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(54) SYSTEM AND METHOD FOR MANAGING SPENDING

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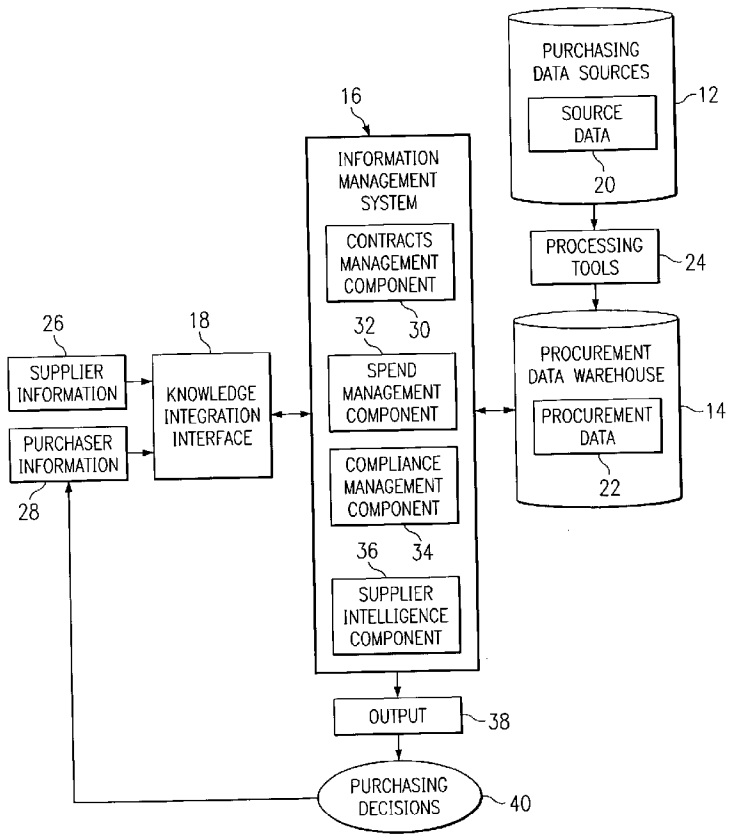
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(51) **Int. Cl.**[7] **G06F 17/60**

(52) **U.S. Cl.** **705/7**

(57) **ABSTRACT**

A method of managing spending is provided. The method includes collecting procurement data from a plurality of data sources which may have associated source-specific product catalogs. The method further includes storing a global catalog specifying mapping relationships between source-specific product attributes specified by the source-specific product catalogs and generic attributes specified by the global catalog. The method further includes mapping the source-specific attributes associated with particular products to corresponding generic attributes based on the mapping relationships. The method further includes analyzing a portion of the collected procurement data, including identifying information regarding products associated with the particular procurement events based on the generic attributes associated with the products. The method further includes automatically generating a visual output based on the analysis of the collected procurement data.



