy resources from When mining text, the extraction is based not only on the settings in the Expert tab but also on the linguistic resources. These resources serve as the basis for how to handle and process the text during extraction to get the concepts, types, and sometimes patterns. You can copy resources into this node from either a resource template or a text analysis package. Select one and then click **Load** to define the package or template from which the resources will be copied. At the moment that you load, a copy of the resources is stored in the node. Therefore, if you ever wanted to use an updated template or TAP, you would have to reload it here or in an interactive workbench session. For your convenience, the date and time at which the resources were copied and loaded is shown in the node. See the topic "Copying resources from templates and TAPs" on page 24 for more information.

Text language. Identifies the language of the text being mined. The resources copied in the node control the language options presented. Select the language for which the resources were tuned.

Build Interactively

In the Model tab of the text mining modeling node, you can choose a build mode for your model nuggets. If you choose **Build interactively**, then an interactive interface opens when you execute the stream. In this interactive workbench, you can:

- Extract and explore the extraction results, including concepts and typing to discover the salient ideas in your text data.
- Use a variety of methods to build and extend categories from concepts, types, TLA patterns, and rules so you can score your documents and records into these categories.
- Refine your linguistic resources (resource templates, libraries, dictionaries, synonyms, and more) so you can improve your results through an iterative process in which concepts are extracted, examined, and refined.
- Perform text link analysis (TLA) and use the TLA patterns discovered to build better category model nuggets. The Text Link Analysis node doesn't offer the same exploratory options or modeling capabilities.
- Generate clusters to discover new relationships and explore relationships between concept, types, patterns, and categories in the Visualization pane.
- Generate refined category model nuggets to the Models palette in IBM SPSS Modeler and use them in other streams.

Note: You cannot build an interactive model if you are creating an IBM SPSS Collaboration and Deployment Services job.

Use session work (categories, TLA, resources, etc.) from last node update. When you work in an interactive workbench session, you can update the node with session data (extraction parameters, resources, category definitions, etc.). The **Use session work** option allows you to relaunch the interactive workbench using the saved session data. This option is disabled the first time you use this node, since no session data could have been saved. To learn how to update the node with session data so that you can use this option, see "Updating Modeling Nodes and Saving" on page 72.

If you launch a session *with* this option, then the extraction settings, categories, resources, and any other work from the last time you performed a node update from an interactive workbench session are available when you next launch a session. Since saved session data are used with this option, certain content, such as the resources copied from the template below, and other tabs are disabled and ignored. But if you launch a session *without* this option, only the contents of the node as they are defined now are used, meaning that any previous work you've performed in the workbench will not be available.

Note: If you change the source node for your stream after extraction results have been cached with the **Use session work...** option, you will need to run a new extraction once the interactive workbench session is launched if you want to get updated extraction results.

Skip extraction and reuse cached data and results. You can reuse any cached extraction results and data in the interactive workbench session. This option is particularly useful when you want to save time and reuse extraction results rather than waiting for a completely new extraction to be performed when the session is launched. In order to use this option, you must have previously updated this node from within an interactive workbench session and chosen the option to **Keep the session work and cache text data with extraction results for reuse**. To learn how to update the node with session data so that you can use this option, see "Updating Modeling Nodes and Saving" on page 72.

Begin session by. Select the option indicating the view and action you want to take place first upon launching the interactive workbench session. Regardless of the view you start in, you can switch to any view once in the session.

- **Using extraction results to build categories.** This option launches the interactive workbench in the Categories and Concepts view and, if applicable, performs an extraction. In this view, you can create categories and generate a category model. You can also switch to another view. See the topic Chapter 7, "Interactive workbench mode," on page 61 for more information.
- **Exploring text link analysis (TLA) results.** This option launches and begins by extracting and identifying relationships between concepts within the text, such as opinions or other links in the Text Link Analysis view. You must select a template or text analysis package that contains TLA pattern rules in order to use this option and obtain results. If you are working with larger datasets, the TLA extraction can take some time. In this case, you may want to consider using a Sample node upstream. See the topic Chapter 11, "Exploring Text Link Analysis," on page 135 for more information.
- **Analyzing co-word clusters.** This option launches in the Clusters view and updates any outdated extraction results. In this view, you can perform co-word cluster analysis, which produces a set of clusters. Co-word clustering is a process that begins by assessing the strength of the link value between two concepts based on their co-occurrence in a given record or document and ends with the grouping of strongly linked concepts into clusters. See the topic Chapter 7, "Interactive workbench mode," on page 61 for more information.

Generate Directly

In the Model tab of the text mining modeling node, you can choose a build mode for your model nuggets. If you choose **Generate directly**, you can set the options in the node and then just execute your stream. The output is a concept model nugget, which was placed directly in the Models palette. Unlike the interactive workbench, no additional manipulation is needed from you at execution time besides the frequency settings defined for this option in the node.

Maximum number of concepts to include in model. This option, which applies only when you build a model automatically (non-interactive), indicates that you want to create a concept model. It also states that this model should contain no more than the specified number of concepts.

- **Check concepts based on highest frequency. Top number of concepts.** Starting with the concept with the highest frequency, this is the number of concepts that will be checked. Here, frequency refers to the number of times a concept (and all its underlying terms) appears in the entire set of the documents/records. This number could be higher than the record count, since a concept can appear multiple times in a record.
- **Uncheck concepts that occur in too many records. Percentage of records.** Unchecks concepts with a record count percentage higher than the number you specified. This option is useful for excluding concepts that occur frequently in your text or in every record but have no significance in your analysis.

Optimize for speed of scoring. Selected by default, this option ensures that the model created is compact and scores at high speed. Deselecting this option creates a much larger model which scores more slowly. However, the larger model ensures that scores displayed initially in the generated concept model are the same as those obtained when scoring the same text with the model nugget.

Copying resources from templates and TAPs

When mining text, the extraction is based not only on the settings in the Expert tab but also on the linguistic resources. These resources serve as the basis for how to handle and process the text during extraction in order to get the concepts, types, and sometimes patterns. You can copy resources into this node from a *resource template*, and if you are in the Text Mining node, you can also select a *text analysis package* (TAP).

By default, resources are copied into the node from the basic template for licensed language for your product when you add the node to the canvas. If you have licenses for multiple language, the first language selected is used to determine the template to load automatically.

At the moment that you load, a copy of the selected resources is stored in the node. Only the contents of the template or TAP are copied while the template or TAP itself is not linked to the node. This means that if this template or TAP is later updated, these updates are not automatically available in the node. In short, the resources loaded into the node are always used unless you either reload a copy of a template or TAP, or unless you update a Text Mining node and select the **Use session work** option. For more information on **Use session work**, see further in this topic.

When you select a template or TAP, choose one with the same language as your text data. You can only use templates or TAPs in the languages for which you are licensed. If you want to perform text link analysis, you must select a template that contains TLA patterns. If a template contains TLA patterns, an icon will appear in the TLA column of the Load Resource Template dialog box.

Note: You cannot load TAPs into the Text Link Analysis node.

Resource templates

A resource template is a predefined set of libraries and advanced linguistic and nonlinguistic resources that have been fine-tuned for a particular domain or usage. In the text mining modeling node, a copy of the resources from a basic template are already loaded in the node when you add the node to the stream, but you can change templates or load a text analysis package by selecting either **Resource template** or **Text analysis package** and then clicking **Load**. For templates, you can then select the template in the Load Resource Template dialog box.

Note: If you do not see the template you want in the list but you have an exported copy on your machine, you can import it now. You can also export from this dialog box to share with other users. See the topic “Importing and Exporting Templates” on page 157 for more information.

Text analysis packages (TAPs)

A text analysis package (TAP) is a predefined set of libraries and advanced linguistic and nonlinguistic resources bundled with one or more sets of predefined categories. IBM SPSS Modeler Text Analytics offers several prebuilt TAPs for English language text, which is fine-tuned for a specific domain. You cannot edit these TAPs but you can use them jump start your category model building. You can also create your own TAPs in the interactive session. See the topic “Loading Text Analysis Packages” on page 125 for more information.

Note: You cannot load TAPs into the Text Link Analysis node.

Using the "Use Session Work" option (Model tab)

While resources are copied into the node in the Model tab, you might also make changes later to the resources in an interactive session and want to update the text mining modeling node with these latest changes. In this case, you would select the **Use session work** option in the Model tab of the text mining modeling node.

If you select **Use session work**, the **Load** button is disabled in the node to indicate that those resources that came from the interactive workbench will be used instead of the resources that were loaded here previously.

To make changes to resources once you've selected the **Use session work** option, you can edit or switch your resources directly inside the interactive workbench session through the Resource Editor view. See the topic "Updating Node Resources After Loading" on page 156 for more information.

Text Mining node: Expert tab

The Expert tab contains certain advanced parameters that impact how text is extracted and handled. The parameters in this dialog box control the basic behavior, as well as a few advanced behaviors, of the extraction process. However, they represent only a portion of the options available to you. There are also a number of linguistic resources and options that impact the extraction results, which are controlled by the resource template you select on the Model tab. See the topic "Text Mining Node: Model Tab" on page 21 for more information.

Note: This entire tab is disabled if you have selected the **Build interactively** mode using saved interactive workbench information on the Model tab, in which case the extraction settings are taken from the last saved workbench session.

You can set the following parameters whenever extracting:

Limit extraction to concepts with a global frequency of at least [n]. Specifies the minimum number of times a word or phrase must occur in the text in order for it to be extracted. In this way, a value of 5 limits the extraction to those words or phrases that occur at least five times in the entire set of records or documents.

In some cases, changing this limit can make a big difference in the resulting extraction results, and consequently, your categories. Let's say that you are working with some restaurant data and you do not increase the limit above 1 for this option. In this case, you might find *pizza (1), thin pizza (2), spinach pizza (2)*, and *favorite pizza (2)* in your extraction results. However, if you were to limit the extraction to a global frequency of 5 or more and re-extract, you would no longer get three of these concepts. Instead you would get *pizza (7)*, since *pizza* is the simplest form and also this word already existed as a possible candidate. And depending on the rest of your text, you might actually have a frequency of more than seven, depending on whether there are still other phrases with pizza in the text. Additionally, if *spinach pizza* was already a category descriptor, you might need to add *pizza* as a descriptor instead to capture all of the records. For this reason, change this limit with care whenever categories have already been created.

Note that this is an extraction-only feature; if your template contains terms (which they usually do), and a term for the template is found in the text, then the term will be indexed regardless of its frequency.

For example, suppose you use a Basic Resources template that includes "los angeles" under the `<Location>` type in the Core library; if your document contains Los Angeles only once, then Los Angeles will be part of the list of concepts. To prevent this you will need to set a filter to display concepts occurring at least the same number of times as the value entered in the **Limit extraction to concepts with a global frequency of at least [n]** field.

Accommodate punctuation errors. This option temporarily normalizes text containing punctuation errors (for example, improper usage) during extraction to improve the extractability of concepts. This option is extremely useful when text is short and of poor quality (as, for example, in open-ended survey responses, e-mail, and CRM data), or when the text contains many abbreviations.

Accommodate spelling for a minimum word character length of [n] This option applies a fuzzy grouping technique that helps group commonly misspelled words or closely spelled words under one concept. The fuzzy grouping algorithm temporarily strips all vowels (except the first one) and strips

double/triple consonants from extracted words and then compares them to see if they are the same so that `modeling` and `modelling` would be grouped together. However, if each term is assigned to a different type, excluding the `<Unknown>` type, the fuzzy grouping technique will not be applied.

You can also define the minimum number of *root* characters required before fuzzy grouping is used. The number of root characters in a term is calculated by totaling all of the characters and subtracting any characters that form inflection suffixes and, in the case of compound-word terms, determiners and prepositions. For example, the term `exercises` would be counted as 8 root characters in the form "exercise," since the letter *s* at the end of the word is an inflection (plural form). Similarly, `apple sauce` counts as 10 root characters ("apple sauce") and `manufacturing of cars` counts as 16 root characters ("manufacturing car"). This method of counting is only used to check whether the fuzzy grouping should be applied but does not influence how the words are matched.

Note: If you find that certain words are later grouped incorrectly, you can exclude word pairs from this technique by explicitly declaring them in the **Fuzzy Grouping: Exceptions** section in the Advanced Resources tab. See the topic "Fuzzy Grouping" on page 183 for more information.

Extract uniterms This option extracts single words (uniterms) as long as the word is not already part of a compound word and if it is either a noun or an unrecognized part of speech.

Extract nonlinguistic entities This option extracts nonlinguistic entities, such as phone numbers, social security numbers, times, dates, currencies, digits, percentages, e-mail addresses, and HTTP addresses. You can include or exclude certain types of nonlinguistic entities in the **Nonlinguistic Entities: Configuration** section of the Advanced Resources tab. By disabling any unnecessary entities, the extraction engine won't waste processing time. See the topic "Configuration" on page 187 for more information.

Uppercase algorithm This option extracts simple and compound terms that are not in the built-in dictionaries as long as the first letter of the term is in uppercase. This option offers a good way to extract most proper nouns.

Group partial and full person names together when possible This option groups names that appear differently in the text together. This feature is helpful since names are often referred to in their full form at the beginning of the text and then only by a shorter version. This option attempts to match any uniterm with the `<Unknown>` type to the last word of any of the compound terms that is typed as `<Person>`. For example, if *doe* is found and initially typed as `<Unknown>`, the extraction engine checks to see if any compound terms in the `<Person>` type include *doe* as the last word, such as *john doe*. This option does not apply to first names since most are never extracted as uniterms.

Maximum nonfunction word permutation This option specifies the maximum number of nonfunction words that can be present when applying the permutation technique. This permutation technique groups similar phrases that differ from each other only by the nonfunction words (for example, of and the) contained, regardless of inflection. For example, let's say that you set this value to at most two words and both `company officials` and `officials of the company` were extracted. In this case, both extracted terms would be grouped together in the final concept list since both terms are deemed to be the same when `of the` is ignored.

Use derivation when grouping multiterms When processing Big Data, select this option to group multiterms by using derivation rules.

Note: To enable the extraction of Text Link Analysis results, you must begin the session with the **Exploring text link analysis results** option and also choose resources that contain TLA definitions. You can always extract TLA results later during an interactive workbench session through the Extraction Settings dialog. See the topic "Extracting data" on page 76 for more information.

Sampling Upstream to Save Time

When you have a large amount of data, the processing times can take minutes to hours, especially when using the interactive workbench session. The greater the size of the data, the more time the extraction and categorization processes will take. To work more efficiently, you can add aIBM SPSS Modeler Sample nodes upstream from your Text Mining node. Use this Sample node to take a random sample using a smaller subset of documents or records to do the first few passes.

A smaller sample is often perfectly adequate to decide how to edit your resources and even create most if not all of your categories. And once you have run on the smaller dataset and are satisfied with the results, you can apply the same technique for creating categories to the entire set of data. Then you can look for documents or records that do not fit the categories you have created and make adjustments as needed.

Note: The Sample node is a standard IBM SPSS Modeler node.

Using the Text Mining node in a stream

The Text Mining modeling node is used to access data and extract concepts in a stream. You can use any source node to access data, such as a Database node, Var. File node, Web Feed node, or Fixed File node. For text that resides in external documents, a File List node can be used.

Example 1: File List node and Text Mining node to build a concept model nugget directly

The following example shows how to use the File list node along with the Text Mining modeling node to generate the concept model nugget. For more information on using the File List node, see "File List node" on page 9.

1. **File List node (Settings tab).** First, we added this node to the stream to specify where the text documents are stored. We selected the directory containing all of the documents on which we want to perform text mining.
2. **Text Mining node (Fields tab).** Next, we added and connected a Text Mining node to the File List node. In this node, we defined our input format, resource template, and output format. We selected the field name produced from the File List node and selected the text field, as well as other settings. See the topic "Using the Text Mining node in a stream" for more information.
3. **Text Mining node (Model tab)**. Next, on the Model tab, we selected the build mode to generate a concept model nugget directly from this node. You can select a different resource template, or keep the basic resources.

Example 2: Excel File and Text Mining nodes to build a category model interactively

This example shows how the Text Mining node can also launch an interactive workbench session. For more information on the interactive workbench, see Chapter 7, "Interactive workbench mode," on page 61.

1. **Excel source node (Data tab).** First, we added this node to the stream to specify where the text is stored.
2. **Text Mining node (Fields tab).** Next, we added and connected a Text Mining node. On this first tab, we defined our input format. We selected a field name from the source node.
3. **Text Mining node (Model tab).** Next, on the Model tab, we selected to build a category model nugget interactively and to use the extraction results to build categories automatically. In this example, we loaded a copy of resources and a set of categories from a text analysis package.
4. **Interactive Workbench session**. Next, we executed the stream, and the interactive workbench interface opened. After an extraction was performed, we began exploring our data and improving our categories.

Text Mining Nugget: Concept Model

A Text Mining concept model nugget is created whenever you successfully execute a Text Mining model node where you've selected the option to **Generate a model directly** in the Model tab. A text mining concept model nugget is used for the real-time discovery of key concepts in other text data, such as scratch-pad data from a call center.

The concept model nugget itself comprises a list of concepts, which have been assigned to types. You can select any or all of the concepts in that model for scoring against other data. When you execute a stream containing a Text Mining model nugget, new fields are added to the data according to the build mode selected on the Model tab of the Text Mining modeling node prior to building the model. See the topic "Concept Model: Model Tab" for more information.

If the model nugget was generated using translated documents, the scoring will be performed in the translated language. Similarly, if the model nugget was generated using English as the language, you can specify a translation language in the model nugget, since the documents will then be translated into English.

Text Mining model nuggets are placed in the model nugget palette (located on the Models tab in the upper right side of the IBM SPSS Modeler window) when they are generated.

Viewing Results

To see information about the model nugget, right-click the node in the model nuggets palette and choose **Browse** from the context menu (or **Edit** for nodes in a stream).

Adding Models to Streams

To add the model nugget to your stream, click the icon in the model nuggets palette and then click the stream canvas where you want to place the node. Or right-click the icon and choose **Add to Stream** from the context menu. Then connect your stream to the node, and you are ready to pass data to generate predictions.

Caution: If you want to use a scoring nugget to regenerate a modeling node that contains both the category model and the template used, we recommend that you create a TAP and use it in an interactive session, in place of the modeling node, before generating the scoring nugget.

Concept Model: Model Tab

In concept models, the Model tab displays the set of concepts that were extracted. The concepts are presented in a table format with one row for each concept. The objective on this tab is to select which of the concepts will be used for scoring.

Note: If you generated a category model nugget instead, this tab will present different information. See the topic "Category Model Nugget: Model Tab" on page 36 for more information.

All concepts are selected for scoring by default, as shown in the check boxes in the leftmost column. A checked box means that the concept will be used for scoring. An unchecked box means that the concept will be excluded from scoring. You can check multiple rows by selecting them and clicking one of the check boxes in your selection.

To learn more about each concept, you can look at the additional information provided in each of the following columns:

Concept. This is the lead word or phrase that was extracted. In some cases, this concept represents the concept name as well as some other underlying terms associated with this concept. To see which

underlying terms are part of a concept, display the Underlying Terms pane inside this tab and select the concept to see the corresponding terms at the bottom of the dialog box. See the topic "Underlying Terms in Concept Models" on page 30 for more information.

Global. Here, global (frequency) refers to the number of times a concept (and all its underlying terms) appears in the entire set of the documents/records.

- **Bar chart.** The global frequency of this concept in the text data presented as a bar chart. The bar takes the color of the type to which the concept is assigned in order to visually distinguish the types.
- **%.** The global frequency of this concept in the text data presented as a percentage.
- **N.** The actual number of occurrences of this concept in the text data.

Docs. Here, Docs refers to the document count, meaning number of documents or records in which the concept (and all its underlying terms) appears.

- **Bar chart.** The document count for this concept presented as a bar chart. The bar takes the color of the type to which the concept is assigned in order to visually distinguish the types.
- **%.** The document count for this concept presented as a percentage.
- **N.** The actual number of documents or records containing this concept.

Type. The type to which the concept is assigned. For each concept, the Global and Docs columns appear in a color to denote the type to which this concept is assigned. A **type** is a semantic groupings of concepts. See the topic "Type dictionaries" on page 169 for more information.

Working with Concepts

By right-clicking a cell in the table, you can display a context menu in which you can:

- **Select All.** All rows in the table will be selected.
- **Copy.** The selected concept(s) are copied to the clipboard.
- **Copy With Fields** The selected concept(s) are copied to the clipboard along with the column heading.
- **Check Selected.** Checks all check boxes for the selected rows in the table thereby including those concepts for scoring.
- **Uncheck Selected.** Unchecks all check boxes for the selected rows in the table.
- **Check All.** Checks all check boxes in the table. This results in all concepts being used in the final output.
- **Uncheck All.** Unchecks all check boxes in the table. Unchecking a concept means that it will not be used in the final output.
- **Include Concepts.** Displays the Include Concepts dialog box. See the topic "Options for Including Concepts for Scoring" for more information.

Options for Including Concepts for Scoring

To quickly check or uncheck those concepts that will be used for scoring, click the toolbar button for **Include Concepts.**.

Figure 1. Include Concepts toolbar button

Clicking this toolbar button will open the Include Concepts dialog box to allow you to select concepts based on rules. All concepts that have a check mark on the Model tab will be included for scoring. Apply a rule in this subdialog to change which concepts will be used for scoring.

You can choose from the following options:

Check concepts based on highest frequency. Top number of concepts. Starting with the concept with the highest global frequency, this is the number of concepts that will be checked. Here, frequency refers to the number of times a concept (and all its underlying terms) appears in the entire set of the documents/records. This number could be higher than the record count, since a concept can appear multiple times in a record.

Check concepts based on document count. Minimum count. This is the lowest document count needed for the concepts to be checked. Here, document count refers to number of documents/records in which the concept (and all its underlying terms) appears.

Check concepts assigned to the type. Select a type from the drop-down list to check all concepts that are assigned to this type. Concepts are assigned to types automatically during the extraction process. A **type** is a semantic grouping of concepts. Types include such things as higher-level concepts, positive and negative words and qualifiers, contextual qualifiers, first names, places, organizations, and more. See the topic "Type dictionaries" on page 169 for more information.

Uncheck concepts that occur in too many records. Percentage of records. Unchecks concepts with a record count percentage higher than the number you specified. This option is useful for excluding concepts that occur frequently in your text or in every record but have no significance in your analysis.

Uncheck concepts assigned to the type. Unchecks concepts matching the type that you select from the drop-down list.

Underlying Terms in Concept Models

You can see the underlying terms that are defined for the concepts that you have selected in the table. By clicking the underlying terms toggle button on the toolbar, you can display the underlying terms table in a split pane at the bottom of the dialog.

These underlying terms include the synonyms defined in the linguistic resources (regardless of whether they were found in the text or not) as well as any extracted plural/singular forms found in the text used to generate the model nugget, permuted terms, terms from fuzzy grouping, and so on.

Figure 2. Display Underlying Terms toolbar button

Note: You cannot edit the list of underlying terms. This list is generated through substitutions, synonym definitions (in the substitution dictionary), fuzzy grouping, and more—all of which are defined in the linguistic resources. In order to make changes to how terms are grouped under a concept or how they are handled, you must make changes directly in the resources (editable in the Resource Editor in the interactive workbench or in the Template Editor and then reload in the node) and then reexecute the stream to get a new model nugget with the updated results.

By right-clicking the cell containing an underlying term or concept, you can display a context menu in which you can:

- **Copy.** The selected cell is copied to the clipboard.
- **Copy With Fields.** The selected cell is copied to the clipboard along with the column headings.
- **Select All.** All cells in the table will be selected.

Concept model: Settings tab

The Settings tab is used to define the text field value for the new input data, if necessary. It is also the place where you define the data model for your output (scoring mode).

Note: This tab appears only when the model nugget is placed onto the canvas. It does not exist when you are accessing this dialog box directly in the Models palette.

Scoring mode: Concepts as records

With this scoring mode, a new record is created for each `concept/document` pair. Typically, there are more records in the output than there were in the input.

In addition to the input fields, the following new fields are added to the data:

Table 4. Output fields for "Concepts as records".

Field	Description
`Concept`	Contains the extracted concept name found in the text data field.
`Type`	Stores the type of the concept as a full type name, such as *Location* or *Person*. A **type** is a semantic grouping of concepts. See the topic "Type dictionaries" on page 169 for more information.
`Count`	Displays the number of occurrences for that concept (and its underlying terms) in the text body (record/document).

When you select this option, all other options except **Accommodate punctuation errors** are disabled.

Scoring mode: Concepts as fields

In concept models, for each input record, a new record is created for every concept found in a given document. Therefore, there are just as many output records as there were in the input. However, each record (row) now contains one new field (column) for each concept that was selected (using the check mark) on the Model tab. The value for each concept field depends on whether you select **Flags** or **Counts** as your field value on this tab.

Note: If you are using very large data sets, for example with a Db2 database, using **Concepts as fields** may encounter processing problems due to the amount of data. In this case we recommend using **Concepts as records** instead.

Field Values. Choose whether the new field for each concept will contain a count or a flag value.

- **Flags.** This option is used to obtain flags with two distinct values in the output, such as *Yes*/*No*, *True*/*False*, *T*/*F*, or *1* and *2*. The storage types are set automatically to reflect the values chosen. For example, if you enter numeric values for the flags, they will be automatically handled as an integer value. The storage types for flags can be string, integer, real number, or date/time. Enter a flag value for **True** and for **False**.
- **Counts.** Used to obtain a count of how many times the concept occurred in a given record.

Field name extension. Specify an extension for the field name. Field names are generated by using the concept name plus this extension.

- **Add as.** Specify where the extension should be added to the field name. Choose **Prefix** to add the extension to the beginning of the string. Choose **Suffix** to add the extension to the end of the string.

Accommodate punctuation errors. This option temporarily normalizes text containing punctuation errors (for example, improper usage) during extraction to improve the extractability of concepts. This option is extremely useful when text is short and of poor quality (as, for example, in open-ended survey responses, e-mail, and CRM data), or when the text contains many abbreviations.

Concept Model: Fields tab

The Fields tab defines the text field value for the new input data, if necessary.

Note: This tab appears only when the model nugget is placed in the stream. It does not exist when you are accessing this output directly in the Models palette.

Text field. Select the field containing the text to be mined. This field depends on the data source.

Document type. The document type specifies the structure of the text. Select one of the following types:

- **Full text.** Use for most documents or text sources. The entire set of text is scanned for extraction. Unlike the other options, there are no additional settings for this option.
- **Structured text.** Use for bibliographic forms, patents, and any files that contain regular structures that can be identified and analyzed. This document type is used to skip all or part of the extraction process. It allows you to define term separators, assign types, and impose a minimum frequency value. If you select this option, you must click the **Settings** button and enter text separators in the **Structured Text Formatting.** area of the Document Settings dialog box. See the topic "Document Settings for Fields Tab" on page 19 for more information.

Input encoding. This option is available only if you indicated that the text field represents **Pathnames to documents**. It specifies the default text encoding. A conversion is done from the specified or recognized encoding to `ISO-8859-1`. So even if you specify another encoding, the extraction engine will convert it to `ISO-8859-1` before it is processed. Any characters that do not fit into the `ISO-8859-1` encoding definition will be converted to spaces.

Text language. Identifies the language of the text being mined; this is the main language detected during extraction. Contact your sales representative if you are interested in purchasing a license for a supported language for which you do not currently have access.

Concept Model: Summary Tab

The Summary tab presents information about the model itself (*Analysis* folder), fields used in the model (*Fields* folder), settings used when building the model (*Build Settings* folder), and model training (*Training Summary* folder).

When you first browse a modeling node, the folders on the Summary tab are collapsed. To see the results of interest, use the expander control to the left of the folder to show the results, or click the **Expand All** button to show all results. To hide the results after viewing them, use the expander control to collapse the specific folder that you want to hide, or click the **Collapse All** button to collapse all folders.

Using Concept Model Nuggets in a Stream

When using a Text Mining modeling node, you can generate either a concept model nugget or a category model nugget (through an interactive workbench session). The following example shows how to use a concept model in a simple stream.

Example: Statistics File node with the concept model nugget

The following example shows how to use the Text Mining concept model nugget.

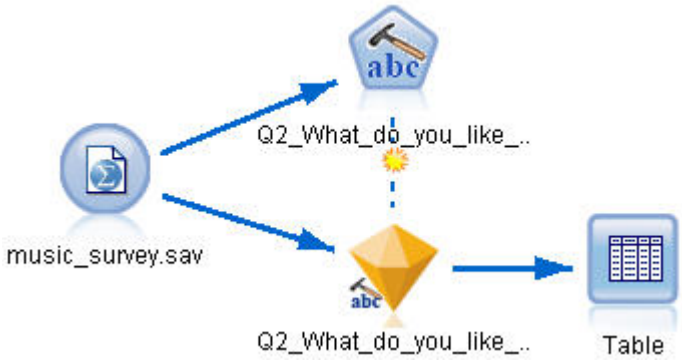


Figure 3. Example stream: Statistics File node with a Text Mining concept model nugget

1. **Statistics File node (Data tab).** First, we added this node to the stream to specify where the text documents are stored.

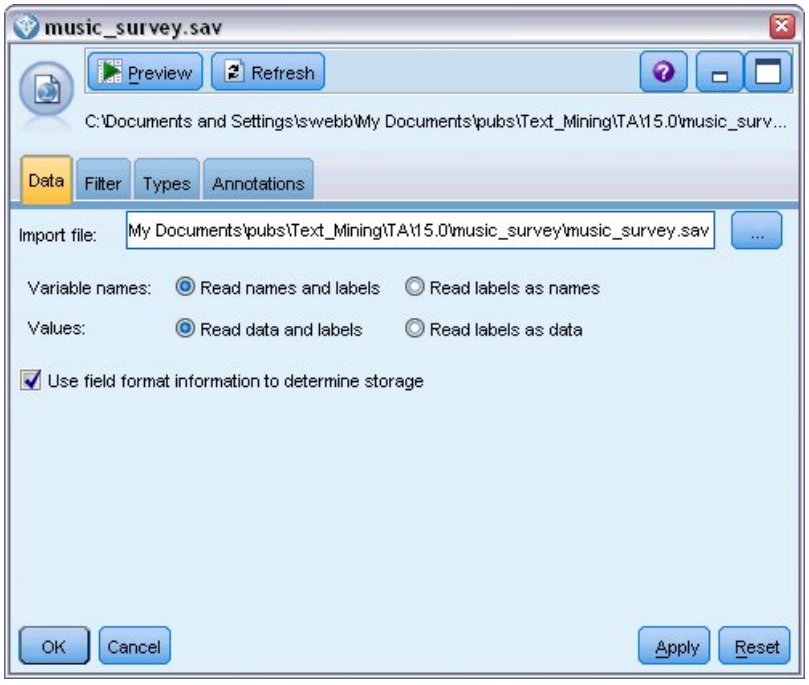


Figure 4. Statistics File node dialog box: Data tab

2. **Text Mining concept model nugget (Model tab).** Next, we added and connected a concept model nugget to the Statistics File node. We selected the concepts we wanted to use to score our data.

Figure 5. Text Mining model nugget dialog box: Model tab

3. **Text Mining concept model nugget (Settings tab).** Next, we defined the output format and selected *Concepts as fields*. One new field will be created in the output for each concept selected in the Model tab. Each field name will be made up of the concept name and the prefix "*Concept_*"

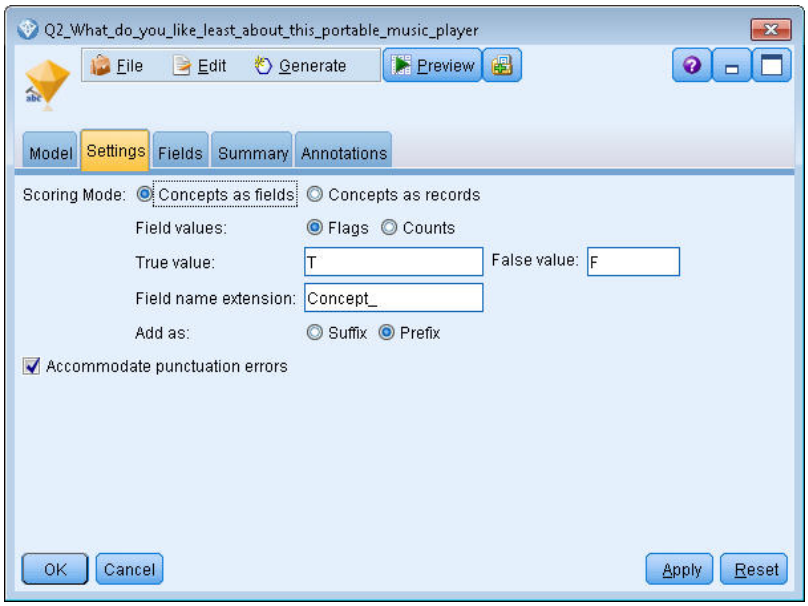


Figure 6. Text Mining concept model nugget dialog box: Settings tab

4. **Text Mining concept model nugget (Fields tab).** Next, we selected the text field, **Q2_What_do_you_like_least_about_this_portable_music_player**, which is the field name coming from the Statistics File node. We also selected the option **Text field represents: Actual text**.

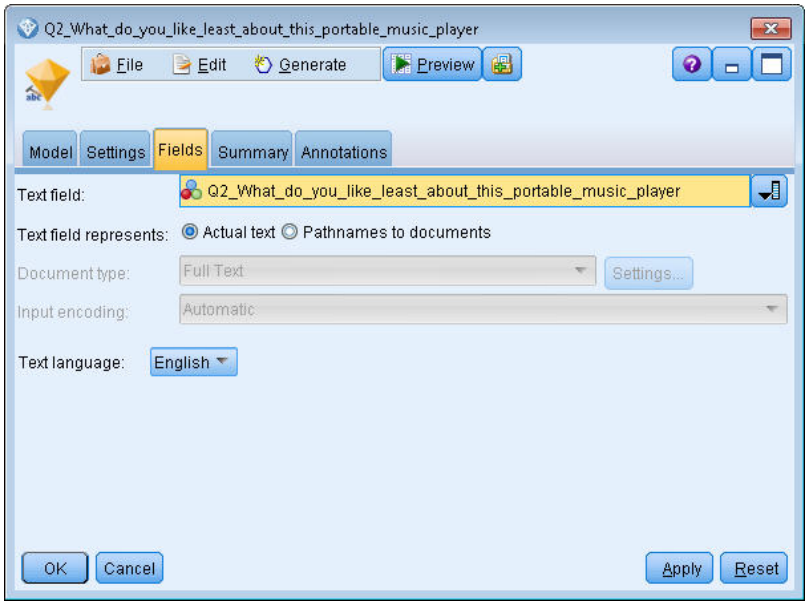
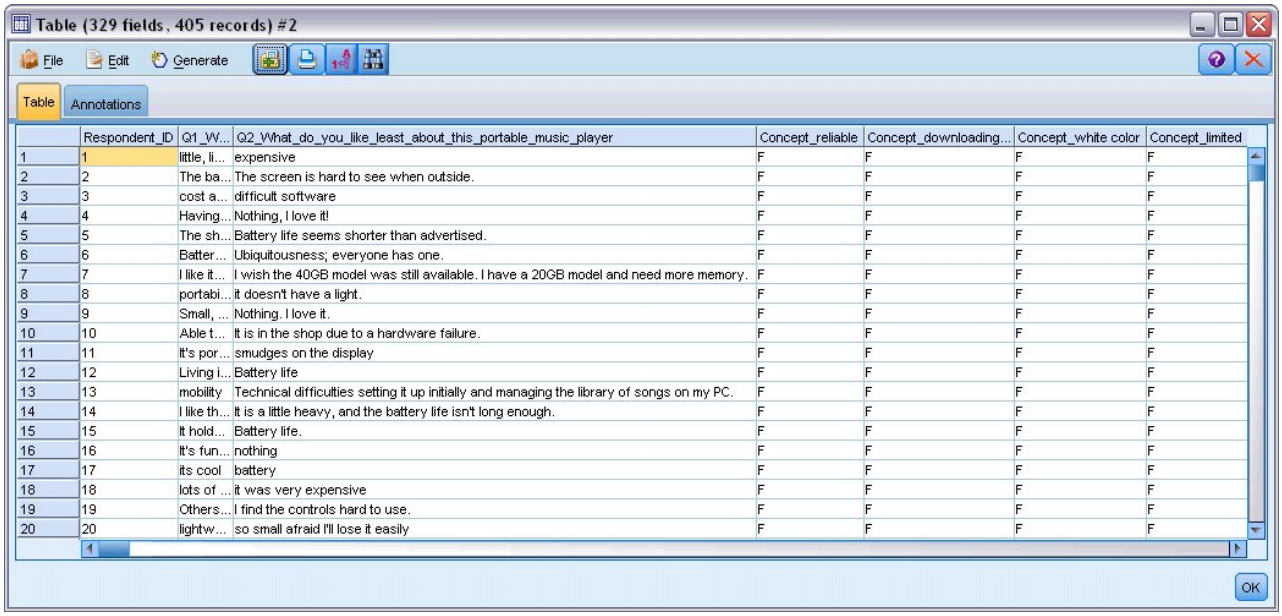


Figure 7. Text Mining concept model nugget dialog box: Fields tab

5. **Table node.** Next, we attached a table node to see the results and executed the stream. The table output opens on screen.



	Respondent_ID	Q1_W...	Q2_What_do_you_like_least_about_this_portable_music_player	Concept_reliable	Concept_downloading...	Concept_white color	Concept_limited
1	1	little, li...	expensive	F	F	F	F
2	2	The ba...	The screen is hard to see when outside.	F	F	F	F
3	3	cost a...	difficult software	F	F	F	F
4	4	Having...	Nothing, I love it!	F	F	F	F
5	5	The sh...	Battery life seems shorter than advertised.	F	F	F	F
6	6	Batter...	Ubiquitousness; everyone has one.	F	F	F	F
7	7	I like it...	I wish the 40GB model was still available. I have a 20GB model and need more memory.	F	F	F	F
8	8	portabi...	it doesn't have a light.	F	F	F	F
9	9	Small, ...	Nothing. I love it.	F	F	F	F
10	10	Able t...	It is in the shop due to a hardware failure.	F	F	F	F
11	11	It's por...	smudges on the display	F	F	F	F
12	12	Living i...	Battery life	F	F	F	F
13	13	mobility	Technical difficulties setting it up initially and managing the library of songs on my PC.	F	F	F	F
14	14	I like th...	It is a little heavy, and the battery life isn't long enough.	F	F	F	F
15	15	It hold...	Battery life.	F	F	F	F
16	16	It's fun...	nothing	F	F	F	F
17	17	its cool	battery	F	F	F	F
18	18	lots of ...	it was very expensive	F	F	F	F
19	19	Others...	I find the controls hard to use.	F	F	F	F
20	20	lightw...	so small afraid I'll lose it easily	F	F	F	F

Figure 8. Table output scrolled to show the concept flags

Text Mining Nugget: Category Model

A Text Mining category model nugget is created whenever you generate a category model from within the interactive workbench. This modeling nugget contains a set of categories, whose definition is made up of concepts, types, TLA patterns, and/or category rules. The nugget is used to categorize survey responses, blog entries, other Web feeds, and any other text data.

If you launch an interactive workbench session in the modeling node, you can explore the extraction results, refine the resources, fine-tune your categories before you generate category models. When you execute a stream containing a Text Mining model nugget, new fields are added to the data according to the build mode selected on the Model tab of the Text Mining modeling node prior to building the model. See the topic "Category Model Nugget: Model Tab" for more information.

If the model nugget was generated using translated documents, the scoring will be performed in the translated language. Similarly, if the model nugget was generated using English as the language, you can specify a translation language in the model nugget, since the documents will then be translated into English.

Text Mining model nuggets are placed in the model nugget palette (located on the Models tab in the upper right side of the IBM SPSS Modeler window) when they are generated.

Viewing Results

To see information about the model nugget, right-click the node in the model nuggets palette and choose **Browse** from the context menu (or **Edit** for nodes in a stream).

Adding Models to Streams

To add the model nugget to your stream, click the icon in the model nuggets palette and then click the stream canvas where you want to place the node. Or right-click the icon and choose **Add to Stream** from the context menu. Then connect your stream to the node, and you are ready to pass data to generate predictions.

Caution: If you want to use a scoring nugget to regenerate a modeling node that contains both the category model and the template used, we recommend that you create a TAP and use it in an interactive session, in place of the modeling node, before generating the scoring nugget.

Category Model Nugget: Model Tab

For category models, the model tab displays the list of categories in the category model on the left and the descriptors for a selected category on the right. Each category is made up of a number of descriptors. For each category you select, the associated descriptors appear in the table. These descriptors can include concepts, category rules, types, and TLA patterns. The type of each descriptor, as well as some examples of what each descriptor represents, is also shown.

On this tab, the objective is to select the categories you want to use for scoring. For a category model, documents and records are scored into categories. If a document or record contains one or more of the descriptors in its text or any underlying terms, then that document or record is assigned to the category to which the descriptor belongs. These underlying terms include the synonyms defined in the linguistic resources (regardless of whether they were found in the text or not) as well as any extracted plural/singular terms found in the text used to generate the model nugget, permuted terms, terms from fuzzy grouping, and so on.

Note: If you generated a concept model nugget instead, this tab will contain different results. See the topic "Concept Model: Model Tab" on page 28 for more information.

Category Tree

To learn more about each category, select that category and review the information that appears for the descriptors in that category. For each descriptor, you can review the following information:

- **Descriptor** name. This field contains an icon representing what kind of descriptor it is, as well as the descriptor name.

Table 5. Descriptor icons

	Concepts		TLA Patterns
	Types		Category Rules

- **Type.** This field contains the type name for the descriptor. Types are collections of similar concepts (semantic groupings), such as organization names, products, or positive opinions. Rules are not assigned to types.
- **Details.** This field contains a list of what is included in that descriptor. Depending on the number of matches, you may not see the entire list for each descriptor due to size limitations in the dialog box.

Selecting and Copying Categories

All top categories are selected for scoring by default, as shown in the check boxes in the left pane. A checked box means that the category will be used for scoring. An unchecked box means that the category will be excluded from scoring. You can check multiple rows by selecting them and clicking one of the check boxes in your selection. Also, if a category or subcategory is selected but one of its subcategories is not selected, then the checkbox shows a blue background to indicate that there is only a partial selection in the children of the selected category.

By right-clicking a category in the tree, you can display a context menu from which you can:

- **Check Selected.** Checks all check boxes for the selected rows in the table.
- **Uncheck Selected.** Unchecks all check boxes for the selected rows in the table.
- **Check All.** Checks all check boxes in the table. This results in all categories being used in the final output. You can also use the corresponding checkbox icon on the toolbar.
- **Uncheck All.** Unchecks all check boxes in the table. Unchecking a category means that it will not be used in the final output.You can also use the corresponding empty checkbox icon on the toolbar.

By right-clicking a cell in the descriptor table, you can display a context menu in which you can:

- **Copy.** The selected concept(s) are copied to the clipboard.
- **Copy With Fields.** The selected descriptor is copied to the clipboard along with the column headings.
- **Select All.** All rows in the table will be selected.

Category model nugget: Settings tab

The Settings tab is used to define the text field value for the new input data, if necessary. It is also the place where you define the data model for your output (scoring mode).

Note: This tab appears in the node dialog box only when the model nugget is placed on the canvas or in a stream. It does not exist when you are accessing this nugget directly in the Models palette.

Scoring mode: Categories as fields

With this option, there are just as many output records as there were in the input. However, each record now contains one new field for every category that was selected (using the check mark) on the Model tab. For each field, enter a flag value for **True** and for **False**, such as *Yes*/*No*, *True*/*False*, *T*/*F*, or *1* and *2*. The storage types are set automatically to reflect the values chosen. For example, if you enter numeric values for the flags, they will be automatically handled as an integer value. The storage types for flags can be string, integer, real number, or date/time.

Note: If you are using very large data sets, for example with a Db2 database, using **Categories as fields** may encounter processing problems due to the amount of data. In this case we recommend using **Categories as records** instead.

Field name extension. You can choose to specify an extension prefix/suffix for the field name or you can choose to use the category codes. Field names are generated by using the category name plus this extension.

- **Add as.** Specify where the extension should be added to the field name. Choose **Prefix** to add the extension to the beginning of the string. Choose **Suffix** to add the extension to the end of the string.

If a subcategory is unselected. This option allows you to specify how the descriptors belonging to subcategories that were not selected for scoring will be handled. There are two options.

- The option **Exclude its descriptors completely from scoring** will cause the descriptors of subcategories that do not have checkmarks (unselected) to be ignored and unused during scoring.
- The option **Aggregate descriptors with those in parent category** will cause the descriptors of subcategories that do not have checkmarks (unselected) to be used as descriptors for the parent category (the category above this subcategory). If several levels of subcategories and unselected, the descriptors will be rolled up under the first available parent category.

Accommodate punctuation errors. This option temporarily normalizes text containing punctuation errors (for example, improper usage) during extraction to improve the extractability of concepts. This option is extremely useful when text is short and of poor quality (as, for example, in open-ended survey responses, e-mail, and CRM data), or when the text contains many abbreviations.

Scoring mode: Categories as records

With this option, a new record is created for each `category`, `document`pair. Typically, there are more records in the output than there were in the input. In addition to the input fields, new fields are also added to the data depending on what kind of model it is.

Table 6. Output fields for "Categories as records".

New Output Field	Description
`Category`	Contains the category name to which the text document was assigned. If the categories is a subcategory of another, then the full path to the category name is controlled by the value you chose in this dialog.

Values for hierarchical categories. This option controls how the names of subcategories are displayed in the output.

- **Full category path.** This option will output the name of the category and the full path of parent categories if applicable using slashes to separate category names from subcategory names.
- **Short category path.** This option will output only the name of the category but use ellipses to show the number of parent categories for the category in question.
- **Bottom level category.** This option will output only the name of the category without the full path or parent categories shown.

If a subcategory is unselected. This option allows you to specify how the descriptors belonging to subcategories that were not selected for scoring will be handled. There are two options.

- The option **Exclude its descriptors completely from scoring** will cause the descriptors of subcategories that do not have checkmarks (unselected) to be ignored and unused during scoring.
- The option **Aggregate descriptors with those in parent category** will cause the descriptors of subcategories that do not have checkmarks (unselected) to be used as descriptors for the parent category (the category above this subcategory). If several levels of subcategories and unselected, the descriptors will be rolled up under the first available parent category.

Accommodate punctuation errors. This option temporarily normalizes text containing punctuation errors (for example, improper usage) during extraction to improve the extractability of concepts. This option is extremely useful when text is short and of poor quality (as, for example, in open-ended survey responses, e-mail, and CRM data), or when the text contains many abbreviations.

Category Model Nugget: Other Tabs

The Fields tab and Settings tab for the category model nugget are the same as for the concept model nugget.

- Fields tab. See the topic "Concept Model: Fields tab" on page 31 for more information.
- Summary tab. See the topic "Concept Model: Summary Tab" on page 32 for more information.

Using Category Model Nuggets in a Stream

The Text Mining category model nugget is generated from an interactive workbench session. You can use this model nugget in a stream.

Example: Statistics File node with the category model nugget

The following example shows how to use the Text Mining model nugget.

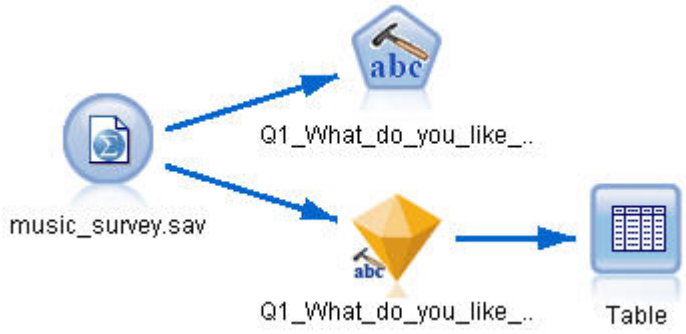


Figure 9. Example stream: Statistics File node with a Text Mining category model nugget

1. **Statistics File node (Data tab).** First, we added this node to the stream to specify where the text documents are stored.

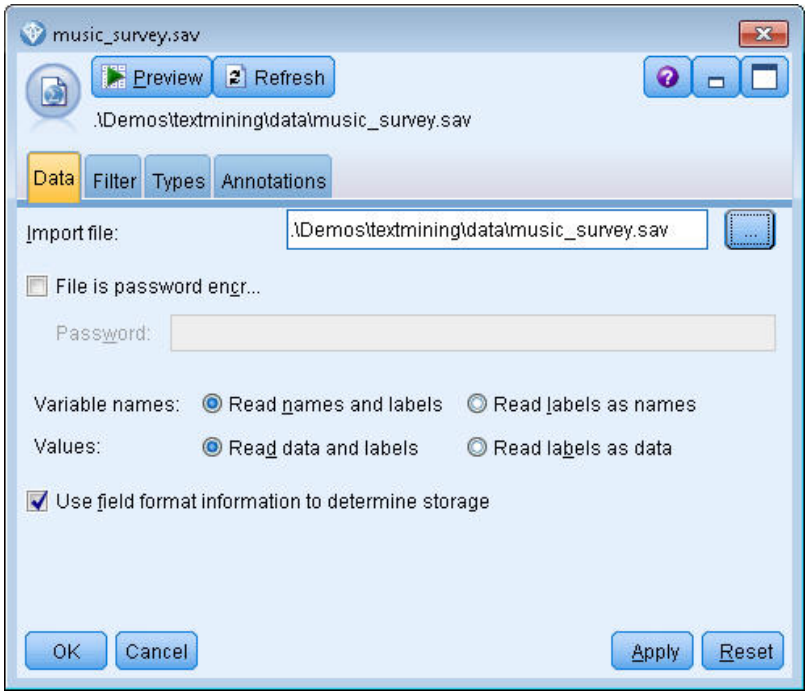


Figure 10. Statistics File node dialog box: Data tab

2. **Text Mining category model nugget (Model tab).** Next, we added and connected a category model nugget to the Statistics File node. We selected the categories we wanted to use to score our data.

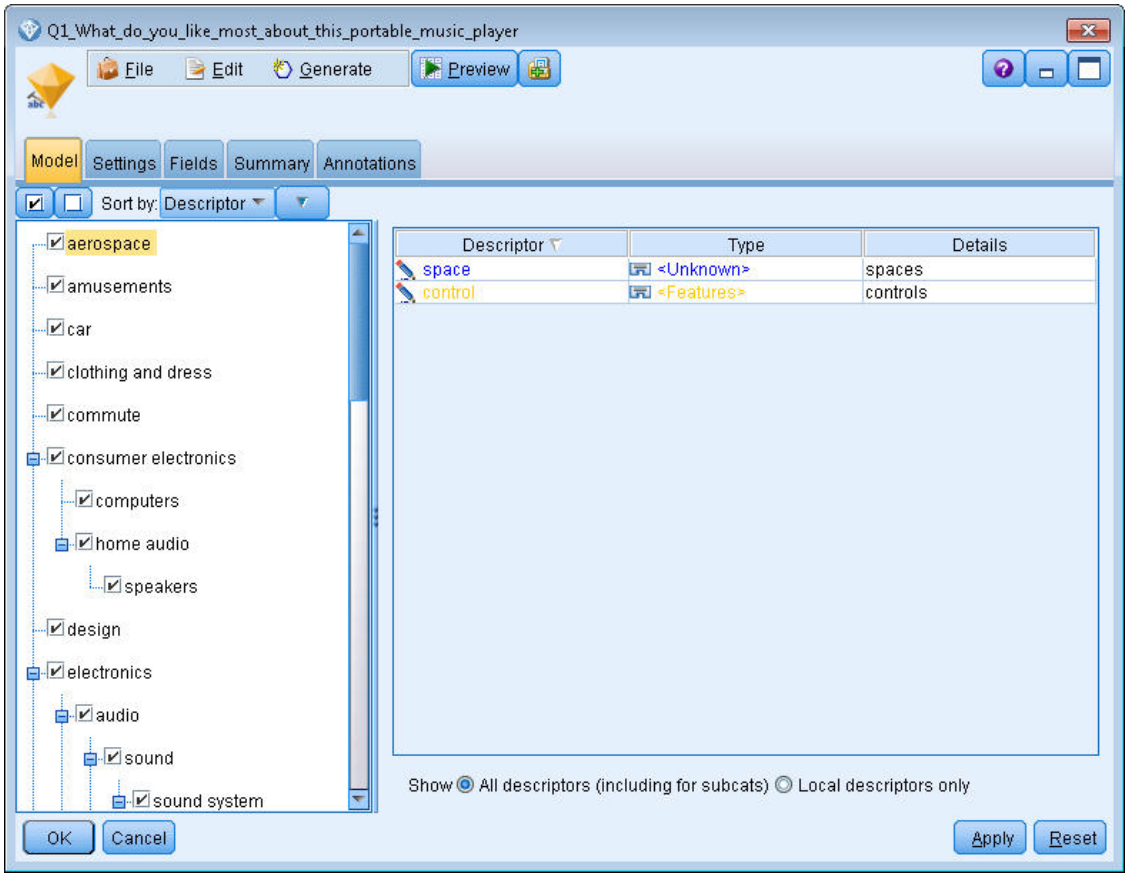


Figure 11. Text Mining model nugget dialog box: Model tab

3. **Text Mining model nugget (Settings tab).** Next, we defined the output format **Categories as fields**.

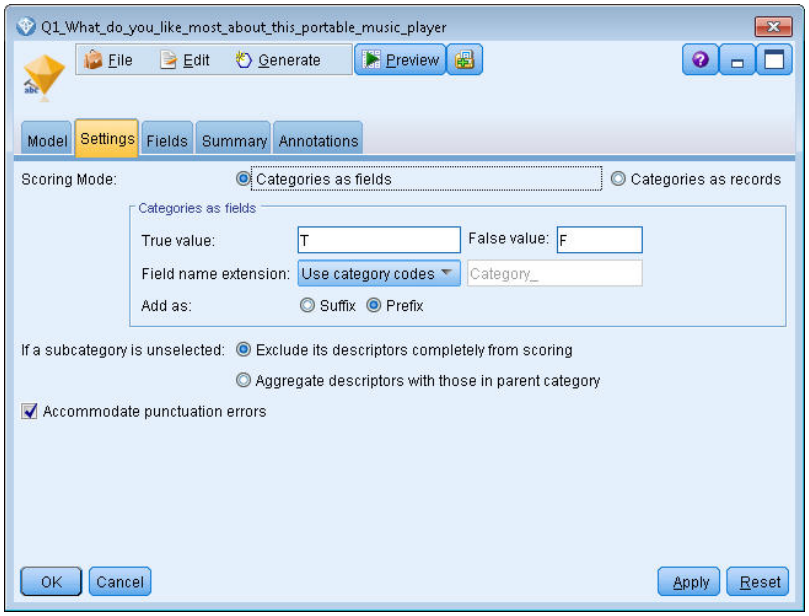


Figure 12. Category model nugget dialog box: Settings tab

4. **Text Mining category model nugget (Fields tab).** Next, we selected the text field variable, which is the field name coming from the Statistics File node, and selected the option Text field represents

Actual text, as well as other settings.

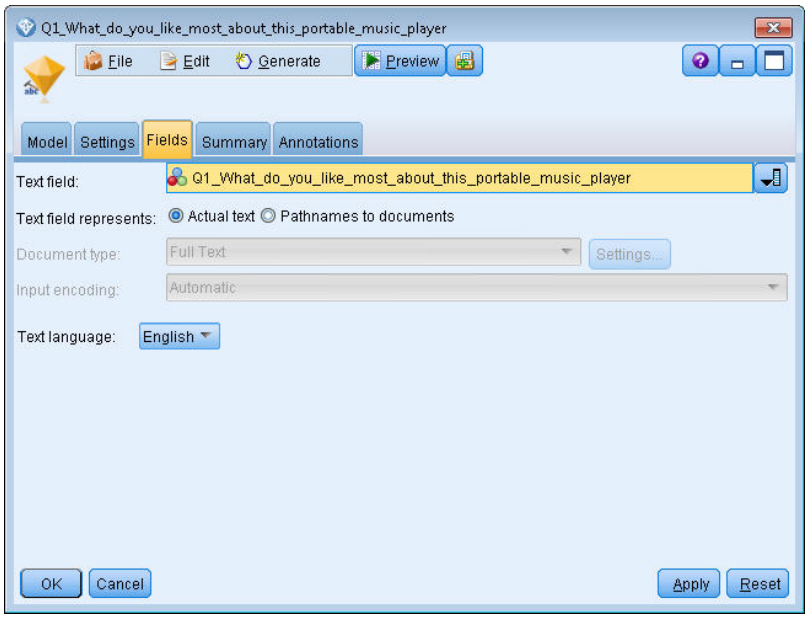
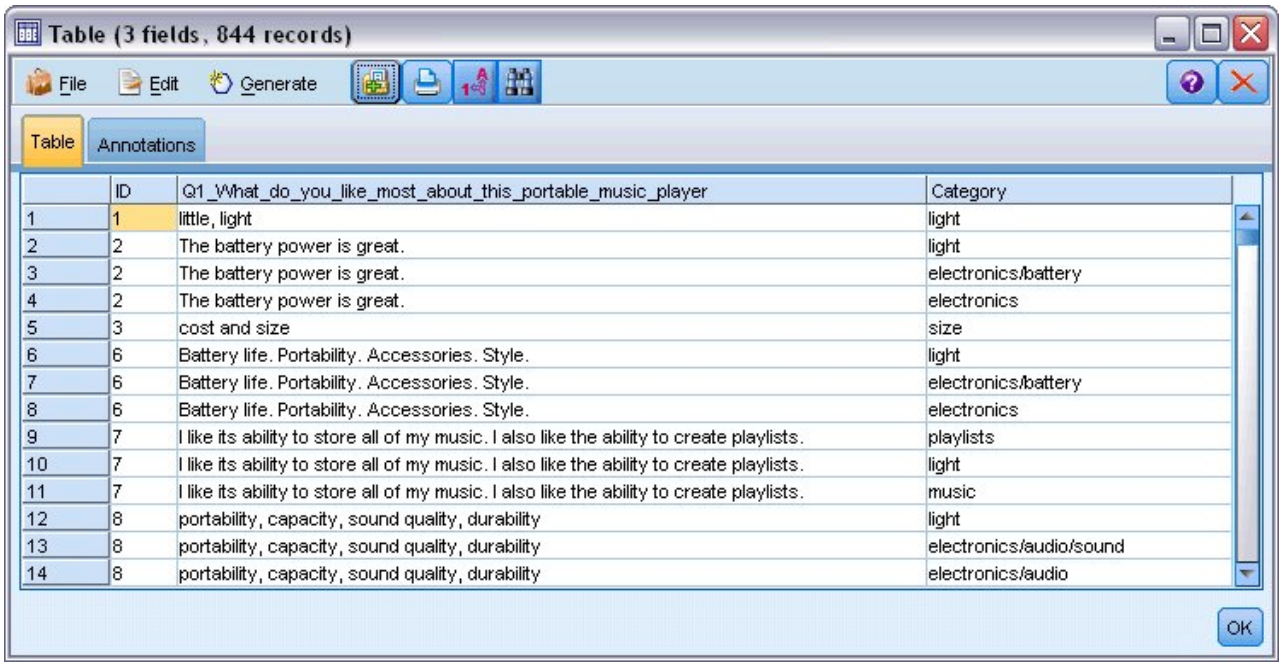


Figure 13. Text Mining model nugget dialog box: Fields tab

5. **Table node.** Next, we attached a table node to see the results and executed the stream.



	ID	Q1_What_do_you_like_most_about_this_portable_music_player	Category
1	1	little, light	light
2	2	The battery power is great.	light
3	2	The battery power is great.	electronics/battery
4	2	The battery power is great.	electronics
5	3	cost and size	size
6	6	Battery life. Portability. Accessories. Style.	light
7	6	Battery life. Portability. Accessories. Style.	electronics/battery
8	6	Battery life. Portability. Accessories. Style.	electronics
9	7	I like its ability to store all of my music. I also like the ability to create playlists.	playlists
10	7	I like its ability to store all of my music. I also like the ability to create playlists.	light
11	7	I like its ability to store all of my music. I also like the ability to create playlists.	music
12	8	portability, capacity, sound quality, durability	light
13	8	portability, capacity, sound quality, durability	electronics/audio/sound
14	8	portability, capacity, sound quality, durability	electronics/audio

Figure 14. Table output

Chapter 4. Mining for Text Links

Text Link Analysis node

The Text Link Analysis (TLA) node adds a pattern-matching technology to text mining's concept extraction in order to identify relationships between the concepts in the text data based on known patterns. These relationships can describe how a customer feels about a product, which companies are doing business together, or even the relationships between genes or pharmaceutical agents.

For example, extracting your competitor's product name may not be interesting enough to you. Using this node, you could also learn how people feel about this product, if such opinions exist in the data. The relationships and associations are identified and extracted by matching known patterns to your text data.

You can use the TLA pattern rules inside certain resource templates shipped with IBM SPSS Modeler Text Analytics or create/edit your own. Pattern rules are made up of macros, word lists, and word gaps to form a Boolean query, or rule, that is compared to your input text. Whenever a TLA pattern rule matches text, this text can be exacted as a TLA result and restructured as output data. See the topic Chapter 18, "About Text Link Rules," on page 193 for more information.

The Text Link Analysis node offers a more direct way to identify and extract TLA pattern results from your text and then add the results to the dataset in the stream. But the Text Link Analysis node is not the only way in which you can perform text link analysis. You can also use an interactive workbench session in the Text Mining modeling node.

In the interactive workbench, you can explore the TLA pattern results and use them as category descriptors and/or to learn more about the results using drill-down and graphs. See the topic Chapter 11, "Exploring Text Link Analysis," on page 135 for more information. In fact, using the Text Mining node to extract TLA results is a great way to explore and fine-tune templates to your data for later use directly in the TLA node.

The output can be represented in up to 6 slots, or parts. See the topic "TLA node output" on page 46 for more information.

You can find this node on the IBM SPSS Modeler Text Analytics tab of nodes palette at the bottom of the IBM SPSS Modeler window. See the topic "IBM SPSS Modeler Text Analytics nodes" on page 7 for more information.

Requirements. The Text Link Analysis node accepts text data read into a field using any of the standard source nodes (Database node, Flat File node, etc.) or read into a field listing paths to external documents generated by a File List node or a Web Feed node.

Strengths. The Text Link Analysis node goes beyond basic concept extraction to provide information about the relationships *between* concepts, as well as related opinions or qualifiers that may be revealed in the data.

Text Link Analysis node: Fields tab

Use the Fields tab to specify the field settings for the data from which you will be extracting concepts. You can set the following parameters:

ID field. Select the field containing the identifier for the text records. Identifiers must be integers. The ID field serves as an index for the individual text records. Use an ID field if the text field represents the text to be mined.

Text field. Select the field containing the text to be mined. This field depends on the data source.

Language field. Select the field that contains the two letter ISO language identifier. If you do not select a field, the language of each document is assumed to be that of the supplied template.

Document type. The document type specifies the structure of the text. Select one of the following types:

- **Full text.** Use for most documents or text sources. The entire set of text is scanned for extraction. Unlike the other options, there are no additional settings for this option.
- **Structured text.** Use for bibliographic forms, patents, and any files that contain regular structures that can be identified and analyzed. This document type is used to skip all or part of the extraction process. It allows you to define term separators, assign types, and impose a minimum frequency value. If you select this option, you must click the **Settings** button and enter text separators in the **Structured Text Formatting.** area of the Document Settings dialog box. See the topic "Document Settings for Fields Tab" on page 19 for more information.

Textual unity. Select the extraction mode from the following:

- **Document mode.** Use for documents that are short and semantically homogenous, such as articles from news agencies.
- **Paragraph mode.** Use for Web pages and nontagged documents. The extraction process semantically divides the documents, taking advantage of characteristics such as internal tags and syntax. If this mode is selected, scoring is applied paragraph by paragraph. Therefore, for example, the rule `apple & orange` is true only if `apple` and `orange` are found in the same paragraph.

  Note: Due to the way text is extracted from PDF documents, **Paragraph mode** does not work on these documents. This is because the extraction suppresses the carriage return marker.

Paragraph mode settings. This option is available only if you set the textual unity option to **Paragraph mode**. Specify the character thresholds to be used in any extraction. The actual size is rounded up or down to the nearest period. To ensure that the word associations produced from the text of the document collection are representative, avoid specifying an extraction size that is too small.

- **Minimum.** Specify the minimum number of characters to be used in any extraction.
- **Maximum.** Specify the maximum number of characters to be used in any extraction.

Copy resources from. When mining text, the extraction is based not only on the settings in the Expert tab but also on the linguistic resources. These resources serve as the basis for how to handle and process the text during extraction to get the concepts, types, and TLA patterns. You can copy resources into this node from a resource template.

A resource template is a predefined set of libraries and advanced linguistic and nonlinguistic resources that have been fine-tuned for a particular domain or usage. These resources serve as the basis for how to handle and process data during extraction. Click **Load** and selecting the template from which to copy your resources.

Templates are loaded when you select them and not when the stream is executed. At the moment that you load, a copy of the resources is stored into the node. Therefore, if you ever wanted to use an updated template, you would have to reload it here. See the topic "Copying resources from templates and TAPs" on page 24 for more information.

Text language. Identifies the language of the text being mined. The resources copied in the node control the language options presented. Select the language for which the resources were tuned.

Text Link Analysis node: Expert tab

In this node, the extraction of text link analysis (TLA) pattern results is automatically enabled. The Expert tab contains certain additional parameters that impact how text is extracted and handled. The parameters

in this dialog box control the basic behavior, as well as a few advanced behaviors, of the extraction process. There are also a number of linguistic resources and options that also impact the extraction results, which are controlled by the resource template you select.

Limit extraction to concepts with a global frequency of at least [n]. Specifies the minimum number of times a word or phrase must occur in the text in order for it to be extracted. In this way, a value of 5 limits the extraction to those words or phrases that occur at least five times in the entire set of records or documents.

In some cases, changing this limit can make a big difference in the resulting extraction results, and consequently, your categories. Let's say that you are working with some restaurant data and you do not increase the limit above 1 for this option. In this case, you might find *pizza (1), thin pizza (2), spinach pizza (2)*, and *favorite pizza (2)* in your extraction results. However, if you were to limit the extraction to a global frequency of 5 or more and re-extract, you would no longer get three of these concepts. Instead you would get *pizza (7)*, since *pizza* is the simplest form and also this word already existed as a possible candidate. And depending on the rest of your text, you might actually have a frequency of more than seven, depending on whether there are still other phrases with pizza in the text. Additionally, if *spinach pizza* was already a category descriptor, you might need to add *pizza* as a descriptor instead to capture all of the records. For this reason, change this limit with care whenever categories have already been created.

Note that this is an extraction-only feature; if your template contains terms (which they usually do), and a term for the template is found in the text, then the term will be indexed regardless of its frequency.

For example, suppose you use a Basic Resources template that includes "los angeles" under the `<Location>` type in the Core library; if your document contains Los Angeles only once, then Los Angeles will be part of the list of concepts. To prevent this you will need to set a filter to display concepts occurring at least the same number of times as the value entered in the **Limit extraction to concepts with a global frequency of at least [n]** field.

Accommodate punctuation errors. This option temporarily normalizes text containing punctuation errors (for example, improper usage) during extraction to improve the extractability of concepts. This option is extremely useful when text is short and of poor quality (as, for example, in open-ended survey responses, e-mail, and CRM data), or when the text contains many abbreviations.

Accommodate spelling for a minimum word character length of [n] This option applies a fuzzy grouping technique that helps group commonly misspelled words or closely spelled words under one concept. The fuzzy grouping algorithm temporarily strips all vowels (except the first one) and strips double/triple consonants from extracted words and then compares them to see if they are the same so that `modeling` and `modelling` would be grouped together. However, if each term is assigned to a different type, excluding the `<Unknown>` type, the fuzzy grouping technique will not be applied.

You can also define the minimum number of *root* characters required before fuzzy grouping is used. The number of root characters in a term is calculated by totaling all of the characters and subtracting any characters that form inflection suffixes and, in the case of compound-word terms, determiners and prepositions. For example, the term `exercises` would be counted as 8 root characters in the form “exercise,” since the letter *s* at the end of the word is an inflection (plural form). Similarly, `apple sauce` counts as 10 root characters (“apple sauce”) and `manufacturing of cars` counts as 16 root characters (“manufacturing car”). This method of counting is only used to check whether the fuzzy grouping should be applied but does not influence how the words are matched.

Note: If you find that certain words are later grouped incorrectly, you can exclude word pairs from this technique by explicitly declaring them in the **Fuzzy Grouping: Exceptions** section in the Advanced Resources tab. See the topic “Fuzzy Grouping” on page 183 for more information.

Extract uniterms This option extracts single words (uniterms) as long as the word is not already part of a compound word and if it is either a noun or an unrecognized part of speech.

Extract nonlinguistic entities This option extracts nonlinguistic entities, such as phone numbers, social security numbers, times, dates, currencies, digits, percentages, e-mail addresses, and HTTP addresses. You can include or exclude certain types of nonlinguistic entities in the **Nonlinguistic Entities: Configuration** section of the Advanced Resources tab. By disabling any unnecessary entities, the extraction engine won't waste processing time. See the topic "Configuration" on page 187 for more information.

Uppercase algorithm This option extracts simple and compound terms that are not in the built-in dictionaries as long as the first letter of the term is in uppercase. This option offers a good way to extract most proper nouns.

Group partial and full person names together when possible This option groups names that appear differently in the text together. This feature is helpful since names are often referred to in their full form at the beginning of the text and then only by a shorter version. This option attempts to match any uniterm with the `<Unknown>` type to the last word of any of the compound terms that is typed as `<Person>`. For example, if *doe* is found and initially typed as `<Unknown>`, the extraction engine checks to see if any compound terms in the `<Person>` type include *doe* as the last word, such as *john doe*. This option does not apply to first names since most are never extracted as uniterms.

Maximum nonfunction word permutation This option specifies the maximum number of nonfunction words that can be present when applying the permutation technique. This permutation technique groups similar phrases that differ from each other only by the nonfunction words (for example, of and the) contained, regardless of inflection. For example, let's say that you set this value to at most two words and both `company officials` and `officials of the company` were extracted. In this case, both extracted terms would be grouped together in the final concept list since both terms are deemed to be the same when `of the` is ignored.

Use derivation when grouping multiterms When processing Big Data, select this option to group multiterms by using derivation rules.

TLA node output

After running the Text Link Analysis node, the data are restructured. It is important to understand the way that text mining restructures your data. If you desire a different structure for data mining, you can use nodes on the Field Operations palette to accomplish this. For example, if you were working with data in which each row represented a text record, then one row is created for each pattern uncovered in the source text data. For each row in the output, there are 15 fields:

- Six fields (**Concept#**, such as **Concept1**, **Concept2**, ..., and **Concept6**) represent any concepts found in the pattern match.
- Six fields (**Type#**, such as **Type1**, **Type2**, ..., and **Type6**) represent the type for each concept.
- **Rule Name** represents the name of the text link rule used to match the text and produce the output.
- A field using the name of the ID field you specified in the node and representing the record or document ID as it was in the input data
- **Matched Text** represents the portion of the text data in the original record or document that was matched to the TLA pattern.

Note: Any preexisting streams containing a Text Link Analysis node from a release prior to 5.0 may not be fully executable until you update the nodes. Certain improvements in later versions of IBM SPSS Modeler require older nodes to be replaced with the newer versions, which are both more deployable and more powerful.

It is also possible to perform an automatic translation of certain languages. This feature enables you to mine documents in a language you may not speak or read. If you want to use the translation feature, you must have access to the SDL Software as a Service (SaaS). See the topic Translation Settings for more information.

Caching TLA Results

If you cache, the text link analysis results are in the stream. To avoid repeating the extraction of text link analysis results each time the stream is executed, select the Text Link Analysis node and from the menus choose, **Edit > Node > Cache > Enable**. The next time the stream is executed, the output is cached in the node. The node icon displays a tiny "document" graphic that changes from white to green when the cache is filled. The cache is preserved for the duration of the session. To preserve the cache for another day (after the stream is closed and reopened), select the node and from the menus choose, **Edit > Node > Cache > Save Cache**. The next time you open the stream, you can reload the saved cache rather than running the translation again.

Alternatively, you can save or enable a node cache by right-clicking the node and choosing **Cache** from the context menu.

Using the Text Link Analysis Node in a Stream

The Text Link Analysis node is used to access data and extract concepts in a stream. You can use any source node to access data.

Example: Statistics File node with the Text Link Analysis node

The following example shows how to use the Text Link Analysis node.

Figure 15. Example: Statistics File node with the Text Link Analysis node

1. **Statistics File node (Data tab).** First, we added this node to the stream to specify where the text is stored.

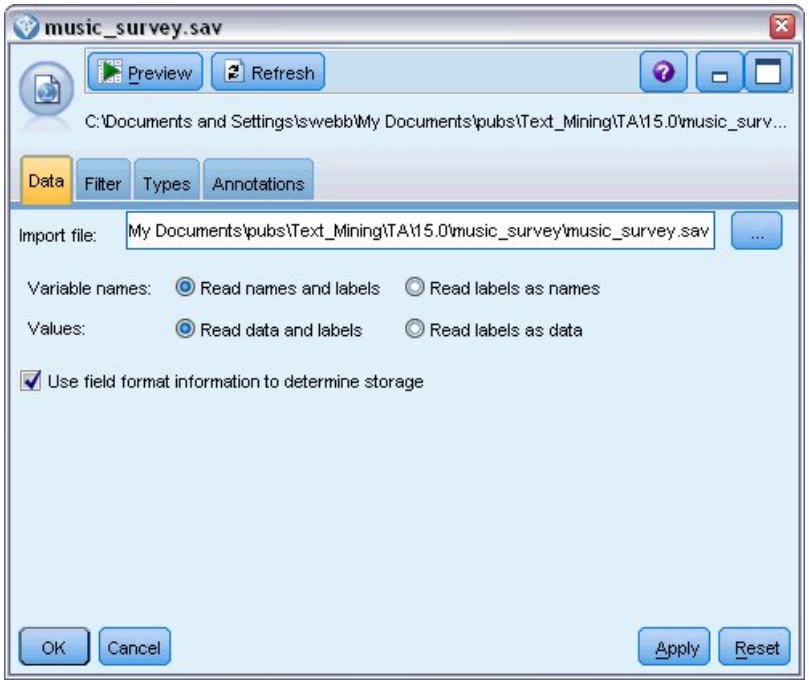


Figure 16. Statistics File node dialog box: Data tab

2. **Text Link Analysis node (Fields tab).** Next, we attached this node to the stream to extract concepts for downstream modeling or viewing. We specified the ID field and the text field name containing the data, as well as other settings.

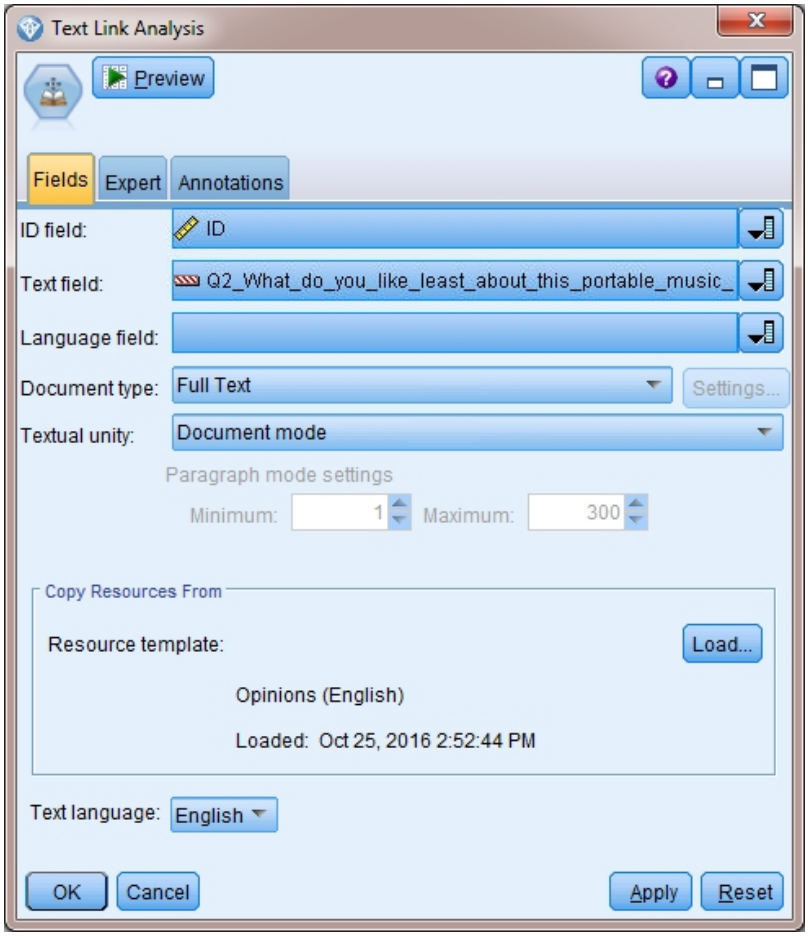
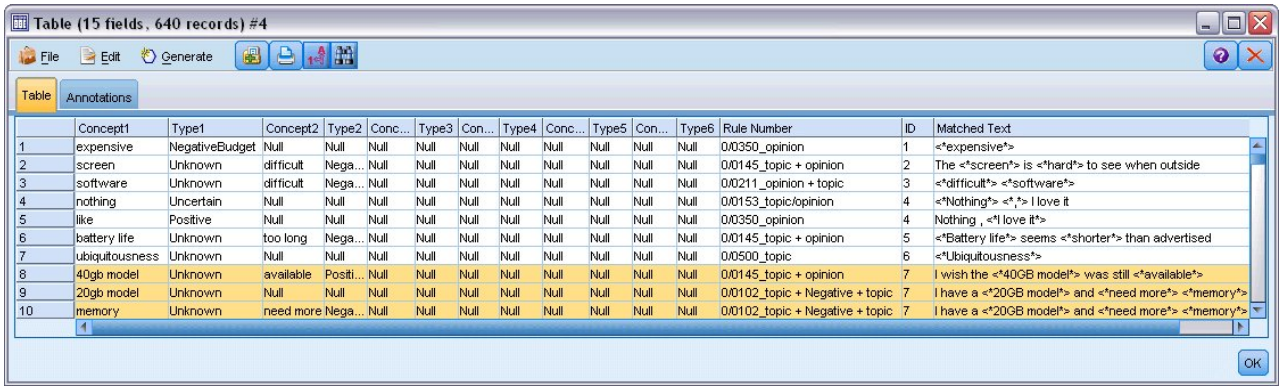


Figure 17. Text Link Analysis node dialog box: Fields tab

3. **Table node.** Finally, we attached a Table node to view the concepts that were extracted from our text documents. In the table output shown, you can see the TLA pattern results found in the data after this stream was executed with a Text Link Analysis node. Some results show only one concept/type was matched. In others, the results are more complex and contain several types and concepts. Additionally, as a result of running data through the Text Link Analysis node and extracting concepts, several aspects of the data are changed. The original data in our example contained 8 fields and 405 records. After executing the Text Link Analysis node, there are now 15 fields and 640 records. There is now one row for each TLA pattern result found. For example, `ID 7` became three rows from the original because three TLA pattern results were extracted. You can use a Merge node if you want to merge this output data back into your original data.



	Concept1	Type1	Concept2	Type2	Conc...	Type3	Con...	Type4	Conc...	Type5	Con...	Type6	Rule Number	ID	Matched Text
1	expensive	NegativeBudget	Null	Null	Null	Null	Null	Null	Null	Null	Null	Null	0/0350_opinion	1	<*expensive*>
2	screen	Unknown	difficult	Nega...	Null	Null	Null	Null	Null	Null	Null	Null	0/0145_topic + opinion	2	The <*screen*> is <*hard*> to see when outside
3	software	Unknown	difficult	Nega...	Null	Null	Null	Null	Null	Null	Null	Null	0/0211_opinion + topic	3	<*difficult*> <*software*>
4	nothing	Uncertain	Null	Null	Null	Null	Null	Null	Null	Null	Null	Null	0/0153_topic/opinion	4	<*Nothing*> <*,*> I love it
5	like	Positive	Null	Null	Null	Null	Null	Null	Null	Null	Null	Null	0/0350_opinion	4	Nothing , <*I love it*>
6	battery life	Unknown	too long	Nega...	Null	Null	Null	Null	Null	Null	Null	Null	0/0145_topic + opinion	5	<*Battery life*> seems <*shorter*> than advertised
7	ubiquitousness	Unknown	Null	Null	Null	Null	Null	Null	Null	Null	Null	Null	0/0500_topic	6	<*Ubiquitousness*>
8	40gb model	Unknown	available	Positi...	Null	Null	Null	Null	Null	Null	Null	Null	0/0145_topic + opinion	7	I wish the <*40GB model*> was still <*available*>
9	20gb model	Unknown	Null	Null	Null	Null	Null	Null	Null	Null	Null	Null	0/0102_topic + Negative + topic	7	I have a <*20GB model*> and <*need more*> <*memory*>
10	memory	Unknown	need more	Nega...	Null	Null	Null	Null	Null	Null	Null	Null	0/0102_topic + Negative + topic	7	I have a <*20GB model*> and <*need more*> <*memory*>

Figure 18. Table output node

Chapter 5. Browsing External Source Text

File Viewer node

When you are mining a collection of documents, you can specify the full path names of files directly into your Text Mining modeling nodes. However, when outputting to a Table node, you will only see the full path name of a document rather than the text within it. The File Viewer node can be used as an analog of the Table node and it enables you to access the actual text within each of the documents without having to merge them all together into a single file.

The File Viewer node can help you better understand the results from text extraction by providing you access to the source, or untranslated, text from which concepts were extracted since it is otherwise inaccessible in the stream. This node is added to the stream after a File List node to obtain a list of links to all the files.

The result of this node is a window showing all of the document elements that were read and used to extract concepts. From this window, you can click a toolbar icon to launch the report in an external browser listing document names as hyperlinks. You can click a link to open the corresponding document in the collection. See the topic “Using the File Viewer Node” on page 50 for more information.

You can find this node on the IBM SPSS Modeler Text Analytics tab of nodes palette at the bottom of the IBM SPSS Modeler window. See the topic “IBM SPSS Modeler Text Analytics nodes” on page 7 for more information.

Note: When you are working in client-server mode and File Viewer nodes are part of the stream, document collections must be stored in a Web server directory on the server. Since the Text Mining output node produces a list of documents stored in the Web server directory, the Web server's security settings manage the permissions to these documents.

File Viewer Node Settings

You can specify the following settings for the File Viewer node.

Document field. Select the field from your data that contains the full name and path of the documents to be displayed.

Title for generated HTML page. Create a title to appear at the top of the page that contains the list of documents.

Using the File Viewer Node

The following example shows how to use the File Viewer node.

Example: File List node and a File Viewer node

Figure 19. Stream illustrating the use of a File Viewer node

1. **File List node (Settings tab).** First, we added this node to specify where the documents are located.

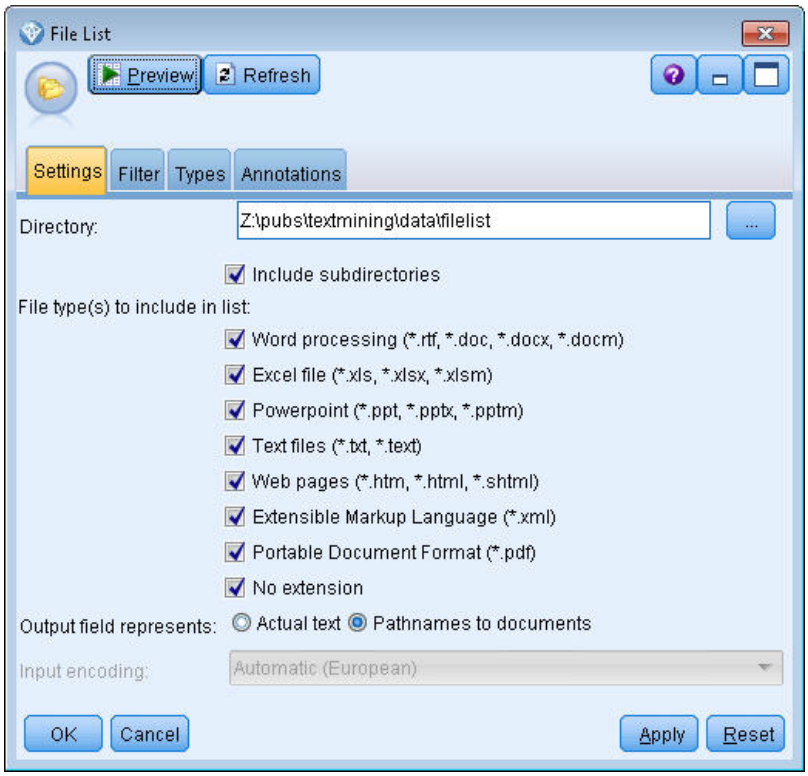


Figure 20. File List node dialog box: Settings tab

2. **File Viewer node (Settings tab).** Next, we attached the File Viewer node to produce an HTML list of documents.

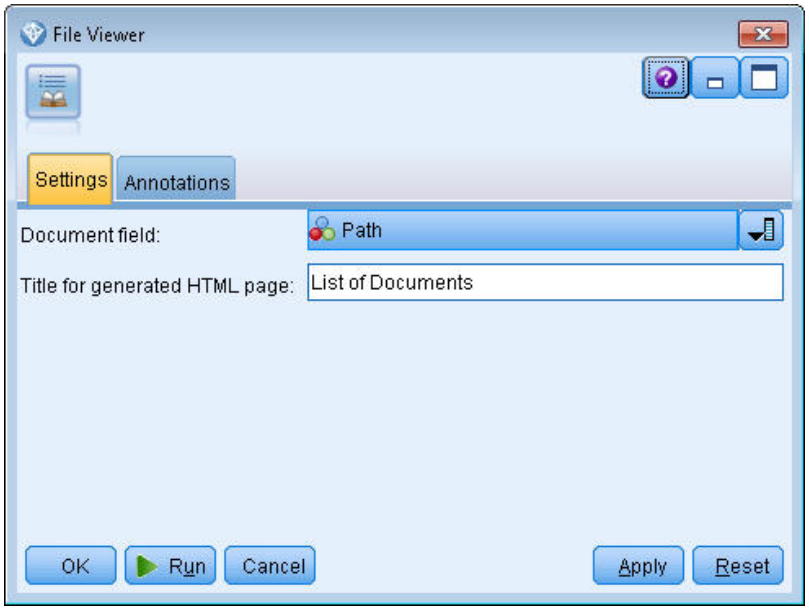


Figure 21. File Viewer node dialog box: Settings tab

3. **File Viewer Output dialog.** Next, we executed the stream which outputs the list of documents in a new window.

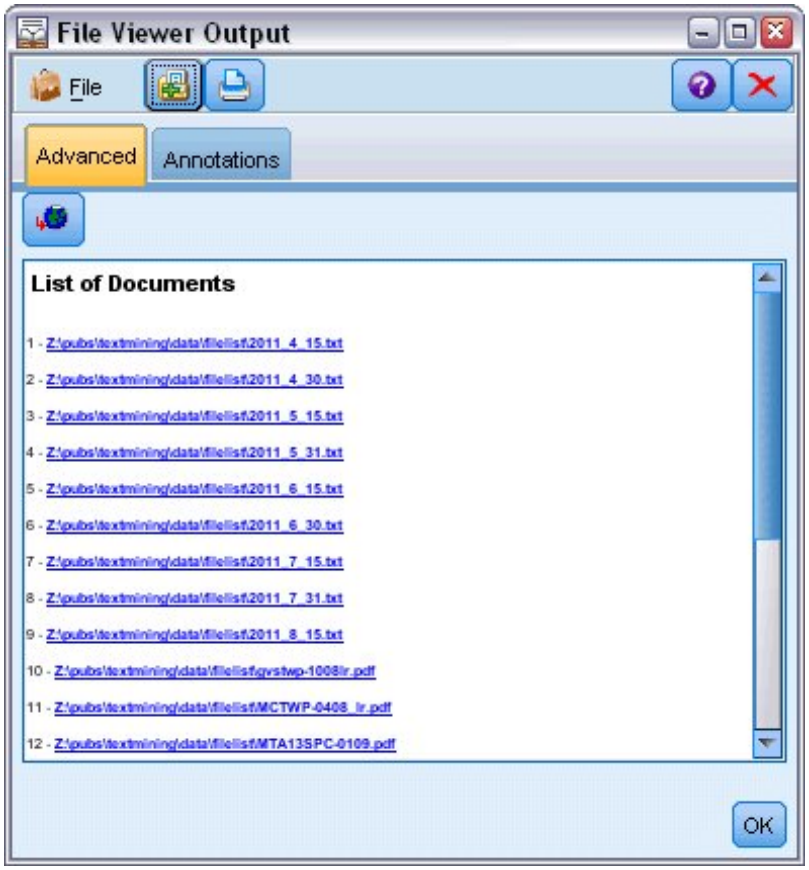


Figure 22. File Viewer Output

4. To see the documents, we clicked the toolbar button showing a globe with a red arrow. This opened a list of document hyperlinks in our browser.

Chapter 6. Node Properties for Scripting

IBM SPSS Modeler has a scripting language to allow you to execute streams from the command line. Here, you can learn about the node properties that are specific to each of the nodes delivered with IBM SPSS Modeler Text Analytics. For more information on the standard set of nodes delivered with IBM SPSS Modeler, please refer to the Scripting and Automation Guide.

File List Node: filelistnode

You can use the properties in the following table for scripting. The node itself is called `filelistnode`.

Table 7. File List node scripting properties

Scripting properties	Data type
`path`	*string*
`recurse`	*flag*
`word_processing`	*flag*
`excel_file`	*flag*
`powerpoint_file`	*flag*
`text_file`	*flag*
`web_page`	*flag*
`xml_file`	*flag*
`pdf_file`	*flag*
`no_extension`	*flag*

Note: 'Create list' parameter is no longer available and any scripts containing that option will be automatically converted into a 'Files' output.

Web Feed Node: webfeednode

You can use the properties in the following table for scripting. The node itself is called `webfeednode`.

Table 8. Web Feed node scripting properties

Scripting properties	Data type	Property description
`urls`	*string1 string2 ...stringn*	Each URL is specified in the list structure. URL list separated by "\n"
`recent_entries`	*flag*	
`limit_entries`	*integer*	Number of most recent entries to read per URL.
`use_previous`	*flag*	To save and reuse Web feed cache.
`use_previous_label`	*string*	Name for the saved Web cache.
`start_record`	*string*	Non-RSS start tag.
`url` *n* `.title`	*string*	For each URL in the list, you must define one here too. The first one will be `url1.title`, where the number matches its position in the URL list. This is the start tag containing the title of the content.
`url` *n* `.short_description`	*string*	Same as for `url` *n* `.title`.
`url` *n* `.description`	*string*	Same as for `url` *n* `.title`.

Table 8. Web Feed node scripting properties (continued)

Scripting properties	Data type	Property description
`url` *n* `.authors`	*string*	Same as for `url` *n* `.title`.
`url` *n* `.contributors`	*string*	Same as for `url` *n* `.title`.
`url` *n* `.published_date`	*string*	Same as for `url` *n* `.title`.
`url` *n* `.modified_date`	*string*	Same as for `url` *n* `.title`.
`html_alg`	`None` `HTMLCleaner`	Content filtering method.
`discard_lines`	*flag*	Discard short lines. Used with `min_words`
`min_words`	*integer*	Minimum number of words.
`discard_words`	*flag*	Discard short lines. Used with `min_avg_len`
`min_avg_len`	*integer*	
`discard_scw`	*flag*	Discard lines with many single character words. Used with `max_scw`
`max_scw`	*integer*	Maximum proportion 0-100 percentage of single characters words in a line
`discard_tags`	*flag*	Discard lines containing certain tags.
`tags`	*string*	Special characters must be escaped with a backslash character \.
`discard_spec_words`	*flag*	Discard lines containing specific strings
`words`	*string*	Special characters must be escaped with a backslash character \.

Language Node: languageidentifier

You can use the properties in the following table for scripting. The node itself is called `languageidentifier`.

Table 9. Language node scripting properties

Scripting properties	Data type	Property description
`text`	*field*	
`language_field_name`	*string*	The field name that is generated as output.

`unidentified_language_value`	`Undefined`
	`Supported`
	`Custom`
		Default value to be used when the language cannot be identified.

`unidentified_language_supported`	`en`
	`de`
	`es`
	`fr`
	`it`
	`ja`
	`nl`
	`pt`
		Iso code. Only available if `unidentified_language_value` is `Supported`.

`unidentified_language_custom`	*string*	Only available if `unidentified_language_value` is `Custom`.

Text Mining node: TextMiningWorkbench

You can use the following parameters to define or update a node through scripting. The node itself is called `TextMiningWorkbench`.

Important: It is not possible to specify a different resource template via scripting. If you think you need a template, you must select it in the node dialog box.

Table 10. Text Mining modeling node scripting properties

Scripting properties	Data type	Property description
`text`	*field*	
`method`	`ReadText` `ReadPath`	
`docType`	*integer*	With possible values (0,1,2) where 0 = `Full Text`, 1 = `Structured Text`, and 2 = `XML`

`encoding`	`Automatic`
	`"UTF-8"`
	`"UTF-16"`
	`"ISO-8859-1"`
	`"US-ASCII"`
	`"CP850"`
	`"EUC-JP"`
	`"SHIFT-JIS"`
	`"ISO2022-JP"`
		Note that values with special characters, such as `"UTF-8"`, should be quoted to avoid confusion with a mathematical operator.

`unity`	*integer*	With possible values (0,1) where 0 = `Paragraph` and 1 = `Document`
`para_min`	*integer*	
`para_max`	*integer*	
`mtag`	*string*	Contains all the mtag settings (from Settings dialog box for XML files)
`mclef`	*string*	Contains all the mclef settings (from Settings dialog box for Structured Text files)
`partition`	*field*	
`custom_field`	*flag*	Indicates whether or not a partition field will be specified.
`use_model_name`	*flag*	
`model_name`	*string*	
`use_partitioned_data`	*flag*	If a partition field is defined, only the training data are used for model building.
`model_output_type`	`Interactive` `Model`	`Interactive` results in a category model. `Model` results in a concept model.
`use_interactive_info`	*flag*	For building interactively in a workbench session only.
`reuse_extraction_results`	*flag*	For building interactively in a workbench session only.

`interactive_view`	`Categories`
	`TLA`
	`Clusters`
		For building interactively in a workbench session only.

Table 10. Text Mining modeling node scripting properties (continued)

Scripting properties	Data type	Property description
extract_top	*integer*	This parameter is used when model_type = Concept
use_check_top	*flag*	
check_top	*integer*	
use_uncheck_top	*flag*	
uncheck_top	*integer*	
language	de en es fr it ja nl pt	
frequency_limit	*integer*	Deprecated in 14.0.
concept_count_limit	*integer*	Limit extraction to concepts with a global frequency of at least this value.
fix_punctuation	*flag*	
fix_spelling	*flag*	
spelling_limit	*integer*	
extract_uniterm	*flag*	
extract_nonlinguistic	*flag*	
upper_case	*flag*	
group_names	*flag*	
permutation	*integer*	Maximum nonfunction word permutation (the default is 3).

Text Mining model nugget: TMWBModelApplier

You can use the properties in the following table for scripting. The nugget itself is called TMWBModelApplier.

Table 11. Text Mining Model Nugget Properties

Scripting properties	Data type	Property description
scoring_mode	Fields Records	
field_values	Flags Counts	This option is not available in the Category model nugget. For Flags, set to TRUE or FALSE
true_value	*string*	With Flags, define the value for true.
false_value	*string*	With Flags, define the value for false.
extension_concept	*string*	Specify an extension for the field name. Field names are generated by using the concept name plus this extension. Specify where to put this extension using the add_as value.

Table 11. Text Mining Model Nugget Properties (continued)

Scripting properties	Data type	Property description
extension_category	*string*	Field name extension. You can choose to specify an extension prefix/suffix for the field name or you can choose to use the category codes. Field names are generated by using the category name plus this extension. Specify where to put this extension using the add_as value.
add_as	Suffix Prefix	
fix_punctuation	*flag*	
excluded_subcategories_descriptors	RollUpToParent Ignore	For category models only. If a subcategory is unselected. This option allows you to specify how the descriptors belonging to subcategories that were not selected for scoring will be handled. There are two options. • Ignore. The option Exclude its descriptors completely from scoring will cause the descriptors of subcategories that do not have checkmarks (unselected) to be ignored and unused during scoring. • RollUpToParent. The option Aggregate descriptors with those in parent category will cause the descriptors of subcategories that do not have checkmarks (unselected) to be used as descriptors for the parent category (the category above this subcategory). If several levels of subcategories and unselected, the descriptors will be rolled up under the first available parent category
check_model	*flag*	Deprecated in version 14
text	*field*	
method	ReadText ReadPath	
docType	*integer*	With possible values (0,1,2) where 0 = Full Text, 1 = Structured Text, and 2 = XML
encoding	Automatic "UTF-8" "UTF-16" "ISO-8859-1" "US-ASCII" "CP850" "EUC-JP" "SHIFT-JIS" "ISO2022-JP"	Note that values with special characters, such as "UTF-8", should be quoted to avoid confusion with a mathematical operator.
language	de en es fr it ja nl pt	

Text Link Analysis node: textlinkanalysis

You can use the parameters in the following table to define or update a node through scripting. The node itself is called `textlinkanalysis`.

Important: It is not possible to specify a resource template via scripting. To select a template, you must do so from within the node dialog box.

Table 12. Text Link Analysis (TLA) node scripting properties

Scripting properties	Data type	Property description
`id_field`	*field*	
`text`	*field*	
`method`	`ReadText` `ReadPath`	
`docType`	*integer*	With possible values (0,1,2) where 0 = `Full Text`, 1 = `Structured Text`, and 2 = `XML`

`encoding`	`Automatic`
	`"UTF-8"`
	`"UTF-16"`
	`"ISO-8859-1"`
	`"US-ASCII"`
	`"CP850"`
	`"EUC-JP"`
	`"SHIFT-JIS"`
	`"ISO2022-JP"`
		Note that values with special characters, such as `"UTF-8"`, should be quoted to avoid confusion with a mathematical operator.

`unity`	*integer*	With possible values (0,1) where 0 = `Paragraph` and 1 = `Document`
`para_min`	*integer*	
`para_max`	*integer*	
`mtag`	*string*	Contains all the mtag settings (from Settings dialog box for XML files)
`mclef`	*string*	Contains all the mclef settings (from Settings dialog box for Structured Text files)

`language`	`de`
	`en`
	`es`
	`fr`
	`it`
	`ja`
	`nl`
	`pt`	

`concept_count_limit`	*integer*	Limit extraction to concepts with a global frequency of at least this value.
`fix_punctuation`	*flag*	
`fix_spelling`	*flag*	
`spelling_limit`	*integer*	
`extract_uniterm`	*flag*	
`extract_nonlinguistic`	*flag*	
`upper_case`	*flag*	
`group_names`	*flag*	

Table 12. Text Link Analysis (TLA) node scripting properties (continued)

Scripting properties	Data type	Property description
`permutation`	*integer*	Maximum nonfunction word permutation (the default is 3).

Chapter 7. Interactive workbench mode

From a text mining modeling node, you can choose to launch an interactive workbench session during stream execution. In this workbench, you can extract key concepts from your text data, build categories, and explore text link analysis patterns and clusters, and generate category models. In this chapter, we discuss the workbench interface from a high-level perspective along with the major elements with which you will work, including:

- **Extraction results.** After an extraction is performed, these are the key words and phrases identified and extracted from your text data, also referred to as *concepts*. These concepts are grouped into *types*. Using these concepts and types, you can explore your data as well as create your categories. These are managed in the **Categories and Concepts** view.
- **Categories.** Using descriptors (such as extraction results, patterns, and rules) as a definition, you can manually or automatically create a set of categories to which documents and records are assigned based on whether or not they contain a part of the category definition. These are managed in the **Categories and Concepts** view.
- **Clusters.** *Clusters* are a grouping of concepts between which links have been discovered that indicate a relationship among them. The concepts are grouped using a complex algorithm that uses, among other factors, how often two concepts appear together compared to how often they appear separately. These are managed in the **Clusters** view. You can also add the concepts that make up a cluster to categories.
- **Text link analysis patterns.** If you have text link analysis (TLA) pattern rules in your linguistic resources or are using a resource template that already has some TLA rules, you can extract patterns from your text data. These patterns can help you uncover interesting relationships between concepts in your data. You can also use these patterns as descriptors in your categories. These are managed in the **Text Link Analysis** view.
- **Linguistic resources.** The extraction process relies on a set of parameters and linguistic definitions to govern how text is extracted and handled. These are managed in the form of templates and libraries in the **Resource Editor** view.

Potential Interactive Workbench issues

- Multiple Interactive Workbench sessions can cause sluggish behavior. SPSS Modeler Text Analytics and SPSS Modeler share a common Java run-time engine when an interactive workbench session is launched. Depending on the number of Interactive Workbench sessions you invoke during a SPSS Modeler session, system memory may cause the application to become sluggish, even if opening and closing the same session. This effect may be especially pronounced if you are working with large data or have a machine with less than the recommended RAM setting of 4GB. If you notice your machine is slow to respond, it is recommended that you save all your work, shut down SPSS Modeler, and re-launch the application. Running SPSS Modeler Text Analytics on a machine with less than the recommended memory, particularly when working with large data sets or for prolonged periods of time, may cause Java to run out of memory and shut down. It is strongly suggested you upgrade to the recommended memory setting or larger (or use SPSS Modeler Text Analytics Server) if you work with large data.
- SPSS Modeler Client can run out of memory after multiple SPSS Modeler Text Analytics Interactive Workbench sessions are run without restarting the application. Monitor the memory usage in the status line and, if running low, close and re-open SPSS Modeler Client.

The Categories and Concepts View

The application interface is made up of several views. The Categories and Concepts view is the window in which you can create and explore categories as well as explore and tweak the extraction results. *Categories* refers to a group of closely related ideas and patterns to which documents and records are assigned through a scoring process. While *concepts* refer to the most basic level of extraction results

available to use as building blocks, called descriptors, for your categories.

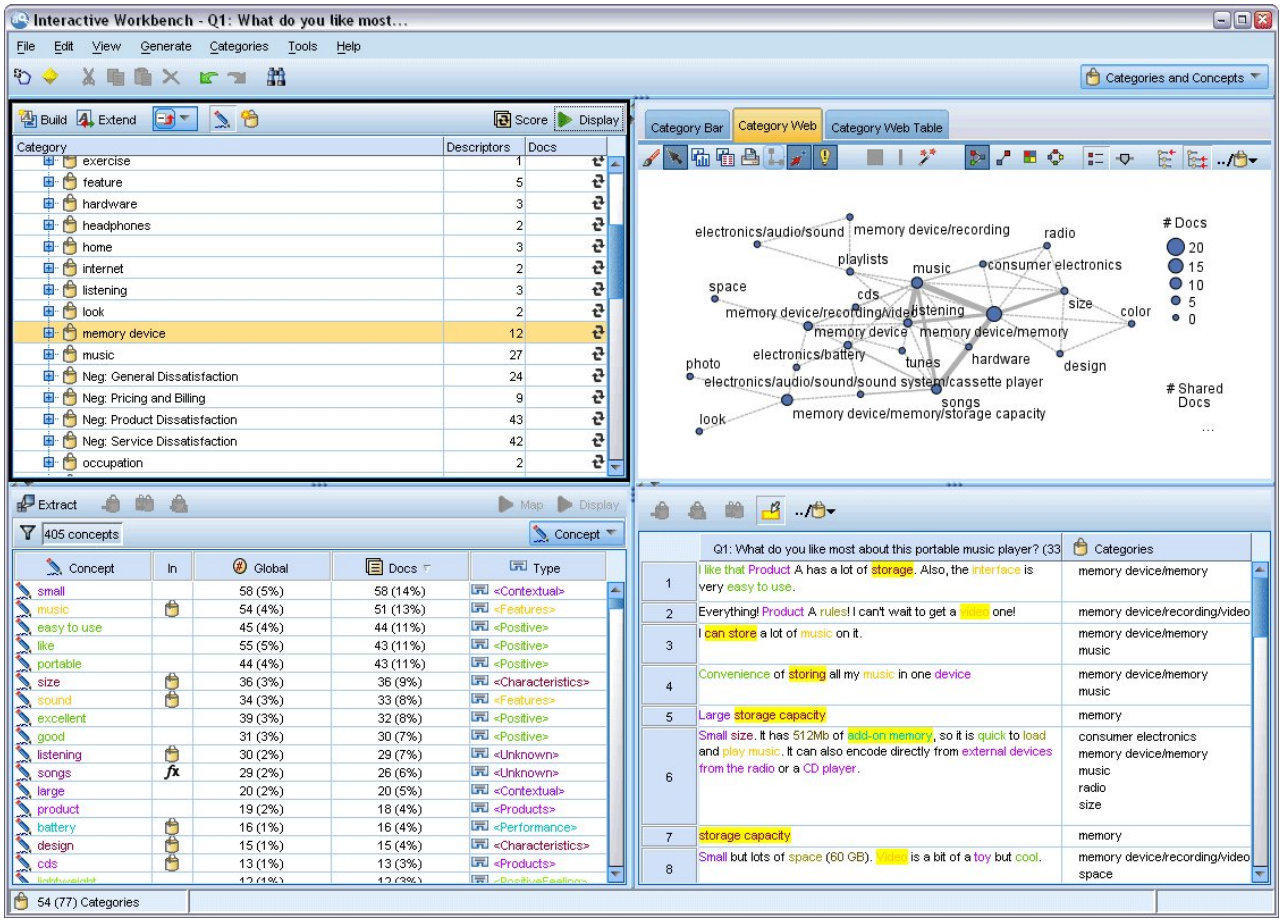


Figure 23. Categories and Concepts view

The Categories and Concepts view is organized into four panes, each of which can be hidden or shown by selecting its name from the View menu. See the topic Chapter 9, “Categorizing Text Data,” on page 87 for more information.

Categories Pane

Located in the upper left corner, this area presents a table in which you can manage any categories you build. After extracting the concepts and types from your text data, you can begin building categories by using techniques such as semantic networks and concept inclusion, or by creating them manually. If you double-click a category name, the Category Definitions dialog box opens and displays all of the descriptors that make up its definition, such as concepts, types, and rules. See the topic Chapter 9, “Categorizing Text Data,” on page 87 for more information. Not all automatic techniques are available for all languages.

When you select a row in the pane, you can then display information about corresponding documents/records or descriptors in the Data and Visualization panes.

Extraction Results Pane

Located in the lower left corner, this area presents the extraction results. When you run an extraction, the extraction engine reads through the text data, identifies the relevant concepts, and assigns a type to each. *Concepts* are words or phrases extracted from your text data. *Types* are semantic groupings of concepts

stored in the form of type dictionaries. When the extraction is complete, concepts and types appear with color coding in the Extraction Results pane. See the topic "Extraction results: Concepts and types" on page 75 for more information.

You can see the set of underlying terms for a concept by hovering your mouse over the concept name. Doing so will display a tooltip showing the concept name and up to several lines of terms that are grouped under that concept. These underlying terms include the synonyms defined in the linguistic resources (regardless of whether they were found in the text or not) as well as the any extracted plural/singular terms, permuted terms, terms from fuzzy grouping, and so on. You can copy these terms or see the full set of underlying terms by right-clicking the concept name and choosing the context menu option.

Text mining is an iterative process in which extraction results are reviewed according to the context of the text data, fine-tuned to produce new results, and then reevaluated. Extraction results can be refined by modifying the linguistic resources. This fine-tuning can be done in part directly from the Extraction Results or Data pane but also directly in the Resource Editor view. See the topic "The Resource Editor view" on page 68 for more information.

Note: If there are more results that can fit in the visible pane, you can use the controls at the bottom of the pane to move forwards and backwards through the results, or enter a page number to go to.

Visualization Pane

Located in the upper right corner, this area presents multiple perspectives on the commonalities in document/record categorization. Each graph or chart provides similar information but presents it in a different manner or with a different level of detail. These charts and graphs can be used to analyze your categorization results and aid in fine-tuning categories or reporting. For example, in a graph you might uncover categories that are too similar (for example, they share more that 75% of their records) or too distinct. The contents in a graph or chart correspond to the selection in the other panes. See the topic "Category Graphs and Charts" on page 141 for more information.

Data Pane

The Data pane is located in the lower right corner. This pane presents a table containing the documents or records corresponding to a selection in another area of the view. Depending on what is selected, only the corresponding text appears in the Data pane. Once you make a selection, click a **Display** button to populate the Data pane with the corresponding text.

If you have a selection in another pane, the corresponding documents or records show the concepts highlighted in color to help you easily identify them in the text. You can also hover your mouse over color-coded items to display a tooltip showing name of the concept under which it was extracted and the type to which it was assigned. See the topic "The Data Pane" on page 95 for more information.

Searching and Finding in the Categories and Concepts view

In some cases, you may need to locate information quickly in a particular section. Using the Find toolbar, you can enter the string you want to search for and define other search criteria such as case sensitivity or search direction. Then you can choose the pane in which you want to search.

To use the Find feature

1. In the Categories and Concepts view, choose **Edit > Find** from the menus. The Find toolbar appears above the Categories pane and Visualization panes.
2. Enter the word string that you want to search for in the text box. You can use the toolbar buttons to control the case sensitivity, partial matching, and direction of the search.

3. In the toolbar, click the name of the pane in which you want to search. If a match is found, the text is highlighted in the window.
4. To look for the next match, click the name of the pane again.

The Clusters View

In the Clusters view, you can build and explore cluster results found in your text data. *Clusters* are groupings of concepts generated by clustering algorithms based on how often concepts occur and how often they appear together. The goal of clusters is to group concepts that co-occur together while the goal of categories is to group documents or records based on how the text they contain matches the descriptors (concepts, rules, patterns) for each category.

The more often the concepts within a cluster occur together coupled with the less frequently they occur with other concepts, the better the cluster is at identifying interesting concept relationships. Two concepts co-occur when they both appear (or one of their synonyms or terms appear) in the same document or record. See the topic Chapter 10, “Analyzing Clusters,” on page 129 for more information.

You can build clusters and explore them in a set of charts and graphs that could help you uncover relationships among concepts that would otherwise be too time-consuming to find. While you cannot add entire clusters to your categories, you can add the concepts in a cluster to a category through the Cluster Definitions dialog box. See the topic “Cluster Definitions” on page 133 for more information.

You can make changes to the settings for clustering to influence the results. See the topic “Building Clusters” on page 130 for more information.

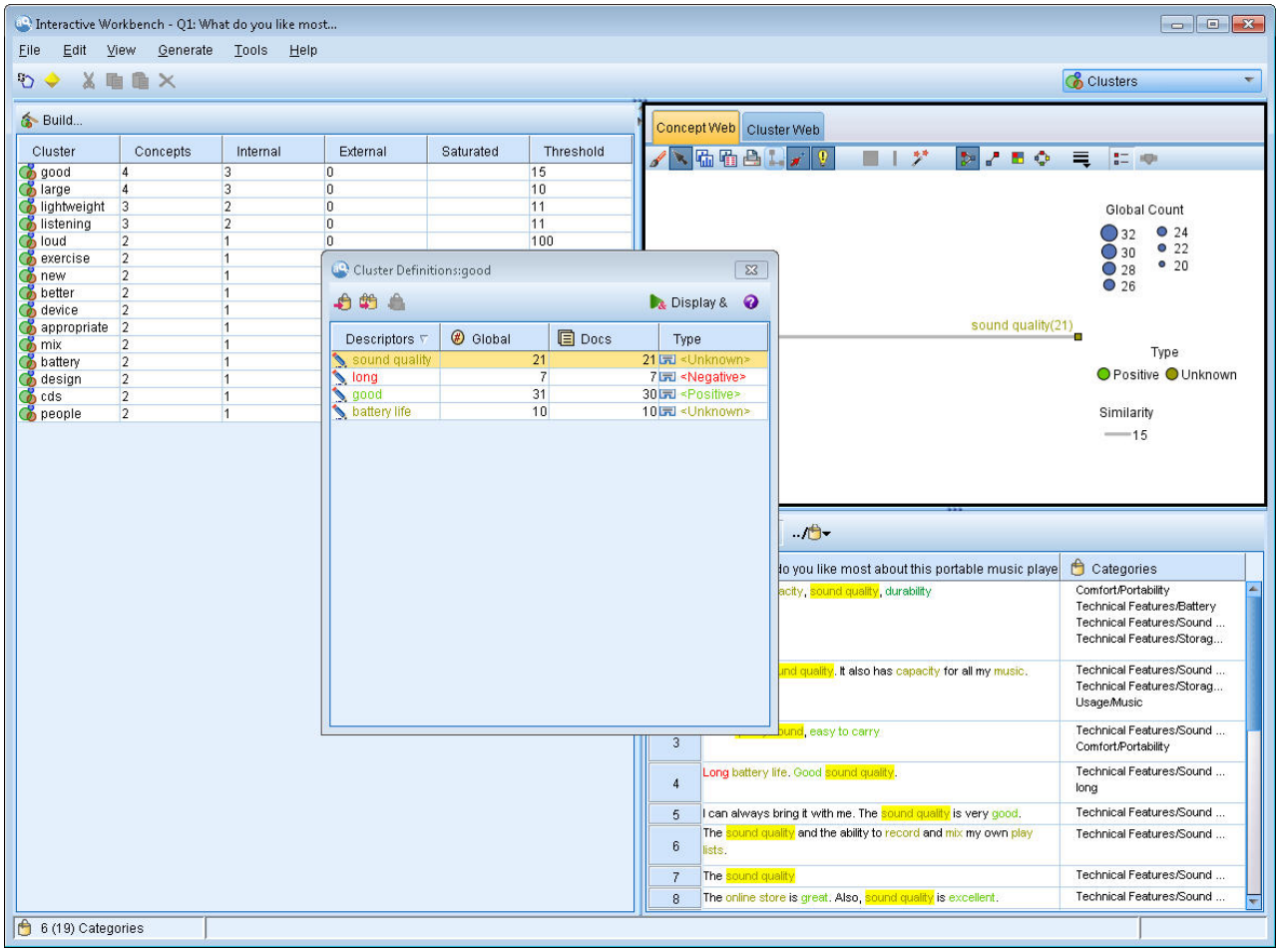


Figure 24. Clusters view

The Clusters view is organized into three panes, each of which can be hidden or shown by selecting its name from the View menu. Typically, only the Clusters pane and the Visualization pane are visible.

Clusters Pane

Located on the left side, this pane presents the clusters that were discovered in the text data. You can create clustering results by clicking the **Build** button. Clusters are formed by a clustering algorithm, which attempts to identify concepts that occur together frequently.

Whenever a new extraction takes place, the cluster results are cleared, and you have to rebuild the clusters to get the latest results. When building the clusters, you can change some settings, such as the maximum number of clusters to create, the maximum number of concepts it can contain, or the maximum number of links with external concepts it can have. See the topic “Exploring Clusters” on page 132 for more information.

Visualization Pane

Located in the upper right corner, this pane offers two perspectives on clustering: a Concept Web graph and a Cluster Web graph. If not visible, you can access this pane from the View menu (**View > Visualization**). Depending on what is selected in the clusters pane, you can view the corresponding interactions between or within clusters. The results are presented in multiple formats:

- **Concept Web.** Web graph showing all of the concepts within the selected cluster(s), as well as linked concepts outside the cluster.

- **Cluster Web.** Web graph showing the links from the selected cluster(s) to other clusters, as well as any links between those other clusters.

Note: In order to display a Cluster Web graph, you must have already built clusters with external links. External links are links between concept pairs in separate clusters (a concept within one cluster and a concept outside in another cluster). See the topic "Cluster Graphs" on page 143 for more information.

Data Pane

The Data pane is located in the lower right corner and is hidden by default. You cannot display any Data pane results from the Clusters pane since these clusters span multiple documents/records, making the data results uninteresting. However, you can see the data corresponding to a selection within the Cluster Definitions dialog box. Depending on what is selected in that dialog box, only the corresponding text appears in the Data pane. Once you make a selection, click the **Display &** button to populate the Data pane with the documents or records that contain all of the concepts together.

The corresponding documents or records show the concepts highlighted in color to help you easily identify them in the text. You can also hover your mouse over color-coded items to display the concept under which it was extracted and the type to which it was assigned. The Data pane can contain multiple columns but the text field column is always shown. It carries the name of the text field that was used during extraction or a document name if the text data is in many different files. Other columns are available. See the topic "The Data Pane" on page 95 for more information.

The Text Link Analysis view

In the Text Link Analysis view, you can build and explore text link analysis patterns found in your text data. Text link analysis (TLA) is a pattern-matching technology that enables you to define TLA rules and compare them to actual extracted concepts and relationships found in your text.

Patterns are most useful when you are attempting to discover relationships between concepts or opinions about a particular subject. Some examples include wanting to extract opinions on products from survey data, genomic relationships from within medical research papers, or relationships between people or places from intelligence data.

Once you've extracted some TLA patterns, you can explore them in the Data or Visualization panes and even add them to categories in the Categories and Concepts view. There must be some TLA rules defined in the resource template or libraries you are using in order to extract TLA results. See the topic Chapter 18, "About Text Link Rules," on page 193 for more information.

If you chose to extract TLA pattern results, the results are presented in this view. If you have not chosen to do so, you will have to use the **Extract** button and choose the option to enable the extraction of patterns .

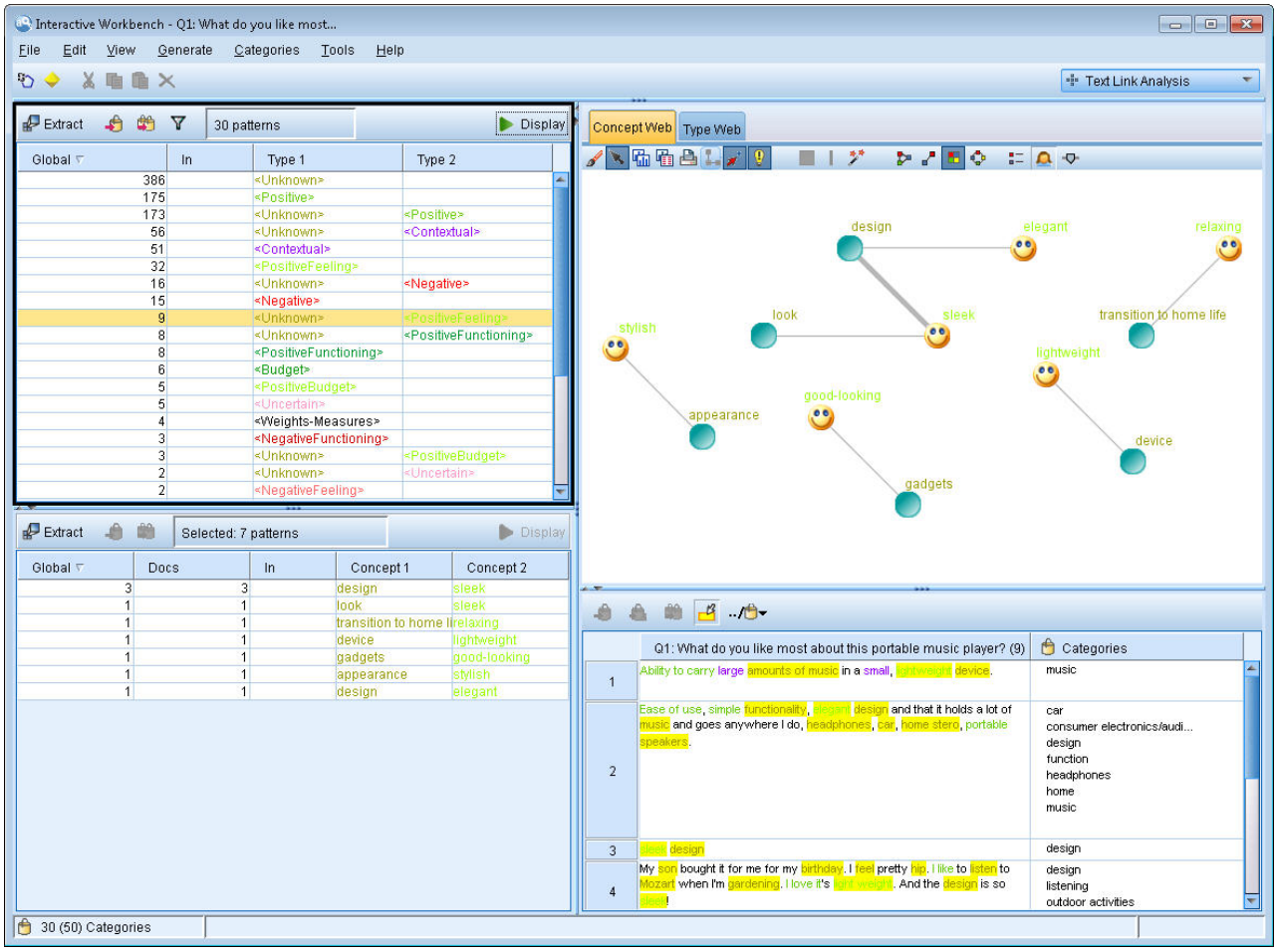


Figure 25. Text Link Analysis view

The Text Link Analysis view is organized into four panes, each of which can be hidden or shown by selecting its name from the View menu. See the topic Chapter 11, “Exploring Text Link Analysis,” on page 135 for more information.