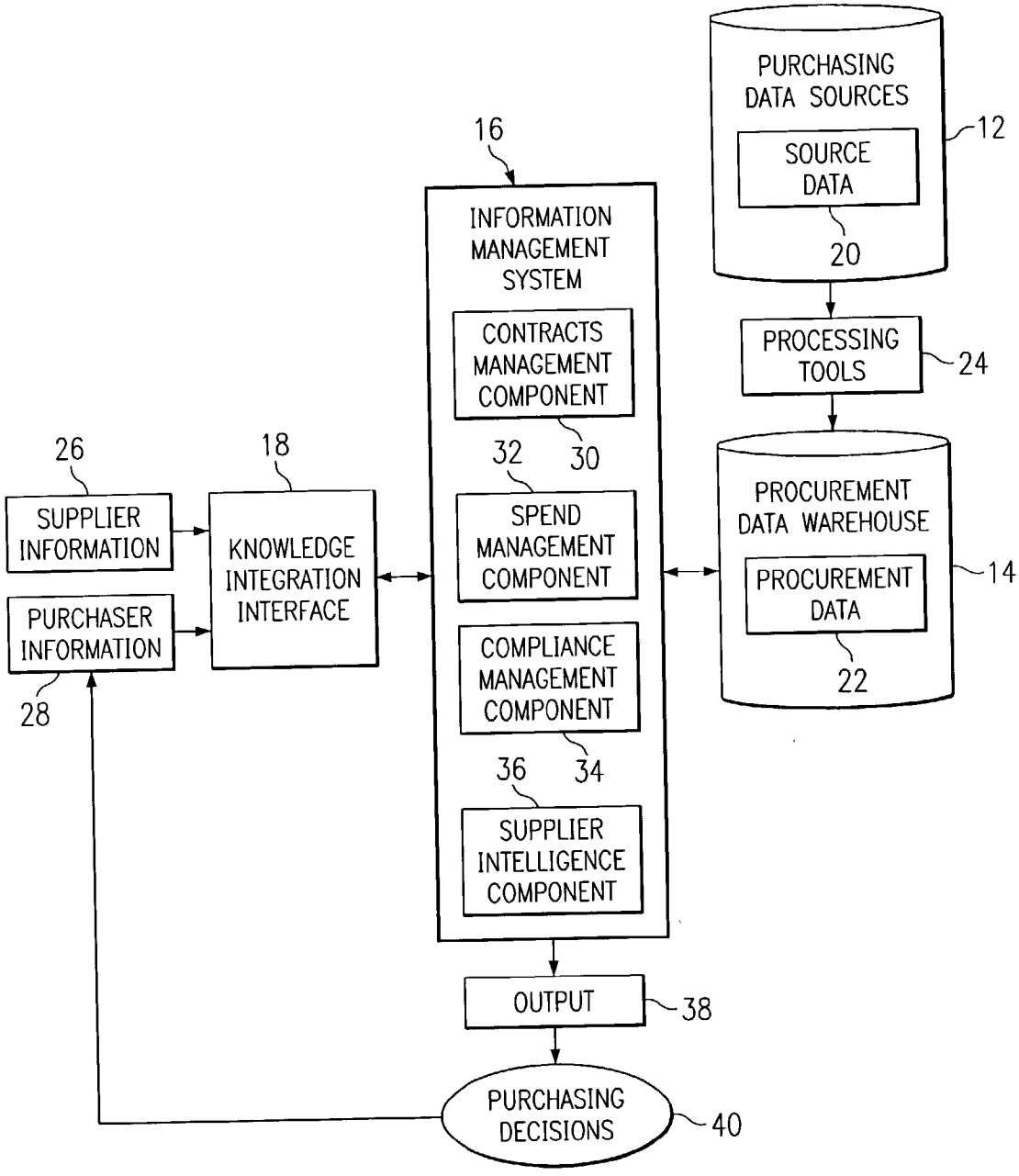

PURCHASING DATA SOURCES
SOURCE DATA
20
12
16
INFORMATION MANAGEMENT SYSTEM
CONTRACTS MANAGEMENT COMPONENT
32
30
SPEND MANAGEMENT COMPONENT
COMPLIANCE MANAGEMENT COMPONENT
36
34
SUPPLIER INTELLIGENCE COMPONENT
PROCESSING TOOLS
24
PROCUREMENT DATA WAREHOUSE
PROCUREMENT DATA
22
14
26
SUPPLIER INFORMATION
PURCHASER INFORMATION
28
18
KNOWLEDGE INTEGRATION INTERFACE
OUTPUT
38
PURCHASING DECISIONS
40

FIG. 1

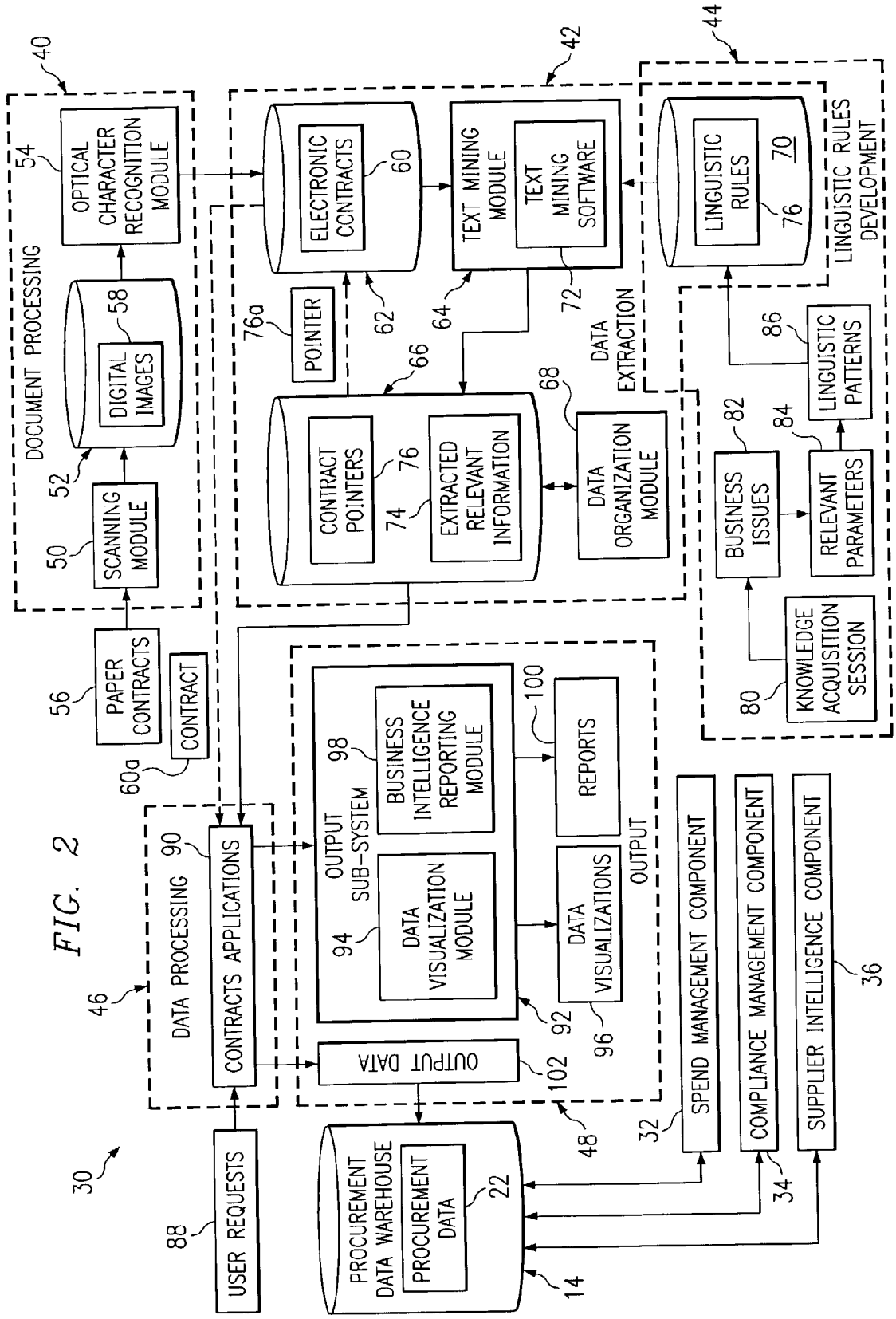
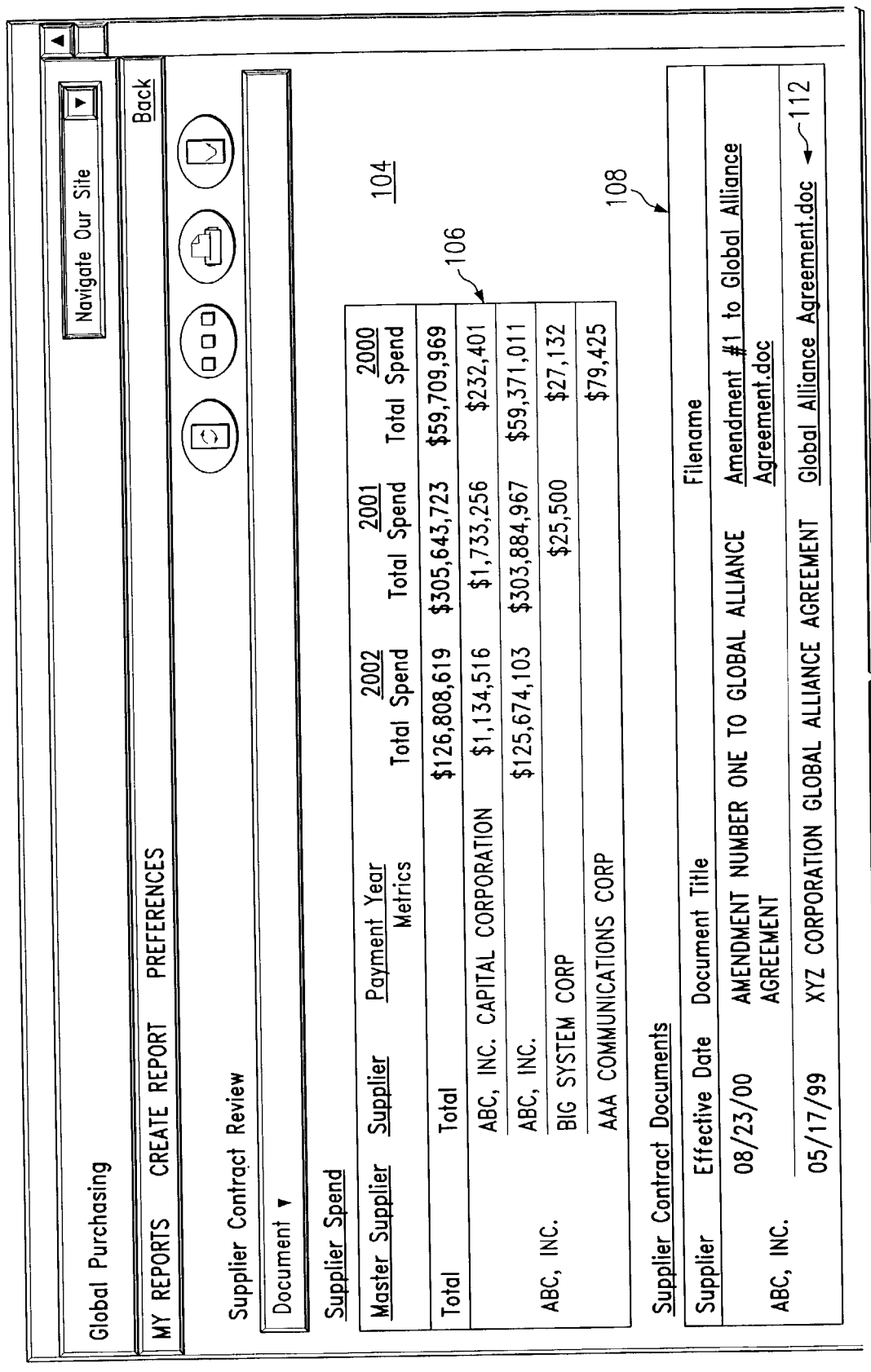