Type and Concept Patterns Panes

Located on the left side, the Type and Concept Pattern panes are two interconnected panes in which you can explore and select your TLA pattern results. Patterns are made up of a series of up to either six types or six concepts. The TLA pattern rule as it is defined in the linguistic resources dictates the complexity of the pattern results. See the topic Chapter 18, “About Text Link Rules,” on page 193 for more information.

Pattern results are first grouped at the type level and then divided into concept patterns. For this reason, there are two different result panes: Type Patterns (upper left) and Concept Patterns (lower left).

- **Type Patterns.** The Type Patterns pane presents extracted patterns consisting of two or more related types matching a TLA pattern rule. Type patterns are shown as `<Organization>` + `<Location>` + `<Positive>`, which might provide positive feedback about an organization in a specific location.
- **Concept Patterns.** The Concept Patterns pane presents the extracted patterns at the concept level for all of the type pattern(s) currently selected in the Type Patterns pane above it. Concept patterns follow a structure such as `hotel + paris + wonderful`.

Just as with the extraction results in the Categories and Concepts view, you can review the results here. If you see any refinements you would like to make to the types and concepts that make up these patterns,

you make those in the Extraction Results pane in the Categories and Concepts view, or directly in the Resource Editor, and reextract your patterns.

Visualization Pane

Located in the upper right corner of the Text Link Analysis view, this pane presents a web graph of the selected patterns as either type patterns or concept patterns. If not visible, you can access this pane from the View menu (**View** > **Visualization**). Depending on what is selected in the other panes, you can view the corresponding interactions between documents/records and the patterns.

The results are presented in multiple formats:

- **Concept Graph.** This graph presents all the concepts in the selected pattern(s). The line width and node sizes (if type icons are not shown) in a concept graph show the number of global occurrences in the selected table.
- **Type Graph.** This graph presents all the types in the selected pattern(s). The line width and node sizes (if type icons are not shown) in the graph show the number of global occurrences in the selected table. Nodes are represented by either a type color or by an icon.

See the topic "Text Link Analysis Graphs" on page 144 for more information.

Data Pane

The Data pane is located in the lower right corner. This pane presents a table containing the documents or records corresponding to a selection in another area of the view. Depending on what is selected, only the corresponding text appears in the Data pane. Once you make a selection, click a **Display** button to populate the Data pane with the corresponding text.

If you have a selection in another pane, the corresponding documents or records show the concepts highlighted in color to help you easily identify them in the text. You can also hover your mouse over color-coded items to display a tooltip showing name of the concept under which it was extracted and the type to which it was assigned. See the topic "The Data Pane" on page 95 for more information.

The Resource Editor view

IBM SPSS Modeler Text Analytics rapidly and accurately captures key concepts from text data using a robust extraction engine. This engine relies heavily on linguistic resources to dictate how large amounts of unstructured, textual data should be analyzed and interpreted.

The Resource Editor view is where you can view and fine-tune the linguistic resources used to extract concepts, group them under types, discover patterns in the text data, and much more. IBM SPSS Modeler Text Analytics offers several preconfigured resource templates. Also, in some languages, you can also use the resources in a text analysis packages. See the topic "Using Text Analysis Packages" on page 123 for more information.

Since these resources may not always be perfectly adapted to the context of your data, you can create, edit, and manage your own resources for a particular context or domain in the Resource Editor. See the topic Chapter 15, "Working with Libraries," on page 161 for more information.

To simplify the process of fine-tuning your linguistic resources, you can perform common dictionary tasks directly from the Categories and Concepts view through context menus in the Extraction Results and Data panes. See the topic "Refining extraction results" on page 82 for more information.

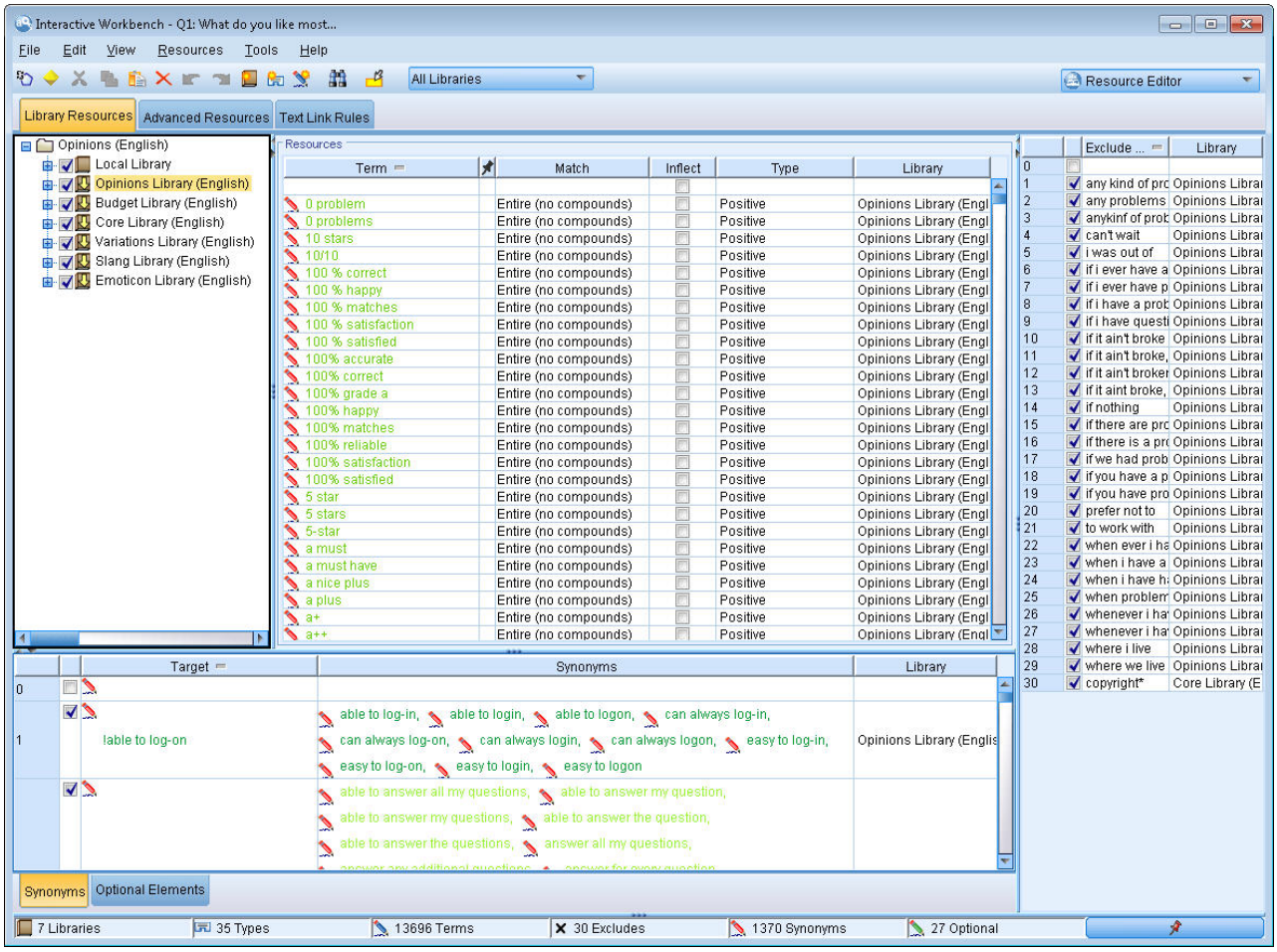


Figure 26. Resource Editor view

The operations that you perform in the Resource Editor view revolve around the management and fine-tuning of the linguistic resources. These resources are stored in the form of templates and libraries. The Resource Editor view is organized into four parts: Library Tree pane, Type Dictionary pane, Substitution Dictionary pane, and Exclude Dictionary pane.

Note: See the topic "The Editor interface" on page 152 for more information.

Setting Options

You can set general options for IBM SPSS Modeler Text Analytics in the Options dialog box. This dialog box contains the following tabs:

- **Session.** This tab contains general options and delimiters.
- **Display.** This tab contains options for the colors used in the interface.
- **Sounds.** This tab contains options for sound cues.

To Edit Options

1. From the menus, choose **Tools > Options**. The Options dialog box opens.
2. Select the tab containing the information you want to change.
3. Change any of the options.
4. Click **OK** to save the changes.

Options: Session Tab

On this tab, you can define some of the basic settings.

Data Pane and Category Graph Display. These options affect how data are presented in the Data pane and in the Visualization pane in the Categories and Concepts view.

- **Display limit for Data pane and Category Web.** This option sets the maximum number of documents to show or use to populate the Data panes or graphs and charts in the Categories and Concepts view.
- **Show categories for documents/records at Display time.** If selected, the documents or records are scored whenever you click Display so that any categories to which they belong can be displayed in the Categories column in the Data pane as well as in the category graphs. In some cases, especially with larger datasets, you may want to turn off this option so that data and graphs are displayed much faster.

Add to Category from Data Pane. These options affect what is added to categories when documents and records are added from the Data pane.

- **In Categories and Concepts view, copy.** Adding a document or record from the Data pane in this view will copy over either **Concepts only** or both **Concepts and Patterns**.
- **In Text Link Analysis view, copy.** Adding a document or record from the Data pane in this view will copy over either **Patterns only** or both **Concepts and Patterns**.

Resource Editor delimiter. Select the character to be used as a delimiter when entering elements, such as concepts, synonyms, and optional elements, in the Resource Editor view.

Options: Display Tab

On this tab, you can edit options affecting the overall look and feel of the application and the colors used to distinguish elements.

Note: To switch the look and feel of the product to a classic look or one from a previous release, open the User Options dialog in the Tools menu in the main IBM SPSS Modeler window.

Custom Colors. Edit the colors for elements appearing onscreen. For each of the elements in the table, you can change the color. To specify a custom color, click the color area to the right of the element you want to change and choose a color from the drop-down color list.

- **Non-extracted text.** Text data that was not extracted yet visible in the Data pane.
- **Highlight background.** Text selection background color when selecting elements in the panes or text in the Data pane.
- **Extraction needed background.** Background color of the Extraction Results, Patterns, and Clusters panes indicating that changes have been made to the libraries and an extraction is needed.
- **Category feedback background.** Category background color that appears after an operation.
- **Default type.** Default color for types and concepts appearing in the Data pane and Extraction Results pane. This color will apply to any custom types that you create in the Resource Editor. You can override this default color for your custom type dictionaries by editing the properties for these type dictionaries in the Resource Editor. See the topic “Creating types” on page 171 for more information.
- **Striped table 1.** First of the two colors used in an alternating manner in the table in the Edit Forced concepts dialog box in order to differentiate each set of lines.
- **Striped table 2.** Second of the two colors used in an alternating manner in the table in the Edit Forced concepts dialog box in order to differentiate each set of lines.

Note: If you click the **Reset to Defaults** button, all options in this dialog box are reset to the values they had when you first installed this product.

Options: Sounds Tab

On this tab, you can edit options affecting sounds. Under Sound Events, you can specify a sound to be used to notify you when an event occurs. A number of sounds are available. Use the ellipsis button (**...**) to browse for and select a sound. The *.wav* files used to create sounds for IBM SPSS Modeler Text Analytics are stored in the *media* subdirectory of the installation directory. If you do not want sounds to be played, select **Mute All Sounds**. Sounds are muted by default.

Note: If you click the **Reset to Defaults** button, all options in this dialog box are reset to the values they had when you first installed this product.

Microsoft Internet Explorer settings for Help

Microsoft Internet Explorer Settings

Most Help features in this application use technology based on Microsoft Internet Explorer. Some versions of Internet Explorer (including the version provided with Microsoft Windows XP, Service Pack 2) will by default block what it considers to be "active content" in Internet Explorer windows on your local computer. This default setting may result in some blocked content in Help features. To see all Help content, you can change the default behavior of Internet Explorer.

1. From the Internet Explorer menus choose:

   Tools > **Internet Options...**
2. Click the **Advanced** tab.
3. Scroll down to the **Security** section.
4. Select **Allow active content to run in files on My Computer**.

Generating Model Nuggets and Modeling Nodes

When you are in an interactive session, you may want to use the work you have done to generate either:

- **A text mining modeling node.** A modeling node generated from an interactive workbench session is a Text Mining node whose settings and options reflect those stored in the open interactive session. This can be useful when you no longer have the original Text Mining node or when you want to make a new version. See the topic Chapter 3, “Mining for Concepts and Categories,” on page 17 for more information.
- **A category model nugget.** A model nugget generated from an interactive workbench session is a category model nugget. You must have at least one category in the Categories and Concepts view in order to generate a category model nugget. See the topic “Text Mining Nugget: Category Model” on page 36 for more information.

To Generate a Text Mining Modeling Node

1. From the menus, choose **Generate > Generate Modeling Node**. A Text Mining modeling node is added to the working canvas using all of the settings currently in the workbench session. The node is named after the text field.

To Generate a Category Model Nugget

1. From the menus, choose **Generate > Generate Model**. A model nugget is generated directly onto the Model palette with the default name.

Updating Modeling Nodes and Saving

While you are working in an interactive session, we recommend that you update the modeling node from time to time to save your changes. You should also update your modeling node whenever you are finished working in the interactive workbench session and want to save your work. When you update the modeling node, the workbench session content is saved back to the Text Mining node that originated the interactive workbench session. This does not close the output window.

Important! This update will not save your stream. To save your stream, do so in the main IBM SPSS Modeler window after updating the modeling node.

To Update a Modeling Node

1. From the menus, choose **File > Update Modeling Node**. The modeling node is updated with the build and extraction settings, along with any options and categories you have.

Closing and Ending Sessions

When you are finished working in your session, you can leave the session in three different ways:

- **Save.** This option allows you to first save your work back into the originating modeling node for future sessions, as well as to publish any libraries for reuse in other sessions. See the topic "Sharing Libraries" on page 165 for more information. After you have saved, the session window is closed, and the session is deleted from the Output manager in the IBM SPSS Modeler window.
- **Exit.** This option will discard any unsaved work, close the session window, and delete the session from the Output manager in the IBM SPSS Modeler window. To free up memory, we recommend saving any important work and exiting the session.
- **Close.** This option will not save or discard any work. This option closes the session window but the session will continue to run. You can open the session window again by selecting this session in the Output manager in the IBM SPSS Modeler window.

To Close a Workbench Session

1. From the menus, choose **File > Close**.

Keyboard Accessibility

The interactive workbench interface offers keyboard shortcuts to make the product's functionality more accessible. At the most basic level, you can press the Alt key plus the appropriate key to activate window menus (for example, Alt+F to access the File menu) or press the Tab key to scroll through dialog box controls. This section will cover the keyboard shortcuts for alternative navigation. There are other keyboard shortcuts for the IBM SPSS Modeler interface.

Table 13. Generic keyboard shortcuts

Shortcut key	Function
Ctrl+1	Display the first tab in a pane with tabs.
Ctrl+2	Display the second tab in a pane with tabs.
Ctrl+A	Select all elements for the pane that has focus.
Ctrl+C	Copy selected text to the clipboard.
Ctrl+E	Launch extraction in Categories and Concepts and Text Link Analysis views.
Ctrl+F	Display the Find toolbar in the Resource Editor/Template Editor, if not already visible, and put focus there.
Ctrl+I	In the Categories and Concepts view, launch the Category Definitions dialog box for the selected category. In the Cluster view, launch the Cluster Definitions dialog box for the selected cluster.

Table 13. Generic keyboard shortcuts (continued)

Shortcut key	Function
Ctrl+R	Open the Add Terms dialog box in the Resource Editor/Template Editor.
Ctrl+T	Open the Type Properties dialog box to create a new type in the Resource Editor/Template Editor.
Ctrl+V	Paste clipboard contents.
Ctrl+X	Cut selected items from the Resource Editor/Template Editor.
Ctrl+Y	Redo the last action in the view.
Ctrl+Z	Undo the last action in the view.
F1	Display Help, or when in a dialog box, display context Help for an item.
F2	Toggle in and out of edit mode in table cells.
F6	Move the focus between the main panes in the active view.
F8	Move the focus to pane splitter bars for resizing.
F10	Expand the main File menu.
up arrow, down arrow	Resize the pane vertically when the splitter bar is selected.
left arrow, right arrow	Resize the pane horizontally when the splitter bar is selected.
Home, End	Resize panes to minimum or maximum size when the splitter bar is selected.
Tab	Move forward through items in the window, pane, or dialog box.
Shift+F10	Display the context menu for an item.
Shift+Tab	Move back through items in the window or dialog box.
Shift+arrow	Select characters in the edit field when in edit mode (F2).
Ctrl+Tab	Move the focus forward to the next main area in the window.
Shift+Ctrl+Tab	Move the focus backward to the previous main area in the window.

Shortcuts for Dialog Boxes

Several shortcut and screen reader keys are helpful when you are working with dialog boxes. Upon entering a dialog box, you may need to press the Tab key to put the focus on the first control and to initiate the screen reader. A complete list of special keyboard and screen reader shortcuts is provided in the following table.

Table 14. Dialog box shortcuts

Shortcut key	Function
Tab	Move forward through the items in the window or dialog box.
Ctrl+Tab	Move forward from a text box to the next item.
Shift+Tab	Move back through items in the window or dialog box.
Shift+Ctrl+Tab	Move back from a text box to the previous item.
space bar	Select the control or button that has focus.
Esc	Cancel changes and close the dialog box.
Enter	Validate changes and close the dialog box (equivalent to the OK button). If you are in a text box, you must first press Ctrl+Tab to exit the text box.

Chapter 8. Extracting Concepts and Types

Whenever you execute a stream that launches the interactive workbench, an extraction is automatically performed on the text data in the stream. The end result of this extraction is a set of concepts, types, and, in the case where TLA patterns exist in the linguistic resources, patterns. You can view and work with concepts and types in the Extraction Results pane. See the topic "How extraction works" on page 5 for more information.

If you want to fine-tune the extraction results, you can modify the linguistic resources and reextract. See the topic "Refining extraction results" on page 82 for more information. The extraction process relies on the resources and any parameters in the Extract dialog box to dictate how to extract and organize the results. You can use the extraction results to define the better part, if not all, of your category definitions.

Extraction results: Concepts and types

During the extraction process, all of the text data is scanned and the relevant concepts are identified, extracted, and assigned to types. When the extraction is complete, the results appear in the Extraction Results pane located in the lower left corner of the Categories and Concepts view. The first time you launch the session, the linguistic resource template you selected in the node is used to extract and organize these concepts and types.

Note: If there are more results that can fit in the visible pane, you can use the controls at the bottom of the pane to move forwards and backwards through the results, or enter a page number to go to.

The concepts, types, and TLA patterns that are extracted are collectively referred to as **extraction results**, and they serve as the descriptors, or building blocks, for your categories. You can also use concepts, types, and patterns in your category rules. Additionally, the automatic techniques use concepts and types to build the categories.

Text mining is an iterative process in which extraction results are reviewed according to the context of the text data, fine-tuned to produce new results, and then reevaluated. After extracting, you should review the results and make any changes that you find necessary by modifying the linguistic resources. You can fine-tune the resources, in part, directly from the Extraction Results pane, Data pane, Category Definitions dialog box, or Cluster Definitions dialog box. See the topic "Refining extraction results" on page 82 for more information. You can also do so directly in the Resource Editor view. See the topic "The Resource Editor view" on page 68 for more information.

After fine-tuning, you can then reextract to see the new results. By fine-tuning your extraction results from the start, you can be assured that each time you reextract, you will get identical results in your category definitions, perfectly adapted to the context of the data. In this way, documents/records will be assigned to your category definitions in a more accurate, repeatable manner.

Concepts

During the extraction process, the text data is scanned and analyzed in order to identify interesting or relevant single words (such as `election` or `peace`) and word phrases (such as `presidential election`, `election of the president`, or `peace treaties`) in the text. These words and phrases are collectively referred to as *terms*. Using the linguistic resources, the relevant terms are extracted and then similar terms are grouped together under a lead term called a **concept**.

You can see the set of underlying terms for a concept by hovering your mouse over the concept name. Doing so will display a tooltip showing the concept name and up to several lines of terms that are grouped under that concept. These underlying terms include the synonyms defined in the linguistic

resources (regardless of whether they were found in the text or not) as well as the any extracted plural/singular terms, permuted terms, terms from fuzzy grouping, and so on. You can copy these terms or see the full set of underlying terms by right-clicking the concept name and choosing the context menu option.

By default, the concepts are shown in lowercase and sorted in descending order according to the document count (Doc. column) . When concepts are extracted, they are assigned a type to help group similar concepts. They are color coded according to this type. Colors are defined in the type properties within the Resource Editor. See the topic "Type dictionaries" on page 169 for more information.

Whenever a concept, type, or pattern is being used in a category definition, an icon appears in the sortable **In** column .

Types

Types are semantic groupings of concepts. When concepts are extracted, they are assigned a type to help group similar concepts. Several built-in types are delivered with IBM SPSS Modeler Text Analytics, such as `<Location>`, `<Organization>`, `<Person>`, `<Positive>`, `<Negative>` and so on. For example, the `<Location>` type groups geographical keywords and places. This type would be assigned to concepts such as `chicago`, `paris`, and `tokyo`. For most languages, concepts that are not found in any type dictionary but are extracted from the text are automatically typed as `<Unknown>` See the topic "Built-in types" on page 170 for more information.

When you select the Type view, the extracted types appear by default in descending order by global frequency. You can also see that types are color coded to help distinguish them. Colors are part of the type properties. See the topic "Creating types" on page 171 for more information. You can also create your own types.

Patterns

Patterns can also be extracted from your text data. However, you must have a library that contains some Text Link Analysis (TLA) pattern rules in the Resource Editor. You also have to choose to extract these patterns in the IBM SPSS Modeler Text Analytics node setting or in the Extract dialog box using the option **Enable Text Link Analysis pattern extraction**. See the topic Chapter 11, "Exploring Text Link Analysis," on page 135 for more information.

Extracting data

Whenever an extraction is needed, the Extraction Results pane becomes yellow in color and the message **Press Extract Button to Extract Concepts** appears below the toolbar in this pane.

You may need to extract if you do not have any extraction results yet, have made changes to the linguistic resources and need to update the extraction results, or have reopened a session in which you did not save the extraction results (**Tools** > **Options**).

Note: If you change the source node for your stream after extraction results have been cached with the **Use session work...** option, you will need to run a new extraction once the interactive workbench session is launched if you want to get updated extraction results.

When you run an extraction, a progress indicator appears to provide feedback on the status of the extraction. During this time, the extraction engine reads through all of the text data and identifies the relevant terms and patterns and extracts them and assigns them to a type. Then, the engine attempts groups synonyms terms under one lead term, called a concept. When the process is complete, the resulting concepts, types, and patterns appear in the Extraction Results pane.

The extraction process results in a set of concepts and types, as well as Text Link Analysis (TLA) patterns, if enabled. You can view and work with these concepts and types in the Extraction Results pane in the Categories and Concepts view. If you extracted TLA patterns, you can see those in the Text Link Analysis view.

Note: There is a relationship between the size of your dataset and the time it takes to complete the extraction process. You can always consider inserting a Sample node upstream or optimizing your machine's configuration.

To extract data

1. From the menus, choose **Tools** > **Extract**. Alternatively, click the **Extract** toolbar button.
2. If you chose to always display the Extraction Settings dialog, it appears so that you can make any changes. See further in this topic for descriptors of each settings.
3. Click **Extract** to begin the extraction process. Once the extraction begins, the progress dialog box opens. After extraction, the results appear in the Extraction Results pane. By default, the concepts are shown in lowercase and sorted in descending order according to the document count (Doc. column) .

You can review the results using the toolbar options to sort the results differently, to filter the results, or to switch to a different view (concepts or types). You can also refine your extraction results by working with the linguistic resources. See the topic “Refining extraction results” on page 82 for more information.

Potential extraction issues

Multiple Interactive Workbench sessions can cause sluggish behavior. SPSS Modeler Text Analytics and SPSS Modeler share a common Java run-time engine when an interactive workbench session is launched. Depending on the number of Interactive Workbench sessions you invoke during a SPSS Modeler session - even if opening and closing the same session - system memory may cause the application to become sluggish. This effect may be especially pronounced if you are working with large data or have a machine with less than the recommended RAM setting of 4GB. If you notice your machine is slow to respond, it is recommended that you save all your work, shut down SPSS Modeler, and re-launch the application. Running SPSS Modeler Text Analytics on a machine with less than the recommended memory, particularly when working with large data sets or for prolonged periods of time, may cause Java to run out of memory and shut down. It is strongly suggested you upgrade to the recommended memory setting or larger (or use SPSS Modeler Text Analytics Server) if you work with large data.

For Dutch, English, French, German, Italian, Portuguese, and Spanish Text

The Extraction Settings dialog box contains some basic extraction options.

Enable Text Link Analysis pattern extraction. Specifies that you want to extract TLA patterns from your text data. It also assumes you have TLA pattern rules in one of your libraries in the Resource Editor. This option may significantly lengthen the extraction time. See the topic Chapter 11, “Exploring Text Link Analysis,” on page 135 for more information.

Accommodate punctuation errors. This option temporarily normalizes text containing punctuation errors (for example, improper usage) during extraction to improve the extractability of concepts. This option is extremely useful when text is short and of poor quality (as, for example, in open-ended survey responses, e-mail, and CRM data), or when the text contains many abbreviations.

Accommodate spelling for a minimum word character length of [n] This option applies a fuzzy grouping technique that helps group commonly misspelled words or closely spelled words under one concept. The fuzzy grouping algorithm temporarily strips all vowels (except the first one) and strips double/triple consonants from extracted words and then compares them to see if they are the same so that `modeling` and `modelling` would be grouped together. However, if each term is assigned to a different type, excluding the `<Unknown>` type, the fuzzy grouping technique will not be applied.

You can also define the minimum number of *root* characters required before fuzzy grouping is used. The number of root characters in a term is calculated by totaling all of the characters and subtracting any characters that form inflection suffixes and, in the case of compound-word terms, determiners and prepositions. For example, the term `exercises` would be counted as 8 root characters in the form "exercise," since the letter *s* at the end of the word is an inflection (plural form). Similarly, `apple sauce` counts as 10 root characters ("apple sauce") and `manufacturing of cars` counts as 16 root characters ("manufacturing car"). This method of counting is only used to check whether the fuzzy grouping should be applied but does not influence how the words are matched.

Note: If you find that certain words are later grouped incorrectly, you can exclude word pairs from this technique by explicitly declaring them in the **Fuzzy Grouping: Exceptions** section in the Advanced Resources tab. See the topic "Fuzzy Grouping" on page 183 for more information.

Extract uniterms This option extracts single words (uniterms) as long as the word is not already part of a compound word and if it is either a noun or an unrecognized part of speech.

Extract nonlinguistic entities This option extracts nonlinguistic entities, such as phone numbers, social security numbers, times, dates, currencies, digits, percentages, e-mail addresses, and HTTP addresses. You can include or exclude certain types of nonlinguistic entities in the **Nonlinguistic Entities: Configuration** section of the Advanced Resources tab. By disabling any unnecessary entities, the extraction engine won't waste processing time. See the topic "Configuration" on page 187 for more information.

Uppercase algorithm This option extracts simple and compound terms that are not in the built-in dictionaries as long as the first letter of the term is in uppercase. This option offers a good way to extract most proper nouns.

Group partial and full person names together when possible This option groups names that appear differently in the text together. This feature is helpful since names are often referred to in their full form at the beginning of the text and then only by a shorter version. This option attempts to match any uniterm with the `<Unknown>` type to the last word of any of the compound terms that is typed as `<Person>`. For example, if *doe* is found and initially typed as `<Unknown>`, the extraction engine checks to see if any compound terms in the `<Person>` type include *doe* as the last word, such as *john doe*. This option does not apply to first names since most are never extracted as uniterms.

Maximum nonfunction word permutation This option specifies the maximum number of nonfunction words that can be present when applying the permutation technique. This permutation technique groups similar phrases that differ from each other only by the nonfunction words (for example, of and the) contained, regardless of inflection. For example, let's say that you set this value to at most two words and both `company officials` and `officials of the company` were extracted. In this case, both extracted terms would be grouped together in the final concept list since both terms are deemed to be the same when `of the` is ignored.

Use derivation when grouping multiterms When processing Big Data, select this option to group multiterms by using derivation rules.

Index Option for Concept Map Specifies that you want to build the map index at extraction time so that concept maps can be drawn quickly later. To edit the index settings, click **Settings**. See the topic "Building Concept Map Indexes" on page 82 for more information.

Always show this dialog before starting an extraction Specify whether you want to see the Extraction Settings dialog each time you extract, if you never want to see it unless you go to the Tools menu, or whether you want to be asked each time you extract if you want to edit any extraction settings.

Filtering Extraction Results

When you are working with very large datasets, the extraction process could produce millions of results. For many users, this amount can make it more difficult to review the results effectively. Therefore, in order to zoom in on those that are most interesting, you can filter these results through the Filter dialog available in the Extraction Results pane.

Keep in mind that all of the settings in this Filter dialog are used together to filter the extraction results that are available for categories.

Filter by Frequency You can filter to display only those results with a certain global or document frequency value.

- **Global frequency** is the total number of times a concept appears in the entire set of documents or records and is shown in the **Global** column.
- **Document frequency** is the total number of documents or records in which a concept appears and is shown in the **Docs** column.

For example, if the concept `nato` appeared 800 times in 500 records, we would say that this concept has a global frequency of 800 and a document frequency of 500.

And by Type You can filter to display only those results belonging to certain types. You can choose all types or only specific types.

And by Match Text You can also filter to display only those results that match the rule you define here. Enter the set of characters to be matched in the **Match text** field and then select the condition in which to apply the match.

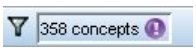
Table 15. Match text conditions

Condition	Description
Contains	The text is matched if the string occurs anywhere. (Default choice)
Starts with	Text is matched only if the concept or type starts with the specified text.
Ends with	Text is matched only if the concept or type ends with the specified text.
Exact match	The entire string must match the concept or type name.

Results Displayed in Extraction Result Pane

Here are some examples of how the results might be displayed, in English, in the Extraction Results pane toolbar based on the filters.

Table 16. Examples of filter feedback

Filter feedback	Description
	The toolbar shows the number of results. Since there was no text matching filter and the maximum was not met, no additional icons are shown.
	The toolbar shows results were limited to the maximum specified in the filter, which in this case was 300. If a purple icon is present, this means that the maximum number of concepts was met. Hover over the icon for more information.
	The toolbar shows results were limited using a match text filter. This is shown by the magnifying glass icon.

To Filter the Results

1. From the menus, choose **Tools** > **Filter**. The Filter dialog box opens.
2. Select and refine the filters you want to use.
3. Click **OK** to apply the filters and see the new results in the Extraction Results pane.

Exploring Concept Maps

You can create a concept map to explore how concepts are interrelated. By selecting a single concept and clicking **Map**, a concept map window opens so that you can explore the set of concepts that are related to the selected concept. You can filter out which concepts are displayed by editing the settings such as which types to include, what kinds of relationship to look for and so on.

Important: Before a map can be created, an index must be generated. This may take several minutes. However, once you have generated the index, you do not have regenerate it again until you re-extract. If you want the index to be generated automatically each time you extract, select that option in the extraction settings. See the topic "Extracting data" on page 76 for more information.

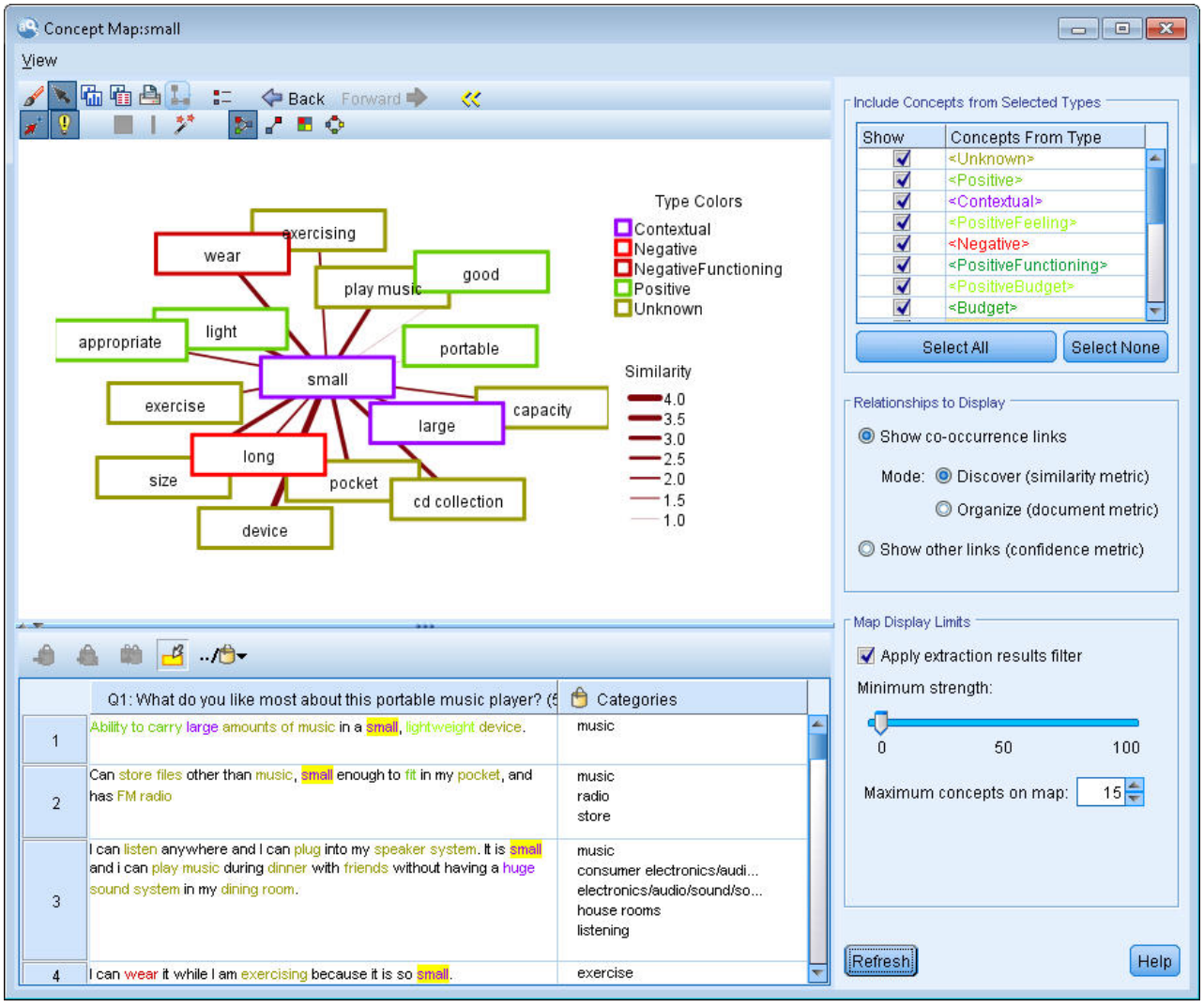


Figure 27. A concept map for the selected concept

To View a Concept Map

1. In the Extraction Results pane, select a single concept.

2. In the toolbar of this pane, click the **Map** button. If the map index was already generated the concept map opens in a separate dialog. If the map index was not generated or was out of date, the index must be rebuilt. This process may take several minutes.
3. Click around the map to explore. If you double-click a linked concept, the map will redraw itself and show you the linked concepts for the concept you just double-clicked.
4. The top toolbar offers some basic map tools such as moving back to a previous map, filtering links according to relationship strengths, and also opening the filter dialog to control the types of concepts that appear as well as the kinds of relationships to represent. A second toolbar line contains graph editing tools. See the topic "Using Graph Toolbars and Palettes" on page 145 for more information.
5. If you are unsatisfied with the kinds of links being found, review the settings for this map show on the right side of the map.

Map Settings: Include Concepts from Selected Types

Only those concepts belonging to the selected types in the table are shown in the map. To hide concepts from a certain type, deselect that type in the table.

Map Settings: Relationships to Display

Show co-occurrence links If you want to show co-occurrence links, choose the mode. The mode affects how the link strength was calculated.

- *Discover (similarity metric)*. With this metric, the strength of the link is calculated using more complex calculation that takes into account how often two concepts appear apart as well as how often they appear together. A high strength value means that a pair of concepts tend to appear more frequently together than to appear apart. With the following formula, any floating point values are converted to integers.

$$\text{similarity coefficient} = \frac{(C_{IJ})^2}{(C_I \times C_J)}$$

Figure 28. Similarity coefficient formula

  In this formula, C_I is the number of documents or records in which the concept I occurs.

  C_J is the number of documents or records in which the concept J occurs.

  C_{IJ} is the number of documents or records in which concept pair I and J co-occurs in the set of documents.
- *Organize (document metric)*. The strength of the links with this metric is determined by the raw count of co-occurrences. In general, the more frequent two concepts are, the more likely they are to occur together at times. A high strength value means that a pair of concepts appear together frequently.

Show other links (confidence metric). You can choose other links to display; these may be semantic, derivation (morphological), or inclusion (syntactical) and are related to how many steps removed a concept is from the concept to which it is linked. These can help you tune resources, particularly synonymy or to disambiguate.For short descriptions of each of these grouping techniques, see "Advanced linguistic settings" on page 99

Note: Keep in mind that if these were not selected when the index was built or if no relationships were found, then none will be displayed. See the topic "Building Concept Map Indexes" on page 82 for more information.

Map Settings: Map Display Limits

Apply extraction results filter. If you do not want to use all of the concepts, you can use the filter in the extraction results pane to limit what is shown. Then select this option and IBM SPSS Modeler Text Analytics will look for related concepts using this filtered set. See the topic "Filtering Extraction Results" on page 79 for more information.

Minimum strength. Set the minimum link strength here. Any related concepts with a relationship strength lower than this limit will be hidden from the map.

Maximum concepts on map. Specify the maximum number of relationships to show on the map.

Building Concept Map Indexes

Before a map can be created, an index of concept relationships must be generated. Whenever you create a concept map, IBM SPSS Modeler Text Analytics refers to this index. You can choose which relationships to index by selecting the techniques in this dialog.

Grouping techniques. Choose one or more technique. For short descriptions of each of these techniques, see "About linguistic techniques" on page 101 Not all techniques are available for all text languages.

Prevent pairing of specific concepts. Select this checkbox to stop the process from grouping or pairing two concepts together in the output. To create or manage concept pairs, click **Manage Pairs**. See the topic "Managing Link Exception Pairs" on page 100 for more information.

Building the index may take several minutes. However, once you have generated the index, you do not have regenerate it again until you re-extract or unless you want to change the settings to include more relationships. If you want to generate an index whenever you extract, you can select that option in the extraction settings. See the topic "Extracting data" on page 76 for more information.

Refining extraction results

Extraction is an iterative process whereby you can extract, review the results, make changes to them, and then re-extract to update the results. Since accuracy and continuity are essential to successful text mining and categorization, fine-tuning your extraction results from the start ensures that each time you re-extract, you will get precisely the same results in your category definitions. In this way, records and documents will be assigned to your categories in a more accurate, repeatable manner.

The extraction results serve as the building blocks for categories. When you create categories using these extraction results, records and documents are automatically assigned to categories if they contain text that matches one or more category descriptors. Although you can begin categorizing before making any refinements to the linguistic resources, it is useful to review your extraction results at least once before beginning.

As you review your results, you may find elements that you want the extraction engine to handle differently. Consider the following examples:

- **Unrecognized synonyms.** Suppose you find several concepts you consider to be synonymous, such as `smart`, `intelligent`, `bright`, and `knowledgeable`, and they all appear as individual concepts in the extraction results. You could create a synonym definition in which `intelligent`, `bright`, and `knowledgeable` are all grouped under the target concept `smart`. Doing so would group all of these together with `smart`, and the global frequency count would be higher as well. See the topic "Adding synonyms" on page 83 for more information.
- **Mistyped concepts.** Suppose that the concepts in your extraction results appear in one type and you would like them to be assigned to another. In another example, imagine that you find 15 vegetable concepts in your extraction results and you want them all to be added to a new type called `<Vegetable>`. For most languages, concepts that are not found in any type dictionary but are extracted

from the text are automatically typed as <Unknown> You can add concepts to types. See the topic "Adding concepts to types" on page 84 for more information.

- **Insignificant concepts.** Suppose that you find a concept that was extracted and has a very high frequency count—that is, it is found in many records or documents. However, you consider this concept to be insignificant to your analysis. You can exclude it from extraction. See the topic "Excluding concepts from extraction" on page 85 for more information.
- **Incorrect matches.** Suppose that in reviewing the records or documents that contain a certain concept, you discover that two words were incorrectly grouped together, such as `faculty` and `facility`. This match may be due to an internal algorithm, referred to as fuzzy grouping, that temporarily ignores double or triple consonants and vowels in order to group common misspellings. You can add these words to a list of word pairs that should not be grouped. See the topic "Fuzzy Grouping" on page 183 for more information.
- **Unextracted concepts.** Suppose that you expect to find certain concepts extracted but notice that a few words or phrases were not extracted when you review the record or document text. Often these words are verbs or adjectives that you are not interested in. However, sometimes you do want to use a word or phrase that was not extracted as part of a category definition. To extract the concept, you can force a term into a type dictionary. See the topic "Forcing Words into Extraction" on page 86 for more information.

Many of these changes can be performed directly from the Extraction Results pane , Data pane, Category Definitions dialog box, or Cluster Definitions dialog box by selecting one or more elements and right-clicking your mouse to access the context menus.

After making your changes, the pane background color changes to show that you need to re-extract to view your changes. See the topic "Extracting data" on page 76 for more information. If you are working with larger data sets, it may be more efficient to re-extract after making several changes rather than after each change.

Note: You can view the entire set of editable linguistic resources used to produce the extraction results in the Resource Editor view (View > Resource Editor). These resources appear in the form of libraries and dictionaries in this view. You can customize the concepts and types directly within the libraries and dictionaries. See the topic Chapter 15, "Working with Libraries," on page 161 for more information.

Adding synonyms

Synonyms associate two or more words that have the same meaning. Synonyms are often also used to group terms with their abbreviations or to group commonly misspelled words with the correct spelling. By using synonyms, the frequency for the target concept is greater, which makes it far easier to discover similar information that is presented in different ways in your text data.

The linguistic resource templates and libraries delivered with the product contain many predefined synonyms. However, if you discover unrecognized synonyms, you can define them so that they will be recognized the next time you extract.

The first step is to decide what the target, or lead, concept will be. The *target concept* is the word or phrase under which you want to group all synonym terms in the final results. During extraction, the synonyms are grouped under this target concept. The second step is to identify all of the synonyms for this concept. The target concept is substituted for all synonyms in the final extraction. A term must be extracted to be a synonym. However, the target concept does not need to be extracted for the substitution to occur. For example, if you want `intelligent` to be replaced by `smart`, then `intelligent` is the synonym and `smart` is the target concept.

If you create a new synonym definition, a new target concept is added to the dictionary. You must then add synonyms to that target concept. Whenever you create or edit synonyms, these changes are recorded in synonym dictionaries in the Resource Editor. If you want to view the entire contents of these synonym

dictionaries or if you want to make a substantial number of changes, you may prefer to work directly in the Resource Editor. See the topic "Substitution/Synonym dictionaries" on page 175 for more information.

Any new synonyms will automatically be stored in the first library listed in the library tree in the Resource Editor view—by default, this is the **Local Library**.

Note: If you look for a synonym definition and cannot find it through the context menus or directly in the Resource Editor, a match may have resulted from an internal fuzzy grouping technique. See the topic "Fuzzy Grouping" on page 183 for more information.

To create a new synonym

1. In either the Extraction Results pane, Data pane, Category Definitions dialog box, or Cluster Definitions dialog box, select the concept(s) for which you want to create a new synonym.
2. From the menus, choose **Edit** > **Add to Synonym** > **New**. The Create Synonym dialog box opens.
3. Enter a target concept in the Target text box. This is the concept under which all of the synonyms will be grouped.
4. If you want to add more synonyms, enter them in the Synonyms list box. Use the global separator to separate each synonym term. See the topic "Options: Session Tab" on page 70 for more information.
5. Click **OK** to apply your changes. The dialog box closes and the Extraction Results pane background color changes, indicating that you need to reextract to see your changes. If you have several changes, make them before you reextract.

To add a synonym

1. In either the Extraction Results pane, Data pane, Category Definitions dialog box, or Cluster Definitions dialog box, select the concept(s) that you want to add to an existing synonym definition.
2. From the menus, choose **Edit** > **Add to Synonym**. The menu displays a set of the synonyms with the most recently created at the top of the list. Select the name of the synonym to which you want to add the selected concept(s). If you see the synonym that you are looking for, select it, and the concept(s) selected are added to that synonym definition. If you do not see it, select **More** to display the All Synonyms dialog box.
3. In the All Synonyms dialog box, you can sort the list by natural sort order (order of creation) or in ascending or descending order. Select the name of the synonym to which you want to add the selected concept(s) and click **OK**. The dialog box closes, and the concepts are added to the synonym definition.

Adding concepts to types

Whenever an extraction is run, the extracted concepts are assigned to types in an effort to group terms that have something in common. IBM SPSS Modeler Text Analytics is delivered with many built-in types. See the topic "Built-in types" on page 170 for more information. For most languages, concepts that are not found in any type dictionary but are extracted from the text are automatically typed as `<Unknown>`

When reviewing your results, you may find some concepts that appear in one type that you want assigned to another, or you may find that a group of words really belongs in a new type by itself. In these cases, you would want to reassign the concepts to another type or create a new type altogether.

For example, suppose that you are working with survey data relating to automobiles and you are interested in categorizing by focusing on different areas of the vehicles. You could create a type called `<Dashboard>` to group all of the concepts relating to gauges and knobs found on the dashboard of the vehicles. Then you could assign concepts such as `gas gauge`, `heater`, `radio`, and `odometer` to that new type.

In another example, suppose that you are working with survey data relating to universities and colleges and the extraction typed `Johns Hopkins` (the university) as a `<Person>` type rather than as an `<Organization>` type. In this case, you could add this concept to the `<Organization>` type.

Whenever you create a type or add concepts to a type's term list, these changes are recorded in type dictionaries within your linguistic resource libraries in the Resource Editor. If you want to view the contents of these libraries or make a substantial number of changes, you may prefer to work directly in the Resource Editor. See the topic "Adding terms" on page 172 for more information.

To add a concept to a type

1. In either the Extraction Results pane, Data pane, Category Definitions dialog box, or Cluster Definitions dialog box, select the concept(s) that you want to add to an existing type.
2. Right-click to open the context menu.
3. From the menus, choose **Edit** > **Add to Type**. The menu displays a set of the types with the most recently created at the top of the list. Select the type name to which you want to add the selected concept(s). If you see the type name that you are looking for, select it, and the concept(s) selected are added to that type. If you do not see it, select **More** to display the All Types dialog box.
4. In the All Types dialog box, you can sort the list by natural sort (order of creation) or in ascending or descending order. Select the name of the type to which you want to add the selected concept(s) and click **OK**. The dialog box closes, and they are added as terms to the type.

To create a new type

1. In either the Extraction Results pane, Data pane, Category Definitions dialog box, or Cluster Definitions dialog box, select the concepts for which you want to create a new type.
2. From the menus, choose **Edit** > **Add to Type** > **New**. The Type Properties dialog box opens.
3. Enter a new name for this type in the Name text box and make any changes to the other fields. See the topic "Creating types" on page 171 for more information.
4. Click **OK** to apply your changes. The dialog box closes and the Extraction Results pane background color changes, indicating that you need to re-extract to see your changes. If you have several changes, make them before you re-extract.

Excluding concepts from extraction

When reviewing your results, you may occasionally find concepts that you did not want extracted or used by any automated category building techniques. In some cases, these concepts have a very high frequency count and are completely insignificant to your analysis. In this case, you can mark a concept to be excluded from the final extraction. Typically, the concepts you add to this list are fill-in words or phrases used in the text for continuity but that do not add anything important and may clutter the extraction results. By adding concepts to the exclude dictionary, you can make sure that they are never extracted.

By excluding concepts, all variations of the excluded concept disappear from your extraction results the next time that you extract. If this concept already appears as a descriptor in a category, it will remain in the category with a zero count after re-extraction.

When you exclude, these changes are recorded in an exclude dictionary in the Resource Editor. If you want to view all of the exclude definitions and edit them directly, you may prefer to work directly in the Resource Editor. See the topic "Exclude dictionaries" on page 178 for more information.

To exclude concepts

1. In either the Extraction Results pane, Data pane, Category Definitions dialog box, or Cluster Definitions dialog box, select the concept(s) that you want to exclude from the extraction.
2. Right-click to open the context menu.

3. Select **Exclude from Extraction**. The concept is added to the exclude dictionary in the Resource Editor and the Extraction Results pane background color changes, indicating that you need to re-extract to see your changes. If you have several changes, make them before you re-extract.

Note: Any words that you exclude will automatically be stored in the first library listed in the library tree in the Resource Editor—by default, this is the **Local Library**.

Forcing Words into Extraction

When reviewing the text data in the Data pane after extraction, you may discover that some words or phrases were not extracted. Often, these words are verbs or adjectives that you are not interested in. However, sometimes you do want to use a word or phrase that was not extracted as part of a category definition.

If you would like to have these words and phrases extracted, you can force a term into a type library. See the topic "Forcing terms" on page 174 for more information.

Important! Marking a term in a dictionary as forced is not foolproof. By this, we mean that even though you have explicitly added a term to a dictionary, there are times when it may not be present in the Extraction Results pane after you have reextracted or it does appear but not exactly as you have declared it. Although this occurrence is rare, it can happen when a word or phrase was already extracted as part of a longer phrase. To prevent this, apply the **Entire (no compounds)** match option to this term in the type dictionary. See the topic "Adding terms" on page 172 for more information.

Chapter 9. Categorizing Text Data

In the Categories and Concepts view, you can create **categories** that represent, in essence, higher-level concepts, or topics, that will capture the key ideas, knowledge, and attitudes expressed in the text.

As of the release of IBM SPSS Modeler Text Analytics 14, categories can also have a hierarchical structure, meaning they can contain subcategories and those subcategories can also have subcategories of their own and so on. You can import predefined category structures, formerly called code frames, with hierarchical categories as well as build these hierarchical categories inside the product.

In effect, hierarchical categories enable you to build a tree structure with one or more subcategories to group items such as different concept or topic areas more accurately. A simple example can be related to leisure activities; answering a question such as *What activity would you like to do if you had more time?* you may have top categories such as *sports*, *art and craft*, *fishing*, and so on; down a level, below *sports*, you may have subcategories to see if this is *ball games*, *water-related*, and so on.

Categories are made up of a set of descriptors, such as *concepts*, *types*, *patterns* and *category rules*. Together, these descriptors are used to identify whether or not a document or record belongs to a given category. The text within a document or record can be scanned to see whether any text matches a descriptor. If a match is found, the document/record is assigned to that category. This process is called **categorization**.

You can work with, build, and visually explore your categories using the data presented in the four panes of the Categories and Concepts view, each of which can be hidden or shown by selecting its name from the View menu.

- **Categories pane.** Build and manage your categories in this pane. See the topic "The Categories Pane" on page 88 for more information.
- **Extraction Results pane.** Explore and work with the extracted concepts and types in this pane. See the topic "Extraction results: Concepts and types" on page 75 for more information.
- **Visualization pane.** Visually explore your categories and how they interact in this pane. See the topic "Category Graphs and Charts" on page 141 for more information.
- **Data pane.** Explore and review the text contained within documents and records that correspond to selections in this pane. See the topic "The Data Pane" on page 95 for more information.

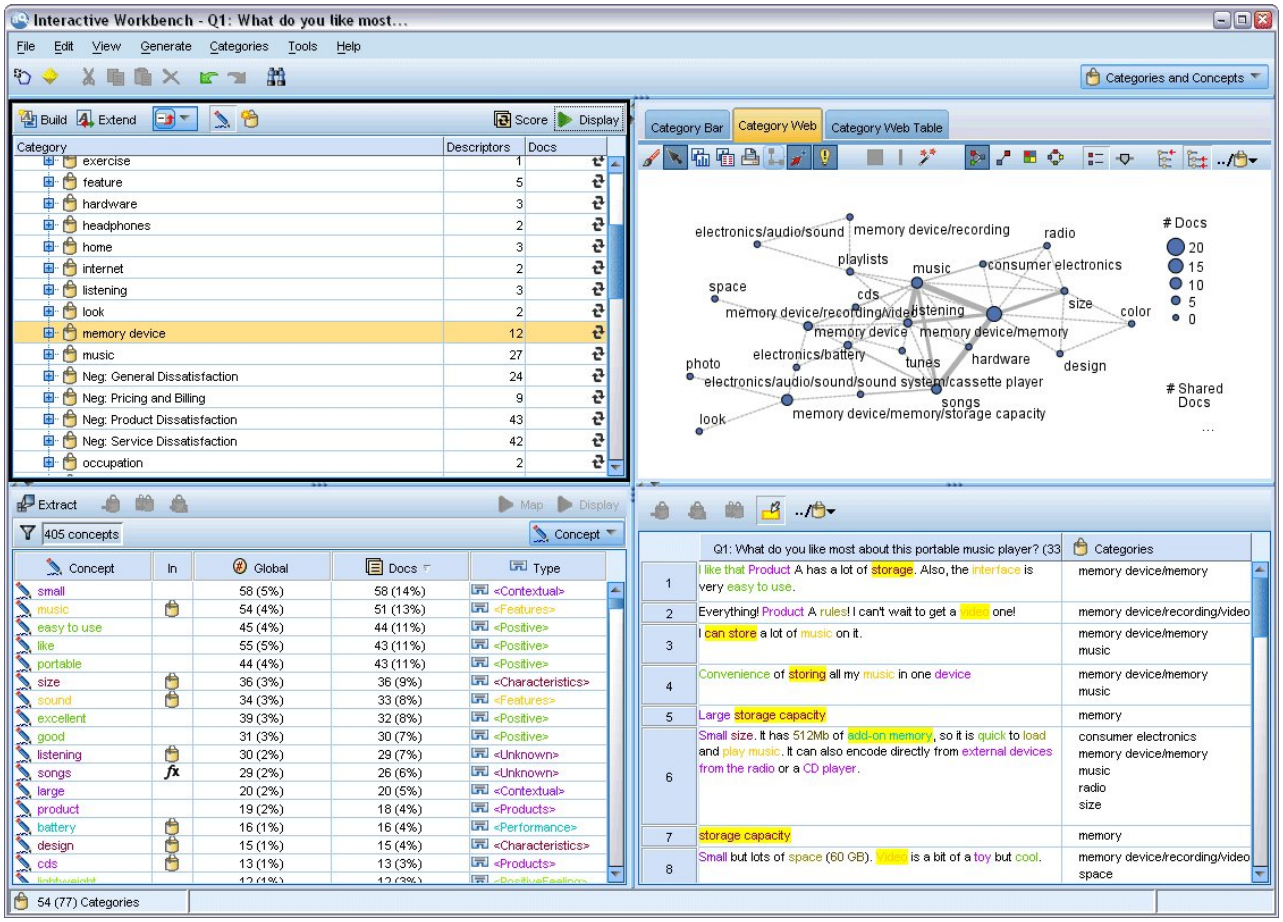


Figure 29. Categories and Concepts view

While you might start with a set of categories from a text analysis package (TAP) or import from a predefined category file, you might also need to create your own. Categories can be created automatically using the product's robust set of automated techniques, which use extraction results (concepts, types, and patterns) to generate categories and their descriptors. Categories can also be created manually using additional insight you may have regarding the data. However, you can only create categories manually or fine-tune them through the interactive workbench. See the topic "Text Mining Node: Model Tab" on page 21 for more information. You can create category definitions manually by dragging and dropping extraction results into the categories. You can enrich these categories or any empty category by adding category rules to a category, using your own predefined categories, or a combination.

Each of the techniques and methods is well suited for certain types of data and situations, but often it will be helpful to combine techniques in the same analysis to capture the full range of documents or records. And in the course of categorization, you may see other changes to make to the linguistic resources.

The Categories Pane

The Categories pane is the area in which you can build and manage your categories. This pane is located in the upper left corner of the Categories and Concepts view. After extracting the concepts and types from your text data, you can begin building categories automatically using techniques such as concept inclusion, co-occurrence, and so on or manually. See the topic "Building categories" on page 97 for more information.

Each time a category is created or updated, the documents or records can be scored by clicking the **Score** button to see whether any text matches a descriptor in a given category. If a match is found, the document or record is assigned to that category. The end result is that most, if not all, of the documents or records are assigned to categories based on the descriptors in the categories.

Note: If there are more categories that can fit in the visible pane, you can use the controls at the bottom of the pane to move forwards and backwards through the categories, or enter a page number to go to.

Category Tree Table

The tree table in this pane presents the set of categories, subcategories, and descriptors. The tree also has several columns presenting information for each tree item. The following columns may be available for display:

- **Code** Lists the code value for each category. This column is hidden by default. You can display this column through the menus: **View** > **Categories Pane**.
- **Category.** Contains the category tree showing the name of the category and subcategories. Additionally if the descriptors toolbar icon is clicked, the set of descriptors will also be displayed.
- **Descriptors.** Provides the number of descriptors that make up its definition. This count does not include the number of descriptors in the subcategories. No count is given when a descriptor name is shown in the **Categories** column. You can display or hide the descriptors themselves in the tree through the menus: **View** > **Categories Pane** > **All Descriptors**.
- **Docs** After scoring, this column provides the number of documents or records that are categorized into a category and all of its subcategories. So if 5 records match your top category based on its descriptors, and 7 different records match a subcategory based on its descriptors, the total doc count for the top category is a sum of the two-- in this case it would be 12. However, if the same record matched the top category and its subcategory, then the count would be 11.

When no categories exist, the table still contains two rows. The top row, called **All Documents**, is the total number of documents or records. A second row, called **Uncategorized**, shows the number of documents/records that have yet to be categorized.

For each category in the pane, a small yellow bucket icon precedes the category name. If you double-click a category, or choose **View > Category Definitions** in the menus, the Category Definitions dialog box opens and presents all of the elements, called *descriptors*, that make up its definition, such as concepts, types, patterns, and category rules. See the topic “About Categories” on page 94 for more information. By default, the category tree table does not show the descriptors in the categories. If you want to see the descriptors directly in the tree rather than in the Category Definitions dialog box, click the toggle button with the pencil icon in the toolbar. When this toggle button is selected, you can expand your tree to see the descriptors as well.