30
40
DOCUMENT PROCESSING
OPTICAL CHARACTER RECOGNITION MODULE
54
DIGITAL IMAGES
58
52
SCANNING MODULE
50
PAPER CONTRACTS
56
CONTRACT
60a
42
ELECTRONIC CONTRACTS
60
TEXT MINING MODULE
TEXT MINING SOFTWARE
72
POINTER
76a
62
64
66
CONTRACT POINTERS
74
76
EXTRACTED RELEVANT INFORMATION
DATA ORGANIZATION MODULE
68
DATA EXTRACTION
44
LINGUISTIC RULES
70
76
LINGUISTIC RULES DEVELOPMENT
86
LINGUISTIC PATTERNS
82
BUSINESS ISSUES
84
RELEVANT PARAMETERS
80
KNOWLEDGE ACQUISITION SESSION
46
DATA PROCESSING
90
CONTRACTS APPLICATIONS
OUTPUT SUB-SYSTEM
98
BUSINESS INTELLIGENCE REPORTING MODULE
94
DATA VISUALIZATION MODULE
100
REPORTS
92
DATA VISUALIZATIONS
96
OUTPUT
OUTPUT DATA
102
48
32
SPEND MANAGEMENT COMPONENT
COMPLIANCE MANAGEMENT COMPONENT
34
SUPPLIER INTELLIGENCE COMPONENT
36
88
USER REQUESTS
PROCUREMENT DATA WAREHOUSE
PROCUREMENT DATA
22
14

FIG. 2

FIG. 3A


Global Purchasing
Navigate Our Site
MY REPORTS CREATE REPORT PREFERENCES
Back
Supplier Contract Review
Document
Supplier Spend
Master Supplier
Supplier
Payment Year
Metrics
2002 Total Spend
2001 Total Spend
2000 Total Spend
104
106
Total
Total
$126,808,619
$305,643,723
$59,709,969
ABC, INC.
ABC, INC. CAPITAL CORPORATION
$1,134,516
$1,733,256
$232,401
ABC, INC.
$125,674,103
$303,884,967
$59,371,011
BIG SYSTEM CORP
$25,500
$27,132
AAA COMMUNICATIONS CORP
$79,425
108
Supplier Contract Documents
Supplier
Effective Date
Document Title
Filename
ABC, INC.
08/23/00
AMENDMENT NUMBER ONE TO GLOBAL ALLIANCE AGREEMENT
Amendment #1 to Global Alliance Agreement.doc
05/17/99
XYZ CORPORATION GLOBAL ALLIANCE AGREEMENT
Global Alliance Agreement.doc
112
TO FIG. 3B