Scoring Categories

The **Docs**. column in the category tree table displays the number of documents or records that are categorized into that specific category. If the numbers are out of date or are not calculated, an icon appears in that column. You can click **Score** on the pane toolbar to recalculate the number of documents. Keep in mind that the scoring process can take some time when you are working with larger datasets.

Selecting Categories in the Tree

When making selections in the tree, you can only select sibling categories -- that is to say, if you select top level categories, you can not also select a subcategory. Or if you select 2 subcategories of a given category, you cannot simultaneously select a subcategory of another category. Selecting a discontiguous category will result in the loss of the previous selection.

Displaying in Data and Visualization Panes

When you select a row in the table, you can click the **Display** button to refresh the Visualization and Data panes with information corresponding to your selection. If a pane is not visible, clicking **Display** will cause the pane to appear.

Refining Your Categories

Categorization may not yield perfect results for your data on the first try, and there may well be categories that you want to delete or combine with other categories. You may also find, through a review of the extraction results, that there are some categories that were not created that you would find useful. If so, you can make manual changes to the results to fine-tune them for your particular context. See the topic "Editing and Refining Categories" on page 126 for more information.

Methods and Strategies for Creating Categories

If you have not yet extracted or your extraction results are out of date, the use of one of the category building or extending techniques will prompt you for an extraction automatically. After you have applied a technique, the concepts and types that were grouped into a category are still available for category building with other techniques. This means that you may see a concept in multiple categories unless you choose not to reuse them.

In order to help you create the best categories, please review the following:

- **Methods for creating categories**
- **Strategies for creating categories**
- **Tips for creating categories**

Methods for Creating Categories

Because every dataset is unique, the number of category creation methods and the order in which you apply them may change over time. Additionally, since your text mining goals may be different from one set of data to the next, you may need to experiment with the different methods to see which one produces the best results for the given text data. None of the automatic techniques will perfectly categorize your data; therefore we recommend finding and applying one or more automatic techniques that work well with your data.

Besides using text analysis packages (TAPs, **.tap*) with prebuilt category sets, you can also categorize your responses using any combination of the following methods:

- **Automatic building techniques.** Several linguistic-based and frequency-based category options are available to automatically build categories for you. See the topic "Building categories" on page 97 for more information.
- **Automatic extending techniques.** Several linguistic techniques are available to extend existing categories by adding and enhancing descriptors so that they capture more records. See the topic "Extending categories" on page 106 for more information.
- **Manual techniques.** There are several manual methods, such as drag-and-drop. See the topic "Creating Categories Manually" on page 109 for more information.

Strategies for Creating Categories

The following list of strategies is by no means exhaustive but it can provide you with some ideas on how to approach the building of your categories.

- When you define the Text Mining node, select a category set from a text analysis package (TAP) so that you begin your analysis with some prebuilt categories. These categories may sufficiently categorize your text right from the start. However, if you want to add more categories, you can edit the Build

Categories settings (**Categories > Build Settings**). Open the **Advanced Settings: Linguistics** dialog and choose the Category input option **Unused extraction results** and build the additional categories.

- When you define the node, select a category set from a TAPin the Categories and Concepts view in the Interactive Workbench. Next, drag and drop unused concepts or patterns into the categories as you deem appropriate. Then, extend the existing categories you've just edited (**Categories > Extend Categories**) to obtain more descriptors that are related to the existing category descriptors.
- Build categories automatically using the advanced linguistic settings (**Categories > Build Categories**). Then, refine the categories manually by deleting descriptors, deleting categories, or merging similar categories until you are satisfied with the resulting categories. Additionally, if you originally built categories **without** using the **Generalize with wildcards where possible** option, you can also try to simplify the categories automatically using the Extend Categories using the **Generalize** option.
- Import a predefined category file with very descriptive category names and/or annotations. Additionally, if you originally imported **without** choosing the option to import or generate descriptors from category names, you can later use the Extend Categories dialog and choose the **Extend empty categories with descriptors generated from the category name.** option. Then, extend those categories a second time but use the grouping techniques this time.
- Manually create a first set of categories by sorting concepts or concept patterns by frequency and then dragging and dropping the most interesting ones to the Categories pane. Once you have that initial set of categories, use the Extend feature (**Categories > Extend Categories**) to expand and refine all of the selected categories so they'll include other related descriptors and thereby match more records.

After applying these techniques, we recommend that you review the resulting categories and use manual techniques to make minor adjustments, remove any misclassifications, or add records or words that may have been missed. Additionally, since using different techniques may produce redundant categories, you could also merge or delete categories as needed. See the topic “Editing and Refining Categories” on page 126 for more information.

Tips for Creating Categories

In order to help you create better categories, you can review some tips that can help you make decisions on your approach.

Tips on Category-to-Document Ratio

The categories into which the documents and records are assigned are not often mutually exclusive in qualitative text analysis for at least two reasons:

- First, a general rule of thumb says that the longer the text document or record, the more distinct the ideas and opinions expressed. Thus, the chances that a document or record can be assigned multiple categories is greatly increased.
- Second, often there are various ways to group and interpret text documents or records that are not logically separate. In the case of a survey with an open-ended question about the respondent's political beliefs, we could create categories, such as *Liberal* and *Conservative*, or *Republican* and *Democrat*, as well as more specific categories, such as *Socially Liberal*, *Fiscally Conservative*, and so forth. These categories do not have to be mutually exclusive and exhaustive.

Tips on Number of Categories to Create

Category creation should flow directly from the data—as you see something interesting with respect to your data, you can create a category to represent that information. In general, there is no recommended upper limit on the number of categories that you create. However, it is certainly possible to create too many categories to be manageable. Two principles apply:

- **Category frequency.** For a category to be useful, it has to contain a minimum number of documents or records. One or two documents may include something quite intriguing, but if they are one or two out of 1,000 documents, the information they contain may not be frequent enough in the population to be practically useful.

- **Complexity.** The more categories you create, the more information you have to review and summarize after completing the analysis. However, too many categories, while adding complexity, may not add useful detail.

Unfortunately, there are no rules for determining how many categories are too many or for determining the minimum number of records per category. You will have to make such determinations based on the demands of your particular situation.

We can, however, offer advice about where to start. Although the number of categories should not be excessive, in the early stages of the analysis it is better to have too many rather than too few categories. It is easier to group categories that are relatively similar than to split off cases into new categories, so a strategy of working from more to fewer categories is usually the best practice. Given the iterative nature of text mining and the ease with which it can be accomplished with this software program, building more categories is acceptable at the start.

Choosing the Best Descriptors

The following information contains some guidelines for choosing or making the best descriptors (concepts, types, TLA patterns, and category rules) for your categories. Descriptors are the building blocks of categories. When some or all of the text in a document or record matches a descriptor, the document or record is matched to the category.

Unless a descriptor contains or corresponds to an extracted concept or pattern, it will not be matched to any documents or records. Therefore, use concepts, types, patterns, and category rules as described in the following paragraphs.

Since concepts represent not only themselves but also a set of underlying terms that can range from plural/singular forms, to synonyms, to spelling variations, only the concept itself should be used as a descriptor or as part of a descriptor. To learn more about the underlying terms for any given concept, click on the concept name in the Extraction Results pane of the Categories and Concepts view. When you hover over the concept name, a tooltip appears and displays any of the underlying terms found in your text during the last extraction. Not all concepts have underlying terms. For example, if `car` and `vehicle` were synonyms but `car` was extracted as the concept with `vehicle` as an underlying term, then you only want to use `car` in a descriptor since it will automatically match document or records with `vehicle`.

Concepts and Types as Descriptors

Use a concept as a descriptor when you want to find all documents or records containing that concept (or any of its underlying terms). In this case, the use of a more complex category rule is not needed since the exact concept name is sufficient. Keep in mind that when you use resources that extract opinions, sometimes concepts can change during TLA pattern extraction to capture the truer sense of the sentence (refer to the example in the next section on TLA).

For example, a survey response indicating each person's favorite fruits such as "*Apple and pineapple are the best*" could result in the extraction of `apple` and `pineapple`. By adding the concept `apple` as a descriptor to your category, all responses containing the concept `apple` (or any of its underlying terms) are matched to that category.

However, if you are interested in simply knowing which responses mention *apple* in any way, you can write a category rule such as `* apple *` and you will also capture responses that contain concepts such as `apple`, `apple sauce`, or `french apple tart`.

You can also capture all the documents or records that contain concepts that were typed the same way by using a type as a descriptor directly such as `<Fruit>`. Please note that you cannot use * with types.

See the topic "Extraction results: Concepts and types" on page 75 for more information.

Text Link Analysis (TLA) Patterns as Descriptors

Use a TLA pattern result as a descriptor when you want to capture finer, nuanced ideas. When text is analyzed during TLA extraction, the text is processed one sentence, or clause, at a time rather than looking at the entire text (the document or record). By considering all of the parts of a single sentence together, TLA can identify opinions, relationships between two elements, or a negation, for example, and understand the truer sense. You can use concept patterns or type patterns as descriptors. See the topic "Type and Concept Patterns" on page 137 for more information.

For example, if we had the text "*the room was not that clean*", the following concepts could be extracted: `room` and `clean`. However, if TLA extraction was enabled in the extraction setting, TLA could detect that `clean` was used in a negative way and actually corresponds to `not clean`, which is a synonym of the concept `dirty`. Here, you can see that using the concept `clean` as a descriptor on its own would match this text but could also capture other document or or records mentioning cleanliness. Therefore, it might be better to use the TLA concept pattern with `dirty` as output concept since it would match this text and likely be a more appropriate descriptor.

Category Business Rules as Descriptors

Category rules are statements that automatically classify documents or records into a category based on a logical expression using extracted concepts, types, and patterns as well as Boolean operators. For example, you could write an expression that means *include all records that contain the extracted concept* `embassy` *but not* `argentina` *in this category*.

You can write and use category rules as descriptors in your categories to express several different ideas using `&`, `|`, and `!()` Booleans. For detailed information on the syntax of these rules and how to write and edit them, see "Using Category Rules" on page 110.

- Use a category rule with the `&` (AND) Boolean operator to help you find documents or records in which 2 or more concepts occur. The 2 or more concepts connected by `&` operators do not need to occur in the same sentence or phrase, but can occur anywhere in the same document or record to be considered a match to the category. For example, if you create the category rule `food & cheap` as a descriptor, it would match a record containing the text, "*the food was pretty expensive, but the rooms were cheap*" despite the fact that `food` was not the noun being called `cheap` since the text contained both `food` and `cheap`.
- Use a category rule with the `!()` (NOT) Boolean operator as a descriptor to help you find documents or records in which some things occur but others do not. This can help avoid grouping information that may seem related based on words but not on context. For example, if you create the category rule `<Organization> & !(ibm)` as a descriptor, it would match the following text *SPSS Inc. was a company founded in 1967* and not match the following text *the software company was acquired by IBM.*.
- Use a category rule with the `|` (OR) Boolean operator as a descriptor to help you find documents or records containing one of several concepts or types. For example, if you create the category rule `(personnel|staff|team|coworkers) & bad` as a descriptor, it would match any documents or records in which any of those nouns are found with the concept `bad`.
- Use types in category rules to make them more generic and possibly more deployable. For example, if you were working with hotel data, you might be very interested in learning what customers think about hotel personnel. Related terms might include words such as receptionist, waiter, waitress, reception desk, front desk and so on. You could, in this case, create a new type called `<HotelStaff>` and add all of the preceding terms to that type. While it is possible to create one category rule for every kind of staff such as `[* waitress * & nice]`, `[* desk * & friendly]`, `[* receptionist * & accommodating]`, you could create a single, more generic category rule using the `<HotelStaff>` type to capture all responses that have favorable opinions of the hotel staff in the form of `[<HotelStaff> & <Positive>]`.

Note: You can use both `+` and `&` in category rules when including TLA patterns in those rules. See the topic "Using TLA Patterns in Category Rules" on page 112 for more information.

Example of how concepts, TLA, or category rules as descriptors match differently

The following example demonstrates how using a concept as a descriptor, category rule as a descriptor, or using a TLA pattern as a descriptor affects how documents or records are categorized. Let's say you had the following 5 records.

- A: *"awesome restaurant staff, excellent food and rooms comfortable and clean."*
- B: *"restaurant personnel was awful, but rooms were clean."*
- C: *"Comfortable, clean rooms."*
- D: *"My room was not that clean."*
- E: *"Clean."*

Since the records include the word *clean* and you want to capture this information, you could create one of the descriptors shown in the following table. Based on the essence you are trying to capture, you can see how using one kind of descriptor over another can produce different results.

Table 17. How Example Records Matched Descriptors.

Descriptor	A	B	C	D	E	Explanation
`clean`	*match*	*match*	*match*	*match*	*match*	Descriptor is an extracted concept. Every record contained the concept `clean`, even record D since without TLA, it is not known automatically that "*not clean*" means `dirty` by the TLA rules.
`clean + .`	-	-	-	-	*match*	Descriptor is a TLA pattern that represents `clean` by itself. Matched only the record where `clean` was extracted with no associated concept during TLA extraction.
`[clean]`	*match*	*match*	*match*	-	*match*	Descriptor is a category rule that looks for a TLA rule that contains `clean` on its own or with something else. Matched all records where a TLA output containing `clean` was found regardless of whether `clean` was linked to another concept such as `room` and in any slot position.

About Categories

Categories refer to a group of closely related concepts, opinions, or attitudes. To be useful, a category should also be easily described by a short phrase or label that captures its essential meaning.

For example, if you are analyzing survey responses from consumers about a new laundry soap, you can create a category labeled *odor* that contains all of the responses describing the smell of the product. However, such a category would not differentiate between those who found the smell pleasant and those who found it offensive. Since IBM SPSS Modeler Text Analytics is capable of extracting opinions when using the appropriate resources, you could then create two other categories to identify respondents who *enjoyed the odor* and respondents who *disliked the odor*.

You can create and work with your categories in the Categories pane in the upper left pane of the Categories and Concepts view window. Each category is defined by one or more descriptors. **Descriptors** are concepts, types, and patterns, as well as category rules that have been used to define a category.

If you want to see the descriptors that make up a given category, you can click the pencil icon in the Categories pane toolbar and then expand the tree to see the descriptors. Alternatively, select the category and open the Category Definitions dialog box (**View > Category Definitions**).

When you build categories automatically using category building techniques such as concept inclusion, the techniques will use concepts and types as the descriptors to create your categories. If you extract TLA patterns, y ou can also add patterns or parts of those patterns as category descriptors. See the topic Chapter 11, "Exploring Text Link Analysis," on page 135 for more information. And if you build clusters, you can add the concepts in a cluster to new or existing categories. Lastly, you can manually create category rules to use as descriptors in your categories. See the topic "Using Category Rules" on page 110 for more information.

Category Properties

In addition to descriptors, categories also have properties you can edit in order to rename categories, add a label, or add an annotation.

The following properties exist:

- **Name.** This name appears in the tree by default. When a category is created using an automated technique, it is given a name automatically.
- **Label.** Using labels is helpful in creating more meaningful category descriptions for use in other products or in other tables or graphs. If you choose the option to display the label, then the label is used in the interface to identify the category.
- **Code.** The code number corresponds to the code value for this category. .
- **Annotation.** You can add a short description for each category in this field. When a category is generated by the Build Categories dialog, a note is added to this annotation automatically. You can also add sample text to an annotation directly from the Data pane by selecting the text and choosing **Categories > Add to Annotation** from the menus.

The Data Pane

As you create categories, there may be times when you might want to review some of the text data you are working with. For example, if you create a category in which 640 documents are categorized, you might want to look at some or all of those documents to see what text was actually written. You can review records or documents in the Data pane, which is located in the lower right. If not visible by default, choose **View > Panes > Data** from the menus.

The Data pane presents one row per document or record corresponding to the selection in the Categories pane, Extraction Results pane, or the Category Definitions dialog box up to a certain display limit. By default, the number of documents or records shown in the Data pane is limited in order to allow you to see your data more quickly. However, you can adjust this in the Options dialog box. If you are dealing with very large datasets, the speed of display may be improved by turning off the option to show categories. See the topic "Options: Session Tab" on page 70 for more information.

Note: If there are more records that can fit in the visible pane, you can use the controls at the bottom of the pane to move forwards and backwards through the records, or enter a page number to go to.

Displaying and Refreshing the Data Pane

The Data pane does not refresh its display automatically because with larger datasets automatic data refreshing could take some time to complete. Therefore, whenever you make a selection in another pane in this view or the Category Definitions dialog box, click **Display** to refresh the contents of the Data pane.

Text Documents or Records

If your text data is in the form of records and the text is relatively short in length, the text field in the Data pane displays the text data in its entirety. However, when working with records and larger datasets, the text field column shows a short piece of the text and opens a Text Preview pane to the right to display more or all of the text of the record you have selected in the table. If your text data is in the form of individual documents, the Data pane shows the document's filename. When you select a document, the Text Preview pane opens with the selected document's text.

Colors and Highlighting

Whenever you display the data, concepts and descriptors found in those documents or records are highlighted in color to help you easily identify them in the text. The color coding corresponds to the types to which the concepts belong. You can also hover your mouse over color-coded items to display the concept under which it was extracted and the type to which it was assigned. Any text that was not extracted appears in black. Typically, these unextracted words are often connectors (*and* or *with*), pronouns (*me* or *they*), and verbs (*is*, *have*, or *take*).

Data Pane Columns

While the text field column is always visible, you can also display other columns. To display other columns, choose **View** > **Data Pane** from the menus, and then select the column that you want to display in the Data pane. The following columns may be available for display:

- **"Text field name" (#)/Documents** Adds a column for the text data from which concepts and type were extracted. If your data is in documents, the column is called Documents and only the document filename or full path is visible. To see the text for those documents you must look in the Text Preview pane. The number of rows in the Data pane is shown in parentheses after this column name. There may be times when not all documents or records are shown due to a limit in the Options dialog used to increase the speed of loading. If the maximum is reached, the number will be followed by **- Max**. See the topic “Options: Session Tab” on page 70 for more information.
- **Categories** Lists each of the categories to which a record belongs. Whenever this column is shown, refreshing the Data pane may take a bit longer so as to show the most up-to-date information.
- **Relevance Rank** Provides a rank for each record in a single category. This rank shows how well the record fits into the category compared to the other records in that category. Select a category in the Categories pane (upper left pane) to see the rank. See the topic “Category Relevance” for more information.
- **Category Count** Lists the number of the categories to which a record belongs.

Category Relevance

To help you build better categories, you can review the relevance of the documents or records in each category as well as the relevance of all categories to which a document or record belongs.

Relevance of a Category to a Record

Whenever a document or record appears in the Data pane, all categories to which it belongs are listed in the Categories column. When a document or record belongs to multiple categories, the categories in this column appear in order from the most to the least relevant match. The category listed first is thought to correspond best to this document or record. See the topic “The Data Pane” on page 95 for more information.

Relevance of a Record to a Category

When you select a category, you can review the relevance of each of its records in the Relevance Rank column in the Data pane. This relevance rank indicates how well the document or record fits into the selected category compared to the other records in that category. To see the rank of the records for a single category, select this category in the Categories pane (upper left pane) and the rank for document or

record appears in the column. This column is not visible by default but you can choose to display it. See the topic "The Data Pane" on page 95 for more information.

The lower the number for the record's rank, the better the fit or the more relevant this record is to the selected category such that 1 is the best fit. If more than one record has the same relevance, each appears with the same rank followed by an equal sign (=) to denote they have equal relevance. For example, you might have the following ranks 1=, 1=, 3, 4, and so on, which means that there are two records that are equally considered as best matches for this category.

Tip: You could add the text of the most relevant record to the category annotation to help provide a better description of the category. Add the text directly from the Data pane by selecting the text and choosing **Categories > Add to Annotation** from the menus.

Building categories

While you may have categories from a text analysis package, you can also build categories automatically using a number of linguistic and frequency techniques. Through the Build Categories Settings dialog box, you can apply the automated linguistic and frequency techniques to produce categories from either concepts or from concept patterns.

In general, categories can be made up of different kinds of descriptors (types, concepts, TLA patterns, category rules). When you build categories using the automated category building techniques, the resulting categories are named after a concept or concept pattern (depending on the input you select) and each contains a set of descriptors. These descriptors may be in the form of category rules or concepts and include all the related concepts discovered by the techniques.

After building categories, you can learn a lot about the categories by reviewing them in the Categories pane or exploring them through the graphs and charts. You can then use manual techniques to make minor adjustments, remove any misclassifications, or add records or words that may have been missed. After you have applied a technique, the concepts, types, and patterns that were grouped into a category are still available for other techniques. Also, since using different techniques may also produce redundant or inappropriate categories, you can also merge or delete categories. See the topic "Editing and Refining Categories" on page 126 for more information.

Important! In earlier releases, co-occurrence and synonym rules were surrounded by square brackets. In this release, square brackets now indicate a text link analysis pattern result. Instead, co-occurrence and synonym rules will be encapsulated by parentheses such as `(speaker systems|speakers)`.

To build categories

1. From the menus, choose **Categories > Build Categories**. Unless you have chosen to never prompt, a message box is displayed.
2. Choose whether you want to build now or edit the settings first.

- Click **Build Now** to begin building categories using the current settings. The settings selected by default are often sufficient to begin the categorization process. The category building process begins and a progress dialog appears.
- Click **Edit** to review and modify the build settings.

Note: The maximum number of categories that can be displayed is 10,000. A warning is displayed if this number is reached or exceeded. If this happens you should change your Build or Extend Categories options to reduce the number of categories built.

Inputs

The categories are built from descriptors derived from either type patterns or types. In the table, you can select the individual types or patterns to include in the category building process.

Type patterns. If you select type patterns, categories are built from patterns rather than types and concepts on their own. In that way, any records or documents containing a concept pattern belonging to the selected type pattern are categorized. So, if you select the <Budget> and <Positive> type pattern in the table, categories such as cost & <Positive> or rates & excellent could be produced.

When using type patterns as input for automated category building, there are times when the techniques identify multiple ways to form the category structure. Technically, there is no single right way to produce the categories; however you might find one structure more suited to your analysis than another. To help customize the output in this case, you can designate a type as the preferred focus. All the top-level categories produced will come from a concept of the type you select here (and no other type). Every subcategory will contain a text link pattern from this type. Choose this type in the **Structure categories by pattern type:** field and the table will be updated to show only the applicable patterns containing the selected type. More often than not, <Unknown> will be preselected for you. This results in all of the patterns containing the type <Unknown> being selected. The table displays the types in descending order starting with the one with the greatest number of records or documents (**Doc.** count).

Types. If you select types, the categories will be built from the concepts belonging to the selected types. So if you select the <Budget> type in the table, categories such as cost or price could be produced since cost and price are concepts assigned to the <Budget> type.

By default, only the types that capture the most records or documents are selected. This pre-selection allows you to quickly focus in on the most interesting types and avoid building uninteresting categories. The table displays the types in descending order starting with the one with the greatest number of records or documents (**Doc.** count). Types from the Opinions library are deselected by default in the types table.

The input you choose affects the categories you obtain. When you choose to use Types as input, you can see the clearly related concepts more easily. For example, if you build categories using Types as input, you could obtain a category Fruit with concepts such as apple, pear, citrus fruits, orange and so on. If you choose Type Patterns as input instead and select the pattern <Unknown> + <Positive>, for example, then you might get a category fruit + <Positive> with one or two kinds of fruit such as fruit + tasty and apple + good. This second result only shows 2 concept patterns because the other occurrences of fruit are not necessarily positively qualified. And while this might be good enough for your current text data, in longitudinal studies where you use different document sets, you may want to manually add in other descriptors such as citrus fruit + positive or use types. Using types alone as input will help you to find all possible fruit.

Techniques

Because every dataset is unique, the number of methods and the order in which you apply them may change over time. Since your text mining goals may be different from one set of data to the next, you may need to experiment with the different techniques to see which one produces the best results for the given text data.

You do not need to be an expert in these settings to use them. By default, the most common and average settings are already selected. Therefore, you can bypass the advanced setting dialogs and go straight to building your categories. Likewise, if you make changes here, you do not have to come back to the settings dialog each time since the latest settings are always retained.

Select either the linguistic or frequency techniques and click the Advanced Settings button to display the settings for the techniques selected. None of the automatic techniques will perfectly categorize your data; therefore we recommend finding and applying one or more automatic techniques that work well with your data.You cannot build using linguistic and frequency techniques simultaneously.

- **Advanced linguistic techniques**. For more information, see "Advanced linguistic settings" on page 99.

- **Advanced frequency techniques**. For more information, see "Advanced Frequency Settings" on page 105.

Advanced linguistic settings

When you build categories, you can select from a number of advanced linguistic category building techniques including *concept root derivation*, *concept inclusion*, *semantic networks* (English text only), and *co-occurrence rules*. These techniques can be used individually or in combination with each other to create categories.

Keep in mind that because every dataset is unique, the number of methods and the order in which you apply them may change over time. Since your text mining goals may be different from one set of data to the next, you may need to experiment with the different techniques to see which one produces the best results for the given text data. None of the automatic techniques will perfectly categorize your data; therefore we recommend finding and applying one or more automatic techniques that work well with your data.

The following areas and fields are available within the Advanced Settings: Linguistics dialog box:

Input and Output

Category input Select from what the categories will be built:

- **Unused extraction results**. This option enables categories to be built from extraction results that are not used in any existing categories. This minimizes the tendency for records to match multiple categories and limits the number of categories produced.
- **All extraction results**. This option enables categories to be built using any of the extraction results. This is most useful when no or few categories already exist.

Category output Select the general structure for the categories that will be built:

- **Hierarchical with subcategories**. This option enables the creation of subcategories and sub-subcategories. You can set the depth of your categories by choosing the maximum number of levels (**Maximum levels created** field) that can be created. If you choose 3, categories could contain subcategories and those subcategories could also have subcategories.
- **Flat categories (single level only)**. This option enables only one level of categories to be built, meaning that no subcategories will be generated.

Grouping Techniques

Each of the techniques available is well suited to certain types of data and situations, but often it is helpful to combine techniques in the same analysis to capture the full range of documents or records. You may see a concept in multiple categories or find redundant categories.

Concept Inclusion. This technique builds categories by grouping multiterm concepts (compound words) based on whether they contain words that are subsets or supersets of a word in the other. For example, the concept `seat` would be grouped with `safety seat`, `seat belt`, and `seat belt buckle`. See the topic "Concept Inclusion" on page 102 for more information.

Semantic Network. This technique begins by identifying the possible senses of each concept from its extensive index of word relationships and then creates categories by grouping related concepts. This technique is best when the concepts are known to the semantic network and are not too ambiguous. It is less helpful when text contains specialized terminology or jargon unknown to the network. In one example, the concept `granny smith apple` could be grouped with `gala apple` and `winesap apple` since they are siblings of the granny smith. In another example, the concept `animal` might be grouped with `cat` and `kangaroo` since they are hyponyms of `animal`. This technique is available for English text only in this release. See the topic "Semantic Networks" on page 103 for more information.

Note: The **Maximum search distance** option is only available if you select **Semantic Network**.

Maximum search distance Select how far you want the techniques to search before producing categories. The lower the value, the fewer results you will get—however, these results will be less noisy and are more likely to be significantly linked or associated with each other. The higher the value, the more results you might get—however, these results may be less reliable or relevant. While this option is globally applied to all techniques, its effect is greatest on co-occurrences and semantic networks.

Prevent pairing of specific concepts. Select this checkbox to stop the process from grouping or pairing two concepts together in the output. To create or manage concept pairs, click **Manage Pairs...**. See the topic "Managing Link Exception Pairs" for more information.

Generalize with wildcards where possible Select this option to allow the product to generate generic rules in categories using the asterisk wildcard. For example, instead of producing multiple descriptors such as `[apple tart + .]` and `[apple sauce + .]`, using wildcards might produce `[apple * + .]`. If you generalize with wildcards, you will often get exactly the same number of records or documents as you did before. However, this option has the advantage of reducing the number and simplifying category descriptors. Additionally, this option increases the ability to categorize more records or documents using these categories on new text data (for example, in longitudinal/wave studies).

Other Options for Building Categories

In addition to selecting the grouping techniques to apply, you can edit several other build options as follow:

Maximum number of top level categories created. Use this option to limit the number of categories that can be generated when you click the Build Categories button next. In some cases, you might get better results if you set this value high and then delete any of the uninteresting categories.

Minimum number of descriptors and/or subcategories per category. Use this option to define the minimum number of descriptors and subcategories a category must contain in order to be created. This option helps limit the creation of categories that do not capture a significant number of records or documents.

Allow descriptors to appear in more than one category When selected, this option allows descriptors to be used in more than one of the categories that will be built next. This option is generally selected since items commonly or "naturally" fall into two or more categories and allowing them to do so usually leads to higher quality categories. If you do not select this option, you reduce the overlap of records in multiple categories and depending on the type of data you have, this might be desirable. However, with most types of data, restricting descriptors to a single category usually results in a loss of quality or category coverage. For example, let's say you had the concept `car seat manufacturer`. With this option, this concept could appear in one category based on the text `car seat` and in another one based on `manufacturer`. But if this option is not selected, although you may still get both categories, the concept `car seat manufacturer` will only appear as a descriptor in the category it best matches based on several factors including the number of records in which `car seat` and `manufacturer` each occur.

Resolve duplicate category names by Select how to handle any new categories or subcategories whose names would be the same as existing categories. You can either merge the new ones (and their descriptors) with the existing categories with the same name. Alternatively, you can choose to skip the creation of any categories if a duplicate name is found in the existing categories.

Managing Link Exception Pairs

During category building, clustering, and concept mapping, the internal algorithms group words by known associations. To prevent two concepts from being paired, or linked together, you can turn on this feature in **Build Categories Advanced Settings** dialog, **Build Clusters** dialog, and **Concept Map Index Settings** dialog and click the **Manage Pairs** button.

In the resulting **Manage Link Exceptions** dialog, you can add, edit, or delete concept pairs. Enter one pair per line. Entering pairs here will prevent the pairing from occurring when building or extending categories, clustering, and concept mapping. Enter words exactly as you want them, for example the accented version of word is not equal to the unaccented version of the word.

For example, if you wanted to make sure that `hot dog` and `dog` are not grouped, you could add the pair as a separate line in the table.

About linguistic techniques

When you build or extend you categories, you can select from a number of advanced linguistic category building techniques including *concept root derivation*, *concept inclusion*, *semantic networks* (English only), and *co-occurrence rules*. These techniques can be used individually or in combination with each other to create categories.

You do not need to be an expert in these settings to use them. By default, the most common and average settings are already selected. If you want, you can bypass this advanced setting dialog and go straight to building or extending your categories. Likewise, if you make changes here, you do not have to come back to the settings dialog each time since it will remember what you last used.

However, keep in mind that because every dataset is unique, the number of methods and the order in which you apply them may change over time. Since your text mining goals may be different from one set of data to the next, you may need to experiment with the different techniques to see which one produces the best results for the given text data. None of the automatic techniques will perfectly categorize your data; therefore we recommend finding and applying one or more automatic techniques that work well with your data.

The main automated linguistic techniques for category building are:

- **Concept root derivation.** This technique creates categories by taking a concept and finding other concepts that are related to it through analyzing whether any of the concept components are morphologically related. See the topic “Concept root derivation” for more information.
- **Concept inclusion.** This technique creates categories by taking a concept and finding other concepts that include it. See the topic “Concept Inclusion” on page 102 for more information.
- **Semantic network.** This technique begins by identifying the possible senses of each concept from its extensive index of word relationships and then creates categories by grouping related concepts. See the topic “Semantic Networks” on page 103 for more information. This option is only available for English text.
- **Co-occurrence.** This technique creates co-occurrence rules that can be used to create a new category, extend a category, or as input to another category technique. See the topic “Co-occurrence Rules” on page 104 for more information.

Concept root derivation

The concept root derivation technique creates categories by taking a concept and finding other concepts that are related to it through analyzing whether any of the concept components are morphologically related. A component is a word. The technique attempts to group concepts by looking at the endings (suffixes) of each component in a concept and finding other concepts that could be derived from them. The idea is that when words are derived from each other, they are likely to share or be close in meaning. In order to identify the endings, internal language-specific rules are used. For example, the concept `opportunities to advance` would be grouped with the concepts `opportunity for advancement` and `advancement opportunity`.

You can use concept root derivation on any sort of text. By itself, it produces fairly few categories, and each category tends to contain few concepts. The concepts in each category are either synonyms or situationally related. You may find it helpful to use this algorithm even if you are building categories manually; the synonyms it finds may be synonyms of those concepts you are particularly interested in.

Note: You can prevent concepts from being grouped together by specifying them explicitly. See the topic "Managing Link Exception Pairs" on page 100 for more information.

Term componentization and de-inflecting

When the concept root derivation or the concept inclusion techniques are applied, the terms are first broken down into components (words) and then the components are de-inflected. When a technique is applied, the concepts and their associated terms are loaded and split into components based on separators, such as spaces, hyphens, and apostrophes. For example, the term `system administrator` is split into components such as {`administrator, system`}.

However, some parts of the original term may not be used and are referred to as stop words. In English, some of these ignorable components might include `a`, `and`, `as`, `by`, `for`, `from`, `in`, `of`, `on`, `or`, `the`, `to`, and `with`.

For example, the term `examination of the data` has the component set {`data, examination`}, and both `of` and `the` are considered ignorable. Additionally, component order is not in a component set. In this way, the following three terms could be equivalent: `cough relief for child`, `child relief from a cough`, and `relief of child cough` since they all have the same component set {`child, cough, relief`}. Each time a pair of terms are identified as being equivalent, the corresponding concepts are merged to form a new concept that references all of the terms.

Additionally, since the components of a term may be inflected, language-specific rules are applied internally to identify equivalent terms regardless of inflectional variation, such as plural forms. In this way, the terms `level of support` and `support levels` can be identified as equivalent since the de-inflected singular form would be`level`.

How concept root derivation works

After terms have been componentized and de-inflected (see previous section), the concept root derivation algorithm analyzes the component endings, or suffixes, to find the component root and then groups the concepts with other concepts that have the same or similar roots. The endings are identified using a set of linguistic derivation rules specific to the text language. For example, there is a derivation rule for English language text that states that a concept component ending with the suffix `ical` might be derived from a concept having the same root stem and ending with the suffix `ic`. Using this rule (and the de-inflection), the algorithm would be able to group the concepts `epidemiologic study` and `epidemiological studies`.

Since terms are already componentized and the ignorable components (for example, `in` and `of`) have been identified, the concept root derivation algorithm would also be able to group the concept `studies in epidemiology` with `epidemiological studies`.

The set of component derivation rules has been chosen so that most of the concepts grouped by this algorithm are synonyms: the concepts `epidemiologic studies`, `epidemiological studies`, `studies in epidemiology` are all equivalent terms. To increase completeness, there are some derivation rules that allow the algorithm to group concepts that are situationally related. For example, the algorithm can group concepts such as `empire builder` and `empire building`.

Concept Inclusion

The concept inclusion technique builds categories by taking a concept and, using lexical series algorithms, identifies concepts included in other concepts. The idea is that when words in a concept are a subset of another concept, it reflects an underlying semantic relationship. Inclusion is a powerful technique that can be used with any type of text.

This technique works well in combination with semantic networks but can be used separately. Concept inclusion may also give better results when the documents or records contain lots of domain-specific

terminology or jargon. This is especially true if you have tuned the dictionaries beforehand so that the special terms are extracted and grouped appropriately (with synonyms).

How Concept Inclusion Works

Before the concept inclusion algorithm is applied, the terms are componentized and de-inflected. See the topic "Concept root derivation" on page 101 for more information. Next, the concept inclusion algorithm analyzes the component sets. For each component set, the algorithm looks for another component set that is a subset of the first component set.

For example, if you have the concept `continental breakfast`, which has the component set {`breakfast`, `continental`}, and you have the concept `breakfast`, which has the component set {`breakfast`}, the algorithm would conclude that `continental breakfast` is a kind of `breakfast` and group these together.

In a larger example, if you have the concept `seat` in the Extraction Results pane and you apply this algorithm, then concepts such as `safety seat`, `leather seat`, `seat belt`, `seat belt buckle`, `infant seat carrier`, and `car seat laws` would also be grouped in that category.

Since terms are already componentized and the ignorable components (for example, `in` and `of`) have been identified, the concept inclusion algorithm would recognize that the concept `advanced spanish course` includes the concept `course in spanish`.

Note: You can prevent concepts from being grouped together by specifying them explicitly. See the topic "Managing Link Exception Pairs" on page 100 for more information.

Semantic Networks

In this release, the semantic networks technique is only available for English language text.

This technique builds categories using a built-in network of word relationships. For this reason, this technique can produce very good results when the terms are concrete and are not too ambiguous. However, you should not expect the technique to find many links between highly technical/specialized concepts. When dealing with such concepts, you may find the concept inclusion and concept root derivation techniques to be more useful.

How Semantic Network Works

The idea behind the semantic network technique is to leverage known word relationships to create categories of synonyms or hyponyms. A **hyponym** is when one concept is a sort of second concept such that there is a hierarchical relationship, also known as an ISA relationship. For example, if `animal` is a concept, then `cat` and `kangaroo` are hyponyms of `animal` since they are sorts of animals.

In addition to synonym and hyponym relationships, the semantic network technique also examines part and whole links between any concepts from the `<Location>` type. For example, the technique will group the concepts `normandy`, `provence`, and `france` into one category because Normandy and Provence are parts of France.

Semantic networks begin by identifying the possible senses of each concept in the semantic network. When concepts are identified as synonyms or hyponyms, they are grouped into a single category. For example, the technique would create a single category containing these three concepts: `eating apple`, `dessert apple`, and `granny smith` since the semantic network contains the information that: 1) `dessert apple` is a synonym of an `eating apple`, and 2) `granny smith` is a sort of `eating apple` (meaning it is a hyponym of `eating apple`).

Taken individually, many concepts, especially uniterms, are ambiguous. For example, the concept `buffet` can denote a sort of meal or a piece of furniture. If the set of concepts includes `meal`, `furniture` and

buffet, then the algorithm is forced to choose between grouping buffet with meal or with furniture. Be aware that in some cases the choices made by the algorithm may not be appropriate in the context of a particular set of records or documents.

The semantic network technique can outperform concept inclusion with certain types of data. While both the semantic network and concept inclusion recognize that apple pie is a sort of pie, only the semantic network recognizes that tart is also a sort of pie.

Semantic networks will work in conjunction with the other techniques. For example, suppose that you have selected both the semantic network and inclusion techniques and that the semantic network has grouped the concept teacher with the concept tutor (because a tutor is a kind of teacher). The inclusion algorithm can group the concept graduate tutor with tutor and, as a result, the two algorithms collaborate to produce an output category containing all three concepts: tutor, graduate tutor, and teacher.

Options for Semantic Network

There are a number of additional settings that might be of interest with this technique.

- Change the **Maximum search distance**. Select how far you want the techniques to search before producing categories. The lower the value, the fewer results produced—however, these results will be less noisy and are more likely to be significantly linked or associated with each other. The higher the value, the more results you will get—however, these results may be less reliable or relevant.

For example, depending on the distance, the algorithm searches from Danish pastry up to coffee roll (its parent), then bun (grand parent) and on upwards to bread.

By reducing the search distance, this technique produces smaller categories that might be easier to work with if you feel that the categories being produced are too large or group too many things together.

Important! Additionally, we recommend that you do not apply the option **Accommodate spelling errors for a minimum root character limit of** (defined on the Expert tab of the node or in the Extract dialog box) for fuzzy grouping when using this technique since some false groupings can have a largely negative impact on the results.

Co-occurrence Rules

Co-occurrence rules enable you to discover and group concepts that are strongly related within the set of documents or records. The idea is that when concepts are often found together in documents and records, that co-occurrence reflects an underlying relationship that is probably of value in your category definitions. This technique creates co-occurrence rules that can be used to create a new category, extend a category, or as input to another category technique. Two concepts strongly co-occur if they frequently appear together in a set of records and rarely separately in any of the other records. This technique can produce good results with larger datasets with at least several hundred documents or records.

For example, if many records contain the words price and availability, these concepts could be grouped into a co-occurrence rule, (price & available). In another example, if the concepts peanut butter, jelly, sandwich and appear more often together than apart, they would be grouped into a concept co-occurrence rule (peanut butter & jelly & sandwich).

Important! In earlier releases, co-occurrence and synonym rules were surrounded by square brackets. In this release, square brackets now indicate a text link analysis pattern result. Instead, co-occurrence and synonym rules will be encapsulated by parentheses such as (speaker systems|speakers).

How Co-occurrence Rules Works

This technique scans the documents or records looking for two or more concepts that tend to appear together. Two or more concepts strongly co-occur if they frequently appear together in a set of documents or records and if they seldom appear separately in any of the other documents or records.

When co-occurring concepts are found, a category rule is formed. These rules consist of two or more concepts connected using the & Boolean operator. These rules are logical statements that will automatically classify a document or record into a category if the set of concepts in the rule all co-occur in that document or record.

Options for Co-occurrence Rules

If you are using the co-occurrence rule technique, you can fine-tune several settings that influence the resulting rules:

- Change the **Maximum search distance**. Select how far you want the technique to search for co-occurrences. As you increase the search distance, the minimum similarity value required for each co-occurrence is lowered; as a result, many co-occurrence rules may be produced, but those which have a low similarity value will often be of little significance. As you reduce the search distance, the minimum required similarity value increases; as a result, fewer co-occurrence rules are produced, but they will tend to be more significant (stronger).
- **Minimum number of documents.** The minimum number of records or documents that must contain a given pair of concepts for it to be considered as a co-occurrence; the lower you set this option, the easier it is to find co-occurrences. Increasing the value results in fewer, but more significant, co-occurrences. As an example, suppose that the concepts "apple" and "pear" are found together in 2 records (and that neither of the two concepts occurs in any other records). With **Minimum number of documents.** set to 2 (the default), the co-occurrence technique will create a category rule (apple and pear). If the value is raised to 3, the rule will no longer be created.

Note: With small datasets (< 1000 responses) you may not find any co-occurrences with the default settings. If so, try increasing the search distance value.

Note: You can prevent concepts from being grouped together by specifying them explicitly. See the topic “Managing Link Exception Pairs” on page 100 for more information.

Advanced Frequency Settings

You can build categories based on a straightforward and mechanical frequency technique. With this technique, you can build one category for each item (type, concept, or pattern) that was found above a given record or document count. Additionally, you can build a single category for all of the less frequently occurring items. By count, we refer to the number of records or documents containing the extracted concept (and any of its synonyms), type, or pattern in question as opposed to the total number of occurrences in the entire text.

Grouping frequently occurring items can yield interesting results, since it may indicate a common or significant response. The technique is very useful on the unused extraction results after other techniques have been applied. Another application is to run this technique immediately after extraction when no other categories exist, edit the results to delete uninteresting categories, and then extend those categories so that they match even more records or documents. See the topic “Extending categories” on page 106 for more information.

Instead of using this technique, you could sort the concepts or concept patterns by descending number of records or documents in the Extraction Results pane and then drag and drop the top ones into the Categories pane to create the corresponding categories.

The following fields are available within the Advanced Settings: Frequencies dialog box:

Generate category descriptors at. Select the kind of input for descriptors. See the topic "Building categories" on page 97 for more information.

- **Concepts level**. Selecting this option means that concepts or concept patterns frequencies will be used. Concepts will be used if types were selected as input for category building and concept patterns are used, if type patterns were selected. In general, applying this technique to the concept level will produce more specific results, since concepts and concept patterns represent a lower level of measurement.
- **Types level**. Selecting this option means that type or type patterns frequencies will be used. Types will be used if types were selected as input for category building and type patterns are used, if type patterns were selected. Applying this technique to the type level allows you to obtain a quick view regarding the kind of information present given.

Minimum doc. count for items to have their own category. This option allows you to build categories from frequently occurring items. This option restricts the output to only those categories containing a descriptor that occurred in at least X number of records or documents, where X is the value to enter for this option.

Group all remaining items into a category called. This option allows you to group all concepts or types occurring infrequently into a single 'catch-all' category with the name of your choice. By default, this category is named *Other*.

Category input. Select the group to which to apply the techniques:

- **Unused extraction results**. This option enables categories to be built from extraction results that are not used in any existing categories. This minimizes the tendency for records to match multiple categories and limits the number of categories produced.
- **All extraction results**. This option enables categories to be built using any of the extraction results. This is most useful when no or few categories already exist.

Resolve duplicate category names by. Select how to handle any new categories or subcategories whose names would be the same as existing categories. You can either merge the new ones (and their descriptors) with the existing categories with the same name. Alternatively, you can choose to skip the creation of any categories if a duplicate name is found in the existing categories.

Extending categories

Extending is a process through which descriptors are added or enhanced automatically to 'grow' existing categories. The objective is to produce a better category that captures related records or documents that were not originally assigned to that category.

The automatic grouping techniques you select will attempt to identify concepts, TLA patterns, and category rules related to existing category descriptors. These new concepts, patterns, and category rules are then added as new descriptors or added to existing descriptors. The grouping techniques for extending include *concept root derivation*, *concept inclusion*, *semantic networks* (English only), and *co-occurrence rules*. The **Extend empty categories with descriptors generated from the category name** method generates descriptors using the words in the category names, therefore, the more descriptive the category names, the better the results.

Note: The frequency techniques are not available when extending categories.

Extending is a great way to interactively improve your categories. Here are some examples of when you might extend a category:

- After dragging/dropping concept patterns to create categories in the Categories pane
- After creating categories by hand and adding simple category rules and descriptors
- After importing a predefined category file in which the categories had very descriptive names

- After refining the categories that came from the TAP you chose

You can extend a category multiple times. For example, if you imported a predefined category file with very descriptive names, you could extend using the **Extend empty categories with descriptors generated from the category name** option to obtain a first set of descriptors, and then extend those categories again. However, in other cases, extending multiple times may result in too generic a category if the descriptors are extended wider and wider. Since the build and extend grouping techniques use similar underlying algorithms, extending directly after building categories is unlikely to produce more interesting results.

Tip:
- If you attempt to extend and do not want to use the results, you can always undo the operation (**Edit > Undo**) immediately after having extended.
- Extending can produce two or more category rules in a category that match exactly the same set of documents since rules are built independently during the process. If desired, you can review the categories and remove redundancies by manually editing the category description. See the topic "Editing Category Descriptors" on page 127 for more information.

To extend categories

1. In the Categories pane, select the categories you want to extend.
2. From the menus, choose **Categories > Extend Categories**. Unless you have chosen the option to never prompt, a message box appears.
3. Choose whether you want to build now or edit the settings first.

- Click **Extend Now** to begin extending categories using the current settings. The process begins and a progress dialog appears.
- Click **Edit** to review and modify the settings.

After attempting to extend, any categories for which new descriptors were found are flagged by the word **Extended** in the Categories pane so that you can quickly identify them. The Extended text remains until you either extend again, edit the category in another way, or clear these through the context menu.

Note: The maximum number of categories that can be displayed is 10,000. A warning is displayed if this number is reached or exceeded. If this happens you should change your Build or Extend Categories options to reduce the number of categories built.

Each of the techniques available when building or extending categories is well suited to certain types of data and situations, but often it is helpful to combine techniques in the same analysis to capture the full range of documents or records. In the interactive workbench, the concepts and types that were grouped into a category are still available the next time you build categories. This means that you may see a concept in multiple categories or find redundant categories.

The following areas and fields are available within the Extend Categories: Settings dialog box:

Extend with. Select what input will be used to extend the categories:
- **Unused extraction results**. This option enables categories to be built from extraction results that are not used in any existing categories. This minimizes the tendency for records to match multiple categories and limits the number of categories produced.
- **All extraction results**. This option enables categories to be built using any of the extraction results. This is most useful when no or few categories already exist.

Grouping techniques

For short descriptions of each of these techniques, see "Advanced linguistic settings" on page 99. These techniques include:

- **Concept root derivation**
- **Semantic network** (English text only, and not used if the Generalize only option is selected.)
- **Concept inclusion**
- **Co-occurrence** and **Minimum number of docs** suboption.

A number of types are permanently excluded from the semantic networks technique since those types will not produce relevant results. They include `<Positive>`, `<Negative>`, `<IP>`, other non linguistic types, etc.

Maximum search distance Select how far you want the techniques to search before producing categories. The lower the value, the fewer results you will get—however, these results will be less noisy and are more likely to be significantly linked or associated with each other. The higher the value, the more results you might get—however, these results may be less reliable or relevant. While this option is globally applied to all techniques, its effect is greatest on co-occurrences and semantic networks.

Prevent pairing of specific concepts. Select this checkbox to stop the process from grouping or pairing two concepts together in the output. To create or manage concept pairs, click **Manage Pairs...** See the topic "Managing Link Exception Pairs" on page 100 for more information.

Where possible: Choose whether to simply extend, generalize the descriptors using wildcards, or both.

- **Extend and generalize.** This option will extend the selected categories and then generalize the descriptors. When you choose to generalize, the product will create generic category rules in categories using the asterisk wildcard. For example, instead of producing multiple descriptors such as `[apple tart + .]` and `[apple sauce + .]`, using wildcards might produce `[apple * + .]`. If you generalize with wildcards, you will often get exactly the same number of records or documents as you did before. However, this option has the advantage of reducing the number and simplifying category descriptors. Additionally, this option increases the ability to categorize more records or documents using these categories on new text data (for example, in longitudinal/wave studies).
- **Extend only**. This option will extend your categories without generalizing. It can be helpful to first choose the **Extend only** option for manually-created categories and then extend the same categories again using the **Extend and generalize** option.
- **Generalize only.** This option will generalize the descriptors without extending your categories in any other way.

  Note: Selecting this option disables the **Semantic network** option; this is because the **Semantic network** option is only available when a description is to be extended.

Other options for extending categories

In addition to selecting the techniques to apply, you can edit any of the following options:

Maximum number of items to extend a descriptor by. When extending a descriptor with items (concepts, types, and other expressions), define the maximum number of items that can be added to a single descriptor. If you set this limit to 10, then no more than 10 additional items can be added to an existing descriptor. If there are more than 10 items to be added, the techniques stop adding new items after the tenth is added. Doing so can make a descriptor list shorter but doesn't guarantee that the most interesting items were used first. You may prefer to cut down the size of the extension without penalizing quality by using the **Generalize with wildcards where possible** option. This option only applies to descriptors that contain the Booleans `&` (AND) or `!` (NOT).

Also extend subcategories. This option will also extend any subcategories below the selected categories.

Extend empty categories with descriptors generated from the category name. This method applies only to empty categories, which have 0 descriptors. If a category already contains descriptors, it will not be

extended in this way. This option attempts to automatically create descriptors for each category based on the words that make up the name of the category. The category name is scanned to see if words in the name match any extracted concepts. If a concept is recognized, it is used to find matching concept patterns and these both are used to form descriptors for the category. This option produces the best results when the category names are both long and descriptive. This is a quick method for generating category descriptors, which in turn enable the category to capture records that contain those descriptors. This option is most useful when you import categories from somewhere else or when you create categories manually with long descriptive names.

Generate descriptors as. This option only applies if the preceding option is selected.

- **Concepts.** Choose this option to produce the resulting descriptors in the form of concepts, regardless of whether they have been extracted from the source text.
- **Patterns.** Choose this option to produce the resulting descriptors in the form of patterns, regardless of whether the resulting patterns or any patterns have been extracted.

Creating Categories Manually

In addition to creating categories using the automated category building techniques and the rule editor, you can also create categories manually. The following manual methods exist:

- Creating an empty category into which you will add elements one by one. See the topic "Creating New or Renaming Categories" for more information.
- Dragging terms, types, and patterns into the categories pane. See the topic "Creating Categories by Drag-and-Drop" for more information.

Creating New or Renaming Categories

You can create empty categories in order to add concepts and types into them. You can also rename your categories.

To Create a New Empty Category

1. Go to the Categories pane.
2. From the menus, choose **Categories > Create Empty Category**. The Category Properties dialog box opens.
3. Enter a name for this category in the Name field.
4. Click **OK** to accept the name and close the dialog box. The dialog box closes and a new category name appears in the pane.

You can now begin adding to this category. See the topic "Adding Descriptors to Categories" on page 126 for more information.

To Rename a Category

1. Select a category and choose **Categories > Rename Category**. The Category Properties dialog box opens.
2. Enter a new name for this category in the Name field.
3. Click **OK** to accept the name and close the dialog box. The dialog box closes and a new category name appears in the pane.

Creating Categories by Drag-and-Drop

The drag-and-drop technique is manual and is not based on algorithms. You can create categories in the Categories pane by dragging:

- Extracted concepts, types, or patterns from the Extraction Results pane into the Categories pane.
- Extracted concepts from the Data pane into the Categories pane.

- Entire rows from the Data pane into the Categories pane. This will create a category made up of all of the extracted concepts and patterns contained in that row.

Note: The Extraction Results pane supports multiple selection to facilitate the dragging and dropping of multiple elements.

Important! You cannot drag and drop concepts from the Data pane that were not extracted from the text. If you want to force the extraction of a concept that you found in your data, you must add this concept to a type. Then run the extraction again. The new extraction results will contain the concept that you just added. You can then use it in your category. See the topic "Adding concepts to types" on page 84 for more information.

To create categories using drag-and-drop:

1. From the Extraction Results pane or the Data pane, select one or more concepts, patterns, types, records, or partial records.
2. While holding the mouse button down, drag the element to an existing category or to the pane area to create a new category.
3. When you have reached the area where you would like to drop the element, release the mouse button. The element is added to the Categories pane. The categories that were modified appear with a special background color. This color is called the **category feedback background**. See the topic "Setting Options" on page 69 for more information.

Note: The resulting category was automatically named. If you want to change a name, you can rename it. See the topic "Creating New or Renaming Categories" on page 109 for more information.

If you want to see which records are assigned to a category, select that category in the Categories pane. The data pane is automatically refreshed and displays all of the records for that category.

Using Category Rules

You can create categories in many ways. One of these ways is to define category rules to express ideas. Category rules are statements that automatically classify documents or records into a category based on a logical expression using extracted concepts, types, and patterns as well as Boolean operators. For example, you could write an expression that means *include all records that contain the extracted concept* `embassy` *but not* `argentina` *in this category*.

While some category rules are produced automatically when building categories using grouping techniques such as *co-occurrence* and *concept root derivation* (**Categories > Build Settings > Advanced Settings: Linguistics**), you can also create category rules manually in the rule editor using your category understanding of the data and context. Each rule is attached to a single category so that each document or record matching the rule is then scored into that category.

Category rules help enhance the quality and productivity of your text mining results and further quantitative analysis by allowing you to categorize responses with greater specificity. Your experience and business knowledge might provide you with a specific understanding of your data and context. You can leverage this understanding to translate that knowledge into category rules to categorize your documents or records even more efficiently and accurately by combining extracted elements with Boolean logic.

The ability to create these rules enhances coding precision, efficiency, and productivity by allowing you to layer your business knowledge onto the product's extraction technology.

Note: For examples of how rules match text, see "Category Rule Examples" on page 116

Category Rule Syntax

While some category rules are produced automatically when building categories using grouping techniques such as *co-occurrence* and *concept root derivation* (**Categories > Build Settings > Advanced Settings: Linguistics**), you can also create category rules manually in the rule editor. Each rule is a descriptor of a single category; therefore, each document or record matching the rule is automatically scored into that category.

Note: For examples of how rules match text, see "Category Rule Examples" on page 116

When you are creating or editing a rule, you must have it open in the rule editor. You can add concepts, types, or patterns as well as use wildcards to extend the matches. When you use extracted concepts, types and patterns, you can benefit from finding all related concepts.

Important! To avoid common errors, we recommend dragging and dropping concepts directly from the Extraction Results pane, Text Link Analysis panes, or the Data pane into the rule editor or adding them via the context menus whenever possible.

When concepts, types, and patterns are recognized, an icon appears next to the text.

Table 18. Extraction icons

Icon	Description
	Extracted concept
	Extracted type
	Extracted pattern

Rule Syntax and Operators

The following table contains the characters with which you'll define your rule syntax. Use these characters along with the concepts, types, and patterns to create your rule.

Table 19. Supported syntax

Character	Description

`&`	The "and" boolean. For example, `a & b` contains both `a` *and* `b` such as:
	`- invasion & united states`
	`- 2016 & olympics`
	`- good & apple`

`|`	The "or" boolean is inclusive, which means that if any or all of the elements are found, a match is made. For example, `a | b` contains either `a` *or* `b` such as:
	`- attack | france`
	`- condominium | apartment`

`!()`	The "not" boolean. For example, `!(a)` does not contain `a`. such as, `!(good & hotel)`, `assassination & !(austria)`, or `!(gold) & !(copper)`
`*`	A wildcard representing anything from a single character to a whole word depending how it is used. See the topic "Using Wildcards in Category Rules" on page 114 for more information.
`()`	An expression delimiter. Any expression within the parenthesis is evaluated first.

Table 19. Supported syntax (continued)

Character	Description
+	The pattern connector used to form an order-specific pattern. When present, the square brackets must be used. See the topic "Using TLA Patterns in Category Rules" for more information.
[]	The pattern delimiter is required if you are looking to match based on an extracted TLA pattern inside of a category rule. The content within the brackets refers to TLA patterns and will never match concepts or types based on simple co-occurrence. If you did not extract this TLA pattern, then no match will be possible. See the topic "Using TLA Patterns in Category Rules" for more information. Do not use square brackets if you are looking to match concepts and types instead of patterns. *Note*: In older versions, co-occurrence and synonym rules generated by the category building techniques used to be surrounded by square brackets. In all new versions, square brackets now indicate the presence of a TLA pattern. Instead, rules produced by the co-occurrence technique and synonyms will be encapsulated in parentheses, such as `(speaker systems|speakers)`.

The `&` and `|` operators are commutative such that `a & b = b & a` and `a | b = b | a`.

Escaping Characters with Backslash

If you have a concept that contains any character that is also a syntax character you must place a backslash in front of that character so that the rule is properly interpreted. The backslash (\) character is used to escape characters that otherwise have a special meaning. When you drag and drop into the editor, backslashing is done for you automatically.

The following rule syntax characters must be preceded by a backslash if you want it treated as it is rather than as rule syntax:

```
& ! | + < > ( ) [ ] *
```

For example, since the concept `r&d` contains the "and" operator (`&`), the backslash is required when it is typed into the rule editor, such as: `r\&d`.

Using TLA Patterns in Category Rules

Text link analysis patterns can be explicitly defined in category rules to allow you to obtain even more specific and contextual results. When you define a pattern in a category rule, you are bypassing the more simple concept extraction results and only matching documents and records based on extracted text link analysis pattern results.

Important! In order to match documents using TLA patterns in your category rules, you must have run an extraction with text link analysis enabled. The category rule will look for the matches found during that process. If you did not choose to explore TLA results in the Model tab of your Text Mining node, you can choose to enable TLA extraction in the extraction settings within the interactive session and then re-extract. See the topic "Extracting data" on page 76 for more information.

Delimiting with square brackets. A TLA pattern must be surrounded by square brackets `[ ]` if you are using it inside of a category rule. The pattern delimiter is required if you are looking to match based on an extracted TLA pattern. Since category rules can contain, types, concepts, or patterns, the brackets clarify to the rule that the contents within the brackets refers to extracted TLA pattern. If you did not extract this TLA pattern, then no match will be possible. If you see a pattern without brackets such as `apple + good` in the Categories pane, this likely means that the pattern was added directly to the category outside of the category rule editor. For example, if you add a concept pattern directly to category from the text link analysis view, it will not appear with square brackets. However, when using a pattern within a category rule, you must encapsulate the pattern within the square brackets inside the category rule such as `[banana + !(good)]`.

Using the + sign in patterns. In IBM SPSS Modeler Text Analytics, you can have up to a 6-part, or -slot, pattern. To indicate that the order is important, use the + sign to connect each element, such as `[company1 + acquired + company2]`. Here the order is important since it would change the meaning of which company was acquiring. Order is not determined by the sentence structure but rather by how the TLA pattern output is structured. For example, if you have the text "*I love Paris*" and you want to extract this idea, the TLA pattern is likely to be `[paris + like]` or `[<Location> + <Positive>]` rather than `[<Positive> + <Location>]` since the default opinion resources generally place opinions in the second position in 2 part patterns. So it can be helpful to use the pattern directly as a descriptor in your category to avoid issues. However, if you need to use a pattern as part of a more complex statement, pay particular attention to order of the elements within the patterns presented in the Text Link Analysis view since order plays a big role in whether a match can be found.