FROM FIG. 3A

Supplier Contract Events

Event Type	Effective Date	Document Title	Event Language
			31.3 With respect to any such Affiliate, and upon ABC, INC's receipt of written notice from XYZ and such Affiliate, the license or other agreement governing the use and support of such products shall automatically be deemed to have been assigned to XYZ, provided, however, that such assigned license or other agreement shall be superseded by, and the use and support of the products shall be governed by, the terms and conditions of this Agreement.
	110		
ASSIGNMENT	05/17/99	XYZ CORPORATION GLOBAL ALLIANCE AGREEMENT	31.4 With respect to any third party with which XYZ either (i) buys, leases, or otherwise acquires all or a substantial part of the assets or business of such third party, or (ii) consolidates with or merges with said third party, the license or other agreement governing the use and support of such products shall automatically be deemed to have been assigned to XYZ, provided, however, that such assigned license or other agreement shall be superseded by, and the use and support of the Products shall be governed by, the terms and conditions of this Agreement.
			33.3 ASSIGNMENT. This Agreement shall be binding on the parties and their respective successors in interest and assigns. Neither party shall have the power to assign this Agreement

FIG. 3B

FIG. 4

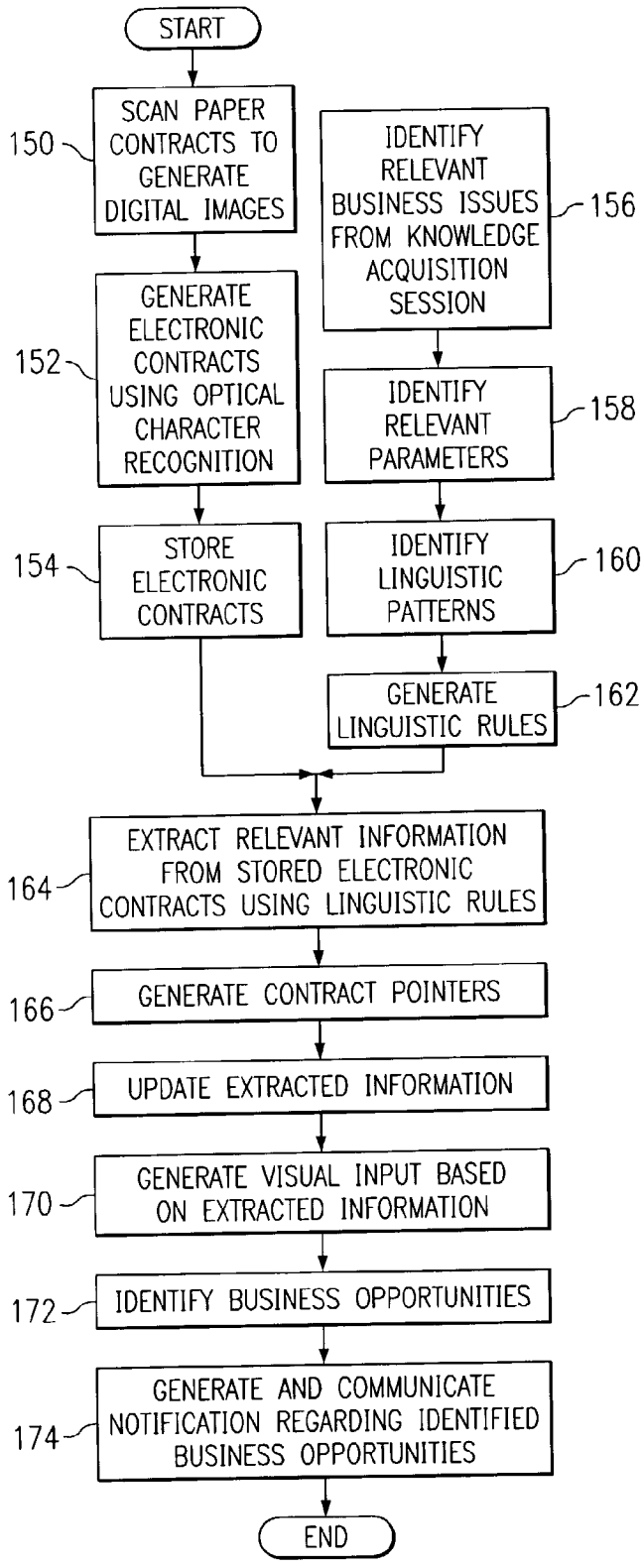

START
150
SCAN PAPER CONTRACTS TO GENERATE DIGITAL IMAGES
152
GENERATE ELECTRONIC CONTRACTS USING OPTICAL CHARACTER RECOGNITION
154
STORE ELECTRONIC CONTRACTS
156
IDENTIFY RELEVANT BUSINESS ISSUES FROM KNOWLEDGE ACQUISITION SESSION
158
IDENTIFY RELEVANT PARAMETERS
160
IDENTIFY LINGUISTIC PATTERNS
162
GENERATE LINGUISTIC RULES
164
EXTRACT RELEVANT INFORMATION FROM STORED ELECTRONIC CONTRACTS USING LINGUISTIC RULES
166
GENERATE CONTRACT POINTERS
168
UPDATE EXTRACTED INFORMATION
170
GENERATE VISUAL INPUT BASED ON EXTRACTED INFORMATION
172
IDENTIFY BUSINESS OPPORTUNITIES
174
GENERATE AND COMMUNICATE NOTIFICATION REGARDING IDENTIFIED BUSINESS OPPORTUNITIES
END