For example, let's say you had the two following sample texts the expression: "I *like pineapple*" and "I hate *pineapple*. However, I *like* strawberries". The expression `like & pineapple` would match both texts as it is a concept expression and not a text link rule (not enclosed in brackets). The expression `pineapple + like` matches only "I *like pineapple*" since in the second text, the word *like* is associated to *strawberries* instead.

Grouping with patterns. You can simplify your rules with your own patterns. Let's say you want to capture the following three expressions, `cayenne peppers + like`, `chili peppers + like`, and `peppers + like`. You can group them into a single category rule such as `[* peppers & like]`. If you had another expression `hot peppers + good`, you can group those four with a rule such as `[* peppers + <Positive>]`.

Order in patterns. In order to better organize output, the text link analysis rules supplied in the templates you installed with your product attempt to output basic patterns in the same order regardless of word order in the sentence. For example, if you had a record containing the text, "*Good presentations.*" and another record containing "*the presentations were good*", both text are matched by the same rule and output in the same order as `presentation + good` in the concept pattern results rather than `presentation + good` and also `good + presentation`. And in two-slot pattern such as those in the example, the concepts assigned to types in the Opinions library will be presented last in the output by default such as `apple + bad`.

Table 20. Pattern syntax and boolean usage

Expression	Matches a document or record that
`[ ]`	Contains any TLA pattern. The pattern delimiter is required *in category rules* if you are looking to match based on an extracted TLA pattern. The content within the brackets refers to TLA patterns not simple concepts and types. If you did not extract this TLA pattern, then no match will be possible. If you wanted to create a rule that did not include any patterns, you could use `!([ ])`.
`[a]`	Contains a pattern of which at least one element is `a` regardless of its position in the pattern. For example, `[deal]` can match `[deal + good]` or just `[deal + .]`
`[a + b]`	Contains a concept pattern. For example, `[deal + good]`. *Note:* If you only want to capture this pattern without adding any other elements, we recommend adding the pattern directly to your category rather than making a rule with it.
`[a + b + c]`	Contains a concept pattern. The + sign denotes that the order of the matching elements is important. For example, `[company1 + acquired + company2]`.
`[<A> + <B>]`	Contains any pattern with type `<A>` in the first slot and type `<B>` in the second slot, and there are exactly two slots. The + sign denotes that the order of the matching elements is important. For example, `[<Budget> + <Negative>]`. *Note:* If you only want to capture this pattern without adding any other elements, we recommend adding the pattern directly to your category rather than making a rule with it.

Table 20. Pattern syntax and boolean usage (continued)

Expression	Matches a document or record that
[<A> & <B>]	Contains any type pattern with type <A> and type <B>. For example, [<Budget> & <Negative>]. This TLA pattern will never be extracted; however, when written as such it is really equal to [<Budget> + <Negative>]|[<Negative> + <Budget>]. The order of the matching elements is unimportant. Additionally, other elements might be in the pattern but it must have at least <Budget> and <Negative>.
[a + .]	Contains a pattern where a is the only concept and there is nothing in any other slots for that pattern. For example, [deal + .] matches the concept pattern where the only output is the concept deal. If you added the concept deal as a category descriptor, you would get all records with deal as a concept including positive statements about a deal. However, using [deal + .] will match only those records pattern results representing deal and no other relationships or opinions and would not match deal + fantastic. *Note:* If you only want to capture this pattern without adding any other elements, we recommend adding the pattern directly to your category rather than making a rule with it.
[<A> + <>]	Contains a pattern where <A> is the only type. For example, [<Budget> + <>] matches the pattern where the only output is a concept of the type <Budget>. *Note:* You can use the <> to denote an empty type only when putting it after the pattern + symbol in type pattern such as [<Budget> + <>] but not [price + <>]. *Note:* If you only want to capture this pattern without adding any other elements, we recommend adding the pattern directly to your category rather than making a rule with it.
[a + !(b)]	Contains at least one pattern that includes the concept a but does not include the concept b. Must include at least one pattern. For example, [price + !(high)] or for types, [!(<Fruit>|<Vegetable>) + <Positive>]
!([<A> & <B>])	Does not contain a specific pattern. For example, !([<Budget> & <Negative>]).

Note: For examples of how rules match text, see "Category Rule Examples" on page 116

Using Wildcards in Category Rules

Wildcards can be added to concepts in rules in order to extend the matching capabilities. The asterisk * wildcard can be placed before and/or after a word to indicate how concepts can be matched. There are two types of wildcard uses:

- **Affix wildcards**. These wildcards immediately prefix or suffix without any space separating the string and the asterisk. For example, operat* could match *operat*, *operate*, *operates*, *operations*, *operational*, and so on.
- **Word wildcards**. These wildcards prefix or suffix a concept with a space between the concept and the asterisk. For example, * operation could match *operation*, *surgical operation*, *post operation*, and so on. Additionally, a word wildcard can be used along side an affix wildcard such as, * operat* *, which could match *operation*, *surgical operation*, *telephone operator*, *operatic aria*, and so on. As you can see in this last example, we recommend that wildcards be used with care so as not to cast the net too widely and capture unwanted matches.

Exceptions!

- A wildcard can never stand on its own. For example, (apple | *) would not be accepted.
- A wildcard can never be used to match type names. <Negative*> will not match any type names at all.
- You cannot filter out certain types from being matched to concepts found through wildcards. The type to which the concept is assigned is used automatically.

- A wildcard can never be in the middle of a word sequence, whether it is end or beginning of a word (open* account) or a standalone component (open * account). You cannot use wildcards in type names either. For example, `word* word`, such as `apple* recipe`, will not match applesauce recipe or anything else at all. However, `apple* *` would match *applesauce recipe*, *apple pie*, *apple* and so on. In another example, `word * word`, such as `apple * toast`, will not match *apple cinnamon toast* or anything else at all since the asterisk appears between two other words. However, `apple *` would match *apple cinnamon toast*, *apple*, *apple pie* and so on.

Table 21. Wildcard usage

Expression	Matches a document or record that
`*apple`	Contains a concept that ends with letter written but may have any number of letters as a prefix. For example: `*apple` ends with the letters *apple* but can take a prefix such as: - `apple` - `pineapple` - `crabapple`
`apple*`	Contains a concept that starts with letters written but may have any number of letters as a suffix. For example: `apple*` starts with the letters *apple* but can take a suffix or no suffix such as: - `apple` - `applesauce` - `applejack` For example, `apple* & !(pear* | quince)`, which contains a concept that starts with the letters `apple` but not a concept starting with the letters *pear* or the concept `quince`, would NOT match: `apple & quince` but could match: - `applesauce` - `apple & orange`
`*product*`	Contains a concept that contains the letters written `product`, but may have any number of letters as either a prefix or suffix or both. For example: `*product*` could match: - `product` - `byproduct` - `unproductive`
`* loan`	Contains a concept that contains the word `loan` but may be a compound with another word placed before it. For example, `* loan` could match: - `loan` - `car loan` - `home equity loan` For example, `[* delivery + <Negative>]` contains a concept that ends in the word `delivery` in the first position and contains a type `<Negative>` in the second position could match the following concept patterns: - `package delivery + slow` - `overnight delivery + late`
`event *`	Contains a concept that contains the word `event` but may be a compound followed by another word. For example, `event *` could match: - `event` - `event location` - `event planning committee`

Table 21. Wildcard usage (continued)

Expression	Matches a document or record that
`* apple *`	Contains a concept that might start with any word followed by the word `apple` possibly followed by another word. `*` means 0 or n, so it also matches `apple`. For example, `* apple *` could match: - gala applesauce - granny smith apple crumble - famous apple pie - apple For example, `[* reservation* * + <Positive>]`, which contains a concept with the word `reservation` (regardless of where it is in the concept) in the first position and contains a type `<Positive>` in the second position could match the concept patterns: - reservation system + good - online reservation + good

Note: For examples of how rules match text, see "Category Rule Examples"

Category Rule Examples

To help demonstrate how rules are matched to records differently based on the syntax used to express them, consider the following example.

Example Records

Imagine you had two records:

- **Record A**: *"when I checked my wallet, I saw I was missing 5 dollars."*
- **Record B**: *"$5 was found at the picnic area, but the blanket was missing."*

The following two tables show what might be extracted for concepts and types as well as concept patterns and type patterns.

Concepts and Types Extracted From Example

Table 22. Example Extracted Concepts and Types

Extracted Concept	Concepts Typed As
`wallet`	`<Unknown>`
`missing`	`<Negative>`
`USD5`	`<Currency>`
`blanket`	`<Unknown>`
`picnic area`	`<Unknown>`

TLA Patterns Extracted From Example

Table 23. Example Extracted TLA Pattern Output

Extracted Concept Patterns	Extracted Type Patterns	From Record
`picnic area + .`	`<Unknown> + <>`	Record B
`wallet + .`	`<Unknown> + <>`	Record A
`blanket + missing`	`<Unknown> + <Negative>`	Record B
`USD5 + .`	`<Currency> + <>`	Record B

Table 23. Example Extracted TLA Pattern Output (continued)

Extracted Concept Patterns	Extracted Type Patterns	From Record
USD5 + missing	<Currency> + <Negative>	Record A

How Possible Category Rules Match

The following table contains some syntax that could be entered in the category rule editor. Not all rules here work and not all match the same records. See how the different syntax affects the records matched.

Table 24. Sample Rules

Rule Syntax	Result
USD5 & missing	Matches both records A and B since they both contain the extracted concept missing and the extracted concept USD5. This is equivalent to: (USD5 & missing)
missing & USD5	Matches both records A and B since they both contain the extracted concept missing and the extracted concept USD5. This is equivalent to: (missing & USD5)
missing & <Currency>	Matches both records A and B since they both contain the extracted concept missing and a concept matching the type <Currency>. This is equivalent to: (missing & <Currency>)
<Currency> & missing	Matches both records A and B since they both contain the extracted concept missing and a concept matching the type <Currency>. This is equivalent to: (<Currency> & missing)
[USD5 + missing]	Matches A but **not** B since record B did not produce any TLA pattern output containing USD5 + missing (see previous table). This is equivalent to the TLA pattern output: USD5 + missing
[missing + USD5]	Matches neither record A nor B since no extracted TLA pattern (see previous table) match the order expressed here with missing in the first position. This is equivalent to the TLA pattern output: USD5 + missing
[missing & USD5]	Matches A but **not** B since no such TLA pattern was extracted from record B. Using the character & indicates that order is unimportant when matching; therefore, this rule looks for a pattern match to either [missing + USD5] or [USD5 + missing]. Only [USD5 + missing] from record A has a match.
[missing + <Currency>]	Matches neither record A nor B since no extracted TLA pattern matched this order. This has no equivalent, since a TLA output is only based on terms (USD5 + missing) or on types (<Currency> + <Negative>), but does not mix concepts and types.
[<Currency> + <Negative>]	Matches record A but not B since no TLA pattern was extracted from record B. This is equivalent to the TLA output: <Currency> + <Negative>
[<Negative> + <Currency>]	Matches neither record A nor B since no extracted TLA pattern matched this order. In the Opinions template, by default, when a *topic* is found with an *opinion*, the *topic* (<Currency>) occupies the first slot position and *opinion* (<Negative>) occupies the second slot position.

Creating Category Rules

When you are creating or editing a rule, you must have the rule open in the rule editor. You can add concepts, types, or patterns as well as use wildcards to extend the matches. When you use recognized concepts, types and patterns, you benefit since it will find all related concepts. For example, when you use a concept, all of its associated terms, plural forms, and synonyms are also matched to the rule. Likewise, when you use a type, all of its concepts are also captured by the rule.

You can open the rule editor by editing an existing rule or by right-clicking the category name and choosing **Create Rule**.

You can use context menus, drag-and-drop, or manually enter concepts, types, and patterns into the editor. Then combine these with Boolean operators (`&`, `!()`, `|`) and brackets to form your rule expressions. To avoid common errors, we recommend dragging and dropping concepts directly from the Extraction Results pane or the Data pane into the rule editor. Pay close attention to the syntax of the rules to avoid errors. See the topic "Category Rule Syntax" on page 111 for more information.

Note: For examples of how rules match text, see "Category Rule Examples" on page 116.

To Create a Rule

1. If you have not yet extracted any data or your extraction is out of date, do so now. See the topic "Extracting data" on page 76 for more information.

   Note: If you filter an extraction in such a way that there are no longer any concepts visible, an error message is displayed when you attempt to create or edit a category rule. To prevent this, modify your extraction filter so that concepts are available.
2. In the Categories pane, select the category in which you want to add your rule.
3. From the menus choose **Categories > Create Rule**. The category rule editor pane opens in the window.
4. In the Rule Name field, enter a name for your rule. If you do not provide a name, the expression will be used as the name automatically. You can rename this rule later.
5. In the larger expression text field, you can:
   - Enter text directly in the field or drag-and-drop from another pane. Use only extracted concepts, types, and patterns. For example, if you enter the word `cats` but only the singular form, `cat`, appears in your Extraction Results pane, the editor will not be able to recognize `cats`. In this last case, the singular form might automatically include the plural, otherwise you could use a wildcard. See the topic "Category Rule Syntax" on page 111 for more information.
   - Select the concepts, types, or patterns you want to add to rules and use the menus.
   - Add Boolean operators to link elements in your rule together. Use the toolbar buttons to add the "and" Boolean **&**, the "or" Boolean `|`, the "not" Boolean **!()**, parentheses **()**, and brackets for patterns **[ ]** to your rule.
6. Click the **Test Rule** button to verify that your rule is well-formed. See the topic "Category Rule Syntax" on page 111 for more information. The number of documents or records found appears in parentheses next to the text **Test result**. To the right of this text, you can see the elements in your rule that were recognized or any error messages. If the graphic next to the type, pattern, or concept appears with a red question mark, this indicates that the element does not match any known extractions. If it does not match, then the rule will not find any records.
7. To test a part of your rule, select that part and click **Test Selection**.
8. Make any necessary changes and retest your rule if you found problems.
9. When finished, click **Save & Close** to save your rule again and close the editor. The new rule name appears in the category.

Editing and Deleting Rules

After you have created and saved a rule, you can edit that rule at any time. See the topic "Category Rule Syntax" on page 111 for more information.

If you no longer want a rule, you can delete it.

To Edit Rules

1. In the Descriptors table in Category Definitions dialog box, select the rule.
2. From the menus choose **Categories > Edit Rule** or double-click the rule name. The editor opens with the selected rule.
3. Make any changes to the rule using extraction results and the toolbar buttons.
4. Retest your rule to make sure that it returns the expected results.
5. Click **Save & Close** to save your rule again and close the editor.

To Delete a Rule

1. In the Descriptors table in Category Definitions dialog box, select the rule.
2. From the menus, choose **Edit > Delete**. The rule is deleted from the category.

Importing and Exporting Predefined Categories

If you have your own categories stored in an Microsoft Excel (*.*xls*, *.*xlsx*) file, you can import them into IBM SPSS Modeler Text Analytics .

You can also export the categories you have in an open interactive workbench session out to an Microsoft Excel (*.*xls*, *.*xlsx*) file. When you export your categories, you can choose to include or exclude some additional information such as descriptors and scores. See the topic "Exporting Categories" on page 123 for more information.

If your predefined categories do not have codes or you want new codes, you can automatically generate a new set of codes for the set of categories in the categories pane by choosing **Categories > Manage Categories > Autogenerate Codes** from the menus. This will remove any existing codes and renumber them all automatically.

Importing Predefined Categories

You can import your predefined categories into IBM SPSS Modeler Text Analytics . Before importing, make sure the predefined category file is in an Microsoft Excel (*.*xls*, *.*xlsx*) file and is structured in one of the supportive formats. You can also choose to have the product automatically detect the format for you. The following formats are supported:

- **Flat list format**: See the topic "Flat List Format" on page 120 for more information.
- **Compact format**: See the topic "Compact Format" on page 121 for more information.
- **Indented format**: See the topic "Indented Format" on page 122 for more information.

To Import Predefined Categories

1. From the interactive workbench menus, choose **Categories > Manage Categories > Import Predefined Categories**. An Import Predefined Categories wizard is displayed.
2. From the Look In drop-down list, select the drive and folder in which the file is located.
3. Select the file from the list. The name of the file appears in the File Name text box.
4. Select the worksheet containing the predefined categories from the list. The worksheet name appears in the Worksheet field.
5. To begin choosing the data format, click **Next**.

6. Choose the format for your file or choose the option to allow the product to attempt to automatically detect the format. The autodetection works best on the most common formats.
   - **Flat list format**: See the topic "Flat List Format" for more information.
   - **Compact format**: See the topic "Compact Format" on page 121 for more information.
   - **Indented format**: See the topic "Indented Format" on page 122 for more information.
7. To define the additional import options, click **Next**. If you choose to have the format automatically detected, you are directed to the final step.
8. If one or more rows contain column headers or other extraneous information, select the row number from which you want to start importing in the **Start import at row** option. For example, if your category names begin on row 7, you must enter the number 7 for this option in order to import the file correctly.
9. If your file contains category codes, choose the option **Contains category codes**. Doing so helps the wizard properly recognize your data.
10. Review the color-coded cells and legend to make sure that the data has been correctly identified. Any errors detected in the file are shown in red and referenced below the format preview table. If the wrong format was selected, go back and choose another one. If you need to make corrections to your file, make those changes and restart the wizard by selecting the file again. You must correct all errors before you can finish the wizard.
11. To review the set of categories and subcategories that will be imported and to define how to create descriptors for these categories, click **Next**.
12. Review the set of categories that will be imported in the table. If you do not see the keywords you expected to see as descriptors, it may be that they were not recognized during the import. Make sure they are properly prefixed and appear in the correct cell.
13. Choose how you want to handle any pre-existing categories in your session.
    - **Replace all existing categories**. This option purges all existing categories and then the newly imported categories are used alone in their place.
    - **Append to existing categories**. This option will import the categories and merge any common categories with the existing categories. When adding to existing categories, you need to determine how you want any duplicates handled. One choice (option: **Merge**) is to merge any categories being imported with existing categories if they share a category name. Another choice (option: **Exclude from import**) is to prohibit the import of categories if one with the same name exists.
14. **Import keywords as descriptors** is an option to import the keywords identified in your data as descriptors for the associated category.
15. **Extend categories by deriving descriptors** is an option that will generate descriptors from the words that represent the name of the category, or subcategory, and/or the words that make up the annotation. If the words match extracted results, then those are added as descriptors to the category. This option produces the best results when the category names or annotations are both long and descriptive. This is a quick method for generating the category descriptors that enable the category to capture records that contain those descriptors.
    - **From** field allows you to select from what text the descriptors will be derived, the names or categories and subcategories, the words in the annotations, or both.
    - **As** field allows you to choose to create these descriptors in the form of concepts or TLA patterns. If TLA extraction has not taken place, the options of **patterns** are disabled in this wizard.
16. To import the predefined categories into the Categories pane, click **Finish**.

Flat List Format

In the flat list format, there is only one top level of categories without any hierarchy, meaning no subcategories or subnets. Category names are in a single column.

The following information can be contained in a file of this format:

- Optional **codes** column contains numerical values that uniquely identify each category. If you specify that the data file does contain codes (**Contains category codes** option in the **Content Settings** step),

then a column containing unique codes for each category must exist in the cell directly to the left of category name. If your data does not contain codes, but you want to create some codes later, you can always generate codes later (**Categories > Manage Categories > Autogenerate Codes**).

- A *required* **category names** column contains all of the names of the categories. This column is required to import using this format.
- Optional **annotations** in the cell immediately to the right of the category name. This annotation consists of text that describes your categories/subcategories.
- Optional **keywords** can be imported as descriptors for categories. In order to be recognized, these keywords must exist in the cell directly below the associated category/subcategory name and the list of keywords must be prefixed by the underscore (_) character such as `_firearms, weapons / guns`. The keyword cell can contain one or more words used to describe each category. These words will be imported as descriptors or ignored depending on what you specify in the last step of the wizard. Later, descriptors are compared to the extracted results from the text. If a match is found, then that record or document is scored into the category containing this descriptor.

Table 25. Flat list format with codes, keywords, and annotations

Column A	**Column B**	**Column C**
Category code (*optional*)	Category name	Annotation
	_Descriptor/keyword list (*optional*)	

Compact Format

The compact format is structured similarly to the flat list format except that the compact format is used with hierarchical categories. Therefore, a code level column is required to define the hierarchical level of each category and subcategory.

The following information can be contained in a file of this format:

- A *required* **code level** column contains numbers that indicate the hierarchical position for the subsequent information in that row. For example, if values 1, 2 or 3 are specified and you have both categories and subcategories, then 1 is for categories, 2 is for subcategories, and 3 is for sub-subcategories. If you have only categories and subcategories, then 1 is for categories and 2 is for subcategories. And so on, until the desired category depth.
- Optional **codes** column contains values that uniquely identify each category. If you specify that the data file does contain codes (**Contains category codes** option in the **Content Settings** step), then a column containing unique codes for each category must exist in the cell directly to the left of category name. If your data does not contain codes, but you want to create some codes later, you can always generate codes later (**Categories > Manage Categories > Autogenerate Codes**).
- A *required* **category names** column contains all of the names of the categories and subcategories. This column is required to import using this format.
- Optional **annotations** in the cell immediately to the right of the category name. This annotation consists of text that describes your categories/subcategories.
- Optional **keywords** can be imported as descriptors for categories. In order to be recognized, these keywords must exist in the cell directly below the associated category/subcategory name and the list of keywords must be prefixed by the underscore (_) character such as `_firearms, weapons / guns`. The keyword cell can contain one or more words used to describe each category. These words will be imported as descriptors or ignored depending on what you specify in the last step of the wizard. Later, descriptors are compared to the extracted results from the text. If a match is found, then that record or document is scored into the category containing this descriptor.

Table 26. Compact format example with codes

Column A	**Column B**	**Column C**
Hierarchical code level	Category code (*optional*)	Category name
Hierarchical code level	Subcategory code (*optional*)	Subcategory name

Table 27. Compact format example without codes

Column A	Column B
Hierarchical code level	Category name
Hierarchical code level	Subcategory name

Indented Format

In the Indented file format, the content is hierarchical, which means it contains categories and one or more levels of subcategories. Furthermore, its structure is indented to denote this hierarchy. Each row in the file contains either a category or subcategory, but subcategories are indented from the categories and any sub-subcategories are indented from the subcategories, and so on. You can manually create this structure in Microsoft Excel or use one that was exported from another product and saved into an Microsoft Excel format.

- **Top level category codes and category names** occupy the columns A and B, respectively. Or, if no codes are present, then the category name is in column A.
- **Subcategory codes and subcategory names** occupy the columns B and C, respectively. Or, if no codes are present, then the subcategory name is in column B. The subcategory is a member of a category. You cannot have subcategories if you do not have top level categories.

Table 28. Indented structure with codes

Column A	Column B	Column C	Column D
Category code (*optional*)	Category name		
	Subcategory code (*optional*)	Subcategory name	
		Sub-subcategory code (*optional*)	Sub-subcategory name

Table 29. Indented structure without codes

Column A	Column B	Column C
Category name		
	Subcategory name	
		Sub-subcategory name

The following information can be contained in a file of this format:

- Optional **codes** must be values that uniquely identify each category or subcategory. If you specify that the data file does contain codes (**Contains category codes** option in the **Content Settings** step), then a unique code for each category or subcategory must exist in the cell directly to the left of category/subcategory name. If your data does not contain codes, but you want to create some codes later, you can always generate codes later (**Categories > Manage Categories > Autogenerate Codes**).
- A *required* **name** for each category and subcategory. Subcategories must be indented from categories by one cell to the right in a separate row.
- Optional **annotations** in the cell immediately to the right of the category name. This annotation consists of text that describes your categories/subcategories.
- Optional **keywords** can be imported as descriptors for categories. In order to be recognized, these keywords must exist in the cell directly below the associated category/subcategory name and the list of keywords must be prefixed by the underscore (_) character such as `_firearms, weapons / guns`. The keyword cell can contain one or more words used to describe each category. These words will be imported as descriptors or ignored depending on what you specify in the last step of the wizard. Later, descriptors are compared to the extracted results from the text. If a match is found, then that record or document is scored into the category containing this descriptor.

Important! If you use a code at one level, you must include a code for each category and subcategory. Otherwise, the import process will fail.

Exporting Categories

You can also export the categories you have in an open interactive workbench session into an Microsoft Excel (*.xls, *.xlsx) file format. The data that will be exported comes largely from the current contents of the Categories pane or from the category properties. Therefore, we recommend that you score again if you plan to also export the **Docs.** score value.

Table 30. Category export options

Always gets exported...	Exported optionally...
• Category codes, if present • Category (and subcategory) names • Code levels, if present (*Flat/Compact* format) • Column headings (*Flat/Compact* format)	• **Docs.** scores • Category annotations • Descriptor names • Descriptors counts

Important! When you export descriptors, they are converted to text strings and prefixed by an underscore. If you re-import into this product, the ability to distinguish between descriptors that are patterns, those that are category rules, and those that are plain concepts is lost. If you intend to reuse these categories in this product, we highly recommend making a text analysis package (TAP) file instead since the TAP format will preserve all descriptors as they are currently defined as well as all your categories, codes, and also the linguistic resources used. TAP files can be used in both IBM SPSS Modeler Text Analytics and IBM SPSS Text Analytics for Surveys . See the topic "Using Text Analysis Packages" for more information.

To Export Predefined Categories

1. From the interactive workbench menus, choose **Categories > Manage Categories > Export Categories**. An Export Categories wizard is displayed.
2. Choose the location and enter the name of the file that will be exported.
3. Enter a name for the output file in the File Name text box.
4. To choose the format into which you will export your category data, click **Next**.
5. Choose the format from the following:
   - **Flat or Compact list format**: See the topic "Flat List Format" on page 120 for more information. Flat list contains no subcategories. See the topic "Compact Format" on page 121 for more information. Compact list format contains hierarchical categories.
   - **Indented format**: See the topic "Indented Format" on page 122 for more information.
6. To begin choosing the content to be exported and to review the proposed data, click **Next**.
7. Review the content for the exported file.
8. Select or unselect the additional content settings to be exported such as **Annotations** or **Descriptor names**.
9. To export the categories, click **Finish**.

Using Text Analysis Packages

A text analysis package, also called a TAP, serves as a template for text response categorization. Using a TAP is an easy way for you to categorize your text data with minimal intervention since it contains the prebuilt category sets and the linguistic resources that are needed to code a vast number of records quickly and automatically. Using the linguistic resources, text data is analyzed and mined in order to extract key concepts. Based on key concepts and patterns that are found in the text, the records can be categorized into the category set you selected in the TAP. You can make your own TAP or update one.

A TAP is made up of the following elements:

- **Category Set(s)**. A category set is essentially made up of predefined categories, category codes, descriptors for each category, and lastly, a name for the whole category set. Descriptors are linguistic elements (concepts, types, patterns, and rules) such as the term *cheap* or the pattern *good price*. Descriptors are used to define a category so that when the text matches any category descriptor, the document or record is put into the category.
- **Linguistic Resources**. Linguistic resources are a set of libraries and advanced resources that are tuned to extract key concepts and patterns. These extraction concepts and patterns, in turn, are used as the descriptors that enable records to be placed into a category in the category set.

You can make your own TAP, update one, or load text analysis packages.

After you select the TAP and choose a category set, SPSS Modeler Text Analytics can extract and categorize your records.

Note: TAPs can be created and used interchangeably between IBM SPSS Text Analytics for Surveys and SPSS Modeler Text Analytics . However, note that scoring on rules might be different in SPSS Modeler Text Analytics depending on whether you load a text analysis package (TAP) from SPSS Modeler Text Analytics directly, or whether you load a TAP from IBM SPSS Text Analytics for Surveys . We recommend that you use TAPs that are made within SPSS Modeler Text Analytics ; this is because TAPs that are made in IBM SPSS Text Analytics for Surveys might be created by using a different version of the linguistic resources.

Making Text Analysis Packages

Whenever you have a session with at least one category and some resources, you can make a text analysis package (TAP) from the contents of the open interactive workbench session. The set of categories and descriptors (concepts, types, rules or TLA pattern outputs) can be made into a TAP along with all of the linguistic resources open in the resource editor.

You can see the language for which the resources were created. The language is set in the Advanced Resources tab of the Template Editor or Resource Editor.

To Make a Text Analysis Package

1. From the menus, choose **File > Text Analysis Packages > Make Package**. The Make Package dialog appears.
2. Browse to the directory in which you will save the TAP. By default, TAPs are saved into the `\TAP` subdirectory of the product installation directory.
3. Enter a name for the TAP in the **File Name** field.
4. Enter a label in the **Package Label** field. When you enter a file name, this name automatically appears as the label but you can change this label.
5. To exclude a category set from the TAP, unselect the **Include** checkbox. Doing so will ensure that it is not added to your package. By default, one category set per question is included in the TAP. There must always be at least one category set in the TAP.
6. Rename any category sets. The **New Category Set** column contains generic names by default, which are generated by adding the `Cat_` prefix to the text variable name. A single click in the cell makes the name editable. Enter or a click elsewhere applies the rename. If you rename a category set, the name changes in the TAP only and does not change the variable name in the open session.
7. Reorder the category sets if desired using the arrow keys to the right of the category set table.
8. Click **Save** to make the text analysis package. The dialog box closes.

Loading Text Analysis Packages

When configuring a text mining modeling node, you must specify the resources that will be used during extraction. Instead to choosing a resource template, you can select a text analysis package (TAP) in order to copy not only its resources but also a category set into the node.

TAPs are most interesting when creating a category model interactively since you can use the category set as a starting point for categorization. When you execute the stream, the interactive workbench session is launched and this set of categories appears in the Categories pane. In this way, you score your documents and records immediately using these categories and then continue to refine, build, and extend these categories until they satisfy your needs. See the topic "Methods and Strategies for Creating Categories" on page 90 for more information.

Beginning in version 14, you can also see the language for which the resources in this TAP were defined when you click **Load** and choose the TAP.

To Load a Text Analysis Package

1. Edit the Text Mining modeling node.
2. In the Models tab, choose *Text analysis package* in the **Copy Resources From** section.
3. Click **Load**. The Load Text Analysis Package dialog opens.
4. Browse to the location of the TAP containing the resources and category set you want to copy into the node. By default, TAPs are saved into the `\TAP` subdirectory of the product installation directory.
5. Enter a name for the TAP in the **File Name** field. The label is automatically displayed.
6. Select the category set you want to use. This is the set of categories that will appear in the interactive workbench session. You can then tweak and improve these categories manually or using the Build or Extend categories options.
7. Click **Load** to copy the contents of the text analysis package into the node. The dialog box closes. When a TAP is loaded, a copy of the TAP is copied into the node; therefore, any changes you make to resources and categories will not be reflected into the TAP unless you explicitly update it and reload it.

Updating Text Analysis Packages

If you make improvements to a category set, linguistic resources, or make a whole new category set, you can update a text analysis package (TAP) to make it easier to reuse these improvements later. To do so, you must be in the open session containing the information you want to put in the TAP. When you update, you can choose to append category sets, replace resources, change the package label, or rename/reorder category sets.

To Update a Text Analysis Package

1. From the menus, choose **File > Text Analysis Packages > Update Package**. The Update Package dialog appears.
2. Browse to the directory containing the text analysis package you want to update.
3. Enter a name for the TAP in the **File Name** field.
4. To replace the linguistic resources inside the TAP with those in the current session, select the **Replace the resources in this package with those in the open session** option. It generally make sense to update the linguistic resources since they were used to extract the key concepts and patterns used to create the category definitions. Having the most recent linguistic resources ensures that you get the best results in categorizing your records. If you do not select this option, the linguistic resources that were already in the package are kept unchanged.
5. To update only the linguistic resources, make sure that you select the **Replace the resources in this package with those in the open session** option and select only the current category sets that were already in the TAP.

6. To include the new category set from the open session into the TAP, select the checkbox for each category set to be added. You can add one, multiple or none of the category sets.
7. To remove category sets from the TAP, unselect the corresponding **Include** checkbox. You might choose to remove a category set that was already in the TAP since you are adding an improved one. To do so, unselect the **Include** checkbox for the corresponding category set in the Current Category Set column. There must always be at least one category set in the TAP.
8. Rename category sets if needed. A single click in the cell makes the name editable. Enter or a click elsewhere applies the rename. If you rename a category set, the name changes in the TAP only and does not change the variable name in the open session. If two category sets have the same name, the names will appear in red until you correct the duplicate.
9. To create a new package with the session contents merged with the contents of the selected TAP, click **Save As New**. The Save As Text Analysis Package dialog appears. See following instructions.
10. Click **Update** to save the changes you made to the selected TAP.

To Save a Text Analysis Package

1. Browse to the directory in which you will save the TAP file. By default, TAP files are saved into the TAP subdirectory of the installation directory.
2. Enter a name for the TAP file in the File name field.
3. Enter a label in the Package label field. When you enter a file name, this name is automatically used as the label. However, you can rename this label. You must have a label.
4. Click **Save** to create the new package.

Editing and Refining Categories

Once you create some categories, you will invariably want to examine them and make some adjustments. In addition to refining the linguistic resources, you should review your categories by looking for ways to combine or clean up their definitions as well as checking some of the categorized documents or records. You can also review the documents or records in a category and make adjustments so that categories are defined in such a way that nuances and distinctions are captured.

You can use the built-in, automated, category-building techniques to create your categories; however, you are likely to want to perform a few tweaks to these categories. After using one or more technique, a number of new categories appear in the window. You can then review the data in a category and make adjustments until you are comfortable with your category definitions. See the topic “About Categories” on page 94 for more information.

Here are some options for refining your categories, most of which are described in the following pages:

Adding Descriptors to Categories

After using automated techniques, you will most likely still have extraction results that were not used in any of the category definitions. You should review this list in the Extraction Results pane. If you find elements that you would like to move into a category, you can add them to an existing or new category.

To Add a Concept or Type to a Category

1. From within the Extraction Results and Data panes, select the elements that you want to add to a new or existing category.
2. From the menus, choose **Categories > Add to Category**. The All Categories dialog box displays the set of categories. Select the category to which you want to add the selected elements. If you want to add the elements to a new category, select **New Category**. A new category appears in the Categories pane using the name of the first selected element.

Editing Category Descriptors

Once you have created some categories, you can open each category to see all of the descriptors that make up its definition. Inside the Category Definitions dialog box, you can make a number of edits to your category descriptors. Also, if categories are shown in the category tree, you can also work with them there.

To Edit a Category

1. Select the category you want to edit in the Categories pane.
2. From the menus, choose **View > Category Definitions**. The Category Definitions dialog box opens.
3. Select the descriptor you want to edit and click the corresponding toolbar button.

The following table describes each toolbar button that you can use to edit your category definitions.

Table 31. Toolbar buttons and descriptions.

Icons	Description
	Deletes the selected descriptors from the category.
	Moves the selected descriptors to a new or existing category.
	Moves the selected descriptors in the form of an & category rule to a category. See the topic "Using Category Rules" on page 110 for more information.
	Moves each of the selected descriptors as its own new category
 **Display**	Updates what is displayed in the Data pane and the Visualization pane according to the selected descriptors

Moving Categories

If you want to place a category into another existing category or move descriptors into another category, you can move it.

To Move a Category

1. In the Categories pane, select the categories that you would like to move into another category.
2. From the menus, choose **Categories > Move to Category**. The menu presents a set of categories with the most recently created category at the top of the list. Select the name of the category to which you want to move the selected concepts.

- If you see the name you are looking for, select it, and the selected elements are added to that category.
- If you do not see it, select **More** to display the All Categories dialog box, and select the category from the list.

Flattening Categories

When you have a hierarchical category structure with categories and subcategories, you can flatten your structure. When you flatten a category, all of the descriptors in the subcategories of that category are moved into the selected category and the now empty subcategories are deleted. In this way, all of the documents that used to match the subcategories are now categorized into the selected category.

To Flatten a Category

1. In the Categories pane, select a category (top level or subcategory) that you would like to flatten.
2. From the menus, choose **Categories > Flatten Categories**. The subcategories are removed and the descriptors are merged into the selected category.

Merging or Combining Categories

If you want to combine two or more existing categories into a new category, you can merge them. When you merge categories, a new category is created with a generic name. All of the concepts, types, and patterns used in the category descriptors are moved into this new category. You can later rename this category by editing the category properties.

To Merge a Category or Part of a Category

1. In the Categories pane, select the elements you would like to merge together.
2. From the menus, choose **Categories > Merge Categories**. The Category Properties dialog box is displayed in which you enter a name for the newly created category. The selected categories are merged into the new category as subcategories.

Deleting Categories

If you no longer want to keep a category, you can delete it.

To Delete a Category

1. In the Categories pane, select the category or categories that you would like to delete.
2. From the menus, choose **Edit > Delete**.

Chapter 10. Analyzing Clusters

You can build and explore concept clusters in the Clusters view (**View** > **Clusters**). A *cluster* is a grouping of related concepts generated by clustering algorithms based on how often these concepts occur in the document/record set and how often they appear together in the same document, also known as *cooccurrence*. Each concept in a cluster cooccurs with at least one other concept in the cluster. The goal of clusters is to group concepts that co-occur together while the goal of categories is to group documents or records based on how the text they contain matches the descriptors (concepts, rules, patterns) for each category.

A good cluster is one with concepts that are strongly linked and cooccur frequently and with few links to concepts in other clusters. When working with larger datasets, this technique may result in significantly longer processing times.

Clustering is a process that begins by analyzing a set of concepts and looking for concepts that cooccur often in documents. Two concepts that cooccur in a document are considered to be a concept pair. Next, the clustering process assesses the *similarity value* of each concept pair by comparing the number of documents in which the pair occur together to the number of documents in which each concept occurs. See the topic "Calculating Similarity Link Values" on page 131 for more information.

Lastly, the clustering process groups similar concepts into clusters by aggregation and takes into account their link values and the settings defined in the Build Clusters dialog box. By aggregation, we mean that concepts are added or smaller clusters are merged into a larger cluster until the cluster is saturated. A cluster is *saturated* when additional merging of concepts or smaller clusters would cause the cluster to exceed the settings in the Build Clusters dialog box (number of concepts, internal links, or external links). A cluster takes the name of the concept within the cluster that has the highest overall number of links to other concepts within the cluster.

In the end, not all concept pairs end up together in the same cluster since there may be a stronger link in another cluster or saturation may prevent the merging of the clusters in which they occur. For this reason, there are both internal and external links.

- *Internal links* are links between concept pairs within a cluster. Not all concepts are linked to each other in a cluster. However, each concept is linked to at least one other concept inside the cluster.
- *External links* are links between concept pairs in separate clusters (a concept within one cluster and a concept outside in another cluster).

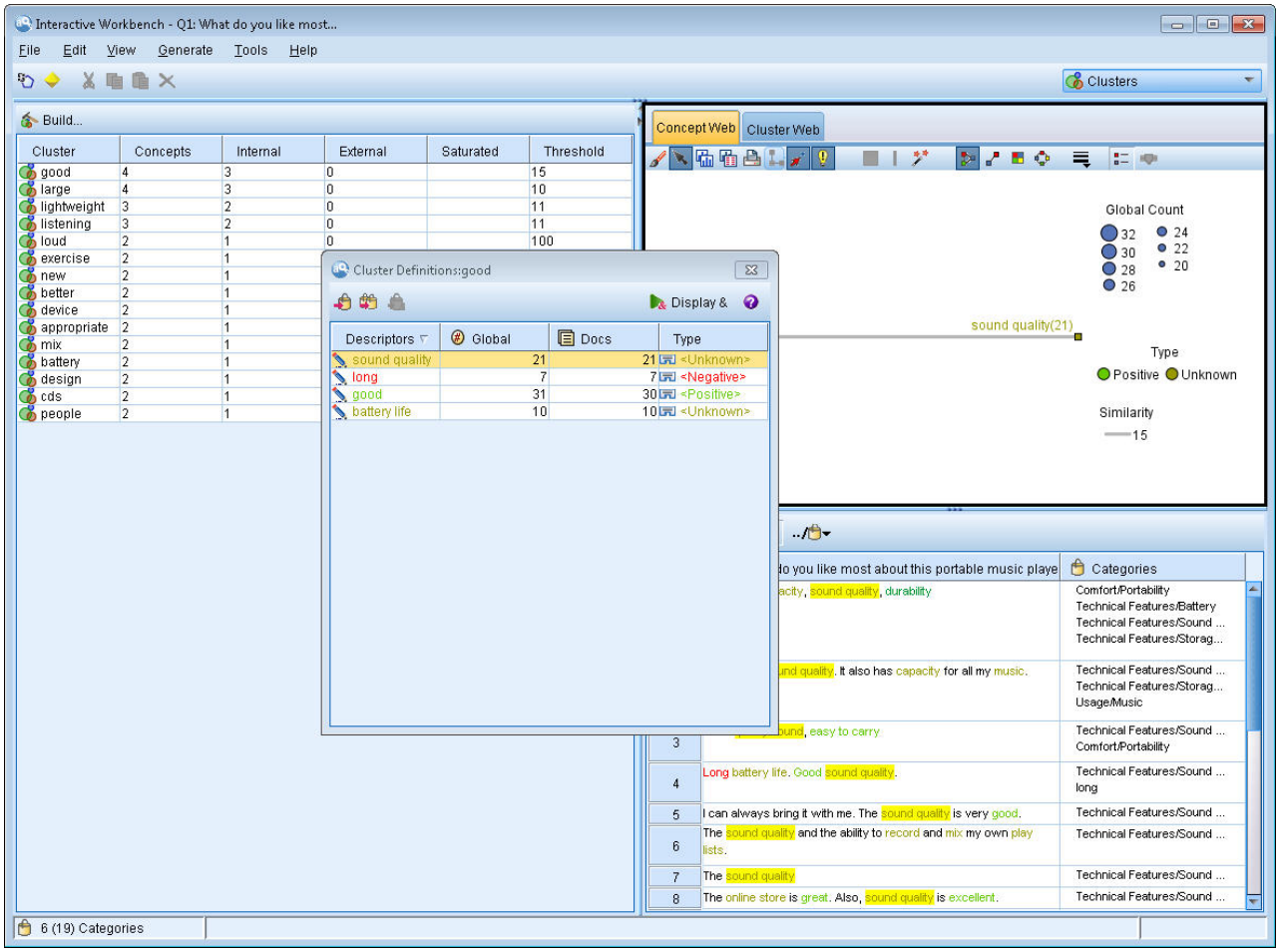


Figure 30. Clusters view

The Clusters view is organized into three panes, each of which can be hidden or shown by selecting its name from the View menu:

- **Clusters pane** You can build and manage your clusters in this pane. See the topic "Exploring Clusters" on page 132 for more information.
- **Visualization pane** You can visually explore your clusters and how they interact in this pane. See the topic "Cluster Graphs" on page 143 for more information.
- **Data pane** You can explore and review the text contained within documents and records that correspond to selections in the Cluster Definitions dialog box. See the topic "Cluster Definitions" on page 133 for more information.

Building Clusters

When you first access the Clusters view, no clusters are visible. You can build the clusters through the menus (**Tools > Build Clusters**) or by clicking the **Build...** button on the toolbar. This action opens the Build Clusters dialog box in which you can define the settings and limits for building your clusters.

Note: Whenever the extraction results no longer match the resources, this pane becomes yellow as does the Extraction Results pane. You can reextract to get the latest extraction results and the yellow coloring will disappear. However, each time an extraction is performed the Clusters pane is cleared, and you will have to rebuild your clusters. Likewise clusters are not saved from one session to another.

The following areas and fields are available within the Build Clusters dialog box:

Inputs

Inputs table Clusters are built from descriptors derived from certain types. In the table, you can select the types to include in the building process. The types that capture the most records or documents are preselected by default.

Concepts to cluster: Select the method of selecting the concepts you want to use for clustering. By reducing the number of concepts, you can speed up the clustering process. You can cluster using a number of top concepts, a percentage of top concepts, or using all the concepts:

- **Number based on doc. count** When you select **Top number of concepts**, enter the number of concepts to be considered for clustering. The concepts are chosen based on those that have the highest doc count value. Doc count is the number of documents or records in which the concept appears. The maximum value is 150,000.
- **Percentage based on doc. count** When you select **Top percentage of concepts**, enter the percentage of concepts to be considered for clustering. The concepts are chosen based on this percentage of concepts with the highest doc count value.

Output Limits

Maximum number of clusters to create This value is the maximum number of clusters to generate and display in the Clusters pane. During the clustering process, saturated clusters are presented before unsaturated ones, and therefore, many of the resulting clusters will be saturated. In order to see more unsaturated clusters, you can change this setting to a value greater than the number of saturated clusters.

Maximum concepts in a cluster This value is the maximum number of concepts a cluster can contain.

Minimum concepts in a cluster This value is the minimum number of concepts that must be linked in order to create a cluster.

Maximum number of internal links This value is the maximum number of internal links a cluster can contain. Internal links are links between concept pairs within a cluster.

Maximum number of external links This value is the maximum number of links to concepts outside of the cluster. External links are links between concept pairs in separate clusters.

Minimum link value This value is the smallest link value accepted for a concept pair to be considered for clustering. Link value is calculated using a similarity formula. See the topic “Calculating Similarity Link Values” for more information.

Prevent pairing of specific concepts. Select this checkbox to stop the process from grouping or pairing two concepts together in the output. To create or manage concept pairs, click **Manage Pairs**. See the topic “Managing Link Exception Pairs” on page 100 for more information.

Calculating Similarity Link Values

Knowing only the number of documents in which a concept pair cooccurs does not in itself tell you how similar the two concepts are. In these cases, the similarity value can be helpful. The similarity link value is measured using the cooccurrence document count compared to the individual document counts for each concept in the relationship. When calculating similarity, the unit of measurement is the number of documents (doc count) in which a concept or concept pair is found. A concept or concept pair is "found" in a document if it occurs *at least* once in the document. You can choose to have the line thickness in the Concept graph represent the similarity link value in the graphs.

The algorithm reveals those relationships that are strongest, meaning that the tendency for the concepts to appear together in the text data is much higher than their tendency to occur independently. Internally, the algorithm yields a similarity coefficient ranging from 0 to 1, where a value of 1 means that the two

concepts always appear together and never separately. The similarity coefficient result is then multiplied by 100 and rounded to the nearest whole number. The similarity coefficient is calculated using the formula shown in the following figure.

$$\text{similarity coefficient} = \frac{(C_{IJ})^2}{(C_I \times C_J)}$$

Figure 31. Similarity coefficient formula

Where:

- C_I is the number of documents or records in which the concept I occurs.
- C_J is the number of documents or records in which the concept J occurs.
- C_{IJ} is the number of documents or records in which concept pair I and J cooccurs in the set of documents.

For example, suppose that you have 5,000 documents. Let I and J be extracted concepts and let IJ be a concept pair cooccurrence of I and J. The following table proposes two scenarios to demonstrate how the coefficient and link value are calculated.

Table 32. Concept frequencies example

Concept/Pair	Scenario A	Scenario B
Concept: I	Occurs in 20 docs	Occurs in 30 docs
Concept: J	Occurs in 20 docs	Occurs in 60 docs
Concept Pair: IJ	Cooccurs in 20 docs	Cooccurs in 20 docs
Similarity coefficient	1	0.22222
Similarity link value	100	22

In scenario A, the concepts I and J as well as the pair IJ occur in 20 documents, yielding a similarity coefficient of 1, meaning that the concepts always occur together. The similarity link value for this pair would be 100.

In scenario B, concept I occurs in 30 documents and concept J occurs in 60 documents, but the pair IJ occurs in only 20 documents. As a result, the similarity coefficient is 0.22222. The similarity link value for this pair would be rounded down to 22.

Exploring Clusters

After you build clusters, you can see a set of results in the Clusters pane. For each cluster, the following information is available in the table:

- **Cluster.** This is the name of the cluster. Clusters are named after the concept with the highest number of internal links.
- **Concepts.** This is the number of concepts in the cluster. See the topic "Cluster Definitions" on page 133 for more information.
- **Internal.** This is the number of internal links in the cluster. Internal links are links between concept pairs within a cluster.
- **External.** This is the number of external links in the cluster. External links are links between concept pairs when one concept is in one cluster and the other concept is in another cluster.
- **Sat.** If a symbol is present, this indicates that this cluster could have been larger but one or more limits would have been exceeded, and therefore, the clustering process ended for that cluster and is considered to be *saturated*. At the end of the clustering process, saturated clusters are presented before

unsaturated ones and therefore, many of the resulting clusters will be saturated. In order to see more unsaturated clusters, you can change the **Maximum number of clusters to create** setting to a value greater than the number of saturated clusters or decrease the **Minimum link value**. See the topic "Building Clusters" on page 130 for more information.

- **Threshold.** For all of the cooccurring concept pairs in the cluster, this is the lowest similarity link value of all in the cluster. See the topic "Calculating Similarity Link Values" on page 131 for more information. A cluster with a high threshold value signifies that the concepts in that cluster have a higher overall similarity and are more closely related than those in a cluster whose threshold value is lower.

To learn more about a given cluster, you can select it and the visualization pane on the right will show two graphs to help you explore the cluster(s). See the topic "Cluster Graphs" on page 143 for more information. You can also cut and paste the contents of the table into another application.

Whenever the extraction results no longer match the resources, this pane becomes yellow as does the Extraction Results pane. You can reextract to get the latest extraction results and the yellow coloring will disappear. However, each time an extraction is performed, the Clusters pane is cleared and you will have to rebuild your clusters. Likewise clusters are not saved from one session to another.

Cluster Definitions

You can see all of the concepts inside a cluster by selecting it in the Clusters pane and opening the Cluster Definitions dialog box (**View > Cluster Definitions**).

All of the concepts in the selected cluster appear in the Cluster Definitions dialog box. If you select one or more concepts in the Cluster Definitions dialog box and click **Display &**, the Data pane will display all of the records or documents in which *all of the selected concepts appear together*. However, the Data pane does not display any text records or documents when you select a cluster in the Clusters pane. For general information on the Data pane, see in.

Selecting concepts in this dialog box also changes the concept web graph. See the topic "Cluster Graphs" on page 143 for more information. Similarly, when you select one or more concepts in the Cluster Definitions dialog box, the Visualization pane will show all of the external and internal links from those concepts.

Column Descriptions

Icons are shown so that you can easily identify each descriptor.

Table 33. Columns and Descriptor Icons

Columns	Description
Descriptors	The name of the concept.
 **Global**	Shows the number of times this descriptor appears in the entire dataset, also known as the global frequency.
 **Docs**	Shows the number of documents or records in which this descriptor appears, also known as the document frequency.
Type	Shows the type or types to which the descriptor belongs. If the descriptor is a category rule, no type name is shown in this column.

Toolbar Actions

From this dialog box, you can also select one or more concepts to use in a category. There are several ways to do this but it is most interesting to select concepts that cooccur in a cluster and add them as a category rule. See the topic "Co-occurrence Rules" on page 104 for more information. You can use the toolbar buttons to add the concepts to categories.

Table 34. Toolbar buttons to add concepts to categories

Icons	Description
	Add the selected concepts to a new or existing category
	Add the selected concepts in the form of an & category rule to a new or existing category. See the topic "Using Category Rules" on page 110 for more information.
	Add each of the selected concepts as its own new category
	Updates what is displayed in the Data pane and the Visualization pane according to the selected descriptors

Note: You can also add concepts to a type, as synonyms, or as exclude items using the context menus.

Chapter 11. Exploring Text Link Analysis

In the Text Link Analysis (TLA) view, you can explore text link analysis pattern results. Text link analysis is a pattern-matching technology that enables you to define pattern rules and compare these to actual extracted concepts and relationships found in your text.

For example, extracting ideas about an organization may not be interesting enough to you. Using TLA, you could also learn about the links between this organization and other organizations or the people within an organization. You can also use TLA to extract opinions on products or, for some languages, the relationships between genes.

Once you've extracted some TLA pattern results, you can review them in the Type and Concept Patterns panes of the Text Link Analysis view. See the topic "Type and Concept Patterns" on page 137 for more information. You can further explore them in the Data or Visualization panes in this view. Possibly most importantly, you can add them to categories.

If you have not already chosen to do so, you can click **Extract** and choose **Enable Text Link Analysis pattern extraction** in the Extract Settings dialog box. See the topic "Extracting TLA Pattern Results" on page 136 for more information.

There must be some TLA pattern rules defined in the resource template or libraries you are using in order to extract TLA pattern results. You can use the TLA patterns in certain resource templates shipped with IBM SPSS Modeler Text Analytics. The kind of relationships and patterns you can extract depend entirely on the TLA rules defined in your resources. You can define your own TLA rules. Patterns are made up of macros, word lists, and word gaps to form a Boolean query, or rule, that is compared to your input text. See the topic Chapter 18, "About Text Link Rules," on page 193 for more information.

Whenever a TLA pattern rule matches text, this text can be extracted as a pattern and restructured as output data. The results are then visible in the Text Link Analysis view panes. Each pane can be hidden or shown by selecting its name from the View menu:

- **Type and Concept Patterns Panes.** You can build and explore your patterns in these two panes. See the topic "Type and Concept Patterns" on page 137 for more information.
- **Visualization pane.** You can visually explore how the concepts and types in your patterns interact in this pane. See the topic "Text Link Analysis Graphs" on page 144 for more information.
- **Data pane.** You can explore and review text contained within documents and records that correspond to selections in another pane. See the topic "Data Pane" on page 139 for more information.

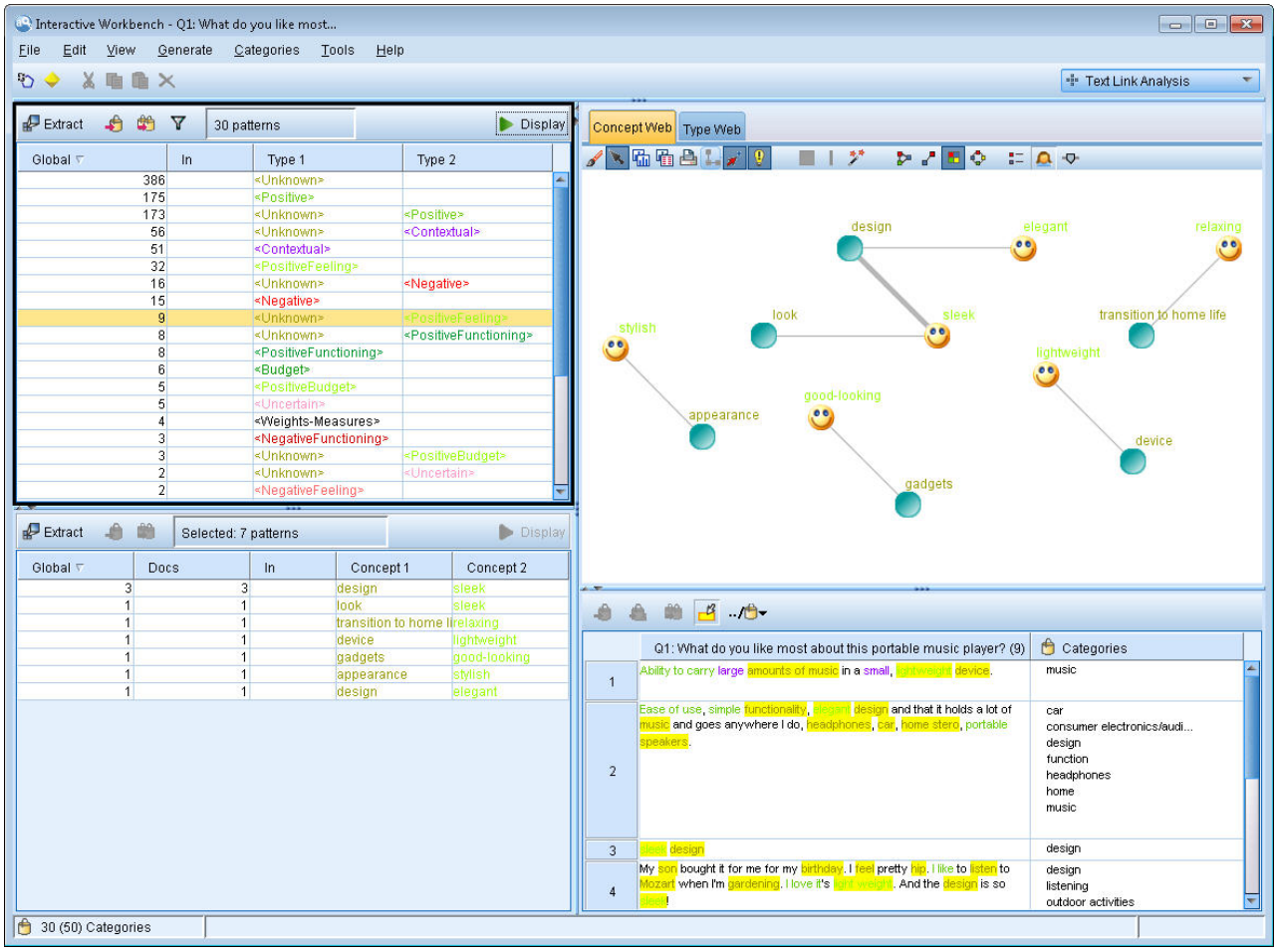


Figure 32. Text Link Analysis view

Extracting TLA Pattern Results

The extraction process results in a set of concepts and types, as well as Text Link Analysis (TLA) patterns, if enabled. If you extracted TLA patterns you can see those in the Text Link Analysis view. Whenever the extraction results are not in sync with the resources, the Patterns panes become yellow in color indicating that a reextraction would produce different results.

You have to choose to extract these patterns in the node setting or in the Extract dialog box using the option **Enable Text Link Analysis pattern extraction**. See the topic "Extracting data" on page 76 for more information.

Note: There is a relationship between the size of your dataset and the time it takes to complete the extraction process. See the installation instructions for performance statistics and recommendations. You can always consider inserting a Sample node upstream or optimizing your machine's configuration.

To Extract Data

1. From the menus, choose **Tools > Extract**. Alternatively, click the **Extract** toolbar button.
2. Change any of the options you want to use. Keep in mind that the option **Enable Text Link Analysis pattern extraction** must be selected on this tab as well as having TLA rules in your template in order to extract TLA pattern results. See the topic "Extracting data" on page 76 for more information.

3. Click **Extract** to begin the extraction process.

Once the extraction begins, the progress dialog box opens. If you want to abort the extraction, click **Cancel**. When the extraction is complete, the dialog box closes and the results appear in the pane. See the topic "Type and Concept Patterns" for more information.

Type and Concept Patterns

Patterns are made up of two parts, a combination of concepts and types. Patterns are most useful when you are attempting to discover opinions about a particular subject or relationships between concepts. For example, extracting your competitor's product name may not be interesting enough to you. In this case, you can look at the extracted patterns to see if you can find examples where a document or record contains text expressing that the product is good, bad, or expensive.

Patterns can consist of up to six types or six concepts. For this reason, the rows in both patterns panes contain up to six slots, or positions. Each slot corresponds to an element's specific position in the TLA pattern rule as it is defined in the linguistic resources. In the interactive workbench, if a slot contains no values, it is not shown in the table. For example, if the longest pattern results contain no more than four slots, the last two are not shown. See the topic Chapter 18, "About Text Link Rules," on page 193 for more information.

When you extract pattern results, they are first grouped at the type level and then divided into concept patterns. For this reason, there are two different result panes: **Type Patterns** (upper left) and **Concept Patterns** (lower left). To see all concept patterns returned, select all of the type patterns. The bottom concept patterns pane will then display all concept patterns up to the maximum rank value (as defined in the Filter dialog box).