FIG. 5

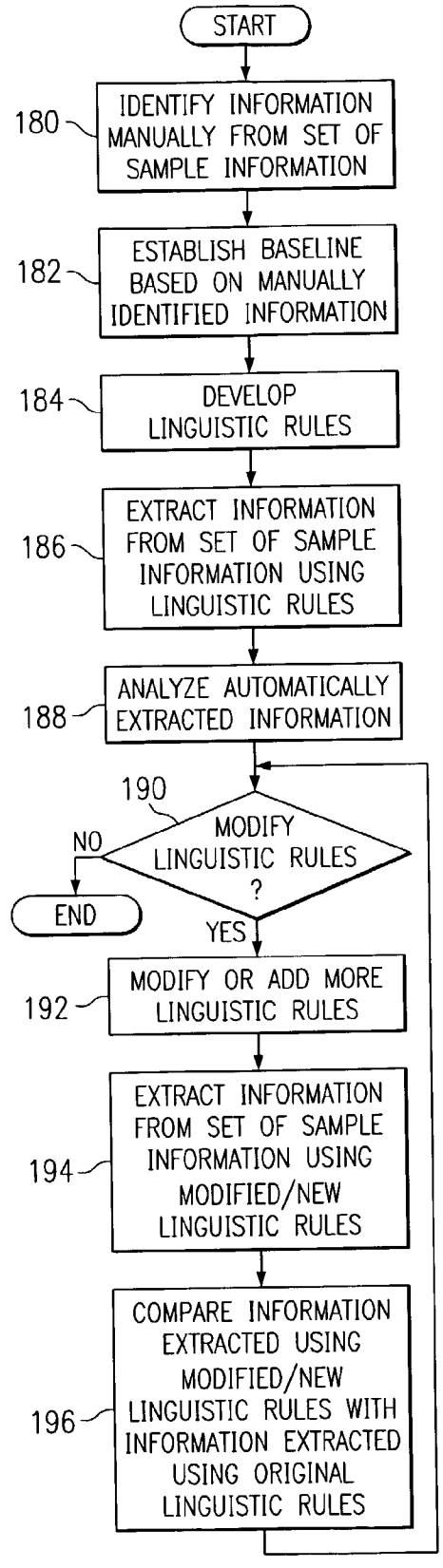

START
180
IDENTIFY INFORMATION MANUALLY FROM SET OF SAMPLE INFORMATION
182
ESTABLISH BASELINE BASED ON MANUALLY IDENTIFIED INFORMATION
184
DEVELOP LINGUISTIC RULES
186
EXTRACT INFORMATION FROM SET OF SAMPLE INFORMATION USING LINGUISTIC RULES
188
ANALYZE AUTOMATICALLY EXTRACTED INFORMATION
190
MODIFY LINGUISTIC RULES ?
NO
END
YES
192
MODIFY OR ADD MORE LINGUISTIC RULES
194
EXTRACT INFORMATION FROM SET OF SAMPLE INFORMATION USING MODIFIED/NEW LINGUISTIC RULES
196
COMPARE INFORMATION EXTRACTED USING MODIFIED/NEW LINGUISTIC RULES WITH INFORMATION EXTRACTED USING ORIGINAL LINGUISTIC RULES