Type Patterns This pane presents pattern results consisting of one or more related types matching a TLA pattern rule. Type patterns are shown as `<Organization>` + `<Location>` + `<Positive>`, which might provide positive feedback about an organization in a specific location. The syntax is as follows:

```
<Type1> + <Type2> + <Type3> + <Type4> + <Type5> + <Type6>
```

Concept Patterns This pane presents the pattern results at the concept level for all of the type pattern(s) currently selected in the Type Patterns pane above it. Concept patterns follow a structure such as `hotel + paris + wonderful`. The syntax is as follows:

```
concept1 + concept2 + concept3 + concept4 + concept5 + concept6
```

When pattern results use less than the six maximum slots, only the necessary number of slots (or columns) are displayed. Any empty slots found between two filled slots are discarded such that the pattern `<Type1>+<>+<Type2>+<>+<>+<>` can be represented by `<Type1>+<Type3>`. For a concept pattern, this would be `concept1+.+concept2` (where `.` represents a null value).

Just as with the extraction results in the Categories and Concepts view, you can review the results here. If you see any refinements you would like to make to the types and concepts that make up these patterns, you make those in the Extraction Results pane in the Categories and Concepts view or directly in the Resource Editor and reextract your patterns. Whenever a concept, type, or pattern is used in a category definition as is or as part of a rule, a category or rule icon appears in the **In** column in the Pattern or Extraction Results table.

Note: If there are more results that can fit in the visible pane, you can use the controls at the bottom of the pane to move forwards and backwards through the results, or enter a page number to go to.

Filtering TLA Results

When you are working with very large datasets, the extraction process could produce millions of results. For many users, this amount can make it more difficult to review the results effectively. You can, however, filter these results in order to zoom in on those that are most interesting. You can change the settings in the Filter dialog box to limit what patterns are shown. All of these settings are used together.

In the TLA view, the Filter dialog box contains the following areas and fields.

Filter by Frequency You can filter to display only those results with a certain global or document frequency value.

- **Global frequency** is the total number of times a pattern appears in the entire set of documents or records and is shown in the **Global** column.
- **Document frequency** is the total number of documents or records in which a pattern appears and is shown in the **Docs** column.

For example, if a pattern appeared 300 times in 500 records, we would say that this pattern has a global frequency of 300 and a document frequency of 500.

And by Match Text You can also filter to display only those results that match the rule you define here. Enter the set of characters to be matched in the **Match text** field, and select whether to look for this text within concept or type names by identifying the slot number or all of them. Then select the condition in which to apply the match (you do not need to use angled brackets to denote the beginning or end of a type name). Select either **And** or **Or** from the drop-down list so that the rule matches both statements or just one of them, and define the second text matching statement in the same manner as the first.

Table 35. Match text conditions

Condition	Description
Contains	Text is matched if the string occurs anywhere. (Default choice)
Starts with	Text is matched only if the concept or type starts with the specified text.
Ends with	Text is matched only if the concept or type ends with the specified text.
Exact Match	The entire string must match the concept or type name.

Results Displayed in Patterns Pane

Suppose you are using an English version of the software; here are some examples of how the results might be displayed on the Patterns pane toolbar based on the filters.

Figure 33. Filter results example 1

In this example, the toolbar shows that the number of patterns returned was limited because of the rank maximum specified in the filter. If a purple icon is present, this means that the maximum number of patterns was met. Hover over the icon for more information. See the preceding explanation of the **And by Rank** filter.

Figure 34. Filter results example 2

In this example, the toolbar shows results were limited using a match text filter (see magnifying glass icon). You can hover over the icon to see what the match text is.

To Filter the Results

1. From the menus, choose **Tools** > **Filter**. The Filter dialog box opens.
2. Select and refine the filters you want to use.
3. Click **OK** to apply the filters and see the new results.

Data Pane

As you extract and explore text link analysis patterns, you may want to review some of the data you are working with. For example, you may want to see the actual records in which a group of patterns were discovered. You can review records or documents in the Data pane, which is located in the lower right. If not visible by default, choose **View** > **Panes** > **Data** from the menus.

The Data pane presents one row per document or record corresponding to a selection in the view, up to a certain display limit. By default, the number of documents or records shown in the Data pane is limited in order to make it faster for you to see your data. However, you can adjust this in the Options dialog box. See the topic “Options: Session Tab” on page 70 for more information.

Note: If there are more results that can fit in the visible pane, you can use the controls at the bottom of the pane to move forwards and backwards through the results, or enter a page number to go to.

Displaying and Refreshing the Data Pane

The Data pane does not refresh its display automatically, because with larger datasets automatic data refreshing could take some time to complete. Therefore, whenever you select type or concept patterns in this view, you can click **Display** to refresh the contents of the Data pane.

Text Documents or Records

If your text data is in the form of records and the text is relatively short in length, the text field in the Data pane displays the text data in its entirety. However, when working with records and larger datasets, the text field column shows a short piece of the text and opens a Text Preview pane to the right to display more or all of the text of the record you have selected in the table. If your text data is in the form of individual documents, the Data pane shows the document's filename. When you select a document, the Text Preview pane opens with the selected document's text.

Colors and Highlighting

Whenever you display the data, concepts and descriptors found in those documents or records are highlighted in color to help you easily identify them in the text. The color coding corresponds to the types to which the concepts belong. You can also hover your mouse over color-coded items to display the concept under which it was extracted and the type to which it was assigned. Any text that was not extracted appears in black. Typically, these unextracted words are often connectors (*and* or *with*), pronouns (*me* or *they*), and verbs (*is*, *have*, or *take*).

Data Pane Columns

While the text field column is always visible, you can also display other columns. To display other columns, choose **View** > **Data Pane** from the menus, and then select the column that you want to display in the Data pane. The following columns may be available for display:

- **"Text field name" (#)/Documents** Adds a column for the text data from which concepts and type were extracted. If your data is in documents, the column is called Documents and only the document filename or full path is visible. To see the text for those documents you must look in the Text Preview

pane. The number of rows in the Data pane is shown in parentheses after this column name. There may be times when not all documents or records are shown due to a limit in the Options dialog used to increase the speed of loading. If the maximum is reached, the number will be followed by **- Max**. See the topic "Options: Session Tab" on page 70 for more information.

- **Categories** Lists each of the categories to which a record belongs. Whenever this column is shown, refreshing the Data pane may take a bit longer so as to show the most up-to-date information.
- **Relevance Rank** Provides a rank for each record in a single category. This rank shows how well the record fits into the category compared to the other records in that category. Select a category in the Categories pane (upper left pane) to see the rank. See the topic "Category Relevance" on page 96 for more information.
- **Category Count** Lists the number of the categories to which a record belongs.

Chapter 12. Visualizing Graphs

The Categories and Concepts view, Clusters view, and Text Link Analysis view all have a visualization pane in the upper right corner of the window. You can use this pane to visually explore your data. The following graphs and charts are available.

- **Categories and Concepts view.** This view has three graphs and charts: *Category Bar*, *Category Web*, and *Category Web Table*. In this view, the graphs are only updated when you click **Display**. See the topic "Category Graphs and Charts" for more information.
- **Clusters view.** This view has two web graphs: *Concept Web Graph* and *Cluster Web Graph*. See the topic "Cluster Graphs" on page 143 for more information.
- **Text Link Analysis view.** This view has two web graphs: *Concept Web Graph* and *Type Web Graph*. See the topic "Text Link Analysis Graphs" on page 144 for more information.

For more information on all of the general toolbars and palettes used for editing graphs, see the section on Editing Graphs in the online help or in the file *ModelerSPOnodes.pdf*, which is available as a part of your product download..

Category Graphs and Charts

When building your categories, it is important to take the time to review the category definitions, the documents or records they contain, and how the categories overlap. The visualization pane offers several perspectives on your categories. The Visualization pane is located in the upper right corner of the Categories and Concepts view . If it is not already visible, you can access this pane from the View menu (**View > Panes > Visualization**).

In this view, the visualization pane offers three perspectives on the commonalities in document or record categorization. The charts and graphs in this pane can be used to analyze your categorization results and aid in fine-tuning categories or reporting. When refining categories, you can use this pane to review your category definitions to uncover categories that are too similar (for example, they share more than 75% of their documents or records) or too distinct. If two categories are too similar, it might help you decide to combine the two categories. Alternatively, you might decide to refine the category definitions by removing certain descriptors from one category or the other.

Depending on what is selected in the Extraction Results pane, Categories pane, or in the Category Definitions dialog box, you can view the corresponding interactions between documents/records and categories on each of the tabs in this pane. Each presents similar information but in a different manner or with a different level of detail. However, in order to refresh a graph for the current selection, click **Display** on the toolbar of the pane or dialog box in which you have made your selection.

The Visualization pane in the Categories and Concepts view offers the following graphs and charts:

- **Category Bar Chart.** A table and bar chart present the overlap between the documents/records corresponding to your selection and the associated categories. The bar chart also presents ratios of the documents/records in categories to the total number of documents/records. See the topic "Category Bar Chart" on page 142 for more information.
- **Category Web Graph.** This graph presents the document/record overlap for the categories to which the documents/records belong according to the selection in the other panes. See the topic "Category Web Graph" on page 142 for more information.
- **Category Web Table.** This table presents the same information as the Category Web tab but in a table format. The table contains three columns that can be sorted by clicking the column headers. See the topic "Category Web Table" on page 142 for more information.

See the topic Chapter 9, “Categorizing Text Data,” on page 87 for more information.

Category Bar Chart

This tab displays a table and bar chart showing the overlap between the documents/records corresponding to your selection and the associated categories. The bar chart also presents ratios of the documents/records in categories to the total number of documents or records . You cannot edit the layout of this chart. You can, however, sort the columns by clicking the column headers.

The chart contains the following columns:

- **Category.** This column presents the name of the categories in your selection. By default, the most common category in your selection is listed first.
- **Bar.** This column presents, in a visual manner, the ratio of the documents or records in a given category to the total number of documents or records.
- **Selection %.** This column presents a percentage based on the ratio of the total number of documents or records for a category to the total number of documents or records represented in the selection.
- **Docs.** This column presents the number of documents or records in a selection for the given category.

Category Web Graph

This tab displays a category web graph. The web presents the documents or records overlap for the categories to which the documents or records belong according to the selection in the other panes. If category labels exist, these labels appear in the graph. You can choose a graph layout (network, circle, directed, or grid) using the toolbar buttons in this pane.

In the web, each node represents a category. Using your mouse, you can select and move the nodes within the pane. The size of the node represents the relative size based on the number of documents or records for that category in your selection. The thickness and color of the line between two categories denotes the number of common documents or records they have. If you hover your mouse over a node in Explore mode, a ToolTip displays the name (or label) of the category and the overall number of documents or records in the category.

Note: By default, the Explore mode in enabled for the graphs on which you can move nodes. However, you can switch to Edit mode to edit your graph layouts including colors, fonts, legends, and more. For more information, see “Using Graph Toolbars and Palettes” on page 145.

If you copy the graph data, using the **Copy Visualization Data** button, and paste it into a spreadsheet or text editor, you will see that the data is given column headers such as V1, V2, through to V7. These columns contain the following information:

- **V1, V2** These values correspond to the screen coordinates (X and Y, respectively).
- **V3, V5** List the category concept.
- **Size, V6** Shows the number of documents the concepts were found in.
- **V7** Currently unused.

Category Web Table

This tab displays the same information as the Category Web tab but in a table format. The table contains three columns that can be sorted by clicking the column headers:

- **Count.** This column presents the number of shared, or common, documents or records between the two categories.
- **Category 1.** This column presents the name of the first category followed by the total number of documents or records it contains, shown in parentheses.
- **Category 2.** This column presents the name of the second category followed by the total number of documents or records it contains, shown in parentheses.

Cluster Graphs

After building your clusters, you can explore them visually in the web graphs in the Visualization pane. The visualization pane offers two perspectives on clustering: a Concept Web graph and a Cluster Web graph. The web graphs in this pane can be used to analyze your clustering results and aid in uncovering some concepts and rules you may want to add to your categories. The Visualization pane is located in the upper right corner of the Clusters view. If it isn't already visible, you can access this pane from the View menu (**View > Panes > Visualization**). By selecting a cluster in the Clusters pane, you can automatically display the corresponding graphs in the Visualization pane.

Note: By default, the graphs are in the interactive/selection mode in which you can move nodes. However, you can edit your graph layouts in Edit mode, including colors and fonts, legends, and more. See the topic "Using Graph Toolbars and Palettes" on page 145 for more information.

The Clusters view has two web graphs.

- **Concept Web Graph**. This graph presents all of the concepts within the selected cluster(s) as well as linked concepts outside the cluster. This graph can help you see how the concepts within a cluster are linked and any external links. See the topic "Concept Web Graph" for more information.
- **Cluster Web Graph**. This graph presents the selected cluster(s) with all of the external links between the selected clusters shown as dotted lines. See the topic "Cluster Web Graph" on page 144 for more information.

See the topic Chapter 10, "Analyzing Clusters," on page 129 for more information.

Concept Web Graph

This tab displays a web graph showing all of the concepts within the selected cluster(s) as well as linked concepts outside the cluster. This graph can help you see how the concepts within a cluster are linked and any external links. Each concept in a cluster is represented as a node, which is color coded according to the type color. See the topic "Creating types" on page 171 for more information.

The internal links between the concepts within a cluster are drawn and the line thickness of each link is directly related to either the doc count for each concept pair's co-occurrence or the similarity link value, depending on your choice on the graph toolbar. The external links between a cluster's concepts and those concepts outside the cluster are also shown.

If concepts are selected in the Cluster Definitions dialog box, the Concept Web graph will display those concepts and any associated internal and external links to those concepts. Any links between other concepts that do not include one of the selected concepts do not appear on the graph.

Note: By default, the graphs are in the interactive/selection mode in which you can move nodes. However, you can edit your graph layouts in Edit mode including colors and fonts, legends, and more. For more information, see "Using Graph Toolbars and Palettes" on page 145.

If you copy the graph data, using the **Copy Visualization Data** button, and paste it into a spreadsheet or text editor, you will see that the data is given column headers such as V1, V2, through to V7. These columns contain the following information:

- **V1, V2** These values correspond to the screen coordinates (X and Y, respectively).
- **V3, V6** List the concept type.
- **V4, V5** Shows the concept label.
- **V7** Currently unused.

Cluster Web Graph

This tab displays a web graph showing the selected cluster(s). The external links between the selected clusters as well as any links between other clusters are all shown as dotted lines. In a Cluster Web graph, each node represents an entire cluster and the thickness of lines drawn between them represents the number of external links between two clusters.

Important! In order to display a Cluster Web graph, you must have already built clusters with external links. External links are links between concept pairs in separate clusters (a concept within one cluster and a concept outside in another cluster).

For example, let's say we have two clusters. `Cluster A` has three concepts: `A1`, `A2`, and `A3`. `Cluster B` has two concepts: `B1` and `B2`. The following concepts are linked: `A1-A2`, `A1-A3`, `A2-B1` (External), `A2-B2` (External), `A1-B2` (External), and `B1-B2`. This means that in the Cluster Web graph, the line thickness would represent the three external links.

Note: By default, the graphs are in the interactive/selection mode in which you can move nodes. However, you can edit your graph layouts in Edit mode including colors and fonts, legends, and more. See the topic "Using Graph Toolbars and Palettes" on page 145 for more information.

Text Link Analysis Graphs

After extracting your Text Link Analysis (TLA) patterns, you can explore them visually in the web graphs in the Visualization pane. The visualization pane offers two perspectives on TLA patterns: a concept (pattern) web graph and a type (pattern) web graph. The web graphs in this pane can be used to visually represent patterns. The Visualization pane is located in the upper right corner of the Text Link Analysis. If it isn't already visible, you can access this pane from the View menu (**View > Panes > Visualization**). If there is no selection, then the graph area is empty.

Note: By default, the graphs are in the interactive/selection mode in which you can move nodes. However, you can edit your graph layouts in Edit mode including colors and fonts, legends, and more. See the topic "Using Graph Toolbars and Palettes" on page 145 for more information.

The Text Link Analysis view has two web graphs.

- **Concept Web Graph**. This graph presents all the concepts in the selected pattern(s). The line width and node sizes (if type icons are not shown) in a concept graph show the number of global occurrences in the selected table. See the topic "Concept Web Graph" for more information.
- **Type Web Graph**. This graph presents all the types in the selected pattern(s). The line width and node sizes (if type icons are not shown) in the graph show the number of global occurrences in the selected table. Nodes are represented by either a type color or by an icon. See the topic "Type Web Graph" for more information.

See the topic Chapter 11, "Exploring Text Link Analysis," on page 135 for more information.

Concept Web Graph

This web graph presents all of the concepts represented in the current selection. For example, if you selected a type pattern that had three matching concept patterns, this graph would show three sets of linked concepts. The line width and node sizes in a concept graph represent the global frequency counts. The graph visually represents the same information as what is selected in the patterns panes. The types of each concept are presented either by a color or by an icon depending on what you select on the graph toolbar. See the topic "Using Graph Toolbars and Palettes" on page 145 for more information.

Type Web Graph

This web graph presents each type pattern for the current selection. For example, if you selected two concept patterns, this graph would show one node per type in the selected patterns and the links

between those it found in the same pattern. The line width and node sizes represent the global frequency counts for the set. The graph visually represents the same information as what is selected in the patterns panes. In addition to the type names appearing in the graph, the types are also identified either by their color or by a type icon, depending on what you select on the graph toolbar. See the topic "Using Graph Toolbars and Palettes" for more information.

Using Graph Toolbars and Palettes

For each graph, there is a toolbar that provides you with quick access to some common palettes from which you can perform a number of actions with your graphs. Each view (Categories and Concepts, Clusters, and Text Link Analysis) has a slightly different toolbar. You can choose between the *Explore* view mode or the *Edit* view mode.

While Explore mode allows you to analytically explore the data and values represented by the visualization, Edit mode allows you to change the visualization's layout and look. For example, you can change the fonts and colors to match your organization's style guide. To select this mode, choose **View** > **Visualization Pane** > **Edit Mode** from the menus (or click the toolbar icon).

In Edit mode, there are several toolbars that affect different aspects of the visualization's layout. If you find that there are any you don't use, you can hide them to increase the amount of space in the dialog box in which the graph is displayed. To select or deselect toolbars, click on the relevant toolbar or palette name on the View menu.

For more information on all of the general toolbars and palettes used for editing graphs, see the section on Editing Visualizations in the online help or in the file *ModelerSPOnodes.pdf* , which is available as a part of your product download.

Table 36. Text Analytics Toolbar buttons.

Button/List	Description
	Enables Edit mode. Switch to the Edit mode to change the look of the graph, such as enlarging the font, changing the colors to match your corporate style guide, or removing labels and legends.
	Enables Explore mode. By default, the Explore mode is turned on, which means that you can move and drag nodes around the graph as well as hover over graph objects to reveal additional ToolTip information.
	Select a type of web display for the graphsin the Categories and Concepts view as well as the Text Link Analysis view. • **Circle Layout** A general layout that can be applied to any graph. It lays out a graph assuming that links are undirected and treats all nodes the same. Nodes are only placed around the perimeter of a circle. • **Network Layout** A general layout that can be applied to any graph. It lays out a graph assuming that links are undirected and treats all nodes the same. Nodes are placed freely within the layout. • **Directed Layout** A layout that should only be used for directed graphs. This layout produces treelike structures from root nodes down to leaf nodes and organizes by colors. Hierarchical data tends to display nicely with this layout. • **Grid Layout** A general layout that can be applied to any graph. It lays out a graph assuming that links are undirected and treats all nodes the same. Nodes are only placed at grid points within the space.
	Link size representation. Choose what the thickness of the line represents in the graph. This only applies to the Clusters view. The Clusters web graph only shows the number of external links between clusters. You can choose between: • **Similarity** Thickness indicates the number of external links between two clusters • **Co-occurrence** Thickness indicates the number of documents in which a co-occurrence of descriptors takes place.

Table 36. Text Analytics Toolbar buttons (continued).

Button/List	Description
	A toggle button that, when pressed, displays the legend. When the button is not pushed, the legend is not shown.
	A toggle button that, when pressed, displays the type icons in the graph rather than type colors. This only applies to Text Link Analysis view.
	A toggle button that, when pressed, displays the Links Slider beneath the graph. You can filter the results by sliding the arrow.
	Will display the graph for highest level of categories selected rather than for their subcategories.
	Will display the graph for lowest level of categories selected.
	This option controls how the names of subcategories are displayed in the output. • **Full category path** This option will output the name of the category and the full path of parent categories if applicable using slashes to separate category names from subcategory names. • **Short category path** This option will output only the name of the category but use ellipses to show the number of parent categories for the category in question. • **Bottom level category** This option will output only the name of the category without the full path or parent categories shown.

Chapter 13. Session Resource Editor

IBM SPSS Modeler Text Analytics rapidly and accurately captures and extracts key concepts from text data. This extraction process relies heavily on linguistic resources to dictate how to extract information from text data. By default, these resources come from resource templates.

IBM SPSS Modeler Text Analytics is shipped with a set of specialized **resource templates** that contain a set of linguistic and nonlinguistic resources, in the form of libraries and advanced resources, to help define how your data will be handled and extracted. See the topic Chapter 14, "Templates and Resources," on page 151 for more information.

In the node dialog box, you can load a copy of the template's resources into the node. Once inside an interactive workbench session, you can customize these resources specifically for this node's data, if you wish. During an interactive workbench session, you can work with your resources in the Resource Editor view. Whenever an interactive session is launched, an extraction is performed using the resources loaded in the node dialog box, unless you have cached your data and extraction results in your node.

Editing Resources in the Resource Editor

The Resource Editor offers access to the set of resources used to produce the extraction results (concepts, types, and patterns) for an interactive workbench session. This editor is very similar to the Template Editor except that in the Resource Editor you are editing the resources for this session. When you are finished working on your resources and any other work you've done, you can update the modeling node to save this work so that it can be restored in a subsequent interactive workbench session. See the topic "Updating Modeling Nodes and Saving" on page 72 for more information.

If you want to work directly on the templates used to load resources into nodes, we recommend you use the Template Editor. Many of the tasks you can perform inside the Resource Editor are performed just like they are in the Template Editor, such as:

- **Working with libraries**. See the topic Chapter 15, "Working with Libraries," on page 161 for more information.
- **Creating type dictionaries**. See the topic "Creating types" on page 171 for more information.
- **Adding terms to dictionaries**. See the topic "Adding terms" on page 172 for more information.
- **Creating synonyms**. See the topic "Defining synonyms" on page 176 for more information.
- **Importing and exporting templates**. See the topic "Importing and Exporting Templates" on page 157 for more information.
- **Publishing libraries**. See the topic "Publishing Libraries" on page 167 for more information.

For Dutch, English, French, German, Italian, Portuguese, and Spanish Text

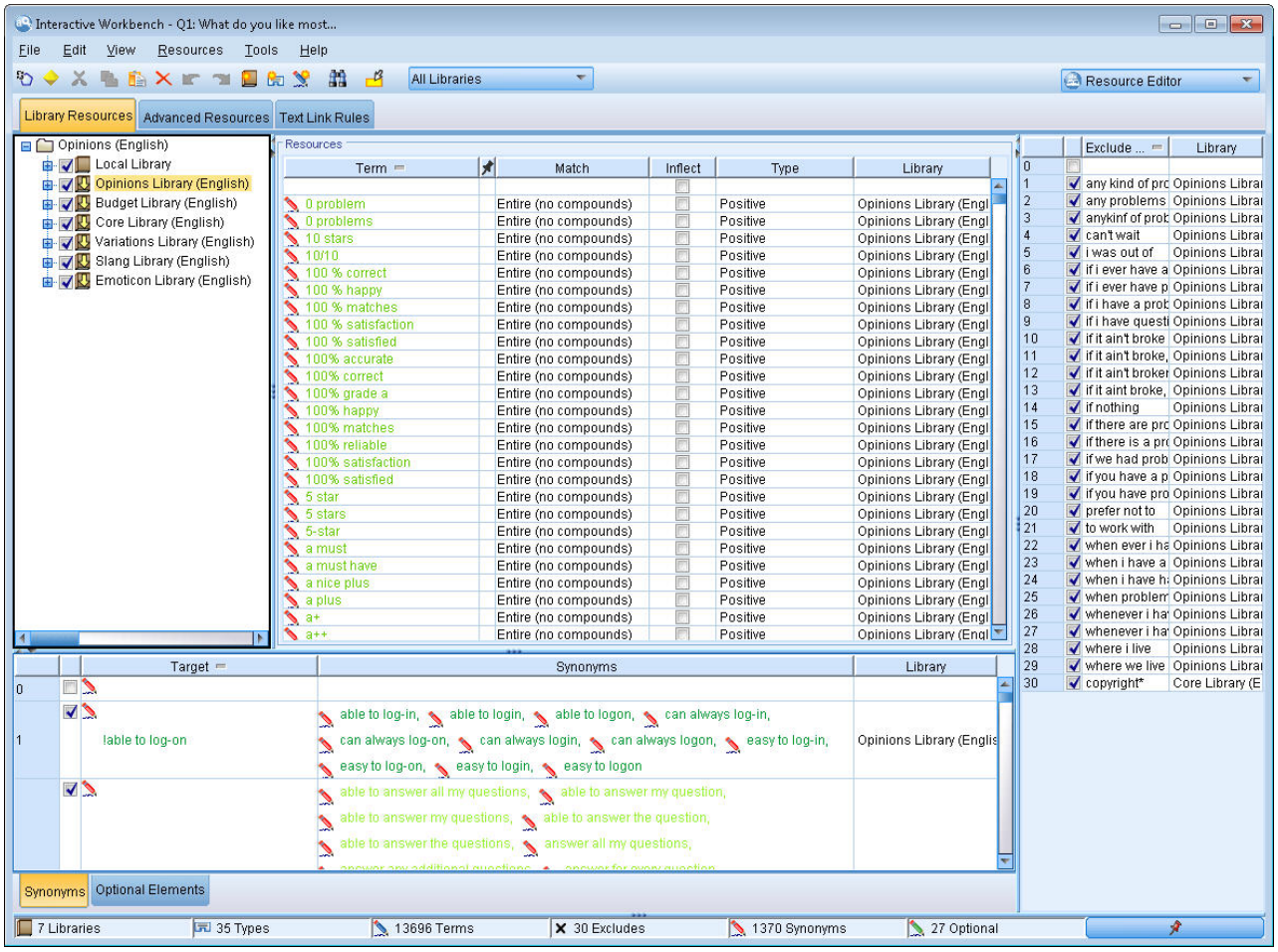


Figure 35. Resource Editor view

Making and Updating Templates

Whenever you make changes to your resources and want to reuse them in the future, you can save the resources as a template. When doing so, you can choose to save using an existing template name or by providing a new name. Then, whenever you load this template in the future, you'll be able to obtain the same resources. See the topic “Copying resources from templates and TAPs” on page 24 for more information.

Note: You can also publish and share your libraries. See the topic “Sharing Libraries” on page 165 for more information.

To Make (or Update) a Template

1. From the menus in the Resource Editor view, choose **Resources > Make Resource Template**. The Make Resource Template dialog box opens.
2. Enter a new name in the Template Name field, if you want to make a new template. Select a template in the table, if you want to overwrite an existing template with the currently loaded resources.
3. Click **Save** to make the template.

Important! Since templates are loaded when you select them in the node and not when the stream is executed, please make sure to reload the resource template in any other nodes in which it is used if you want to get the latest changes. See the topic "Updating Node Resources After Loading" on page 156 for more information.

Switching resource templates

If you want to replace the resources currently loaded in the session with a copy of those from another template, you can switch to those resources. Doing so will overwrite any resources currently loadedin the session. If you are switching resources in order to have some predefined Text Link Analysis (TLA) pattern rules, make sure to select a template that has them marked in the TLA column.

Switching resources is particularly useful when you want to restore the session work (categories, patterns, and resources) but want to load an updated copy of the resources from a template without losing your other session work.You can select the template whose contents you want copy into the Resource Editor and click **OK.** This replaces the resources you have in this session. Make sure you update the modeling node at the end of your session if you want to keep these changes next time you launch the interactive workbench session.

Note: If you switch to the contents of another template during an interactive session, the name of the template listed in the node will still be the name of the last template loaded and copied. In order to benefit from these resources or other session work, update your modeling node before exiting the session and select the **Use session work** option in the node. See the topic "Updating Modeling Nodes and Saving" on page 72 for more information.

To switch resources

1. From the menus in the Resource Editor view, choose **Resources > Switch Resource Templates**. The Switch Resources dialog box opens.
2. Select the template you want to use from those shown in the table.
3. Click **OK** to abandon those resources currently loaded and load a copy of those in the selected template in their place. If you have made changes to your resources and want to save your libraries for a future use, you can publish, update, and share them before switching. See the topic "Sharing Libraries" on page 165 for more information.

Chapter 14. Templates and Resources

IBM SPSS Modeler Text Analytics rapidly and accurately captures and extracts key concepts from text data. This extraction process relies heavily on linguistic resources to dictate how to extract information from text data. See the topic "How extraction works" on page 5 for more information. You can fine-tune these resources in the Resource Editor view.

When you install the software, you also get a set of specialized resources. These shipped resources allow you to benefit from years of research and fine-tuning for specific languages and specific applications. Since the shipped resources may not always be perfectly adapted to the context of your data, you can edit these resource templates or even create and use custom libraries uniquely fine-tuned to your organization's data. These resources come in various forms and each can be used in your session. Resources can be found in the following:

- **Resource templates**. Templates are made up of a set of libraries, types, and some advanced resources which together form a specialized set of resources adapted to a particular domain or context such as product opinions.
- **Text analysis packages (TAP)**. In addition to the resources stored in a template, TAPs also bundle together one or more specialized category sets generated using those resources so that both the categories and the resources are stored together and reusable. See the topic "Using Text Analysis Packages" on page 123 for more information.
- **Libraries**. Libraries are used as building blocks for both TAPs and templates. They can also be added individually to resources in your session. Each library is made up of several dictionaries used to define and manage types, synonyms, and exclude lists. While libraries are also delivered individually, they are prepackaged together in templates and TAPs. See the topic Chapter 15, "Working with Libraries," on page 161 for more information.

Note: During extraction, some compiled internal resources are also used. These compiled resources contain a large number of definitions complementing the types in the Core library. These compiled resources cannot be edited.

The Resource Editor offers access to the set of resources used to produce the extraction results (concepts, types, and patterns). There are a number of tasks you might perform in the Resource Editor and they include:

- **Working with libraries**. See the topic Chapter 15, "Working with Libraries," on page 161 for more information.
- **Creating type dictionaries**. See the topic "Creating types" on page 171 for more information.
- **Adding terms to dictionaries**. See the topic "Adding terms" on page 172 for more information.
- **Creating synonyms**. See the topic "Defining synonyms" on page 176 for more information.
- **Updating the resources in TAPs**. See the topic "Updating Text Analysis Packages" on page 125 for more information.
- **Making templates**. See the topic "Making and Updating Templates" on page 148 for more information.
- **Importing and exporting templates**. See the topic "Importing and Exporting Templates" on page 157 for more information.
- **Publishing libraries**. See the topic "Publishing Libraries" on page 167 for more information.

Template Editor vs. Resource Editor

There are two main methods for working with and editing your templates, libraries, and their resources. You can work on linguistic resources in the Template Editor or the Resource Editor.

Template Editor

The Template Editor allows you to create and edit resource templates without an interactive workbench session and independent of a specific node or stream. You can use this editor to create or edit resource templates before loading them into the Text Link Analysis node and the Text Mining modeling node.

The Template Editor is accessible through the main IBM SPSS Modeler toolbar from the **Tools > Text Analytics Template Editor** menu.

Resource Editor

The Resource Editor, which is accessible within an interactive workbench session, allows you to work with the resources in the context of a specific node and dataset. When you add a Text Mining modeling node to a stream, you can load a copy of a resource template's content or a copy of a text analysis package (category sets *and* resources) to control how text is extracted for text mining. When you launch an interactive workbench session, in addition to creating categories, extracting text link analysis patterns, and creating category models, you can also fine-tune the resources for that session's data in the integrated Resource Editor view. See the topic “Editing Resources in the Resource Editor” on page 147 for more information.

Whenever you work on the resources in an interactive workbench session, those changes apply only to that session. If you want to save your work (resources, categories, patterns, etc.) so you can continue in a subsequent session, you must update the modeling node. See the topic “Updating Modeling Nodes and Saving” on page 72 for more information.

If you want to save your changes back to the original template, whose contents were copied into the modeling node, so that this updated template can be loaded into other nodes, you can make a template from the resources. See the topic “Making and Updating Templates” on page 148 for more information.

The Editor interface

The operations that you perform in the Template Editor or Resource Editor revolve around the management and fine-tuning of the linguistic resources. These resources are stored in the form of templates and libraries. See the topic “Type dictionaries” on page 169 for more information.

Library Resources tab

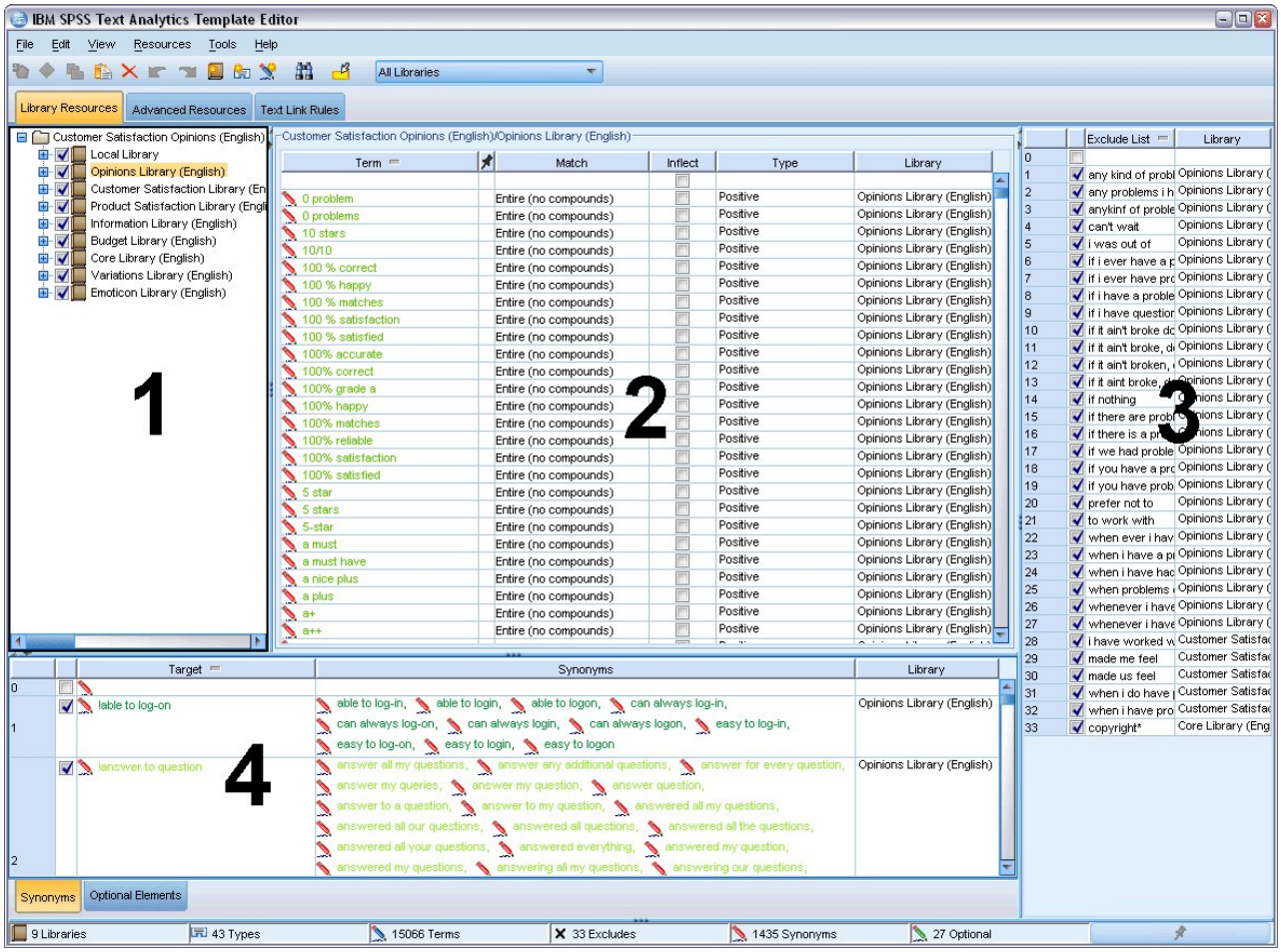


Figure 36. Text Mining Template Editor

The interface is organized into four parts, as follows:

1. Library Tree pane. Located in the upper left corner, this plan displays a tree of the libraries. You can enable and disable libraries in this tree as well as filter the views in the other panes by selecting a library in the tree. You can perform many operations in this tree using the context menus. If you expand a library in the tree, you can see the set of types it contains. You can also filter this list through the **View** menu if you want to focus on a particular library only.

2. Term Lists from Type Dictionaries pane. Located to the right of the library tree, this pane displays the term lists of the type dictionaries for the libraries selected in the tree. A **type dictionary** is a collection of terms to be grouped under one label, or type, name. When the extraction engine reads your text data, it compares words found in the text to the terms in the type dictionaries. If an extracted concept appears as a term in a type dictionary, then that type name is assigned. You can think of the type dictionary as a distinct dictionary of terms that have something in common. For example, the `<Location>` type in the Core library contains concepts such as `new orleans`, `great britain`, and `new york`. These terms all represent geographical locations. A library can contain one or more type dictionaries. See the topic “Type dictionaries” on page 169 for more information.

3. Exclude Dictionary pane. Located on the right side, this pane displays the collection of terms that will be excluded from the final extraction results. The terms appearing in this exclude dictionary do not appear in the Extraction Results pane. Excluded terms can be stored in the library of your choosing. However, the Exclude Dictionary pane displays all of the excluded terms for all libraries visible in the library tree.See the topic “Exclude dictionaries” on page 178 for more information.

4. Substitution Dictionary pane. Located in the lower left, this pane displays synonyms and optional elements, each in their own tab. Synonyms and optional elements help group similar terms under one lead, or target, concept in the final extraction results. This dictionary can contain known synonyms and user-defined synonyms and elements, as well as common misspellings paired with the correct spelling. Synonym definitions and optional elements can be stored in the library of your choosing. However, the substitution dictionary pane displays all of the contents for all libraries visible in the library tree. While this pane displays all synonyms or optional elements from all libraries, The substitutions for all of the libraries in the tree are shown together in this pane. A library can contain only one substitution dictionary. See the topic "Substitution/Synonym dictionaries" on page 175 for more information.

Notes:

- If you want to filter so that you see only the information pertaining to a single library, you can change the library view using the drop-down list on the toolbar. It contains a top-level entry called **All Libraries** as well as an additional entry for each individual library. See the topic "Viewing Libraries" on page 163 for more information.

Advanced Resources tab

The advanced resources are available from the second tab of the editor view. You can review and edit the advanced resources in this tab. See the topic Chapter 17, "About Advanced Resources," on page 181 for more information.

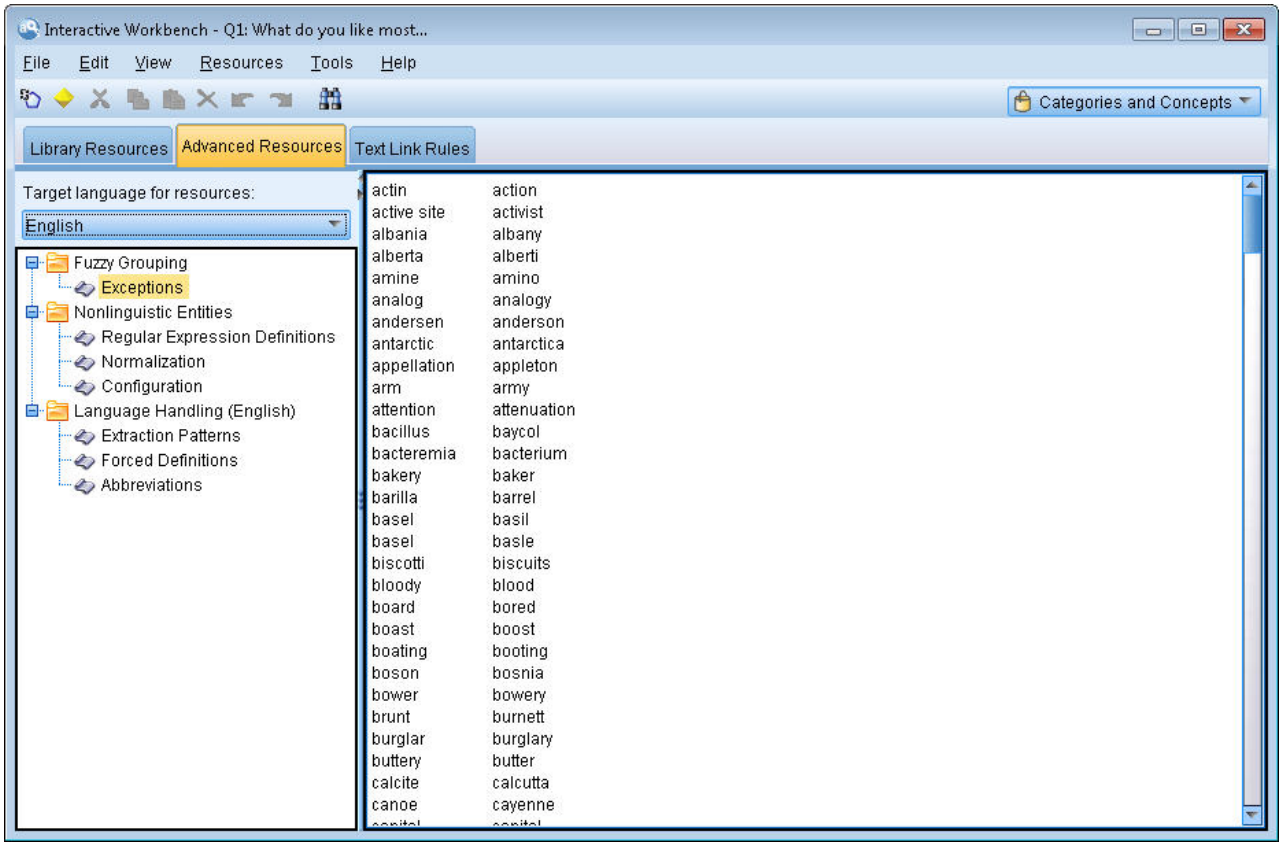


Figure 37. Text Mining Template Editor - Advanced Resources tab

Text Link Rules tab

Since version 14, the text link analysis rules are editable in their own tab of the editor view. You can work in the rule editor, create your own rules, and even run simulations to see how your rules impact the TLA

results. See the topic Chapter 18, “About Text Link Rules,” on page 193 for more information.

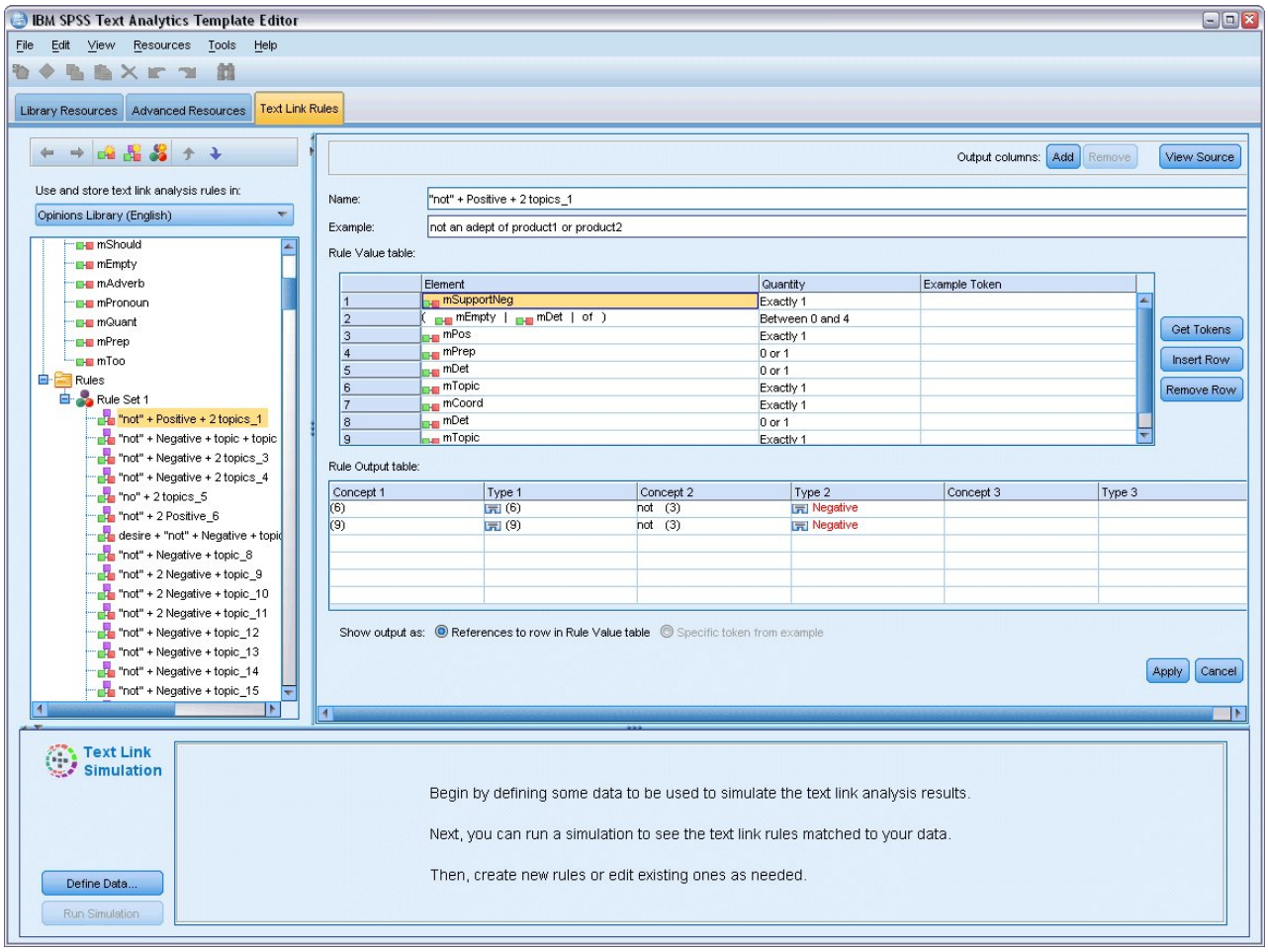


Figure 38. Text Mining Template Editor - Text Link Rules tab

Opening Templates

When you launch the Template Editor, you are prompted to open a template. Likewise, you can open a template from the File menu. If you want a template that contains some Text Link Analysis (TLA) rules, make sure to select a template that has an icon in the TLA column. The language for which a template was created is shown in the Language column.

If you want to import a template that isn't shown in the table or if you want to export a template, you can use the buttons in the Open Template dialog box. See the topic “Importing and Exporting Templates” on page 157 for more information.

To Open a Template

1. From the menus in the Template Editor, choose **File > Open Resource Template**. The Open Resource Template dialog box opens.
2. Select the template you want to use from those shown in the table.
3. Click **OK** to open this template. If you currently have another template open in the editor, clicking OK will abandon that template and display the template you selected here. If you have made changes to your resources and want to save your libraries for a future use, you can publish, update, and share them before opening another. See the topic “Sharing Libraries” on page 165 for more information.

Saving Templates

In the Template Editor, you can save the changes you made to a template. You can choose to save using an existing template name or by providing a new name.

If you make changes to a template that you've already loaded into a node at a previous time, you will have to reload the template contents into the node to get the latest changes. See the topic “Copying resources from templates and TAPs” on page 24 for more information.

Or, if you are using the option **Use saved interactive work** in the Model tab of the Text Mining node, meaning you are using resources from a previous interactive workbench session, you'll need to switch to this template's resources from within the interactive workbench session. See the topic “Switching resource templates” on page 149 for more information.

Note: You can also publish and share your libraries. See the topic “Sharing Libraries” on page 165 for more information.

To Save a Template

1. From the menus in the Template Editor, choose **File > Save Resource Template**. The Save Resource Template dialog box opens.
2. Enter a new name in the Template name field, if you want to save this template as a new template. Select a template in the table, if you want to overwrite an existing template with the currently loaded resources.
3. If desired, enter a description to display a comment or annotation in the table.
4. Click **Save** to save the template.

Important! Since resources from templates or TAPs are loaded/copied into the node, you must update the resources by reloading them if you make changes to a template and want to benefit from these changes in an existing stream. See the topic “Updating Node Resources After Loading” for more information.

Updating Node Resources After Loading

By default, when you add a node to a stream, a set of resources from a default template are loaded and embedded into your node. And if you change templates or use a TAP, when you load them, a copy of those resources then overwrites the resources. Since templates and TAPs are not linked to the node directly, any changes you make changes to a template or TAP are not automatically available in a preexisting node. In order to benefit from those changes, you would have to update the resources in that node. The resources can be updated in one of two ways.

Method 1: Reloading Resources in Model Tab

If you want to update the resources in the node using a new or updated template or TAP, you can reload it in the Model tab of the node. By reloading, you will replace the copy of the resources in the node with a more current copy. For your convenience, the updated time and date will appear on the Model tab along with the originating template's name. See the topic “Copying resources from templates and TAPs” on page 24 for more information.

However, if you are working with interactive session data in a Text Mining modeling node and you have selected the **Use session work** option on the Model tab, the saved session work and resources will be used and the **Load** button is disabled. It is disabled because, at one time during an interactive workbench session, you chose the **Update Modeling Node** option and kept the categories, resources, and other session work. In that case, if you want to change or update those resources, you can try the next method of switching the resources in the Resource Editor.

Method 2: Switching Resources in the Resource Editor

Anytime you want to use different resources during an interactive session, you can exchange those resources using the Switch Resources dialog box. This is especially useful when you want to reuse existing category work but replace the resources. In this case, you can select the **Use session work** option on the Model tab of a Text Mining modeling node. Doing so will disable the ability to reload a template through the node dialog box and instead keep the settings and changes you made during your session. Then you can launch the interactive workbench session by executing the stream and switch the resources in the Resource Editor. See the topic "Switching resource templates" on page 149 for more information.

In order to keep session work for subsequent sessions, including the resources, you need to update the modeling node from within the interactive workbench session so that the resources (and other data) are saved back to the node. See the topic "Updating Modeling Nodes and Saving" on page 72 for more information.

Note: If you switch to the contents of another template during an interactive session, the name of the template listed in the node will still be the name of the last template loaded and copied. In order to benefit from these resources or other session work, update your modeling node before exiting the session.

Managing Templates

There are also some basic management tasks you might want to perform from time to time on your templates, such as renaming your templates, importing and exporting templates, or deleting obsolete templates. These tasks are performed in the Manage Templates dialog box. Importing and exporting templates enables you to share templates with other users. See the topic "Importing and Exporting Templates" for more information.

Note: You cannot rename or delete the templates that are installed (or shipped) with this product. Instead, if you want to rename, you can open the installed template and make a new one with the name of your choice. You can delete your custom templates; however, if you try to delete a shipped template, it will be reset to the version originally installed.

To Rename a Template

1. From the menus, choose **Resources > Manage Resource Templates**. The Manage Templates dialog box opens.
2. Select the template you want to rename and click **Rename**. The name box becomes an editable field in the table.
3. Type a new name and press the Enter key. A confirmation dialog box opens.
4. If you are satisfied with the name change, click **Yes**. If not, click **No**.

To Delete a Template

1. From the menus, choose **Resources > Manage Resource Templates**. The Manage Templates dialog box opens.
2. In the Manage Templates dialog box, select the template you want to delete.
3. Click **Delete**. A confirmation dialog box opens.
4. Click **Yes** to delete or click **No** to cancel the request. If you click **Yes**, the template is deleted.

Importing and Exporting Templates

You can share templates with other users or machines by importing and exporting them. Templates are stored in an internal database but can exported as **.lrt* files to your hard drive.

Since there are circumstances under which you might want to import or export templates, there are several dialog boxes that offer those capabilities.

- Open Template dialog box in the Template Editor
- Load Resources dialog box in the Text Mining modeling node and Text Link Analysis node.
- Manage Templates dialog box in the Template Editor and the Resource Editor.

To Import a Template

1. In the dialog box, click **Import**. The Import Template dialog box opens.
2. Select the resource template file (*.*lrt*) to import and click **Import**. You can save the template you are importing with another name or overwrite the existing one. The dialog box closes, and the template now appears in the table.

To Export a Template

1. In the dialog box, select the template you want export and click **Export**. The Select Directory dialog box opens.
2. Select the directory to which you want to export and click **Export**. This dialog box closes, and the template is exported and carries the file extension (*.*lrt*)

Exiting the Template Editor

When you are finished working in the Template Editor, you can save your work and exit the editor.

To Exit the Template Editor

1. From the menus, choose **File > Close**. The Save and Close dialog box opens.
2. Select **Save changes to template** in order to save the open template before closing the editor.
3. Select **Publish libraries** if you want to publish any of the libraries in the open template before closing the editor. If you select this option, you will be prompted to select the libraries to publish. See the topic "Publishing Libraries" on page 167 for more information.

Backing Up Resources

You may want to back up your resources from time to time as a security measure.

Important! When you restore, the entire contents of your resources will be wiped clean and only the contents of the backup file will be accessible in the product. This includes any open work.

Note: You can only backup and restore to the same major version of your software. For example, if you backup from version 15, you cannot restore that backup to version 16.

To Back Up the Resources

1. From the menus, choose **Resources > Backup Tools > Backup Resources**. The Backup dialog box opens.
2. Enter a name for your backup file and click **Save**. The dialog box closes, and the backup file is created.

To Restore the Resources

1. From the menus, choose **Resources > Backup Tools > Restore Resources**. An alert warns you that restoring will overwrite the current contents of your database.
2. Click **Yes** to proceed. The dialog box opens.
3. Select the backup file you want to restore and click **Open**. The dialog box closes, and resources are restored in the application.

Importing resource files

If you have made changes directly in resource files outside of this product, you can import them into a selected library by selecting that library and proceeding with the import. When you import a directory, you can import all of supported files into a specific open library as well. You can only import `*.txt` files.

Each imported file must contain only one entry per line, and if the contents are structured as:

- A list words or phrases (one per line). The file is imported as a term list for a type dictionary, where the type dictionary takes the name of the file minus the extension.
- A list of entries such as `term1 <TAB> term2`, then it is imported as a list of synonyms, where `term1` is the set of the underlying term and `term2` is the target term.

To import a single resource file

1. From the menus, choose **Resources > Import Files > Import Single File**. The Import File dialog box opens.
2. Select the file you want to import and click **Import**. The file contents are transformed into an internal format and added to your library.

To import all files in a directory

1. From the menus, choose **Resources > Import Files > Import Entire Directory**. The Import Directory dialog box opens.
2. Select the library in which you want all of the resource files imported from the **Import** list. If you select the **Default** option, a new library will be created using the name of the directory as its name.
3. Select the directory from which to import the files. Subdirectories will not be read.
4. Click **Import**. The dialog box closes and the content from those imported resource files now appears in the editor in the form of dictionaries and advanced resource files.

Chapter 15. Working with Libraries

The resources used by the extraction engine to extract and group terms from your text data always contain one or more libraries. You can see the set of libraries in the library tree located in the upper left part of the Template Editor and Resource Editor. The libraries are composed of three kinds of dictionaries: Type, Substitution, and Exclude. See the topic Chapter 16, "About Library Dictionaries," on page 169 for more information.

The resource template or the resources from the TAP you chose includes several libraries to enable you to immediately begin extracting concepts from your text data. However, you can create your own libraries as well and also publish them so you can reuse them. See the topic "Publishing Libraries" on page 167 for more information.

For example, suppose that you frequently work with text data related to the automotive industry. After analyzing your data, you decide that you would like to create some customized resources to handle industry-specific vocabulary or jargon. Using the Template Editor, you can create a new template, and in it a library to extract and group automotive terms. Since you will need the information in this library again, you publish your library to a central repository, accessible in the **Manage Libraries** dialog box, so that it can be reused independently in different stream sessions .

Suppose that you are also interested in grouping terms that are specific to different subindustries, such as electronic devices, engines, cooling systems, or even a particular manufacturer or market. You can create a library for each group and then publish the libraries so that they can be used with multiple sets of text data. In this way, you can add the libraries that best correspond to the context of your text data.

Note: Additional resources can be configured and managed in the Advanced Resources tab. Some apply to all of the libraries and manage nonlinguistic entities, fuzzy grouping exceptions, and so on. Additionally, you can edit the text link analysis pattern rules, which are library-specific, in the Text Link Rules tab as well. See the topic Chapter 17, "About Advanced Resources," on page 181 for more information.

Shipped libraries

By default, several libraries are installed with IBM SPSS Modeler Text Analytics. You can use these preformatted libraries to access thousands of predefined terms and synonyms as well as many different types. These shipped libraries are fine-tuned to several different domains and are available in several different languages.

There are a number of libraries but the most commonly used are as follows:

- **Local library.** Used to store user-defined dictionaries. It is an empty library added by default to all resources. It contains an empty type dictionary too. It is most useful when making changes or refinements to the resources directly (such as adding a word to a type) from the Categories and Concepts view, Clusters view, and the Text Link Analysis view . In this case, those changes and refinements are automatically stored in the first library listed in the library tree in the Resource Editor; by default, this is the *Local Library*. You cannot publish this library because it is specific to the session data. If you want to publish its contents, you must rename the library first.
- **Core library.** Used in most cases, since it comprises the basic five built-in types representing people, locations, organizations, products, and unknown. While you may see only a few terms listed in one of its type dictionaries, the types represented in the Core library are actually complements to the robust types found in the internal, compiled resources delivered with your text-mining product. These internal, compiled resources contain thousands of terms for each type. For this reason, while you may not see a term in the type dictionary term list, it can still be extracted and typed with a Core type. This

explains how names such as *George* can be extracted and typed as <Person> when only *John* appears in the <Person> type dictionary in the Core library. Similarly, if you do not include the Core library, you may still see these types in your extraction results, since the compiled resources containing these types will still be used by the extraction engine.

- **Opinions library.** Used most commonly to extract opinions and sentiments from text data. This library includes thousands of words representing attitudes, qualifiers, and preferences that—when used in conjunction with other terms—indicate an opinion about a subject. This library includes a number of built-in types, synonyms, and excludes. It also includes a large set of pattern rules used for text link analysis. To benefit from the text link analysis rules in this library and the pattern results they produce, this library must be specified in the Text Link Rules tab. See the topic Chapter 18, "About Text Link Rules," on page 193 for more information.
- **Budget library.** Used to extract terms referring to the cost of something. This library includes many words and phrases that represent adjectives, qualifiers, and judgments regarding the price or quality of something.
- **Variations library.** Used to include cases where certain language variations require synonym definitions to properly group them. This library includes only synonym definitions.

Although some of the libraries shipped outside the templates resemble the contents in some templates, the templates have been specifically tuned to particular applications and contain additional advanced resources. We recommend that you try to use a template that was designed for the kind of text data you are working with and make your changes to those resources rather than just adding individual libraries to a more generic template.

Compiled resources are also delivered with IBM SPSS Modeler Text Analytics. They are always used during the extraction process and contain a large number of complementary definitions to the built-in type dictionaries in the default libraries. Since these resources are compiled, they cannot be viewed or edited. You can, however, force a term that was typed by these compiled resources into any other dictionary. See the topic "Forcing terms" on page 174 for more information.

Creating Libraries

You can create any number of libraries. After creating a new library, you can begin to create type dictionaries in this library and enter terms, synonyms, and excludes.

To Create a Library

1. From the menus, choose **Resources > New Library**. The Library Properties dialog opens.
2. Enter a name for the library in the Name text box.
3. If desired, enter a comment in the Annotation text box.
4. Click **Publish** if you want to publish this library now before entering anything in the library. See the topic "Sharing Libraries" on page 165 for more information. You can also publish later at any time.
5. Click **OK** to create the library. The dialog box closes and the library appears in the tree view. If you expand the libraries in the tree, you will see that an empty type dictionary has been automatically included in the library. In it, you can immediately begin adding terms. See the topic "Adding terms" on page 172 for more information.

Adding public libraries

If you want to reuse a library from another session data, you can add it to your current resources as long as it is a public library. A *public library* is a library that has been published. See the topic "Publishing Libraries" on page 167 for more information.

When you add a public library, a *local* copy is embedded into your session data. You can make changes to this library; however, you must republish the public version of the library if you want to share the changes.

When adding a public library, a Resolve Conflicts dialog box may appear if any conflicts are discovered between the terms and types in one library and the other local libraries. You must resolve these conflicts or accept the proposed resolutions in order to complete this operation. See the topic "Resolving Conflicts" on page 167 for more information.

Note: If you always update your libraries when you launch an interactive workbench session or publish when you close one, you are less likely to have libraries that are out of sync. See the topic "Sharing Libraries" on page 165 for more information.

To add a library

1. From the menus, choose **Resources > Add Library**. The Add Library dialog box opens.
2. Select the library or libraries in the list.
3. Click **Add**. If any conflicts occur between the newly added libraries and any libraries that were already there, you will be asked to verify the conflict resolutions or change them before completing the operation. See the topic "Resolving Conflicts" on page 167 for more information.

Finding Terms and Types

You can search in the various panes in the editor using the Find feature. In the editor, you can choose **Edit > Find** from the menus and the Find toolbar appears. You can use this toolbar to find one occurrence at a time. By clicking **Find** again, you can find subsequent occurrences of your search term.

When searching, the editor searches only the library or libraries listed in the drop-down list on the Find toolbar. If **All Libraries** is selected, the program will search everything in the editor.

When you start a search, it begins in the area that has the focus. The search continues through each section, looping back around until it returns to the active cell. You can reverse the order of the search using the directional arrows. You can also choose whether or not your search is case sensitive.

To Find Strings in the View

1. From the menus, choose **Edit** > **Find**. The Find toolbar is displayed.
2. Enter the string for which you want to search.
3. Click the **Find** button to begin the search. The next occurrence of the term or type is then highlighted.
4. Click the button again to move from occurrence to occurrence.

Using an asterisk in terms

Using an asterisk (*) in terms is especially useful if you are dealing with an agglutinative language that creates new words by compounding other words together without intervening spaces. For example, the German word *Übernachtungspreis*, which is made up of: *Übernachtung* + *s* + *Preis*.

As an example, if you search in terms for `preis*` in the type `Budget`, it will match extracted concepts such as `preiserhöhung`. In the same way, `*preis` will match `Übernachtung` and `*preis*` will match `Übernachtungspreiserhöhung`.

Viewing Libraries

You can display the contents of one particular library or all libraries. This can be helpful when dealing with many libraries or when you want to review the contents of a specific library before publishing it. Changing the view only impacts what you see in this Library Resources tab but does not disable any libraries from being used during extraction. See the topic "Disabling Local Libraries" on page 164 for more information.

The default view is **All Libraries**, which shows all libraries in the tree and their contents in other panes. You can change this selection using the drop-down list on the toolbar or through a menu selection (**View > Libraries**) When a single library is being viewed, all items in other libraries disappear from view but are still read during the extraction.

To Change the Library View

1. From the menus in the Library Resources tab, choose **View > Libraries**. A menu with all of the local libraries opens.
2. Select the library that you want to see or select the **All Libraries** option to see the contents of all libraries. The contents of the view are filtered according to your selection.

Managing Local Libraries

Local libraries are the libraries inside your interactive workbench session or inside a template, as opposed to public libraries. See the topic "Managing Public Libraries" on page 165 for more information. There are also some basic local library management tasks that you might want to perform, including: renaming, disabling, or deleting a local library.

Renaming Local Libraries

You can rename local libraries. If you rename a local library, you will disassociate it from the public version, if a public version exists. This means that subsequent changes can no longer be shared with the public version. You can republish this local library under its new name. This also means that you will not be able to update the original public version with any changes that you make to this local version.

Note: You cannot rename a public library.

1. From the menus, choose **Edit > Library Properties**. The Library Properties dialog box opens.

To Rename a Local Library

1. In the tree view, select the library that you want to rename.
2. Enter a new name for the library in the Name text box.
3. Click **OK** to accept the new name for the library. The dialog box closes and the library name is updated in the tree view.

Disabling Local Libraries

If you want to temporarily exclude a library from the extraction process, you can deselect the check box to the left of the library name in the tree view. This signals that you want to keep the library but want the contents ignored when checking for conflicts and during extraction.

To Disable a Library

1. In the library tree pane, select the library you want to disable.
2. Click the spacebar. The check box to the left of the name is cleared.

Deleting Local Libraries

You can remove a library without deleting the public version of the library and vice versa. Deleting a local library will delete the library and all of its content from session only. Deleting a local version of a library does not remove that library from other sessions or the public version. See the topic "Managing Public Libraries" on page 165 for more information.

To Delete a Local Library

1. In the tree view, select the library you want to delete.
2. From the menus, choose **Edit > Delete** to delete the library. The library is removed.

3. If you have never published this library before, a message asking whether you would like to delete or keep this library opens. Click **Delete** to continue or **Keep** if you would like to keep this library.

Note: One library must always remain.

Managing Public Libraries

In order to reuse local libraries, you can publish them and then work with them and see them through the Manage Libraries dialog box (**Resources > Manage Libraries**). See the topic "Sharing Libraries" for more information. Some basic public library management tasks that you might want to perform include importing, exporting, or deleting a public library. You cannot rename a public library.

Importing Public Libraries

1. In the Manage Libraries dialog box, click **Import...**. The Import Library dialog box opens.
2. Select the library file (**.lib*) that you want to import and if you also want to add this library locally, select **Add library to current project**.
3. Click **Import**. The dialog box closes. If a public library with the same name already exists, you will be asked to rename the library that you are importing or to overwrite the current public library.

Exporting Public Libraries

You can export public libraries into the *.lib* format so that you can share them.

1. In the Manage Libraries dialog box, select the library that you want to export in the list.
2. Click **Export**. The Select Directory dialog box opens.
3. Select the directory to which you want to export and click **Export**. The dialog box closes and the library file (**.lib*) is exported.

Deleting Public Libraries

You can remove a local library without deleting the public version of the library and vice versa. However, if the library is deleted from this dialog box, it can no longer be added to any session resources until a local version is published again.

If you delete a library that was installed with the product, the originally installed version is restored.

1. In the Manage Libraries dialog box, select the library that you want to delete. You can sort the list by clicking on the appropriate header.
2. Click **Delete** to delete the library. IBM SPSS Modeler Text Analytics verifies whether the local version of the library is the same as the public library. If so, the library is removed with no alert. If the library versions differ, an alert opens to ask you whether you want to keep or remove the public version is issued.

Sharing Libraries

Libraries allow you to work with resources in a way that is easy to share among multiple interactive workbench sessions . Libraries can exist in two states, or versions. Libraries that are editable in the editor and part of an interactive workbench session are called **local libraries**. While working with in an interactive workbench session , you may make a lot of changes in the *Vegetables* library, for example. If your changes could be useful with other data, you can make these resources available by creating a **public library** version of the *Vegetables* library. A public library, as the name implies, is available to any other resources in any interactive workbench session.

You can see the public libraries in the Manage Libraries dialog box. Once this public library version exists, you can add it to the resources in other contexts so that these custom linguistic resources can be shared.

The shipped libraries are initially public libraries. It is possible to edit the resources in these libraries and then create a new public version. Those new versions would then be accessible in other interactive workbench sessions.

As you continue to work with your libraries and make changes, your library versions will become desynchronized. In some cases, a local version might be more recent than the public version, and in other cases, the public version might be more recent than the local version. It is also possible for both the public and local versions to contain changes that the other does not if the public version was updated from within another interactive workbench session. If your library versions become desynchronized, you can synchronize them again. Synchronizing library versions consists of republishing and/or updating local libraries.

Whenever you launch an interactive workbench session or close one , you will be prompted to synchronize any libraries that need updating or republishing. Additionally, you can easily identify the synchronization state of your local library by the icon appearing beside the library name in the tree view or by viewing the Library Properties dialog box. You can also choose to do so at any time through menu selections. The following table describes the five possible states and their associated icons.

Table 37. Local library synchronization states.

Icon	Local library status description
	Unpublished—The local library has never been published.
	Synchronized—The local and public library versions are identical. This also applies to the *Local Library*, which cannot be published because it is intended to contain only session -specific resources.
	Out of date—The public library version is more recent than the local version. You can update your local version with the changes.
	Newer—The local library version is more recent than the public version. You can republish your local version to the public version.
	Out of sync—Both the local and public libraries contain changes that the other does not. You must decide whether to update or publish your local library. If you update, you will lose the changes that you made since the last time you updated or published. If you choose to publish, you will overwrite the changes in the public version.

Note: If you always update your libraries when you launch an interactive workbench session or publish when you close one, you are less likely to have libraries that are out of synchronization.

You can republish a library any time you think that the changes in the library would benefit other streams that may also contain this library. Then, if your changes would benefit other streams, you can update the local versions in those streams. In this way, you can create streams for each context or domain that applies to your data by creating new libraries and/or adding any number of public libraries to your resources.

If a public version of a library is shared, there is a greater chance that differences between local and public versions will arise. Whenever you launch or close and publish from an interactive workbench session or open or close a template from the Template Editor , a message is displayed to enable you to publish and/or update any libraries whose versions are not in sync with those in the Manage Libraries dialog box. If the public library version is more recent than the local version, a dialog box asking whether you would like to update opens. You can choose whether to keep the local version as is instead of updating with the public version or merge the updates into the local library.

Publishing Libraries

If you have never published a particular library, publishing entails creating a public copy of your local library in the database. If you are republishing a library, the contents of the local library will replace the existing public version's contents. After republishing, you can update this library in any other stream sessions so that their local versions are in sync with the public version. Even though you can publish a library, a local version is always stored in the session .

Important! If you make changes to your local library and, in the meantime, the public version of the library was also changed, your library is considered to be out of sync. We recommend that you begin by updating the local version with the public changes, make any changes that you want, and then publish your local version again to make both versions identical. If you make changes and publish first, you will overwrite any changes in the public version.

To Publish Local Libraries to the Database

1. From the menus, choose **Resources > Publish Libraries**. The Publish Libraries dialog box opens, with all libraries in need of publishing selected by default.
2. Select the check box to the left of each library that you want to publish or republish.
3. Click **Publish** to publish the libraries to the Manage Libraries database.

Updating Libraries

Whenever you launch or close an interactive workbench session, you can update or publish any libraries that are no longer in sync with the public versions. If the public library version is more recent than the local version, a dialog box asking whether you would like to update the library opens. You can choose whether to keep the local version instead of updating with the public version or replacing the local version with the public one. If a public version of a library is more recent than your local version, you can update the local version to synchronize its content with that of the public version. Updating means incorporating the changes found in the public version into your local version.

Note: If you always update your libraries when you launch an interactive workbench session or publish when you close one, you are less likely to have libraries that are out of sync. See the topic "Sharing Libraries" on page 165 for more information.

To Update Local Libraries

1. From the menus, choose **Resources > Update Libraries**. The Update Libraries dialog box opens, with all libraries in need of updating selected by default.
2. Select the check box to the left of each library that you want to publish or republish.
3. Click **Update** to update the local libraries.

Resolving Conflicts

Local versus Public Library Conflicts

Whenever you launch a stream session, IBM SPSS Modeler Text Analytics performs a comparison of the local libraries and those listed in the Manage Libraries dialog box. If any local libraries in your session are not in sync with the published versions, the Library Synchronization Warning dialog box opens. You can choose from the following options to select the library versions that you want to use here:

- **All libraries local to file.** This option keeps all of your local libraries as they are. You can always republish or update them later.
- **All published libraries on this machine.** This option will replace the shown local libraries with the versions found in the database.
- **All more recent libraries.** This option will replace any older local libraries with the more recent public versions from the database.

- **Other.** This option allows you to manually select the versions that you want by choosing them in the table.

Forced Term Conflicts

Whenever you add a public library or update a local library, conflicts and duplicate entries may be uncovered between the terms and types in this library and the terms and types in the other libraries in your resources. If this occurs, you will be asked to verify the proposed conflict resolutions or change them before completing the operation in the Edit Forced Terms dialog box. See the topic "Forcing terms" on page 174 for more information.

The Edit Forced Terms dialog box contains each pair of conflicting terms or types. Alternating background colors are used to visually distinguish each conflict pair. These colors can be changed in the Options dialog box. See the topic "Options: Display Tab" on page 70 for more information. The Edit Forced Terms dialog box contains two tabs:

- **Duplicates.** This tab contains the duplicated terms found in the libraries. If a pushpin icon appears after a term, it means that this occurrence of the term has been forced. If a black X icon appears, it means that this occurrence of the term will be ignored during extraction because it has been forced elsewhere.
- **User Defined.** This tab contains a list of any terms that have been forced manually in the type dictionary term pane and not through conflicts.

Note: The Edit Forced Terms dialog box opens after you add or update a library. If you cancel out of this dialog box, you will not be canceling the update or addition of the library.

To Resolve Conflicts

1. In the Edit Forced Terms dialog box, select the radio button in the Use column for the term that you want to force.
2. When you have finished, click **OK** to apply the forced terms and close the dialog box. If you click **Cancel**, you will cancel the changes you made in this dialog box.

Chapter 16. About Library Dictionaries

The resources used to extract text data are stored in the form of templates and libraries. A library can be made up of three dictionaries.

- The **type dictionary** contains a collection of terms grouped under one label, or type name. When the extraction engine reads your text data, it compares the words found in the text to the terms defined in your type dictionaries. During extraction, inflected forms of a type's terms and synonyms are grouped under a target term called concept. Extracted concepts are assigned to the type dictionary in which they appear as terms. You can manage your type dictionaries in the upper left and center panes of the editor—the library tree and the term pane. See the topic "Type dictionaries" for more information.
- The **substitution dictionary** contains a collection of words defined as synonyms or as optional elements used to group similar terms under one target term, called a concept in the final extraction results. You can manage your substitution dictionaries in the lower left pane of the editor using the Synonyms tab and the Optional tab. See the topic "Substitution/Synonym dictionaries" on page 175 for more information.
- The **exclude dictionary** contains a collection of terms and types that will be removed from the final extraction results. You can manage your exclude dictionaries in the rightmost pane of the editor. See the topic "Exclude dictionaries" on page 178 for more information.

See the topic Chapter 15, "Working with Libraries," on page 161 for more information.

Type dictionaries

A *type dictionary* is made up of a type name, or label, and a list of terms. Type dictionaries are managed in the upper left and center panes of Library Resources tab in the editor. You can access this view with **View > Resource Editor** in the menus, if you are in an interactive workbench session. Otherwise, you can edit dictionaries for a specific template in the Template Editor.

When the extraction engine reads your text data, it compares words found in the text to the terms defined in your type dictionaries. Terms are words or phrases in the type dictionaries in your linguistic resources.

When a word matches a term, it is assigned to the type name for that term. When the resources are read during extraction, the terms that were found in the text then go through several processing steps before they become concepts in the Extraction Results pane. If multiple terms belonging to the same type dictionary are determined to be synonymous by the extraction engine, then they are grouped under the most frequently occurring term and called a *concept* in the Extraction Results pane. For example, if the terms `question` and `query` might appear under the concept name `question` in the end.

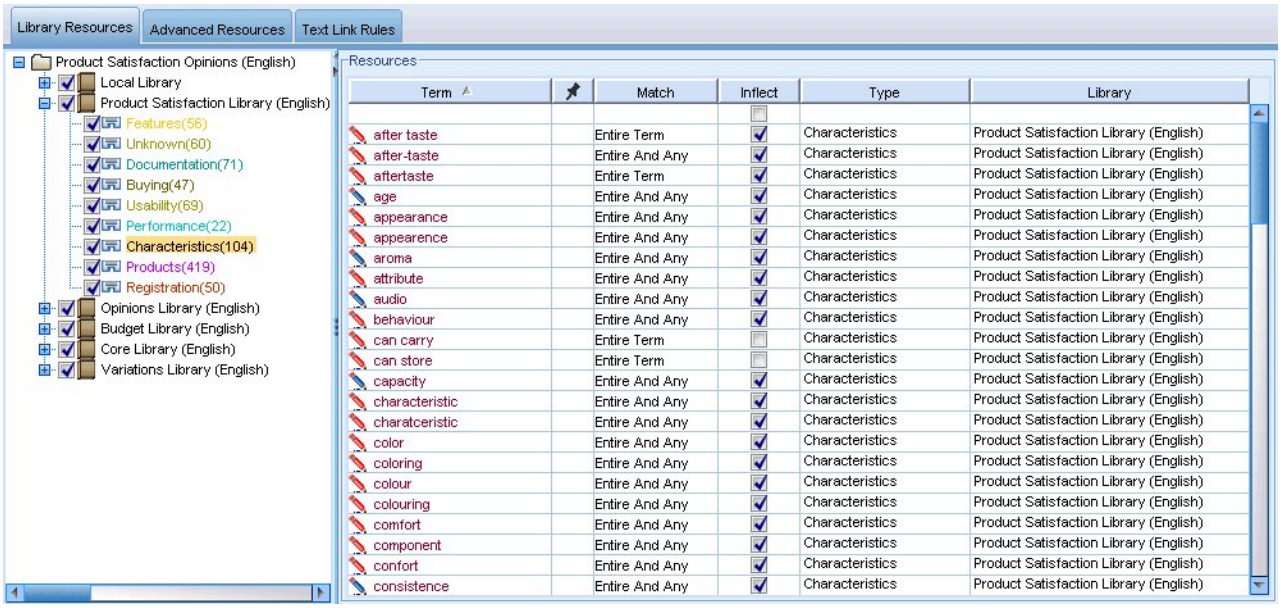


Figure 39. Library tree and term pane

The list of type dictionaries is shown in the library tree pane on the left. The content of each type dictionary appears in the center pane. Type dictionaries consist of more than just a list of terms. The manner in which words and word phrases in your text data are matched to the terms defined in the type dictionaries is determined by the match option defined. A **match option** specifies how a term is anchored with respect to a candidate word or phrase in the text data. See the topic "Adding terms" on page 172 for more information.

Additionally, you can extend the terms in your type dictionary by specifying whether you want to automatically generate and add inflected forms of the terms to the dictionary. By generating the inflected forms, you automatically add plural forms of singular terms, singular forms of plural terms, and adjectives to the type dictionary. See the topic "Adding terms" on page 172 for more information.

Note: For most languages, concepts that are not found in any type dictionary but are extracted from the text are automatically typed as `<Unknown>`

Using an asterisk in terms

Using an asterisk (*) in terms is especially useful if you are dealing with an agglutinative language that creates new words by compounding other words together without intervening spaces. For example, the German word *Übernachtungspreis*, which is made up of: *Übernachtung* + *s* + *Preis*.

As an example, if you search in terms for `preis*` in the type `Budget`, it will match extracted concepts such as `preiserhöhung`. In the same way, `*preis` will match `Übernachtung` and `*preis*` will match `Übernachtungspreiserhöhung`.

Built-in types

IBM SPSS Modeler Text Analytics is delivered with a set of linguistic resources in the form of shipped libraries and compiled resources. The shipped libraries contain a set of built-in type dictionaries such as `<Location>`, `<Organization>`, `<Person>`, and `<Product>`.

These type dictionaries are used by the extraction engine to assign types to the concepts it extracts such as assigned the type `<Location>` to the concept `paris`. Although a large number of terms have been defined in the built-in type dictionaries, they do not cover every possibility. Therefore, you can add to

them or create your own. For a description of the contents of a particular shipped type dictionary, read the annotation in the Type Properties dialog box. Select the type in the tree and choose **Edit > Properties** from the context menu.

Note:

In addition to the shipped libraries, the compiled resources (also used by the extraction engine) contain a large number of definitions complementary to the built-in type dictionaries, but their content is not visible in the product. You can, however, force a term that was typed by the compiled dictionaries into any other dictionary. See "Forcing terms" on page 174 for more information.

Creating types

You can create type dictionaries to help group similar terms. When terms appearing in this dictionary are discovered during the extraction process, they will be assigned to this type name and extracted under a concept name. Whenever you create a library, an empty type library is always included so that you can begin entering terms immediately.

If you are analyzing text about food and want to group terms relating to vegetables, you could create your own `<Vegetables>` type dictionary. You could then add terms such as `carrot`, `broccoli`, and `spinach` if you feel that they are important terms that will appear in the text. Then, during extraction, if any of these terms are found, they are extracted as concepts and assigned to the `<Vegetables>` type.

You do not have to define every form of a word or expression, because you can choose to generate the inflected forms of terms. By choosing this option, the extraction engine will automatically recognize singular or plural forms of the terms among other forms as belonging to this type. This option is particularly useful when your type contains mostly nouns, since it is unlikely you would want inflected forms of verbs or adjectives.

The Type Properties dialog box contains the following fields.

Name. The name you give to the type dictionary you are creating. We recommend that you do not use spaces in type names, especially if two or more type names start with the same word.

Note: There are some constraints about type names and the use of symbols. For example, do not use symbols such as "@" or "!" within the name.

Default match. The default match attribute instructs the extraction engine how to match this term to text data. Whenever you add a term to this type dictionary, this is the match attribute automatically assigned to it. You can always change the match choice manually in the term list. Options include: **Entire Term**, **Start**, **End**, **Any**, **Start or End**, **Entire and Start**, **Entire and End**, **Entire and (Start or End)**, and **Entire (no compounds)**. See the topic "Adding terms" on page 172 for more information.

Add to. This field indicates the library in which you will create your new type dictionary.

Generate inflected forms by default. This option tells the extraction engine to use grammatical morphology to capture and group similar forms of the terms that you add to this dictionary, such as singular or plural forms of the term. This option is particularly useful when your type contains mostly nouns. When you select this option, all new terms added to this type will automatically have this option although you can change it manually in the list.

Font color. This field allows you to distinguish the results from this type from others in the interface. If you select **Use parent color**, the default type color is used for this type dictionary, as well. This default color is set in the options dialog box. See the topic "Options: Display Tab" on page 70 for more information. If you select **Custom**, select a color from the drop-down list.

Annotation. This field is optional and can be used for any comments or descriptions.

To create a type dictionary

1. Select the library in which you would like to create a new type dictionary.
2. From the menus, choose **Tools > New Type**. The Type Properties dialog box opens.
3. Enter the name of your type dictionary in the **Name** text box and choose the options you want.
4. Click **OK** to create the type dictionary. The new type is visible in the library tree pane and appears in the center pane. You can begin adding terms immediately. For more information, see "Adding terms."

Note: These instructions show you how to make changes within the Resource Editor view or the Template Editor. Keep in mind that you can also do this kind of fine-tuning directly from the Extraction Results pane, Data pane, Categories pane, or Cluster Definitions dialog box in the other views. See the topic "Refining extraction results" on page 82 for more information.

Adding terms

The library tree pane displays libraries and can be expanded to show the type dictionaries that they contain. In the center pane, a term list displays the terms in the selected library or type dictionary, depending on the selection in the tree.

In the Resource Editor, you can add terms to a type dictionary directly in the term pane or through the Add New Terms dialog box. The terms that you add can be single words or compound words. You will always find a blank row at the top of the list to allow you to add a new term.

Note: These instructions show you how to make changes within the Resource Editor view or the Template Editor. Keep in mind that you can also do this kind of fine-tuning directly from the Extraction Results pane, Data pane, Categories pane, or Cluster Definitions dialog box in the other views. See the topic "Refining extraction results" on page 82 for more information.

Term column

In this column, enter single or compound words into the cell. The color in which the term appears depends on the color for the type in which the term is stored or forced. You can change type colors in the Type Properties dialog box. See the topic "Creating types" on page 171 for more information.

Force column

In this column, by putting a pushpin icon into this cell, the extraction engine knows to ignore any other occurrences of this same term in other libraries. See the topic "Forcing terms" on page 174 for more information.

Match column

In this column, select a match option to instruct the extraction engine how to match this term to text data. See the table for examples. You can change the default value by editing the type properties. See the topic "Creating types" on page 171 for more information. From the menus, choose **Edit > Change Match**. The following are the basic match options since combinations of these are also possible:

- **Start**. If the term in the dictionary matches the first word in a concept extracted from the text, this type is assigned. For example, if you enter `apple`, `apple tart` will be matched.
- **End**. If the term in the dictionary matches the last word in a concept extracted from the text, this type is assigned. For example, if you enter `apple`, `cider apple` will be matched.
- **Any**. If the term in the dictionary matches any word of a concept extracted from the text, this type is assigned. For example, if you enter `apple`, the **Any** option will type `apple tart`, `cider apple`, and `cider apple tart` the same way.

- **Entire Term**. If the entire concept extracted from the text matches the exact term in the dictionary, this type is assigned. Adding a term as **Entire term**, **Entire and Start**, **Entire and End**, **Entire and Any**, or **Entire (no compounds)** will force the extraction of a term.

  Furthermore, since the `<Person>` type extracts only two part names, such as *edith piaf* or *mohandas gandhi*, you may want to explicitly add the first names to this type dictionary if you are trying to extract a first name when no last name is mentioned. For example, if you want to catch all instances of *edith* as a name, you should add `edith` to the `<Person>` type using **Entire term** or **Entire and Start**.
- **Entire (no compounds)**. If the entire concept extracted from the text matches the exact term in the dictionary, this type is assigned and the extraction is stopped to prohibit the extraction from matching the term to a longer compound. For example, if you enter `apple`, the **Entire (no compound)** option will type `apple` and not extract the compound `apple sauce` unless it is forced in somewhere else.

In the following table, assume that the term `apple` is in a type dictionary. Depending on the match option, this table shows which concepts would be extracted and typed if they were found in the text.

Table 38. Matching Examples

Match options for the term:  **`apple`**	**Extracted concepts**			
	`apple`	**`apple`** *tart*	*ripe* **`apple`**	*homemade* **`apple`** *tart*
Entire Term	✔			
Start		✔		
End			✔	
Start or End		✔	✔	
Entire and Start	✔	✔		
Entire and End	✔		✔	
Entire and (Start or End)	✔	✔	✔	
Any		✔	✔	✔
Entire and Any	✔	✔	✔	✔
Entire (no compounds)	✔	*never extracted*	*never extracted*	*never extracted*

Inflect column

In this column, select whether the extraction engine should generate inflected forms of this term during extraction so that they are all grouped together. The default value for this column is defined in the Type Properties but you can change this option on a case-by-case basis directly in the column. From the menus, choose **Edit > Change Inflection**.

Type column

In this column, select a type dictionary from the drop-down list. The list of types is filtered according to your selection in the library tree pane. The first type in the list is always the default type selected in the library tree pane. From the menus, choose **Edit > Change Type**.

Library column

In this column, the library in which your term is stored appears. You can drag and drop a term into another type in the library tree pane to change its library.

To add a single term to a type dictionary

1. In the library tree pane, select the type dictionary to which you want to add the term.
2. In the term list in the center pane, type your term in the first available empty cell and set any options you want for this term.

To add multiple terms to a type dictionary

1. In the library tree pane, select the type dictionary to which you want to add terms.
2. From the menus, choose **Tools > New Terms**. The Add New Terms dialog box opens.
3. Enter the terms you want to add to the selected type dictionary by typing the terms or copying and pasting a set of terms. If you enter multiple terms, you must separate them using the delimiter that is defined in the Options dialog, or add each term on a new line. See the topic "Setting Options" on page 69 for more information.
4. Click **OK** to add the terms to the dictionary. The match option is automatically set to the default option for this type library. The dialog box closes and the new terms appear in the dictionary.

Forcing terms

If you want a term to be assigned to a particular type, you can add it to the corresponding type dictionary. However, if there are multiple terms with the same name, the extraction engine must know which type should be used. Therefore, you will be prompted to select which type should be used. This is called *forcing* a term into a type. This option is most useful when overriding the type assignment from a compiled (internal, non-editable) dictionary. In general, we recommend avoiding duplicate terms altogether.

Forcing will not *remove* the other occurrences of this term; rather, they will be ignored by the extraction engine. You can later change which occurrence should be used by forcing or unforcing a term. You may also need to force a term into a type dictionary when you add a public library or update a public library.

You can see which terms are forced or ignored in the Force column, the second column in the term pane. If a pushpin icon appears, this means that this occurrence of the term has been forced. If a black X icon appears, this means that this occurrence of the term will be ignored during extraction because it has been forced elsewhere. Additionally, when you force a term, it will appear in the color for the type in which it was forced. This means that if you forced a term that is in both `Type 1` and `Type 2` into `Type 1`, any time you see this term in the window, it will appear in the font color defined for `Type 1`.

You can double-click the icon in order to change the status. If the term appears elsewhere, a Resolve Conflicts dialog box opens to allow you to select which occurrence should be used.

Renaming types

You can rename a type dictionary or change other dictionary settings by editing the type properties.

Important: We recommend that you do not use spaces in type names, especially if two or more type names start with the same word. We also recommend that you do not rename the types in the Core or Opinions libraries or change their default match attributes.

To rename a type

1. In the library tree pane, select the type dictionary you want to rename.
2. Right-click your mouse and choose **Type Properties** from the context menu. The Type Properties dialog box opens.
3. Enter the new name for your type dictionary in the Name text box.
4. Click **OK** to accept the new name. The new type name is visible in the library tree pane.

Moving types

You can drag a type dictionary to another location within a library or to another library in the tree.

To reorder a type within a library

1. In the library tree pane, select the type dictionary you want to move.
2. From the menus, choose **Edit > Move Up** to move the type dictionary up one position in the library tree pane or **Edit > Move Down** to move it down one position.

To move a type to another library

1. In the library tree pane, select the type dictionary you want to move.
2. Right-click your mouse and choose **Type Properties** from the context menu. The Type Properties dialog box opens. (You can also drag and drop the type into another library).
3. In the Add To list box, select the library to which you want to move the type dictionary.
4. Click **OK**. The dialog box closes, and the type is now in the library you selected.

Disabling and deleting types

If you want to temporarily remove a type dictionary, you can disable it by deselecting the check box to the left of the dictionary name in the library tree pane. This signals that you want to keep the dictionary in your library but want the contents ignored during conflict checking and during the extraction process.

You can also permanently delete type dictionaries from a library.

To disable a type dictionary

1. In the library tree pane, select the type dictionary you want to disable.
2. Click the spacebar. The check box to the left of the type name is cleared.

To delete a type dictionary

1. In the library tree pane, select the type dictionary you want to delete.
2. From the menus, choose **Edit > Delete** to delete the type dictionary.

Substitution/Synonym dictionaries

A *substitution dictionary* is a collection of terms that help to group similar terms under one target term. Substitution dictionaries are managed in the bottom pane of the Library Resources tab. You can access this view with **View > Resource Editor** in the menus, if you are in an interactive workbench session. Otherwise, you can edit dictionaries for a specific template in the Template Editor.

You can define two forms of substitutions in this dictionary: *synonyms* and *optional elements*. You can click the tabs in this pane to switch between them.

After you run an extraction on your text data, you may find several concepts that are synonyms or inflected forms of other concepts. By identifying optional elements and synonyms, you can force the extraction engine to map these to one single target term.

Substituting using synonyms and optional elements reduces the number of concepts in the Extraction Results pane by combining them together into more significant, representative concepts with higher frequency Doc. counts.

Synonyms

Synonyms associate two or more words that have the same meaning. You can also use synonyms to group terms with their abbreviations or to group commonly misspelled words with the correct spelling. You can define these synonyms on the Synonyms tab.

A synonym definition is made up of two parts. The first is a **Target** term, which is the term under which you want the extraction engine to group all synonym terms. Unless this target term is used as a synonym of another target term or unless it is excluded, it is likely to become the concept that appears in the Extraction Results pane. The second is the list of synonyms that will be grouped under the target term.

For example, if you want `automobile` to be replaced by `vehicle`, then `automobile` is the synonym and `vehicle` is the target term.

You can enter any words into the **Synonym** column, but if the word is not found during extraction and the term had a match option with `Entire`, then no substitution can take place. However, the target term does not need to be extracted for the synonyms to be grouped under this term.

Optional elements

Optional elements identify optional words in a compound term that can be ignored during extraction in order to keep similar terms together even if they appear slightly different in the text. Optional elements are single words that, if removed from a compound, could create a match with another term. These single words can appear anywhere within the compound--at the beginning, middle, or end. You can define optional elements on the Optional tab.

For example, to group the terms `ibm` and `ibm corp` together, you should declare `corp` to be treated as an optional element in this case. In another example, if you designate the term `access` to be an optional element and during extraction both `internet access speed` and `internet speed` are found, they will be grouped together under the term that occurs most frequently.

Defining synonyms

On the Synonyms tab, you can enter a synonym definition in the empty line at the top of the table. Begin by defining the target term and its synonyms. You can also select the library in which you would like to store this definition. During extraction, all occurrences of the synonyms will be grouped under the target term in the final extraction. See the topic "Adding terms" on page 172 for more information.

For example, if your text data includes a lot of telecommunications information, you may have these terms: `cellular phone`, `wireless phone`, and `mobile phone`. In this example, you may want to define `cellular` and `mobile` as synonyms of `wireless`. If you define these synonyms, then every extracted occurrence of `cellular phone` and `mobile phone` will be treated as the same term as `wireless phone` and will appear together in the term list.

When you are building your type dictionaries, you may enter a term and then think of three or four synonyms for that term. In that case, you could enter all of the terms and then your target term into the substitution dictionary and then drag the synonyms.

Synonym substitution is also applied to the inflected forms (such as the plural form) of the synonym. Depending on the context, you may want to impose constraints on how terms are substituted. Certain characters can be used to place limits on how far the synonym processing should go:

- **Exclamation mark (!).** When the exclamation mark directly precedes the synonym `!synonym`, this indicates that no inflected forms of the synonym will be substituted by the target term. However, an exclamation mark directly preceding the target term `!target-term` means that you do not want any part of the compound target term or variants to receive any further substitutions.
- **Asterisk (*).** An asterisk placed directly after a synonym, such as `synonym*`, means that you want this word to be replaced by the target term. For example, if you defined `manage*` as the synonym and `management` as the target, then `associate managers` will be replaced by the target term `associate management`. You can also add a space and an asterisk after the word (`synonym *`) such as `internet *`. If you defined the target as `internet` and the synonyms as `internet * *` and `web *`, then `internet access card` and `web portal` would be replaced with `internet`. You cannot begin a word or string with the asterisk wildcard in this dictionary.
- **Caret (^).** A caret and a space preceding the synonym, such as `^ synonym`, means that the synonym grouping applies only when the term begins with the synonym. For example, if you define `^ wage` as the synonym and `income` as the target and both terms are extracted, then they will be grouped together under the term `income`. However, if `minimum wage` and `income` are extracted, they will not be grouped together, since `minimum wage` does not begin with `wage`. A space must be placed between this symbol and the synonym.
- **Dollar sign ($).** A space and a dollar sign following the synonym, such as `synonym $`, means that the synonym grouping applies only when the term ends with the synonym. For example, if you define `cash $` as the synonym and `money` as the target and both terms are extracted, then they will be grouped together under the term `money`. However, if `cash cow` and `money` are extracted, they will not be grouped together, since `cash cow` does not end with `cash`. A space must be placed between this symbol and the synonym.
- **Caret (^) and dollar sign ($).** If the caret and dollar sign are used together, such as `^ synonym $`, a term matches the synonym only if it is an exact match. This means that no words can appear before or after the synonym in the extracted term in order for the synonym grouping to take place. For example, you may want to define `^ van $` as the synonym and `truck` as the target so that only `van` is grouped with `truck`, while `marie van guerin` will be left unchanged. Additionally, whenever you define a synonym using the caret and dollar signs and this word appears anywhere in the source text, the synonym is automatically extracted.

To add a synonym entry

1. With the substitution pane displayed, click the **Synonyms** tab in the lower left corner.
2. In the empty line at the top of the table, enter your target term in the Target column. The target term you entered appears in color. This color represents the type in which the term appears or is forced, if that is the case. If the term appears in black, this means that it does not appear in any type dictionaries.
3. Click the second cell to the right of the target and enter the set of synonyms. Separate each entry using the global delimiter as defined in the Options dialog box. See the topic “Setting Options” on page 69 for more information. The terms that you enter appear in color. This color represents the type in which the term appears. If the term appears in black, this means that it does not appear in any type dictionaries.
4. Click the last cell to select the library in which you want to store this synonym definition.

Note: These instructions show you how to make changes within the Resource Editor view or the Template Editor. Keep in mind that you can also do this kind of fine-tuning directly from the Extraction

Results pane, Data pane, Categories pane, or Cluster Definitions dialog box in the other views. See the topic "Refining extraction results" on page 82 for more information.

Defining optional elements

On the Optional tab, you can define optional elements for any library you want. These entries are grouped together for each library. As soon as a library is added to the library tree pane, an empty optional element line is added to the Optional tab.

All entries are transformed into lowercase words automatically. The extraction engine will match entries to both lowercase and uppercase words in the text.

Note: Terms are delimited using the delimiter defined in the Options dialog. See the topic "Setting Options" on page 69 for more information. If the optional element that you are entering includes the same delimiter as part of the term, a backslash must precede it.

To add an entry

1. With the substitution pane displayed, click the Optional tab in the lower left corner of the editor.
2. Click in the cell in the Optional Elements column for the library to which you want to add this entry.
3. Enter the optional element. Separate each entry using the global delimiter as defined in the Options dialog box. See the topic "Setting Options" on page 69 for more information.

Disabling and Deleting Substitutions

You can remove an entry in a temporary manner by disabling it in your dictionary. By disabling an entry, the entry will be ignored during extraction.

You can also delete any obsolete entries in your substitution dictionary.

To Disable an Entry

1. In your dictionary, select the entry you want to disable.
2. Click the spacebar. The check box to the left of the entry is cleared.

Note: You can also deselect the check box to the left of the entry to disable it.

To Delete a Synonym Entry

1. In your dictionary, select the entry you want to delete.
2. From the menus, choose **Edit > Delete** or press the **Delete** key on your keyboard. The entry is no longer in the dictionary.

To Delete an Optional Element Entry

1. In your dictionary, double-click the entry you want to delete.
2. Manually delete the term.
3. Press Enter to apply the change.

Exclude dictionaries

An *exclude dictionary* is a list of words, phrases, or partial strings. Any terms matching or containing an entry in the exclude dictionary will be ignored or excluded from extraction. Exclude dictionaries are managed in the right pane of the editor. Typically, the terms that you add to this list are fill-in words or phrases that are used in the text for continuity but that do not really add anything important to the text and may clutter the extraction results. By adding these terms to the exclude dictionary, you can make sure that they are never extracted.

Exclude dictionaries are managed in the upper right pane of Library Resources tab in the editor. You can access this view with **View > Resource Editor** in the menus, if you are in an interactive workbench session. Otherwise, you can edit dictionaries for a specific template in the Template Editor.

In the exclude dictionary, you can enter a word, phrase, or partial string in the empty line at the top of the table. You can add character strings to your exclude dictionary as one or more words or even partial words using the asterisk as a wildcard. The entries declared in the exclude dictionary will be used to bar concepts from extraction. If an entry is also declared somewhere else in the interface, such as in a type dictionary, it is shown with a strike-through in the other dictionaries, indicating that it is currently excluded. This string does not have to appear in the text data or be declared as part of any type dictionary to be applied.

Note: If you add a concept to the exclude dictionary that also acts as the target in a synonym entry, then the target and all of its synonyms will also be excluded. See the topic "Defining synonyms" on page 176 for more information.

Using wildcards (*)

can use the asterisk wildcard to denote that you want the exclude entry to be treated as a partial string. Any terms found by the extraction engine that contain a word that begins or ends with a string entered in the exclude dictionary will be excluded from the final extraction. However, there are two cases where the wildcard usage is not permitted:

- Dash character (-) preceded by an asterisk wildcard, such as *-
- Apostrophe (') preceded by an asterisk wildcard, such as *'*s*

Table 39. Examples of exclude entries

Entry	Example	Results
word	*next*	No concepts (or its terms) will be extracted if they contain the word *next*.
phrase	*for example*	No concepts (or its terms) will be extracted if they contain the phrase *for example*.
partial	*copyright**	Will exclude any concepts (or its terms) matching or containing the variations of the word *copyright*, such as `copyrighted`, `copyrighting`, `copyrights`, or `copyright 2010`.
partial	**ware*	Will exclude any concepts (or its terms) matching or containing the variations of the word *ware*, such as `freeware`, `shareware`, `software`, `hardware`, `beware`, or `silverware`.

To add entries

- In the empty line at the top of the table, enter a term. The term that you enter appears in color. This color represents the type in which the term appears. If the term appears in black, this means that it does not appear in any type dictionaries.

To disable entries

You can temporarily remove an entry by disabling it in your exclude dictionary. By disabling an entry, the entry will be ignored during extraction.

1. In your exclude dictionary, select the entry that you want to disable.
2. Click the spacebar. The check box to the left of the entry is cleared.

Note: You can also deselect the check box to the left of the entry to disable it.

To delete entries

You can delete any unneeded entries in your exclude dictionary.

1. In your exclude dictionary, select the entry that you want to delete.
2. From the menus, choose **Edit > Delete**. The entry is no longer in the dictionary.

Chapter 17. About Advanced Resources

In addition to type, exclude and substitution dictionaries, you can also work with a variety of advanced resource settings such as Fuzzy Grouping settings or nonlinguistic type definitions. You can work with these resources in the Advanced Resources tab in the Template Editor or Resource Editor view.

When you go to the Advanced Resources tab, you can edit the following information:

- **Target language for resources.** Used to select the language for which the resources will be created and tuned. See the topic "Target Language for Resources" on page 183 for more information.
- **Fuzzy Grouping (Exceptions).** Used to exclude word pairs from the fuzzy grouping (spelling error correction) algorithm. See the topic "Fuzzy Grouping" on page 183 for more information.
- **Nonlinguistic Entities.** Used to enable and disable which nonlinguistic entities can be extracted, as well as the regular expressions and the normalization rules that are applied during their extraction. See the topic "Nonlinguistic Entities" on page 184 for more information.
- **Language Handling.** Used to declare the special ways of structuring sentences (extraction patterns and forced definitions) and using abbreviations for the selected language. See the topic "Language Handling" on page 188 for more information.

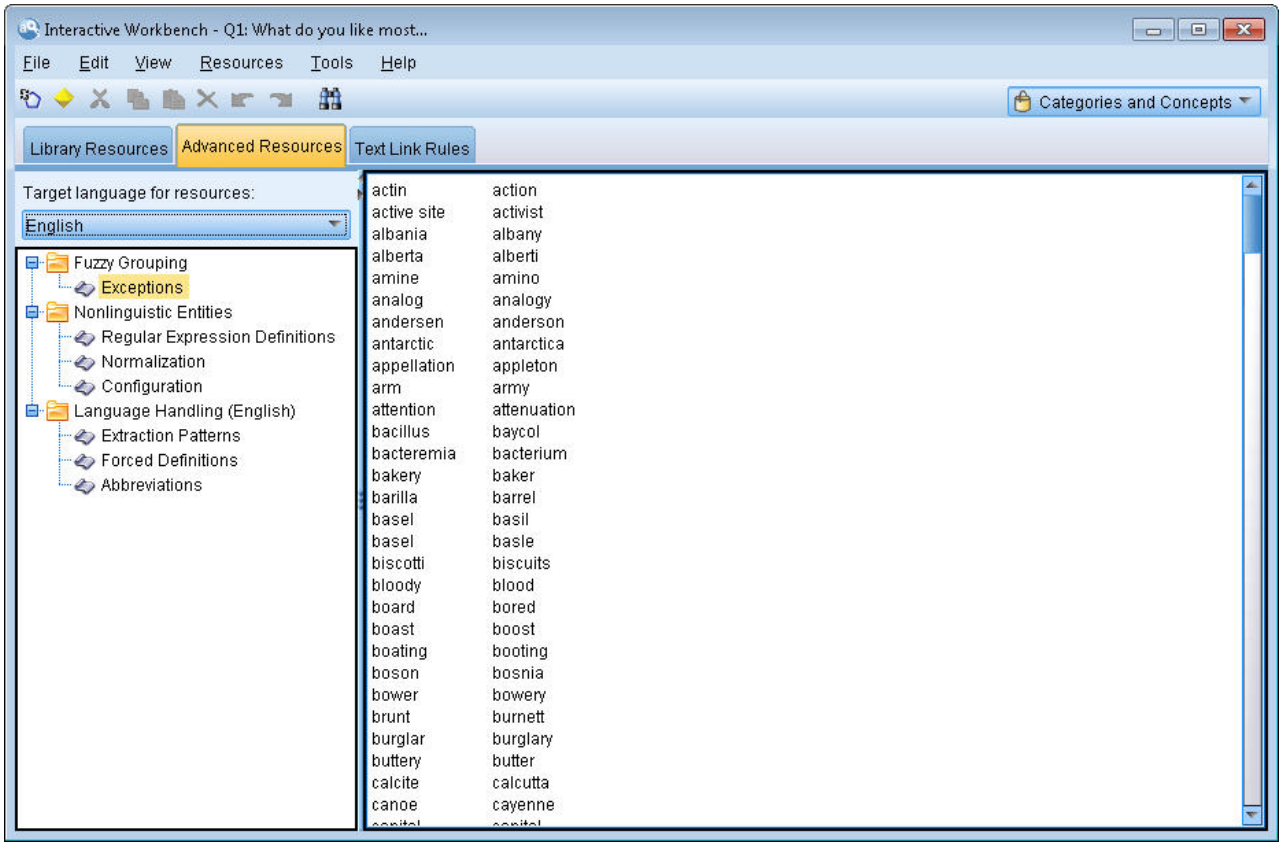


Figure 40. Text Mining Template Editor - Advanced Resources tab

Note: You can use the Find/Replace toolbar to find information quickly or to make uniform changes to a section. For more information, see "Replacing" on page 182.

To Edit Advanced Resources

1. Locate and select the resource section that you want to edit. The contents appear in the right pane.
2. Use the menu or the toolbar buttons to cut, copy, or paste content, if necessary.
3. Edit the file(s) that you want to change using the formatting rules in this section. Your changes are saved as soon as you make them. Use the undo or redo arrows on the toolbar to revert to the previous changes.

Finding

In some cases, you may need to locate information quickly in a particular section. For example, if you perform text link analysis, you may have hundreds of macros and pattern definitions. Using the Find feature, you can find a specific rule quickly. To search for information in a section, you can use the Find toolbar.

To Use the Find Feature

1. Locate and select the resource section that you want to search. The contents appear in the right pane of the editor.
2. From the menus, choose **Edit > Find**. The Find toolbar appears at the upper right of the Edit Advanced Resources dialog box.
3. Enter the word string that you want to search for in the text box. You can use the toolbar buttons to control the case sensitivity, partial matching, and direction of the search.
4. Click **Find** to start the search. If a match is found, the text is highlighted in the window.
5. Click **Find** again to look for the next match.

Note: When working in the Text Link Rules tab, the Find option is only available when you view the source code.

Replacing

In some cases, you may need to make broader updates to your advanced resources. The Replace feature can help you to make uniform updates to your content.

To Use the Replace Feature

1. Locate and select the resource section in which you want to search and replace. The contents appear in the right pane of the editor.
2. From the menus, choose **Edit > Replace**. The Replace dialog box opens.
3. In the **Find what** text box, enter the word string that you want to search for.
4. In the **Replace with** text box, enter the string that you want to use in place of the text that was found.
5. Select **Match whole word only** if you want to find or replace only complete words.
6. Select **Match case** if you want to find or replace only words that match the case exactly.
7. Click **Find Next** to find a match. If a match is found, the text is highlighted in the window. If you do not want to replace this match, click **Find Next** again until you find a match that you want to replace.
8. Click **Replace** to replace the selected match.
9. Click **Replace** to replace all matches in the section. A message opens with the number of replacements made.
10. When you are finished making your replacements, click **Close**. The dialog box closes.

Note: If you made a replacement error, you can undo the replacement by closing the dialog box and choosing **Edit > Undo** from the menus. You must perform this once for every change that you want to undo.

Target Language for Resources

Resources are created for a particular text language. The language for which these resources are tuned is defined in the Advanced Resources tab. You can switch to another language if necessary by selecting that language in the **Target language for resources** combobox. Additionally, the language listed here will appear as the language for any text analysis packages you create with these resources.

Important: You will rarely ever need to change the language in your resources. Doing so can cause issues when your resources no longer match the extraction language. Though rarely employed, you might change a language if you planned to use the `ALL` language option during extraction because you expected to have text in more than one language. By changing the language, you can access, for example, the language handling resources for extraction patterns, abbreviations and force definitions for the secondary language you are interested in. However, keep in mind that before publishing or saving the resource changes you've made or running another extraction, set the language back to the primary language you are interested in extracting.

Fuzzy Grouping

In the Text Mining node and Extraction Settings, if you select **Accommodate spelling for a minimum root character limit of**, you have enabled the fuzzy grouping algorithm.

Fuzzy grouping helps to group commonly misspelled words or closely spelled words by temporarily stripping all vowels (except for the first vowel) and double or triple consonants from extracted words and then comparing them to see if they are the same. During the extraction process, the fuzzy grouping feature is applied to the extracted terms and the results are compared to determine whether any matches are found. If so, the original terms are grouped together in the final extraction list. They are grouped under the term that occurs most frequently in the data.

Note: If the two terms being compared are assigned to different types, excluding the `<Unknown>` type, then the fuzzy grouping technique is not be applied to this pair. In other words, the terms must belong to the same type or the `<Unknown>` type in order for the technique to be applied.

If you enabled this feature and found that two words with similar spelling were incorrectly grouped together, you may want to exclude them from fuzzy grouping. You can do this by entering the incorrectly matched pairs into the Exceptions section in the Advanced Resources tab. See the topic Chapter 17, “About Advanced Resources,” on page 181 for more information.

The following example demonstrates how fuzzy grouping is performed. If fuzzy grouping is enabled, these words appear to be the same and are matched in the following manner:

```
color  -> colr                mountain -> montn
colour -> colr                montana  -> montn

modeling  -> modlng           furniture -> furntr
modelling -> modlng           furnature -> furntr
```

In the preceding example, you would most likely want to exclude `mountain` and `montana` from being grouped together. Therefore, you could enter them in the Exceptions section in the following manner:

```
mountain      montana
```

Important: In some cases, fuzzy grouping exceptions do not stop 2 words from being paired because certain synonym rules are being applied. In that case, you may want to try entering synonyms using the exclamation mark wildcard (!) to prohibit the words from becoming synonymous in the output. For more information, see "Defining synonyms" on page 176.

Formatting Rules for Fuzzy Grouping Exceptions

- Define only one exception pair per line.
- Use simple or compound words.
- Use only lowercase characters for the words. Uppercase words will be ignored.
- Use a TAB character to separate each word in a pair.

Nonlinguistic Entities

When working with certain kinds of data, you might be very interested in extracting dates, social security numbers, percentages, or other nonlinguistic entities. These entities are explicitly declared in the configuration file, in which you can enable or disable the entities. See the topic "Configuration" on page 187 for more information. In order to optimize the output from the extraction engine, the input from nonlinguistic processing is normalized to group like entities according to predefined formats. See the topic "Normalization" on page 187 for more information.

Note: You can turn on and off nonlinguistic entity extraction in the extraction settings.

Available Nonlinguistic Entities

The nonlinguistic entities in the following table can be extracted. The type name is in parentheses.

Table 40. Nonlinguistic entities that can be extracted

Addresses	(<Address>)
Amino acids	(<Aminoacid>)
Currencies	(<Currency>)
Dates	(<Date>)
Delay	(<Delay>)
Digits	(<Digit>)
E-mail addresses	(<email>)
HTTP/URL addresses	(<url>)
IP address	(<IP>
Organizations	(<Organization>)
Percentages	(<Percent>)
Products	(<Product>)
Proteins	(<Gene>)
Phone numbers	(<PhoneNumber>)
Times	(<Time>)
U.S. social security	(<SocialSecurityNumber>)
Weights and measures	(<Weights-Measures>)

Cleaning Text for Processing

Before nonlinguistic entities extraction occurs, the input text is cleaned. During this step, the following temporary changes are made so that nonlinguistic entities can be identified and extracted as such:

- Any sequence of two or more spaces is replaced by a single space.
- Tabulations are replaced by space.
- Single end-of-line characters or sequence characters are replaced by a space, while multiple end-of-line sequences are marked as end of a paragraph. End of line can be denoted by carriage returns (CR) and line feed (LF) or even both together.
- HTML and XML tags are temporarily stripped and ignored.

Regular Expression Definitions

When extracting nonlinguistic entities, you may want to edit or add to the regular expression definitions that are used to identify regular expressions. This is done in the **Regular Expression Definitions** section in the Advanced Resources tab. See the topic Chapter 17, "About Advanced Resources," on page 181 for more information.

The file is broken up into distinct sections. The first section is called `[macros]`. In addition to that section, an additional section can exist for each nonlinguistic entity. You can add sections to this file. Within each section, rules are numbered (*regexp1*, *regexp2*, and so on). These rules must be numbered sequentially from 1–*n*. Any break in numbering will cause the processing of this file to be suspended altogether.

In certain cases, an entity is language dependent. An entity is considered to be language dependent if it takes a value other than 0 for the language parameter in the configuration file. See the topic "Configuration" on page 187 for more information. When an entity is language dependent, the language must be used to prefix the section name, such as `[english/PhoneNumber]`. That section would contain rules that apply only to English phone numbers when the `PhoneNumber` entity is given a value of 2 for the language.

Important! If you make changes to this file or any other in the editor and the extraction engine no longer works as desired, use the **Reset to Original** option on the toolbar to reset the file to the original shipped content. This file requires a certain level of familiarity with regular expressions. If you require additional assistance in this area, please contact IBM Corp. for help.

Special Characters . [] {} () \ * + ? | ^ $

All characters match themselves except for the following special characters, which are used for a specific purpose in expressions: `.[{()\*+?|^$` To use these characters as such, they must be preceded by a backslash (\) in the definition.

For example, if you were trying to extract Web addresses, the full stop character is very important to the entity, therefore, you must backslash it such as:

```
www\.[a-z]+\.[a-z]+
```

Repetition Operators and Quantifiers ? + * {}

To enable the definitions to be more flexible, you can use several wildcards that are standard to regular expressions. They are `* ? +`

- *Asterisk* * indicates that there are *zero or more* of the preceding string. For example, `ab*c` matches "*ac*", "*abc*", "*abbbc*", and so on.
- *Plus sign* + indicates that there is *one or more* of the preceding string. For example, `ab+c` matches "*abc*", "*abbc*", "*abbbc*", but not "*ac*".
- *Question mark ?* indicates that there is *zero or one* of the preceding string. For example, `model?ing` matches both "*modeling*" and "*modeling*".
- *Limiting repetition with brackets {}* indicates the bounds of the repetition. For example, `[0-9]{n}` matches a digit repeated exactly *n* times. For example, `[0-9]{4}` will match "*1998*", but neither "*33*" nor "*19983*".

`[0-9]{n,}` matches a digit repeated *n or more* times. For example, `[0-9]{3,}` will match "*199*" or "*1998*", but not "*19*".

`[0-9]{n,m}` matches a digit repeated between *n and m times inclusive* . For example, `[0-9]{3,5}` will match "*199*", "*1998*" or "*19983*", but not "*19*" nor "*199835*".

Optional Spaces and Hyphens

In some cases, you want to include an optional space in a definition. For example, if you wanted to extract currencies such as "*uruguayan pesos*", "*uruguayan peso*", "*uruguay pesos*", "*uruguay peso*", "*pesos*" or "*peso*", you would need to deal with the fact that there may be two words separated by a space. In this case, this definition should be written as `(uruguayan |uruguay )?pesos?`. Since *uruguayan* or *uruguay* are followed by a space when used with *pesos/peso*, the optional space must be defined within the optional sequence `(uruguayan |uruguay )`. If the space was not in the optional sequence such as `(uruguayan|uruguay)? pesos?`, it would not match on "*pesos*" or "*peso*" since the space would be required.

If you are looking for a series of things including a hyphen characters (-) in a list, then the hyphen must be defined last. For example, f you are looking for a comma (,) or a hyphen (-), use `[,-]` and never `[-,]`.

Order of Strings in Lists and Macros

You should always define the longest sequence before a shorter one or else the longest will never be read since the match will occur on the shorter one. For example, if you were looking for strings "*billion*" or "*bill*", then "*billion*" must be defined before "*bill*". So for instance `(billion|bill)` and not `(bill|billion)`. This also applies to macros, since macros are lists of strings.

Order of Rules in the Definition Section

Define one rule per line. Within each section, rules are numbered (*regexp1*, *regexp2*, and so on). These rules must be numbered sequentially from 1–*n*. Any break in numbering will cause the processing of this file to be suspended altogether. To disable an entry, place a # symbol at the beginning of each line used to define the regular expression. To enable an entry, remove the # character before that line.

In each section, the most specific rules must be defined before the most general ones to ensure proper processing. For example, if you were looking for a date in the form "*month year*" and in the form "*month*", then the "*month year*" rule must be defined before the "*month*" rule. Here is how it should be defined:

```
#@# January 1932
regexp1=$(MONTH),? [0-9]{4}

#@# January
regexp2=$(MONTH)
```

and not

```
#@# January
regexp1=$(MONTH)

#@# January 1932
regexp2=$(MONTH),? [0-9]{4}
```

Using Macros in Rules

Whenever a specific sequence is used in several rules, you can use a macro. Then, if you need to change the definition of this sequence, you will need to change it only once, and not in all the rules referring to it. For example, assuming you had the following macro:

```
MONTH=((january|february|march|april|june|july|august|september|october|
november|december)|(jan|feb|mar|apr|may|jun|jul|aug|sep|oct|nov|dec)(\.)?)
```

Whenever you refer to the name of the macro, it must be enclosed in $(), such as: regexp1=$(MONTH)

All macros must be defined in the [macros] section.

Normalization

When extracting nonlinguistic entities, the entities encountered are normalized to group like entities according to predefined formats. For example, currency symbols and their equivalent in words are treated as the same. The normalization entries are stored in the **Normalization** section in the Advanced Resources tab. See the topic Chapter 17, “About Advanced Resources,” on page 181 for more information. The file is broken up into distinct sections.

Important! This file is for advanced users only. It is highly unlikely that you would need to change this file. If you require additional assistance in this area, please contact IBM Corp. for help.

Formatting Rules for Normalization

- Add only one normalization entry per line.
- Strictly respect the sections in this file. No new sections can be added.
- To disable an entry, place a # symbol at the beginning of that line. To enable an entry, remove the # character before that line.

English Dates in Normalization

By default dates in an English template are recognized in the American style date format; that is: month, date, year. If you need to change that to the day, month, year format, disable the "format:US" line (by adding # at the beginning of the line) and enable "format:UK" (by removing the # from that line).

Configuration

You can enable and disable the nonlinguistic entity types that you want to extract in the nonlinguistic entity configuration file. By disabling the entities that you do not need, you can decrease the processing time required. This is done in the **Configuration** section in the Advanced Resources tab. See the topic Chapter 17, “About Advanced Resources,” on page 181 for more information. If nonlinguistic extraction is enabled, the extraction engine reads this configuration file during the extraction process to determine which nonlinguistic entity types should be extracted.

The syntax for this file is as follows:

#name<TAB>*Language*<TAB>*Code*

Table 41. Syntax for configuration file.

Column label	Description
#name	The wording by which nonlinguistic entities will be referenced in the two other required files for nonlinguistic entity extraction. The names used here are case sensitive.
Language	The language of the documents . It is best to select the specific language; however, an **Any** option exists. Possible options are: 0 = Any which is used whenever a regexp is not specific to a language and could be used in several templates with different languages, for instance an IP/URL/email addresses; 1 = French; 2 = English; 4 = German; 5 = Spanish; 6 = Dutch; 8 = Portuguese; 10 = Italian.
Code	Part-of-speech code. Most entities take a value of “s” except in a few cases. Possible values are: s = stopword; a = adjective; n = noun. If enabled, nonlinguistic entities are first extracted and the extraction patterns are applied to identify its role in a larger context. For example, percentages are given a value of “a.” Suppose that 30% is extracted as an nonlinguistic entity. It would be identified as an adjective. Then if your text contained "30% salary increase," the “30%” nonlinguistic entity fits the part-of-speech pattern “ann” (adjective noun noun).