FIG. 6

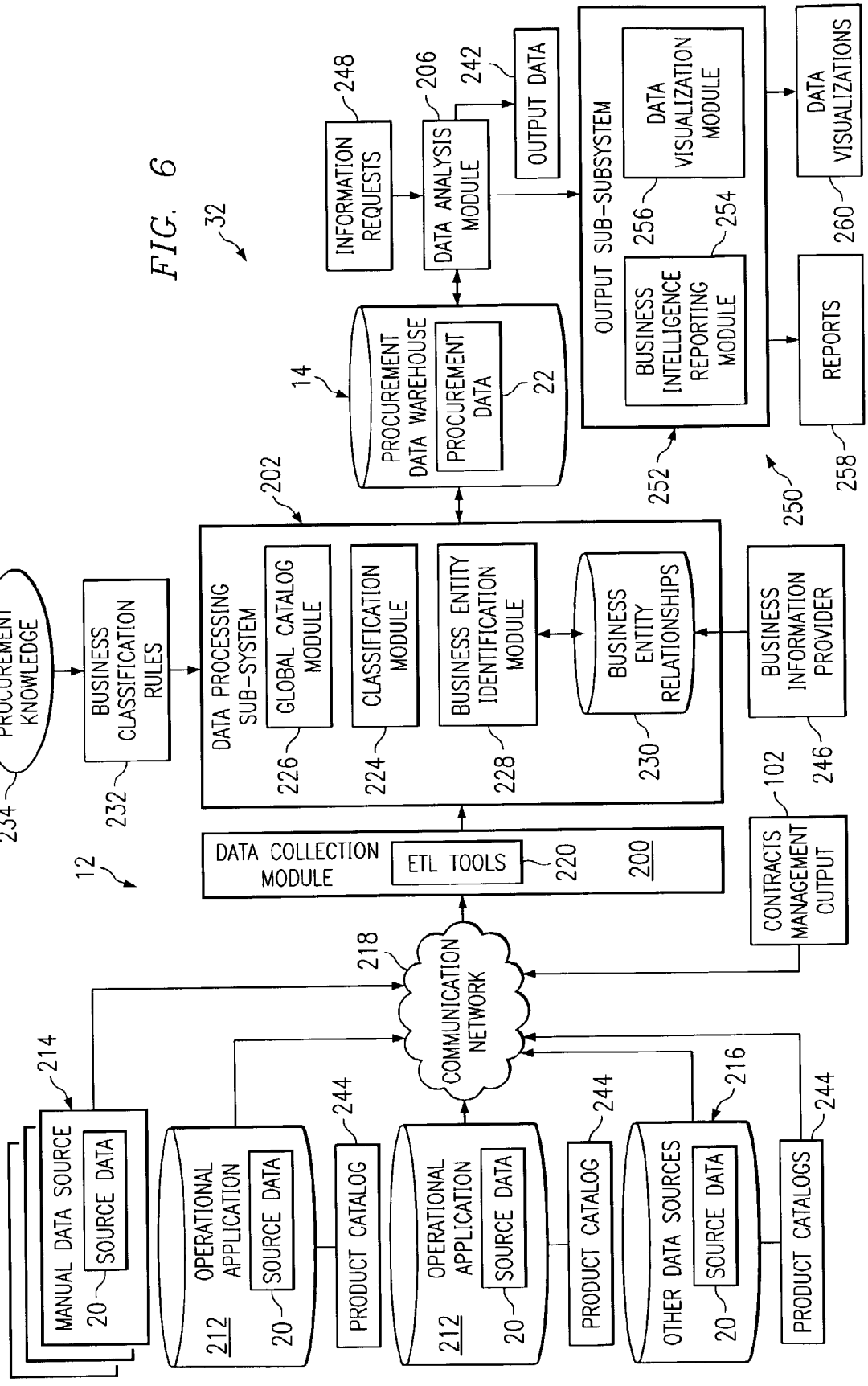

32
INFORMATION REQUESTS
248
DATA ANALYSIS MODULE
206
OUTPUT DATA
242
OUTPUT SUB-SUBSYSTEM
DATA VISUALIZATION MODULE
256
DATA VISUALIZATIONS
260
BUSINESS INTELLIGENCE REPORTING MODULE
254
REPORTS
258
252
250
14
PROCUREMENT DATA WAREHOUSE
PROCUREMENT DATA
22
202
PROCUREMENT KNOWLEDGE
234
BUSINESS CLASSIFICATION RULES
232
DATA PROCESSING SUB-SYSTEM
GLOBAL CATALOG MODULE
226
CLASSIFICATION MODULE
224
BUSINESS ENTITY IDENTIFICATION MODULE
228
BUSINESS ENTITY RELATIONSHIPS
230
BUSINESS INFORMATION PROVIDER
246
12
DATA COLLECTION MODULE
ETL TOOLS
220
200
102
CONTRACTS MANAGEMENT OUTPUT
218
COMMUNICATION NETWORK
214
MANUAL DATA SOURCE
SOURCE DATA
20
OPERATIONAL APPLICATION
212
SOURCE DATA
20
244
PRODUCT CATALOG
OPERATIONAL APPLICATION
212
SOURCE DATA
20
244
PRODUCT CATALOG
216
OTHER DATA SOURCES
SOURCE DATA
20
244
PRODUCT CATALOGS

FIG. 7

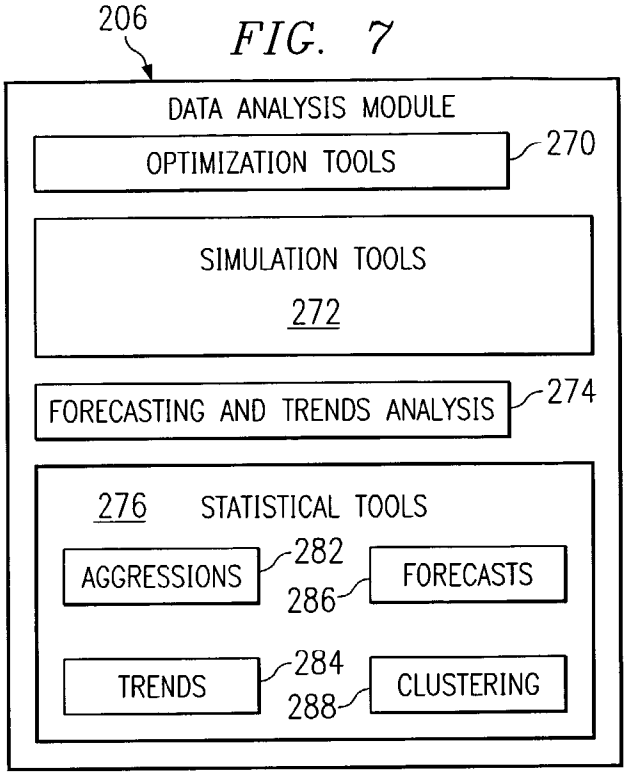

206
DATA ANALYSIS MODULE
OPTIMIZATION TOOLS
270
SIMULATION TOOLS
272
FORECASTING AND TRENDS ANALYSIS
274
276 STATISTICAL TOOLS
AGGRESSIONS
282
FORECASTS
286
TRENDS
284
CLUSTERING
288