Order in Defining Entities

The order in which the entities are declared in this file is important and affects how they are extracted. They are applied in the order listed. Changing the order will change the results. The most specific nonlinguistic entities must be defined before more general ones.

For example, the nonlinguistic entity "Aminoacid" is defined by:

```
regexp1=($(AA)-?$(NUM))
```

where $(AA) corresponds to "(ala|arg|asn|asp|cys|gln|glu|gly|his|ile|leu|lys|met|phe|pro|ser)", which are specific 3-letter sequences corresponding to particular amino acids.

On the other hand, the nonlinguistic entity "Gene" is more general and is defined by:

```
regexp1=p[0-9]{2,3}
regexp2=[a-z]{2,4}-?[0-9]{1,3}-?[r]
regexp3=[a-z]{2,4}-?[0-9]{1,3}-?p?
```

If "Gene" is defined before "Aminoacid" in the Configuration section, then "Aminoacid" will never be matched, since regexp3 from "Gene" will always match first.

Formatting Rules for Configuration

- Use a TAB character to separate each entry in a column.
- Do not delete any lines.
- Respect the syntax shown in the preceding table.
- To disable an entry, place a # symbol at the beginning of that line. To enable an entity, remove the # character before that line.

Language Handling

Every language used today has special ways of expressing ideas, structuring sentences, and using abbreviations. In the Language Handling section, you can edit extraction patterns, force definitions for those patterns, and declare abbreviations for the language that you have selected in the Language drop-down list.

- Extraction patterns
- Forced definitions
- Abbreviations

Extraction patterns

When extracting information from your documents, the extraction engine applies a set of parts-of-speech extraction patterns to a "stack" of words in the text to identify candidate terms (words and phrases) for extraction. You can add or modify the extraction patterns.

Parts of speech include grammatical elements, such as nouns, adjectives, past participles, determiners, prepositions, coordinators, first names, initials, and particles. A series of these elements makes up a part-of-speech extraction pattern. In IBM Corp. text mining products, each part of speech is represented by a single character to make it easier to define your patterns. For instance, an adjective is represented by the lowercase letter *a*. The set of supported codes appears by default at the top of each default extraction patterns section along with a set of patterns and examples of each pattern to help you understand each code that is used.

Formatting rules for extraction patterns

- One pattern per line.
- Use # at the beginning of a line to disable a pattern.

The order in which you list the extraction patterns is very important because a given sequence of words is read only once by the extraction engine and is assigned to the first extraction patterns for which the engine finds a match.

Supported parts of speech codes

Following is a table of all supported parts of speech codes defined in the English compiled dictionary.

All the parts of speech that are used in a particular template are listed at the top of **Advanced Resources > Extraction patterns**.

The main difference between the basic resources template and the opinions template is that when minimal determiners ("d") and prepositions ("c") are used in basic, their extended equivalents ("e" and "r") are used in opinions. Also, in the opinions template, all words with both "a" and "Q" parts of speech will only be processed as "Q." "0," "1," and "2" have a limited use in all the opinions templates. See **Advanced Resources > Language Handling (English) > Forced Definitions and Extraction patterns**.

Other English templates may use some parts of speech not listed in the dictionary (for instance, "w" and "W", in the Market Intelligence template). But in that case, those parts of speech are assigned to specific words under **Advanced Resources > Forced Definitions**.

Table 42. Supported parts of speech codes

Code	Meaning	Example
a	adjective	abdominal, blue...
A	unused	unused
b	adverb	frequently, often, very, ...
B	unused	unused
c	preposition	"of"
C	internal code for misspelled words	
d	determiner	"the"
D	unused	unused
e	extended	determiner the, an, my, your...
E	unused	unused
f	first name	John, Mary...
F	unused	unused
g	unused	unused
G	nationality adjective	french, american...
h	unused	unused
H	unused	unused
i	unused	unused
I	unused	unused
j	unused	unused
J	unused	unused
k	unused	unused
K	unused	unused
l	unused	unused
L	unused	unused

Table 42. Supported parts of speech codes (continued)

Code	Meaning	Example
m	noun or unknown	dog, ibm
M	unused	unused
n	noun	dog
N	unused	unused
o	coordination	"and", "&"
O	unused	unused
p	past participle	abandoned, accessorized...
P	unused	unused
q	unused	unused
Q	qualifier	expensive, small, good, ...
r	extended preposition	of, among, against, from...
R	unused	unused
s	stop word	any word that we do not want to extract
S	unused	unused
t	title	mrs., mrs, captain, brig., ...
T	technical adjectives	tumor-restricted... (all "T" are also "a")
u	unknown by definition, not in dictionary	
U	unused	unused
v	verb	eat, eats, ate, eating, ...
V	infinitive verb	eat, ...
w	unused	unused
W	unused	unused
x	auxiliary	be
X	unused	unused
y	particle	von, di, de, ... (used to extract person names: John von Doe)
Y	unused	unused
z	unused	unused
Z	unused	unused
0	opinion adverb	Only in Opinions. See **Advanced resources** > **Language Handling (English)** > **Forced Definitions**.
1	"to" in opinions	See **Advanced resources** > **Language Handling (English)** > **Forced Definitions**
2	specific Qualifier	Only in Opinions. See **Advanced resources** > **Language Handling (English)** > **Forced Definitions**.
3	unused	unused
4	unused	unused
5	unused	unused
6	unused	unused
7	unused	unused
8	unused	unused

Table 42. Supported parts of speech codes (continued)

Code	Meaning	Example
9	unused	unused

Forced Definitions

When extracting information from your documents , the extraction engine scans the text and identifies the part of speech for every word it encounters. In some cases, a word could fit several different roles depending on the context. If you want to force a word to take a particular part-of-speech role or to exclude the word completely from processing, you can do so in the **Forced Definition** section of the Advanced Resources tab. See the topic Chapter 17, "About Advanced Resources," on page 181 for more information.

To force a part-of-speech role for a given word, you must add a line to this section using the following syntax:

term:*code*

Table 43. Syntax description.

Entry	Description
term	A term name.
code	A single-character code representing the part-of-speech role. You can list up to six different part-of-speech codes per uniterm. Additionally, you can stop a word from being extracted into compound words/phrases by using the lowercase code s, such as additional:s.

Formatting Rules for Forced Definitions

- One line per word.
- Terms cannot contain a colon.
- Use the lowercase s as a part-of-speech code to stop a word from being extracted altogether.
- Use up to six part-of-speech codes per line. Supported part-of speech codes are shown in the Extraction Patterns section. See the topic "Extraction patterns" on page 188 for more information.
- Use the asterisk character (*) as a wildcard at the end of a string for partial matches. For example, if you enter add*:s, words such as add, additional, additionally, addendum, and additive are never extracted as a term or as part of a compound word term. However, if a word match is explicitly declared as a term in a compiled dictionary or in the forced definitions, it will still be extracted. For example, if you enter both add*:s and addendum:n, addendum will still be extracted if found in the text.

Abbreviations

When the extraction engine is processing text, it will generally consider any period it finds as an indication that a sentence has ended. This is typically correct; however, this handling of period characters does not apply when abbreviations are contained in the text.

If you extract terms from your text and find that certain abbreviations were mishandled, you should explicitly declare that abbreviation in this section.

Note: If the abbreviation already appears in a synonym definition or is defined as a term in a type dictionary, there is no need to add the abbreviation entry here.

Formatting Rules for Abbreviations

- Define one abbreviation per line.

Chapter 18. About Text Link Rules

Text link analysis (TLA) is a pattern matching technology that is used to extract relationships found in your text using a set of rules. When text link analysis is enabled for extraction, the text data is compared against these rules. When a match is found, the text link analysis pattern is extracted and presented. These rules are defined in the Text Link Rules tab.

For example, extracting concepts representing simple ideas about an organization may not be interesting enough to you, but by using TLA, you could also learn about the links between different organizations or the people associated with the organization. TLA can also be used to extract opinions about topics such as how people feel about a given product or experience.

To benefit from TLA, you must have resources that contain text link (TLA) rules. When you select a template, you can see which templates have TLA rules by whether or not they have an icon in the TLA column.

Text link analysis patterns are found in the text data during the pattern matching phase of the extraction process. During this phase, rules are compared to the text data and when a match is found, this information is extracted as a pattern. There are times when you might want to get more from text link analysis or change how something is matched. In these cases, you can refine the rules to adapt them to your particular needs. This is performed in the Text Link Rules tab.

Note: Support for variables was discontinued in version 13. Use macros instead. See the topic "Working with Macros" on page 198 for more information.

Where to work on text link rules

You can edit and create rules directly in the Text Link Rules tab in the Template Editor or Resource Editor view. To help you see how rules might match text, you can run a simulation in this tab. During simulation, an extraction is run only on the sample simulation data and the text link rules are applied to see if any patterns match. Any rules that match the text are then shown in the simulation pane. Based on the matches, you can choose to edit rules and macros to change how the text is matched.

Unlike the other advanced resources, TLA rules are library-specific; therefore, you can only use the TLA rules from one library at a time. From within the Template Editor or Resource Editor, go to the **Text Link Rules** tab. In this tab, you can specify the library in your template that contains the TLA rules you want to use or edit. For this reason, we strongly recommend that you store all your rules in one library unless there is a very specific reason this isn't desired.

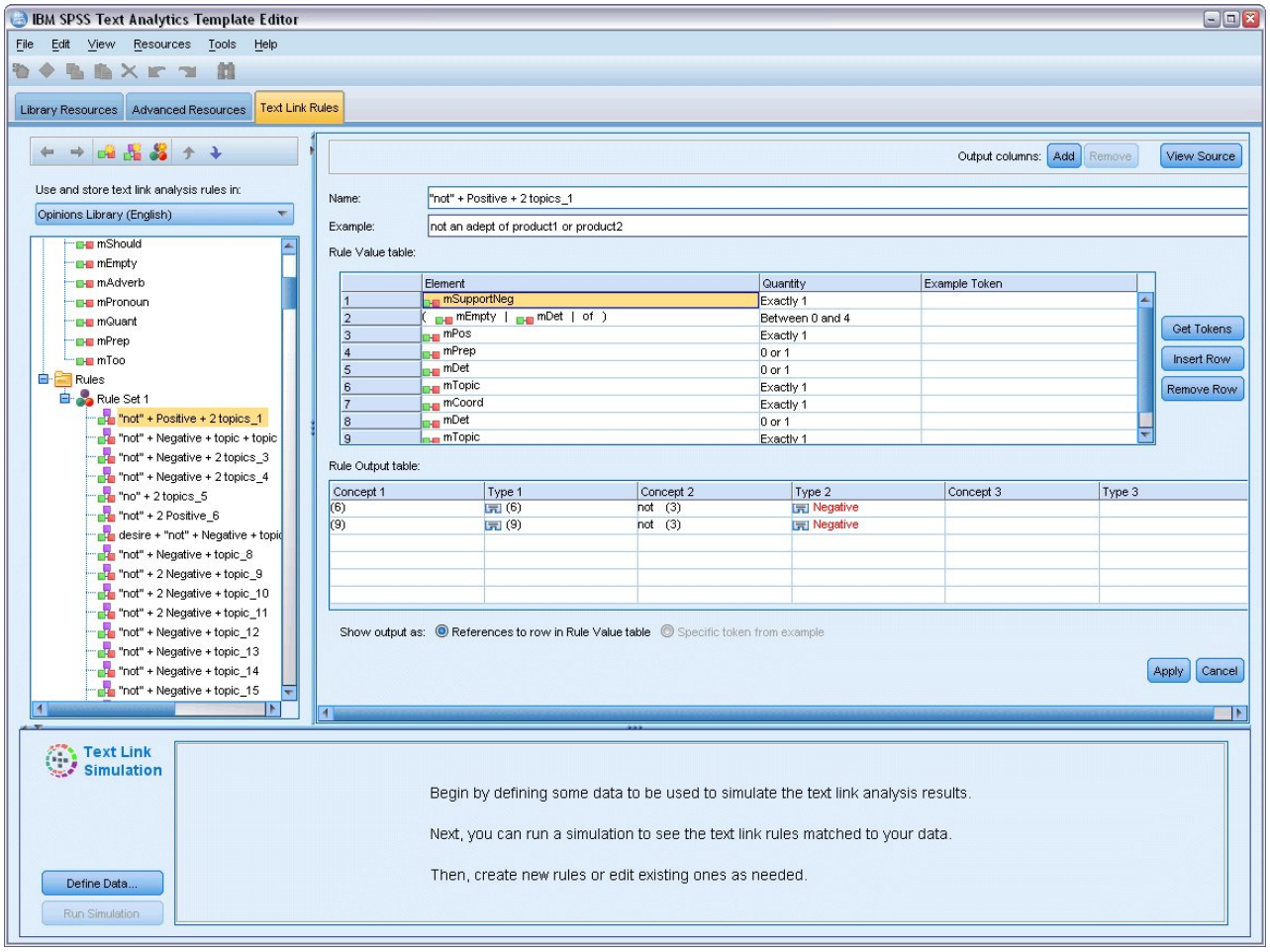


Figure 41. Text Link Rules tab

Where to Begin

There are a number of ways to start working in the Text Link Rules tab editor:

- Start by simulating results with some sample text and edit or create matching rules based on how the current set of rules extract patterns from the simulation data.
- Create a new rule from scratch or edit an existing rule.
- Work in source view directly.

When to Edit or Create Rules

While the text link analysis rules delivered with each template are often adequate for extracting many simple or complex relationships from your text, there are times that you may want to make some changes to these rules or create some rules of your own. For example:

- To capture an idea or relation that isn't being extracted with the existing rules by creating a new rule or macro.
- To change the default behavior of a type you added to the resources. This usually requires you to edit a macro such as `mTopic` or `mNonLingEntities`. See the topic "Special Macros: mTopic, mNonLingEntities, SEP" on page 200 for more information.

- To add new types to existing text link analysis rules and macros. For example, if you think the type <Organization> is too broad, you could create new types for organizations in several different business sectors such as <Pharmaceuticals>, <Car Manufacturing>, <Finance>, and so on. In this case, you must edit the text link analysis rules and/or create a macro to take these new types into account and process them accordingly.
- To add types to an existing text link analysis rule. For example, let's say you have a rule that captures the following text john doe called jane doe but you want this rule that captures phone communications to also capture email exchanges. You could add the nonlinguistic entity type for email to the rule so it would also capture text such as: johndoe@ibm.com emailed janedoe@ibm.com.
- To slightly modify an existing rule, instead of creating a new one. For example, let's say you have a rule that matches the following text xyz is very good but you want this rule to also capture xyz is very, very good.

Simulating Text Link Analysis Results

In order to help define new text link rules or help understand how certain sentences are matched during text link analysis, it is often useful to take a sample piece of text and run a simulation. During simulation, an extraction is run only on the sample simulation data using the current set of linguistic resources and the current extraction settings. The goal is to obtain the simulated results and use these results to improve your rules, create new ones, or better understand how matching occurs. For each piece of text (sentence, word, or clause depending on the context), a simulation output displays the collection of tokens and any TLA rules that uncovered a pattern in that text. A **token** is defined as any word or word phrase identified during the extraction process.

Unlike the other advanced resources, TLA rules are library-specific; therefore, you can only use the TLA rules from one library at a time. From within the Template Editor or Resource Editor, go to the **Text Link Rules** tab. In this tab, you can specify the library in your template that contains the TLA rules you want to use or edit. For this reason, we strongly recommend that you store all your rules in one library unless there is a very specific reason this isn't desired.

Important! We strongly recommend that if you use a data file, please ensure that the text it contains is short in order to minimize processing time. The goal of simulation is to see how a piece of text is interpreted and to understand how rules match this text. This information will help you write and edit your rules. Use the text link analysis node or run a stream with interactive session with TLA extraction enabled to obtain results for a more complete data set. This simulation is for testing and rule authoring purposes only.

Defining Data for Simulation

To help you see how rules might match text, you can run a simulation using sample data. The first step is to define the data.

Defining Data

1. Click **Define Data** in the simulation pane in bottom of the **Text Link Rules** tab. Alternatively, if no data have been previously defined, choose **Tools** > **Run Simulation** from the menus. The Simulation Data wizard opens.
2. Specify the data type by selecting one of the following:
   - **Paste or enter text directly** A text box is provided for you to paste some text from the clipboard or to manually enter the desired text to be processed. You can enter one sentence per line or use punctuation to break up the sentence such as periods or commas. Once you have entered your text, you can begin the simulation by clicking **Run Simulation**.
   - **Specify a file data source** This option indicates that you want to process a file that contains text. Click **Next** to proceed to the wizard step in which you can define the file to be processed. Once the file has been selected, you can begin the simulation by clicking **Run Simulation**. The following file

types are supported: `.txt` and `.text`. The data file you choose is read 'as-is' during the simulation. The entire file is treated in the same manner as if you had connected a File List node to a Text Mining Node.

Important: We strongly recommend that if you use a data file, ensure that the text it contains is short in order to minimize processing time. The goal of simulation is to see how a piece of text is interpreted and to understand how rules match this text. This information will help you write and edit your rules. Use the text link analysis node or run a stream with interactive session with TLA extraction enabled to obtain results for a more complete data set. This simulation is for testing and rule authoring purposes only.

3. To begin the simulation process, click **Run Simulation**. A progress dialog appears. If you are in an interactive session, the extraction settings used during simulation are those currently selected in the interactive session (see **Tools** > **Extraction Settings** in the Concepts and Categories view). If you are in the Template Editor, the extraction settings used during simulation are the default extraction settings, which are the same as those shown in the Expert tab of a Text Link Analysis node. For more information, see "Understanding Simulation Results."

Understanding Simulation Results

To help you see how rules might match text, you can run a simulation using sample data and review the results. From there you can change your set of rules to better fit your data. When the extraction and simulation process has completed, you will be presented with the results of the simulation.

For each "sentence" identified during extraction, you are presented with several pieces of information including the exact "sentence", the breakdown of the tokens found in this input text sentence, and finally any rules that matched text in that sentence. By "**sentence**", we mean either a word, sentence, or clause depending on how the extractor broke down the text into readable chunks.

A **token** is defined as any word or word phrase identified during the extraction process. For example, in the sentence *My uncle lives in New York*, the following tokens might be found during extraction: *my*, *uncle*, *lives*, *in*, and *new york*. Additionally, *uncle* could be extracted as a concept and typed as `<Unknown>`, and *new york* could also be extracted as a concept and typed as `<Location>`. All concepts are tokens but not all tokens are concepts. Tokens can also be other macros, literal strings, and word gaps. Only those words or word phrases that are typed can be concepts.

When you are working in the interactive session or resource editor, you are working at the concept level. TLA rules are more granular, and individual tokens in a sentence can be used in the definition of a rule even if they are never extracted and typed. Being able to use tokens which are not concepts offers rules even more flexibility in capturing complex relationships in your text.

If you have more than one sentence in your simulation data, you can move forward and backward through the results by clicking **Next** and **Previous**.

In those cases where a sentence does not match any TLA rule in the selected library (see library name above tree in this tab), the results are considered unmatched and the buttons **Next Unmatched** and **Previous Unmatched** are enabled to let you know that there is text for which no rule found a match and to allow you to navigate to these instances quickly.

After creating new rules, editing your rules, or changing your resources or extraction settings, you may want to rerun a simulation. To re-run a simulation, click **Run Simulation** in the simulation pane and the same input data will be used again.

The following fields and tables are shown in the simulation results:

Input text. The actual 'sentence' identified by the extraction process from the simulation data you defined in the wizard. By sentence, we mean either a word, sentence, or clause depending on how the extractor broken down the text into readable chunks.

System View. A collection of tokens that the extraction process has identified.

- **Input Text Token.** Each token found in the input text. Tokens were defined earlier in this topic.
- **Typed As.** If a token was identified as a concept and typed, then the associated type name (such as `<Unknown>`, `<Person>`, `<Location>`) is shown in this column.
- **Matching Macro.** If a token matched an existing macro, then the associated macro name is displayed in this column.

Rules Matched to Input Text. This table shows you any TLA rules that were matched against the input text. For each matched rule, you will see the name of the rule in the **Rule Output** column and the associated output values for that rule (Concept + Type pairs). You can double-click on the matched rule name to open the rule in the editor pane above the simulation pane.

Generate Rule button. If you click this button in the simulation pane, a new rule will open in the rule editor pane above the simulation pane. It will take the input text as its example. Likewise, any token that was typed or matched to a macro during simulation is automatically inserted in the Elements column in the **Rule Values table**. If a token was typed *and* matched a macro, the macro value is the one that will be used in the rule so as to simplify the rule. For example, the sentence "*I like pizza*" could be typed during simulation as `<Unknown>` and matched to macro `mTopic` if you were using the Basic English resources. In this case `mTopic` will be used as the element in the generated rule. See the topic "Working with Text Link Rules" on page 201 for more information.

Navigating Rules and Macros in the Tree

When text link analysis is performed during extraction, the text link rules stored in the library selected in the **Text Link Rules** tab will be used.

Unlike the other advanced resources, TLA rules are library-specific; therefore, you can only use the TLA rules from one library at a time. From within the Template Editor or Resource Editor, go to the **Text Link Rules** tab. In this tab, you can specify the library in your template that contains the TLA rules you want to use or edit. For this reason, we strongly recommend that you store all your rules in one library unless there is a strong or specific reason this isn't desired.

You can specify in which library you want to work in the Text Link Rules tab by selecting that library in the **Use and store text link analysis rules in:** dropdown list in this tab. When text link analysis is performed during extraction, the text link rules stored in the library selected in the **Text Link Rules** tab will be used. Therefore, if you defined text link rules (TLA rules) in more than one library, only the first library in which TLA rules are found will be used for text link analysis. For this reason, we strongly recommend that you store all your rules in one library unless there is a very specific reason this isn't desired.

When you select a macro or rule in the tree, its contents are displayed in the editor pane to the right. If you right-click on any item in the tree, a context menu will open to show you what other tasks are possible, such as:

- Create a new macro in the tree and open it in the editor to the right.
- Create a new rule in the tree and open it in the editor to the right.
- Create a new rule set in the tree.
- Cut, copy, and paste items to simplify editing.
- Delete macros, rules, and rule sets to remove them from the resources.
- Disable macros, rules, and rule sets to indicate that they should be ignored during processing.

- Move rules up or down to affect processing order.

Warnings in the tree

Warnings are displayed with a yellow triangle in the tree and are there to inform you that there may be a problem. Hover the mouse pointer over the faulty macro or rule to display a pop-up explanation. In most cases, you will see something such as: **Warning: No example provided; Enter an example** so you need to enter an example.

If you're missing an example, or if the example doesn't match the rule, you will not be able to use the Get Tokens feature so we recommend you enter just one example per rule.

When the rule is highlighted in yellow it means that a type or macro is unknown to the TLA editor. The message will be similar to: **Warning: Unknown type or macro**. This is to inform you that an item that would be defined by `$something` in the source view, for instance `$myType`, is not a legacy type in your library, nor is it a macro.

To update the syntax checker you need to switch to another rule or macro; there is no need to recompile anything. So, for example, if rule `A` displays a warning because the example is missing, you need to add an example, click on either an upper or lower rule, and then go back to rule `A` to check that it is now correct.

Working with Macros

Macros can simplify the appearance of text link analysis rules by allowing you to group types, other macros, and literal (word) strings together with an `OR` operator (`|`). The advantage to using macros is that not only can you reuse macros in multiple text link analysis rules to simplify them, but it also enables you to make updates in one macro rather than having to make updates throughout all of your text link analysis rules. Most shipped TLA rules contain predefined macros. Macros appear at the top of the tree in the leftmost pane of the Text Link Rules tab.

The following fields and tables are shown in the simulation results:

Name. A unique name identifying this macro. We recommend that you prefix macro names with a lowercase m to help you identify macros quickly in your rules. When you manually refer to macros in your rules (by inline editing or in the source view) you have to use the $ character prefix so that the extraction process knows to look for this special name. However, if you drag and drop the macro name or add it through the context menus, the product will automatically recognize it as a macro and no $ will be added.

Macro Value table.

- A number of rows representing all of the possible values this macro can represent. These values are case-sensitive.
- These values can include one or a combination of types, literal strings, word gaps, or macros. See the topic “Supported Elements for Rules and Macros” on page 207 for more information.
- To enter a value for an element in a macro, double-click the row you want to work in. An editable text box appears in which you can enter a type reference, a macro reference, a literal string, or a word gap. Alternatively, right-click in the cell to display a contextual menu offering lists of common macros, type names, and nonlinguistic type names. To reference a type or a macro you must precede the macro or type name with a ‘`$`’ character such as `$mTopic` for the macro `mTopic`. When combining arguments, you must use parentheses `( )` to group the arguments and the character `|` to indicate a Boolean `OR`.
- You can add or remove rows in the Macro Value table using the buttons to its right.
- Enter each element in its own row. For example, if you wanted to create a macro that represents one of 3 literal strings such as `am OR was OR is`, you would enter each literal string on a separate row in the view, and your Macro table would contain 3 rows.

Creating and Editing Macros

You can create new macros or edit existing ones. Follow the guidelines and descriptions for the macro editor. See the topic "Working with Macros" on page 198 for more information.

Creating New Macros

1. From the menus, choose **Tools > New Macro**. Alternatively, click the New Macro icon in the tree toolbar to open a new macro in the editor.
2. Enter a unique name and define the macro value elements.
3. Click **Apply** when finished to check for errors.

Editing Macros

1. Click the macro name in the tree. The macro opens in the editor pane on the right.
2. Make your changes.
3. Click **Apply** when finished to check for errors.

Disabling and Deleting Macros

Disabling Macros

If you want a macro to be ignored during processing, you can disable it. Doing so may cause warnings or errors in any rules that still reference this disabled macro. Take caution when deleting and disabling macros.

1. Click the macro name in the tree. The macro opens in the editor pane on the right.
2. Right-click on the name.
3. From the context menus, choose **Disable**. The macro icon becomes gray and the macro itself becomes uneditable.

Deleting Macros

If you want to get rid of a macro, you can delete it. Doing so may cause errors in any rules that still reference this macro. Take caution when deleting and disabling macros.

1. Click the macro name in the tree. The macro opens in the editor pane on the right.
2. Right-click on the name.
3. From the context menus, choose **Delete**. The macro disappears from the list.

Checking for Errors, Saving, and Cancelling

Applying Macro Changes

If you click outside of the macro editor or if you click **Apply**, the macro is automatically scanned for errors. If an error is found, you will need to fix it before moving on to another part of the application.

However, if less serious errors are detected, only a warning is given. For example, if your macro contains incomplete or unreferenced definitions to types or other macros, a warning message is displayed. Once you click **Apply**, any uncorrected warnings cause a warning icon to appear to the left of the macro name in the Rules and Macro Tree in the left pane.

Applying a macro does not mean that your macro is permanently saved. Applying will cause the validation process to check for errors and warnings.

Saving Resources inside an Interactive Workbench Session

1. To save the changes you made to your resources during an interactive workbench session so you can get them next time you run your stream, you must:

- Update your modeling node to make sure that you can get these same resources next time you execute your stream. See the topic "Updating Modeling Nodes and Saving" on page 72 for more information. Then save your stream. To save your stream, do so in the main IBM SPSS Modeler window after updating the modeling node.

2. To save the changes you made to your resources during an interactive workbench session so that you can use them in other streams, you can:

- Update the template you used or make a new one. See the topic "Making and Updating Templates" on page 148 for more information. This will not save the changes for the current node (see previous step)
- Or, update the TAP you used. See the topic "Updating Text Analysis Packages" on page 125 for more information.

Saving Resources inside the Template Editor

1. First, publish the library. See the topic "Publishing Libraries" on page 167 for more information.
2. Then, save the template through **File > Save Resource Template** in the menus.

Cancelling Macro Changes

1. If you wish to discard the changes, click **Cancel**.

Special Macros: mTopic, mNonLingEntities, SEP

The Opinions template (and like templates) as well as the Basic Resources templates are shipped with two special macros called `mTopic` and `mNonLingEntities`.

mTopic

By default, the macro `mTopic` groups all the types shipped in the template that are likely to be connected with an opinion, such as the following *Core* library types: `<Person>`, `<Organization>`, `<Location>`, and so on, as long as the type is not an opinion type (for example, `<Negative>` or `<Positive>`) or a type defined as a nonlinguistic entity in the Advanced Resources.

Whenever you create a new type in an Opinions (or similar) template, the product assumes that unless this type is specified in another macro or in the nonlinguistic entities section of the Advanced Resource tab, it will be treated the same way as the other types defined in the macro `mTopic`.

Let's say you created new types in the resources from an Opinions template: `<Vegetables>` and `<Fruit>`. Without having to make any changes, your new types are treated as `mTopic` types so you can automatically uncover the positive, negative, neutral, and contextual opinions about your new types. During extraction, for example, the sentence "*I enjoy broccoli, but I hate grapefruit*" would produce the following 2 output patterns:

```
broccoli <Vegetables> + like <Positive>

grapefruit <Fruit> + dislike <Negative>
```

However, if you want to process those types differently than the other types in mTopic, you can either add the type name to an existing macro such as `mPos`, which groups all positive opinion types, or create a new macro that you can later reference in one or more rules.

Important! If you create a new type such as `<Vegetables>`, this new type will be included as a type in mTopic, however, this type name will not be explicitly visible in the macro definition.

mNonLingEntities

Similarly, if you add new nonlinguistic entities in the **Nonlinguistic Entities** section of the Advanced Resources tab, they will be automatically processed as `mNonLingEntities` unless specified otherwise. See the topic "Nonlinguistic Entities" on page 184 for more information.

SEP

You can also use the predefined macro `SEP`, which corresponds to the global separator defined on the local machine, generally a comma (,).

Working with Text Link Rules

A text link analysis rule is a Boolean query that is used to perform a match on a sentence. Text link analysis rules contain one or more of the following arguments: types, macros, literal strings, or word gaps. You must have at least one text link analysis rule in order to extract TLA results.

The following areas and fields are displayed in the Text Link Rules tab, Rule Editor:

Name field. The unique name for the text link rule.

Example field. Optionally, you can include an example sentence or word sequence that would be captured by this rule. We recommend using examples. In this editor, you will be able to generate tokens from this example text to see how it matches the rule and how it will be output. A **token** is defined as any word or word phrase identified during the extraction process. For example, in the sentence *My uncle lives in New York*, the following tokens might be found during extraction: *my*, *uncle*, *lives*, *in*, and *new york*. Additionally, *uncle* could be extracted as a concept and typed as `<Unknown>`, and *new york* could also be extracted as a concept and typed as `<Location>`. All concepts are tokens but not all tokens are concepts. Tokens can also be other macros, literal strings, and word gaps. Only those words or word phrases that are typed can be concepts.

Rule Value table. This table contains the elements of the rule that are used for matching a rule to a sentence. You can add or remove rows in the table using the buttons to its right. The table consists of 3 columns:

- **Element** column. Enter values as one or a combination of types, literal strings, word gaps (`<Any Token>`), or macros. See the topic "Supported Elements for Rules and Macros" on page 207 for more information. Double-click the element cell to enter the information directly. Alternatively, right-click in the cell to display a contextual menu offering lists of common macros, type names, and nonlinguistic type names. Keep in mind that if you enter the information into the cell by typing it in, precede the macro or type name with a '$' character such as `$mTopic` for the macro `mTopic`. The order in which you create your element rows is critical to how the rule will be matched to the text. When combining arguments, you must use parentheses `( )` to group the arguments and the character `|` to indicate a Boolean `OR`. Keep in mind that values are case-sensitive.
- **Quantity** column. This indicates the minimum and maximum number of times the element must be found for a match to occur. For example, if you want to define a gap, or a series of words, between two other elements of anywhere from 0 to 3 words, you could choose **Between 0 and 3** from the list or enter the numbers directly into the dialog box. The default is '**Exactly 1**'. In some cases you will want to make an element optional. If this is the case, then it will have a minimum quantity of 0 and a maximum quantity greater than 0 (i.e. 0 or 1, between 0 and 2). Note that the first element in a rule cannot be optional, meaning it cannot have a quantity of 0.
- **Example Token** column. If you click **Get Tokens**, the program breaks the **Example** text down into tokens and uses those tokens to fill this column with those that match the elements you defined. You can also see these tokens in the output table if you choose to.

Rule Output table Each row in this table defines how the TLA pattern output will appear in the results. Rule output can produce patterns of up to six Concept/Type column pairs, each representing a *slot*. For example, the type pattern `<Location> + <Positive>` is a two slot pattern meaning that it is made up of 2 Concept/Type column pairs.

Note: Terms in the **Element** column of the **Rule Value table**, or in any of the **Concept** columns of the **Rule Output table** cannot start with any of the following characters: `, #, %, ^, *, _, -, :, <, >, /, \, or ".

Just as language gives us the freedom to express the same basic ideas in many different ways, so you might have a number of rules defined to capture the same basic idea. For example, the text *"Paris is a place I love"* and the text *"I really, really like Paris and Florence"* represent the same basic idea -- that Paris is liked -- but are expressed differently and would require two different rules to both be captured. However, it is easier to work with the pattern results if similar ideas are grouped together. For this reason, while you might have 2 different rules to capture these 2 phrases, you could define the same output for both rules, such as the type pattern `<Location> + <Positive>` so that it represents both texts. And in this way, you can see that the output does not always mimic the structure or order of the words found in the original text. Furthermore, such a type pattern could match other phrases and could produce concept patterns such as: `paris + like` and `tokyo + like`.

To help you define the output quickly with fewer errors, you can use the context menu to choose the element you want to see in the output. Alternatively, you can also drag and drop elements from the Rule Value table into the output. For example, if you have a rule that contains a reference to the `mTopic` macro in row 2 of the Rule Value table, and you want that value to be in your output, you can simply drag/drop the element for `mTopic` to the first column pair in the Rule Output table. Doing so will automatically populate both the Concept and Type for the pair you've selected. Or if you want the output to begin with the type defined by the third element (row 3) of the rule value table, then drag that type from the Rule Value table to the **Type 1** cell in the output table. The table will update to show the row reference in parenthesis (3).

Alternatively, you can enter these references manually into the table by double-clicking the cell in each **Concept** column you want to output and entering the $ symbol followed by the row number, such as `$2` to refer to the element defined in row 2 of the Rule Value table. When you enter the information manually, you need to also define the **Type** column, enter the # symbol followed by the row number, such as `#2` to refer to the element defined in row 2 of the Rule Value table.

Furthermore, you might even combine methods. Let's say you had the type `<Positive>` in row 4 of your Rule Value table. You could drag it to the `Type 2` column and then double-click the cell in the `Concept 2` column and then manually enter the word *'not'* in front of it. The output column would then read `not (4)` in the table, or if you were in the edit mode or source mode `not $4`. Then you could right-click in the Type 1 column and select, for example, the macro called `mTopic`. Then this output could result in a concept pattern such as: `car + bad`.

Most rules have only one output row but there are times when more than one output is possible and desired. In this case, define one output per row in the Rule Output table.

Important: Keep in mind that other linguistic handling operations are performed during the extraction of TLA patterns. So when the output reads `t$3\t#3`, this means that the pattern will ultimately display the final concept for the third element and the final type for the third element after all linguistic processing is applied (synonyms and other groupings).

- **Show output as**. By default, the option **References to row in Rule Value table** is selected and the output is shown by using the numerical references to the row as defined in the Rule Value tab. If you previously clicked Get Tokens and have tokens in the Example Tokens column in the Rule Value table, you can choose to see the output for these specific tokens by choosing the option .

Note: If there are not enough concept/type output pairs shown in the output table, you can add another pair by clicking the Add button in the editor toolbar. If 3 pairs are currently shown and you click add, 2

more columns (Concept 4 and Type 4) are added to the table. This means that you will now see 4 pairs in the output table for all rules. You can also remove unused pairs as long as no other rule in the set of rules in this library uses that pair.

Example Rule

Let's suppose your resources contain the following text link analysis rule and that you have enabled the extraction of TLA results:

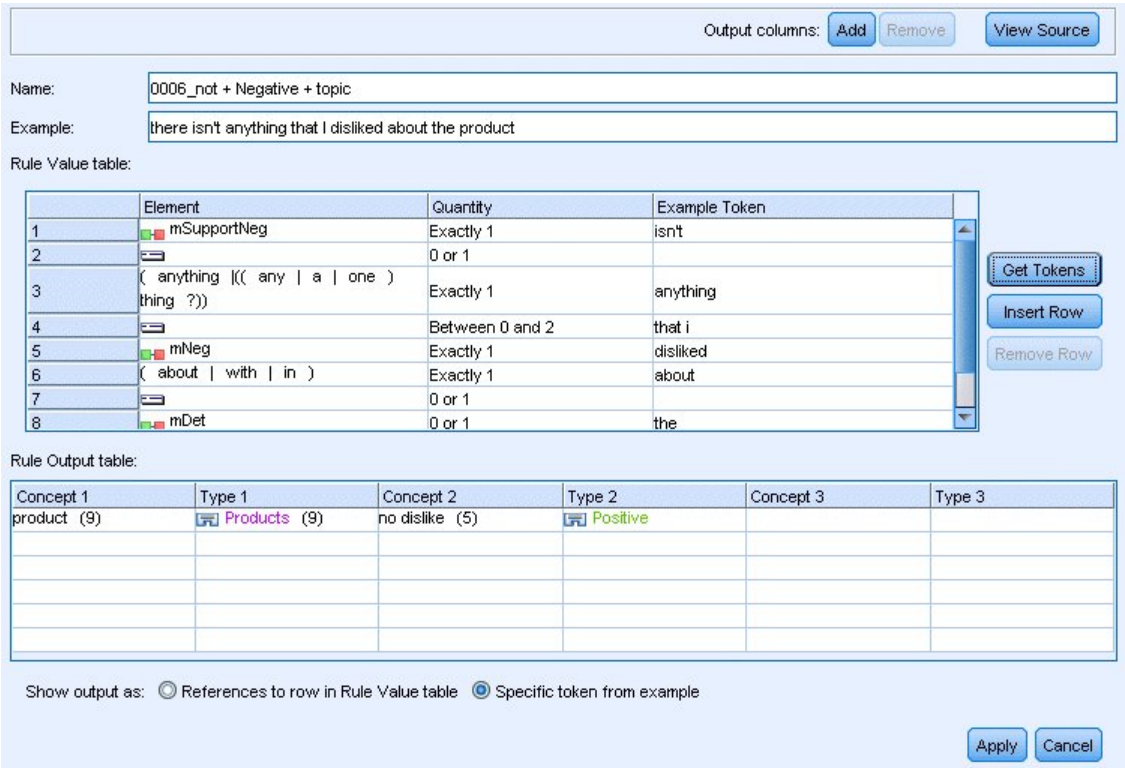


Figure 42. Text Link Rules tab: Rule Editor

Whenever you extract, the extraction engine will read each sentence and will try to match the following sequence:

Table 44. Extraction sequence example

Element (row)	Description of the arguments
1	The concept from one of the types represented by the macros `mPos` or `mNeg` or from the type `<Uncertain>`.
2	A concept typed as one of the types represented by the macro `mTopic`.
3	One of the words represented by the macro `mBe`.
4	An optional element, 0 or 1 words, also referred to as a word gap or `<Any Token>`
5	A concept typed as one of the types represented by the macro `mTopic`.

The output table shows that all that is wanted from this rule is a pattern where any concept or type corresponding to the `mTopic` macro that was defined in row 5 in the **Rule Value table** + any concept or type corresponding to the `mPos`, `mNeg`, or `<Uncertain>` as was defined in row 1 in the **Rule Value table**. This could be `sausage + like` or `<Unknown> + <Positive>`.

Creating and Editing Rules

You can create new rules or edit existing ones. Follow the guidelines and descriptions for the rule editor. See the topic "Working with Text Link Rules" on page 201 for more information.

Creating New Rules

1. From the menus, choose **Tools > New Rule**. Alternatively, click the New rule icon in the tree toolbar to open a new rule in the editor.
2. Enter a unique name and define the rule value elements.
3. Click **Apply** when finished to check for errors.

Editing Rules

1. Click the rule name in the tree. The rule opens in the editor pane on the right.
2. Make your changes.
3. Click **Apply** when finished to check for errors.

Disabling and Deleting Rules

Disabling Rules

If you want a rule to be ignored during processing, you can disable it. Take caution when deleting and disabling rules.

1. Click the rule name in the tree. The rule opens in the editor pane on the right.
2. Right-click on the name.
3. From the context menus, choose **Disable**. The rule icon becomes gray and the rule itself becomes uneditable.

Deleting Rules

If you want to get rid of a rule, you can delete it. Take caution when deleting and disabling rules.

1. Click the rule name in the tree. The rule opens in the editor pane on the right.
2. Right-click on the name.
3. From the context menus, choose **Delete**. The rule disappears from the list.

Checking for Errors, Saving, and Cancelling

Applying Rule Changes

If you click outside of the rule editor or if you click **Apply**, the rule is automatically scanned for errors. If an error is found, you will need to fix it before moving on to another part of the application.

However, if less serious errors are detected, only a warning is given. For example, if your rule contains incomplete or unreferenced definitions to types or macros, a warning message is displayed. Once you click **Apply**, any uncorrected warnings cause a warning icon to appear to the left of the rule name in the tree in the left pane.

Applying a rule does not mean that your rule is permanently saved. Applying will cause the validation process to check for errors and warnings.

Saving Resources inside an Interactive Workbench Session

1. To save the changes you made to your resources during an interactive workbench session so you can get them next time you run your stream, you must:

- Update your modeling node to make sure that you can get these same resources next time you execute your stream. See the topic "Updating Modeling Nodes and Saving" on page 72 for more information. Then save your stream. To save your stream, do so in the main IBM SPSS Modeler window after updating the modeling node.

2. To save the changes you made to your resources during an interactive workbench session so that you can use them in other streams, you can:
   - Update the template you used or make a new one. See the topic "Making and Updating Templates" on page 148 for more information. This will not save the changes for the current node (see previous step)
   - Or, update the TAP you used. See the topic "Updating Text Analysis Packages" on page 125 for more information.

Saving Resources inside the Template Editor

1. First, publish the library. See the topic "Publishing Libraries" on page 167 for more information.
2. Then, save the template through **File > Save Resource Template** in the menus.

Cancelling Rule Changes

1. If you wish to discard the changes, click **Cancel** in the editor pane.

Processing Order for Rules

When text link analysis is performed during extraction, a "sentence" (clause, word, phrase) will be matched against each rule in turn until a match is found or all rules have been exhausted. Position in the tree dictates the order in which rules are tried. Best practice states that you should order your rules from most specific to most generic. The most specific ones should be at the top of the tree. To change the order of a specific rule or rule set, select **Move up** or **Move down** from the Rules and Macro Tree context menu or the up and down arrows in the toolbar.

If you are *in the source view*, you cannot change the order of the rules by moving them around in the editor. The higher up the rule appears in the source view, the sooner it is processed. We strongly recommend reordering rules only in the tree to avoid copy/paste issues.

Important! In previous versions of IBM SPSS Modeler Text Analytics, you were required to have a unique, numeric rule ID. Starting in version 18.1.1, you can only indicate processing order by moving a rule up or down in the tree, or by their position in the source view.

For example, suppose your text contains the following two sentences:

I love anchovies

I love anchovies and green peppers

In addition, suppose that two text link analysis rules exist with the following values:

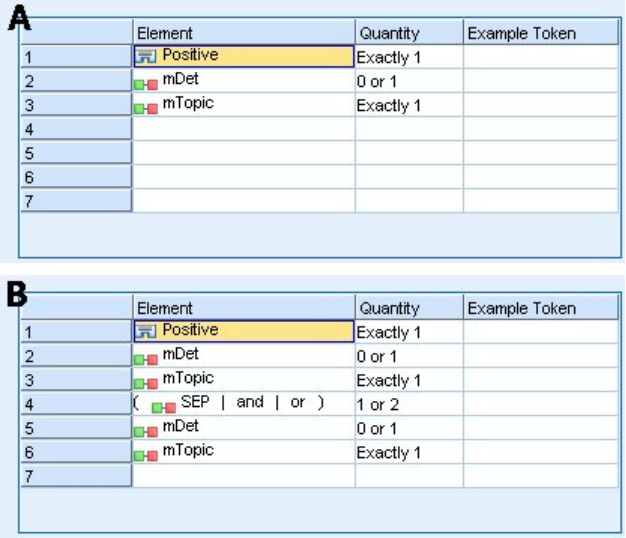


Figure 43. 2 Example Rules

In the source view, the rule values might look like the following:

A: `value = $Positive $mDet? $mTopic`

B: `value = $Positive $mDet? $mTopic ($SEP|and|or){1,2} $mDet? $mTopic`

If rule **A** is higher up in the tree (closer to the top) than rule **B**, then rule **A** will be processed first and the sentence *I love anchovies and green peppers* will be first matched by `$Positive $mDet? $mTopic`, and it will produce an incomplete pattern output (`anchovies + like`) since it was matched by a rule that wasn't looking for 2 `$mTopic` matches.

Therefore, to capture the true essence of the text, the most specific rule, in this case **B** must be placed higher in the tree than the more generic one, in this case rule **A**.

Working with Rule Sets (Multiple Pass)

A rule set is a helpful way of grouping a related set of rules together in the Rules and Macro Tree so as to perform multiple pass processing. A rule set has no definition itself other than a name, and is used to organize your rules into meaningful groups. In some contexts, the text is too rich and varied to be processed in a single pass. For example, when working with security intelligence data, the text may contain links between individuals that are uncovered through contact methods (*x called y*), through family relationships (*y's brother-in-law x*), through exchange of money (*x wired $100 to y*), and so on. In this case, it is helpful to create specialized sets of text link analysis rules, each of which is focused on a certain kind of relationship such as one for uncovering contacts, another for uncovering family members, and so on.

To create a rule set, select "Create Rule Set" from the Rules and Macro Tree context menu, or from the toolbar. You can then create new rules directly under a Rule Set node on the tree, or move existing rules to a Rule Set.

When you run an extraction using resources in which the rules are grouped into rule sets, the extraction engine is forced to make multiple passes through the text in order to match different kinds of patterns in each pass. In this way, a "sentence" can be matched to a rule in each rule set, whereas without a rule set it can only matched to a single rule.

Note: You can add up to 512 rules per rule set.

Creating New Rule Sets

1. From the menus, choose **Tools > New Rule Set**. Alternatively, click the New Rule Set icon in the tree toolbar. A rule set appears in the rule tree.
2. Add new rules to this rule set or move existing rules into the set.

Disabling Rule Sets

1. Right-click the rule set name in the tree.
2. From the context menus, choose **Disable**. The rule set icon becomes gray and all of the rules contained within that rule set are also disabled and ignored during processing.

Deleting Rule Sets

1. Right-click the rule set name in the tree.
2. From the context menus, choose **Delete**. The rule set and all the rules it contains are deleted from the resources.

Supported Elements for Rules and Macros

The following arguments are accepted for the value parameters in text link analysis rules and macros:

Macros

You can use a macro directly in a text link analysis rule or within another macro. If you are entering the macro name by hand or from within the source view (as opposed to selecting the macro name from a context menu), make sure to prefix the name with a dollar sign character ($), such as `$mTopic`. The macro name is case sensitive. You can choose from any macro defined in the current Text Link Rules tab when selecting macros through the context menus.

Types

You can use a type directly in a text link analysis rule or macro. If you are entering the type name by hand or in the source view (as opposed to selecting the type from a context menu), make sure to prefix the type name with a dollar sign character ($), such as `$Person`. The type name is case sensitive. If you use the context menus, you can choose from any type from the current set of resources being used.

If you reference an unrecognized type, you will receive a warning message, and the rule will have a warning icon in the Rules and Macro Tree until you correct it.

Literal Strings

To include information that was never extracted, you can define a literal string for which the extraction engine will search. All extracted words or phrases have been assigned to a type and for this reason, they cannot be used in literal strings. If you use a word that was extracted, it will be ignored, even if its type is `<Unknown>`.

A literal string can be one or more words. The following rules apply when defining a list of literal strings:

- Enclose the list of strings in parentheses such as (his). If there is a choice of literal strings then each string must be separated by the OR operator, such as `(a|an|the)` or `(his|hers|its)`.
- Use single or compound words.
- Separate each word in the list by the | character, which is like a Boolean `OR`.
- Enter both singular and plural forms if you want to match both. Inflection is not automatically generated.
- Use lower case only.

- To reuse literal strings, define them as a macro and then use that macro in your other macros and text link analysis rules.
- If a string contains periods (full stops) or hyphens, you must include them. For example, to match `a.k.a` in the text, enter the periods along with the letters `a.k.a` as the literal string.

Exclusion Operator

Use `!` as an exclusion operator to stop any expression of the negation from occupying a particular slot. You can only add an exclusion operator by hand through inline cell editing (double-click the cell in the Rule Value table or Macro Value table) or in the source view. For example, if you add `$mTopic @{0,2} !($Positive) $Budget` to your text link analysis rule, you are looking for text that contains (1) a term assigned to any of the types in the `mTopic` macro, (2) a word gap of zero to two words long, (3) no instances of a term assigned to the `<Positive>` type, and (4) a term assigned to the `<Budget>` type. This might capture "*cars have an inflated price tag*" but would ignore "*store offers amazing discounts*".

To use this operator, you must enter the exclamation point and parenthesis manually into the element cell by double-clicking the cell.

Word Gaps (<Any Token>)

A word gap, also referred to as `<Any Token>`, defines a numeric range of tokens that may be present between two elements. Word gaps are very useful when matching very similar phrases that may differ only slightly due to the presence of additional determiners, prepositional phrases, adjectives, or other such words.

Table 45. Example of the elements in a Rule Value table without a word gap

#	Element
1	 `Unknown`
2	 `mBeHave`
3	 `Positive`

Note: In the source view this value is defined as: `$Unknown $mBeHave $Positive`

This value will match sentences like "*the hotel staff was nice*", where *hotel staff* belongs to type `<Unknown>`, *was* is under the macro `mBeHave` and *nice* is `<Positive>`. But it will not match "*the hotel staff was very nice*".

Table 46. Example of the elements in a Rule Value table with a <Any Token> word gap

#	Element
1	 `Unknown`
2	 `mBeHave`
3	

Table 46. Example of the elements in a Rule Value table with a <Any Token> word gap (continued)

4	 `Positive`

Note: In the source view this value is defined as: `$Unknown $mBeHave @{0,1} $Positive`

If you add a word gap to your rule value, it will match both "*the hotel staff was nice*" and "*the hotel staff was very nice*".

In the source view or with inline editing, the syntax for a word gap is `@{#,#}`, where `@` signifies a word gap and the `{#,#}` defines the minimum and maximum of words accepted between the preceding element and following element. For example, `@{1,3}` means that a match can be made between the two defined elements if there is at least one word present but no more than three words appearing between those two elements. `@{0,3}` means that a match can be made between the two defined elements if there is 0, 1, 2 or 3 words present but no more than three words.

Viewing and working in source mode

For each rule and macro the TLA editor generates the underlying source code that is used by the Extractor for matching and producing TLA output. If you prefer to work with the code itself, you can view this source code and edit it directly by clicking the "View Source" button at the top of the Editor. The Source view will jump to and highlight the currently selected rule or macro. However, we recommend using the editor panes to reduce the chance of errors.

When you have finished viewing or editing the source, click **Exit Source**. If you generate invalid syntax for a rule, you will be required to fix it before you exit the source view.

Important: If you edit in the source view, we strongly recommend that you edit rules and macros one at a time. After editing a macro, please validate the results by extracting. If you are satisfied with the result, we recommend that you save the template before making another change. If you are not satisfied with the result or an error occurs, revert to your saved resources.

Macros in the Source View

```
[macro]
name = macro_name
value = ([type_name|macro_name|literal_string|word_gap])
```

Table 47. Macro entries

`[macro]`	Each macro must begin with the line marked [macro] to denote the beginning of a macro.
`name`	The name of the macro definition. Each name must be unique.
`value`	A combination of one or more types, literal strings, word gaps, or macros.See the topic "Supported Elements for Rules and Macros" on page 207 for more information. When combining arguments, you must use parentheses ( ) to group the arguments and the character `|` to indicate a Boolean OR.

In addition to the guidelines and syntax covered in the section on Macros, the source view has a few additional guidelines that aren't required when working in the editor view. Macros must also respect the following when working in source mode:

- Each macro must begin with the line marked `[macro]` to denote the beginning of a macro.
- To disable an element, place a comment indicator (#) before each line.

Example. This example defines a macro called `mTopic`. The value for `mTopic` is the presence of a term matching *one* of the following types: `<Product>`, `<Person>`, `<Location>`, `<Organization>`, `<Budget>`, or `<Unknown>`.

```
[macro]
name=mTopic
value=($Unknown|$Product|$Person|$Location|$Organization|$Budget|$Currency)
```

Rules in the Source View

```
[pattern(ID)]
name = pattern_name
value = [$type_name|macro_name|word_gaps|literal_strings]
output = $digit[\t]#digit[\t]$digit[\t]#digit[\t]$digit[\t]#digit[\t]
```

Table 48. Rule entries

`[pattern (<ID>)]`	Indicates the start of a that text link analysis rule and provides a unique numerical ID use to determine processing order.
`name`	Provides a unique name for this text link analysis rule.
`value`	Provides the syntax and arguments to be matched to the text. See the topic "Supported Elements for Rules and Macros" on page 207 for more information.
`output`	The output format for the resulting matched patterns discovered in the text. The output does not always resemble the exact original position of elements in the source text. Additionally, it is possible to have multiple output lines for a given text link analysis rule by placing each output on a separate line. Syntax for output: • Separate output with the tab code `\t`, such as `$1\t#1\t$3\t#3` • `$` and a number calls for the term found matching the argument defined in the value parameter in that position. So `$1` means the term matching the first argument defined for the value. • `#` and a number calls for the type name of the element in that position. If an item is a list of literal strings, the type `<Unknown>` will be assigned. • A value of `Null\tNull` will not create any output.

In addition to the guidelines and syntax covered in the section on Rules, the source view has a few additional guidelines that aren't required when working in the editor view. Rules must also respect the following when working in source mode:

- Whenever two or more elements are defined, they must be enclosed in parentheses whether or not they are optional (for example, `($Negative|$Positive)` *or* `($mCoord|$SEP)?`). `$SEP` represents a comma.
- The first element in a text link analysis rule cannot be an optional element. For example, you cannot begin with `value = $mTopic?` or `value = @{0,1}`.
- It is possible to associate a quantity (or instance count) to a token. This is useful in writing only one rule that encompasses all cases instead of writing a separate rule for each case. For example, you may use the literal string `($SEP|and)` if you are trying to match either `,` (comma) or `and`. If you extend this by adding a quantity so that the literal string becomes `($SEP|and){1,2}`, you will now match any of the following instances: "`,`" "`and`" "`, and`".
- Spaces are not supported between the macro name and the `$` and `?` characters in the text link analysis rule `value`.
- Spaces are not supported in the text link analysis rule `output`.
- To disable an element, place a comment indicator (#) before each line.

Example. Let's suppose your resources contain the following TLA text link analysis rule and that you have enabled the extraction of TLA results:

```
## Jean Doe was the former HR director of IBM in France
[pattern(201)]
name= 1_201
value = $Person ($SEP|$mDet|$mSupport|as|then){1,2} @{0,1} $Function
 (of|with|for|in|to|at) @{0,1} $Organization @{0,2} $Location
output = $1\t#1\t$4\t#4\t$7\t#7\t$9\t#9
```

Whenever you extract, the extraction engine will read each sentence and will try to match the following sequence:

Table 49. Extraction sequence example

Position	Description of the arguments
1	The name of a person ($Person),
2	One or two of the following: comma ($SEP), determiner ($mDet), auxiliary verb ($mSupport), the strings "then" or "as",
3	0 or 1 word (@{0,1})
4	A function ($Function)
5	One of the following strings: "of", "with", "for", "in", "to", or "at",
6	0 or 1 word (@{0,1})
7	The name of an organization ($Organization)
8	0, 1, or 2 words (@{0,2})
9	The name of a location ($Location)

This sample text link analysis rule would match sentences or phrases like:

Jean Doe, the HR director of IBM in France

Jean Doe was the former HR director of IBM in France

IBM appointed Jean Doe as the HR director of IBM in France

This sample text link analysis rule would produce the following output:

```
jean doe <Person> hr director <Function> ibm <Organization> france <Location>
```

Where:

- jean doe is the term corresponding to $1 (the first element in the text link analysis rule) and <Person> is the type for jean doe (#1),
- hr director is the term corresponding to $4 (the 4th element in the text link analysis rule) and <Function> is the type for hr director (#4),
- ibm is the term corresponding to $7 (the 7th element in the text link analysis rule) and <Organization> is the type for ibm. (#7),
- france is the term corresponding to $9 (the 9th element in the text link analysis rule) and <Location> is the type for france (#9)

Rule Sets in the Source View

```
[set(<ID>)]
```

Where [set (<ID>)] indicates the start of a rule set and provides a unique numerical ID use to determine processing order of the sets.

Example. The following sentence contains information about individuals, their function within a company, and also the merge/acquisition activities of that company.

```
Org1 Inc has entered into a definitive merger agreement with Org2 Ltd, said John Doe, CEO of
Org2 Ltd.
```

You could write one rule with several outputs to handle all possible output such as:

```
## Org1 Inc entered into a definitive merger agreement with Org2 Ltd, said
John Doe, CEO of Org2 Ltd.

[pattern(020)]
name=020
value = $Organization @{0,4} $ActionNouns @{0,6}  $mOrg @{1,2}
 $Person @{0,2} $Function @{0,1} $Organization
output = $1\t#1\t$3\t#3\t$5\t#5
output = $7\t#7\t$9\t#9\t$11\t#11
```

which would produce the following 2 output patterns:

- `org1 inc<Organization> + merges with <ActiveVerb> + org2 ltd<Organization>`
- `john doe <Person> + ceo <Function> + org2 ltd<Organization>`

Important! Keep in mind that other linguistic handling operations are performed during the extraction of TLA patterns. In this case, `merger` is grouped under `merges with` during the synonym grouping phase of the extraction process. And since `merges with` belongs to `<ActiveVerb>` type, this type name is what appears in the final TLA pattern output. So when the output reads `t$3\t#3`, this means that the pattern will ultimately display the final concept for the third element and the final type for the third element after all linguistic processing is applied (synonyms and other groupings).

Instead of writing complex rules like the preceding, it can be easier to manage and work with two rules. The first is specialized in finding out mergers/acquisitions between companies:

```
[set(1)]
## Org1 Inc has entered into a definitive merger agreement with Org2 Ltd
[pattern(44)]
name=firm + action + firm_0044
value=$mOrg @{0,20} $ActionNouns @{0,6} $mOrg
output(1)=$1\t#1\t$3\t#3\t$5\t#5
```

which would produce `org1 inc<Organization> + merges with <ActiveVerb> + org2 ltd <Organization>`

The second is specialized in individual/function/company:

```
[set(2)]
## said John Doe, CEO of Org2 Ltd
[pattern(52)]
name=individual + role + firm_0007
value=$Person @{0,3} $mFunction (at|of)? ($mOrg|$Media|$Unknown)
output(1)=$1\t#1\t$3\tFunction\t$5\t#5
```

which would produce `john doe <Person> + ceo <Function> + org2 ltd <Organization>`

Notices

This information was developed for products and services offered worldwide.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive, MD-NC119
Armonk, NY 10504-1785
US

For license inquiries regarding double-byte (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

Intellectual Property Licensing
Legal and Intellectual Property Law
IBM Japan Ltd.
19-21, Nihonbashi-Hakozakicho, Chuo-ku
Tokyo 103-8510, Japan

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you provide in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

IBM Director of Licensing
IBM Corporation
North Castle Drive, MD-NC119
Armonk, NY 10504-1785
US

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

The performance data and client examples cited are presented for illustrative purposes only. Actual performance results may vary depending on specific configurations and operating conditions.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBMproducts. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to actual people or business enterprises is entirely coincidental.

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at "Copyright and trademark information" at www.ibm.com/legal/copytrade.shtml.

Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

Other product and service names might be trademarks of IBM or other companies.

Index

Special characters

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

U

V

W

Printed in USA