FIG. 8

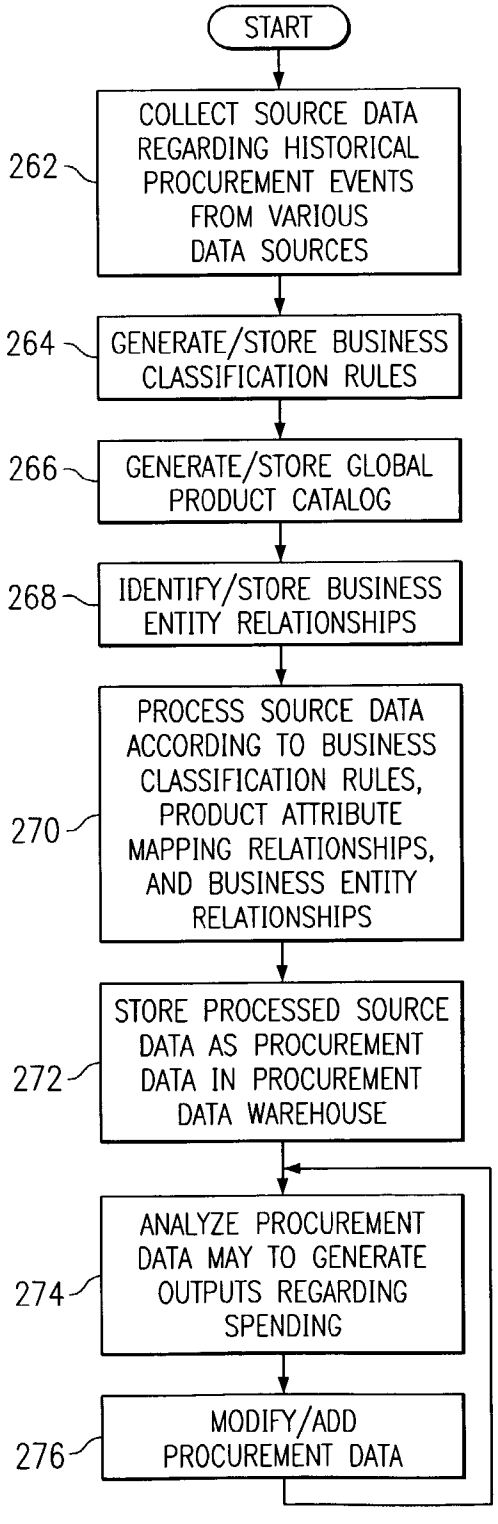

START
262
COLLECT SOURCE DATA REGARDING HISTORICAL PROCUREMENT EVENTS FROM VARIOUS DATA SOURCES
264
GENERATE/STORE BUSINESS CLASSIFICATION RULES
266
GENERATE/STORE GLOBAL PRODUCT CATALOG
268
IDENTIFY/STORE BUSINESS ENTITY RELATIONSHIPS
270
PROCESS SOURCE DATA ACCORDING TO BUSINESS CLASSIFICATION RULES, PRODUCT ATTRIBUTE MAPPING RELATIONSHIPS, AND BUSINESS ENTITY RELATIONSHIPS
272
STORE PROCESSED SOURCE DATA AS PROCUREMENT DATA IN PROCUREMENT DATA WAREHOUSE
274
ANALYZE PROCUREMENT DATA MAY TO GENERATE OUTPUTS REGARDING SPENDING
276
MODIFY/ADD PROCUREMENT DATA

FIG. 9A

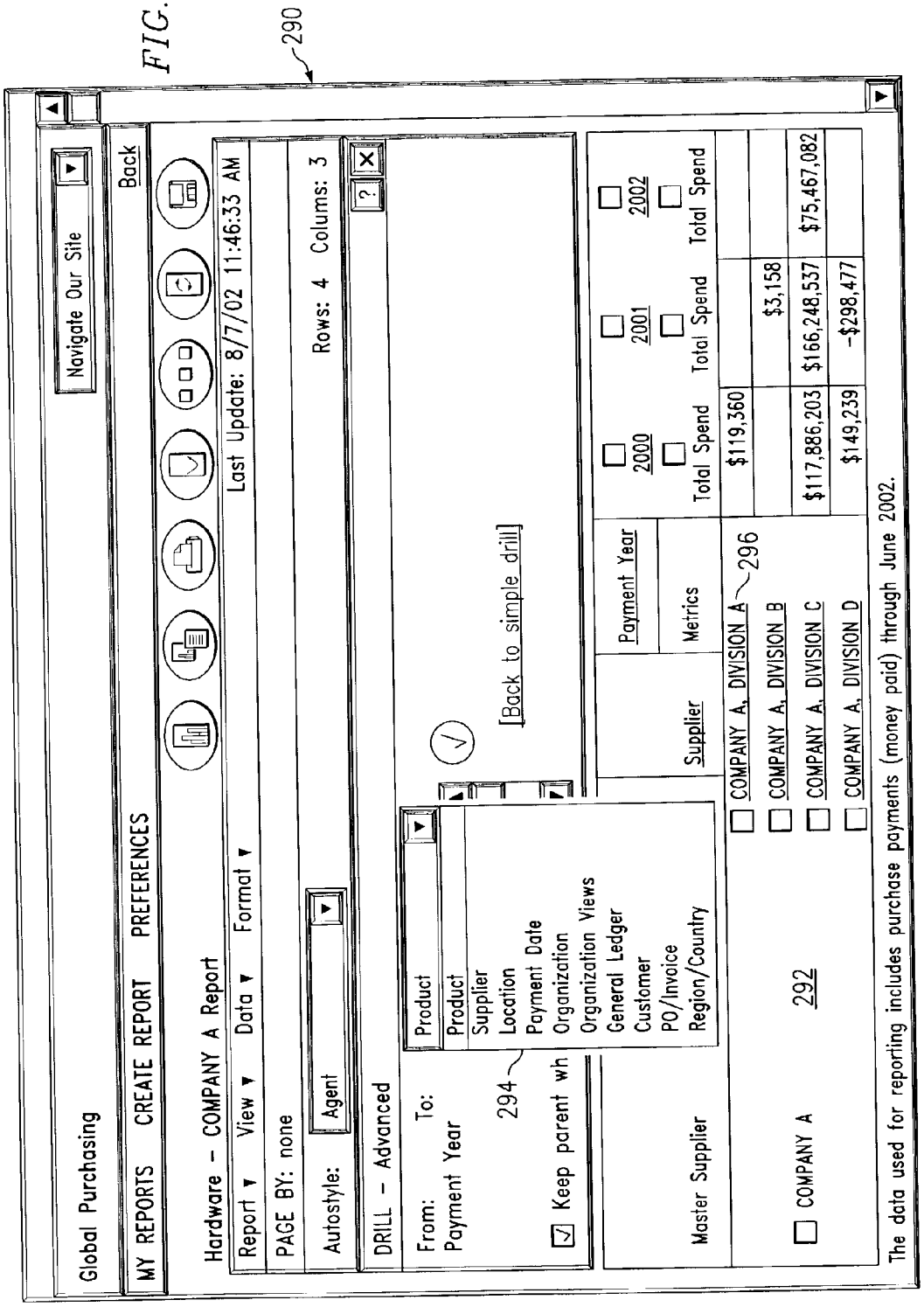

290
Global Purchasing
Navigate Our Site
MY REPORTS CREATE REPORT PREFERENCES
Back
Hardware – COMPANY A Report
Last Update: 8/7/02 11:46:33 AM
Report ▼ View ▼ Data ▼ Format ▼
PAGE BY: none
Rows: 4 Colums: 3
Autostyle: Agent
DRILL – Advanced
From: To:
Payment Year
294
Keep parent wh
Product
Product
Supplier
Location
Payment Date
Organization
Organization Views
General Ledger
Customer
PO/Invoice
Region/Country
[Back to simple drill]
Master Supplier
Supplier
Payment Year
Metrics
2000
2001
2002
Total Spend
Total Spend
Total Spend
COMPANY A
292
COMPANY A, DIVISION A
296
$119,360
COMPANY A, DIVISION B
$3,158
COMPANY A, DIVISION C
$117,886,203
$166,248,537
$75,467,082
COMPANY A, DIVISION D
$149,239
-$298,477
The data used for reporting includes purchase payments (money paid) through June 2002.

FIG. 9B

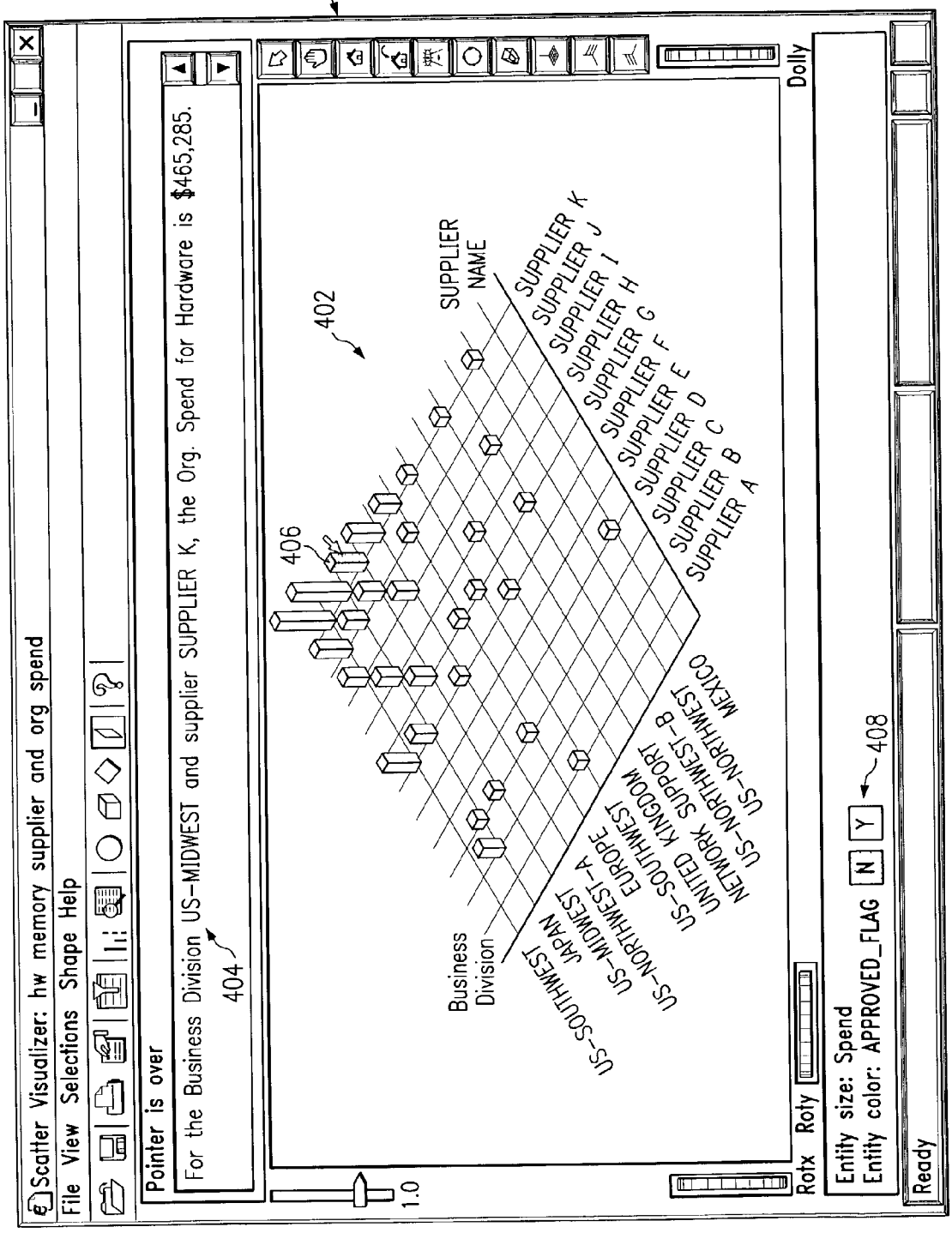

400
Scatter Visualizer: hw memory supplier and org spend
File View Selections Shape Help
Pointer is over
For the Business Division US-MIDWEST and supplier SUPPLIER K, the Org. Spend for Hardware is $465,285.
404
402
406
SUPPLIER NAME
SUPPLIER K
SUPPLIER J
SUPPLIER I
SUPPLIER H
SUPPLIER G
SUPPLIER F
SUPPLIER E
SUPPLIER D
SUPPLIER C
SUPPLIER B
SUPPLIER A
Business Division
US-SOUTHWEST
US-MIDWEST JAPAN
US-NORTHWEST-A
EUROPE
US-SOUTHWEST
UNITED KINGDOM
NETWORK SUPPORT
US-NORTHWEST-B
MEXICO
US-NORTHWEST
1.0
Rotx Roty
Dolly
Entity size: Spend
Entity color: APPROVED_FLAG N Y
408
Ready

FIG. 10

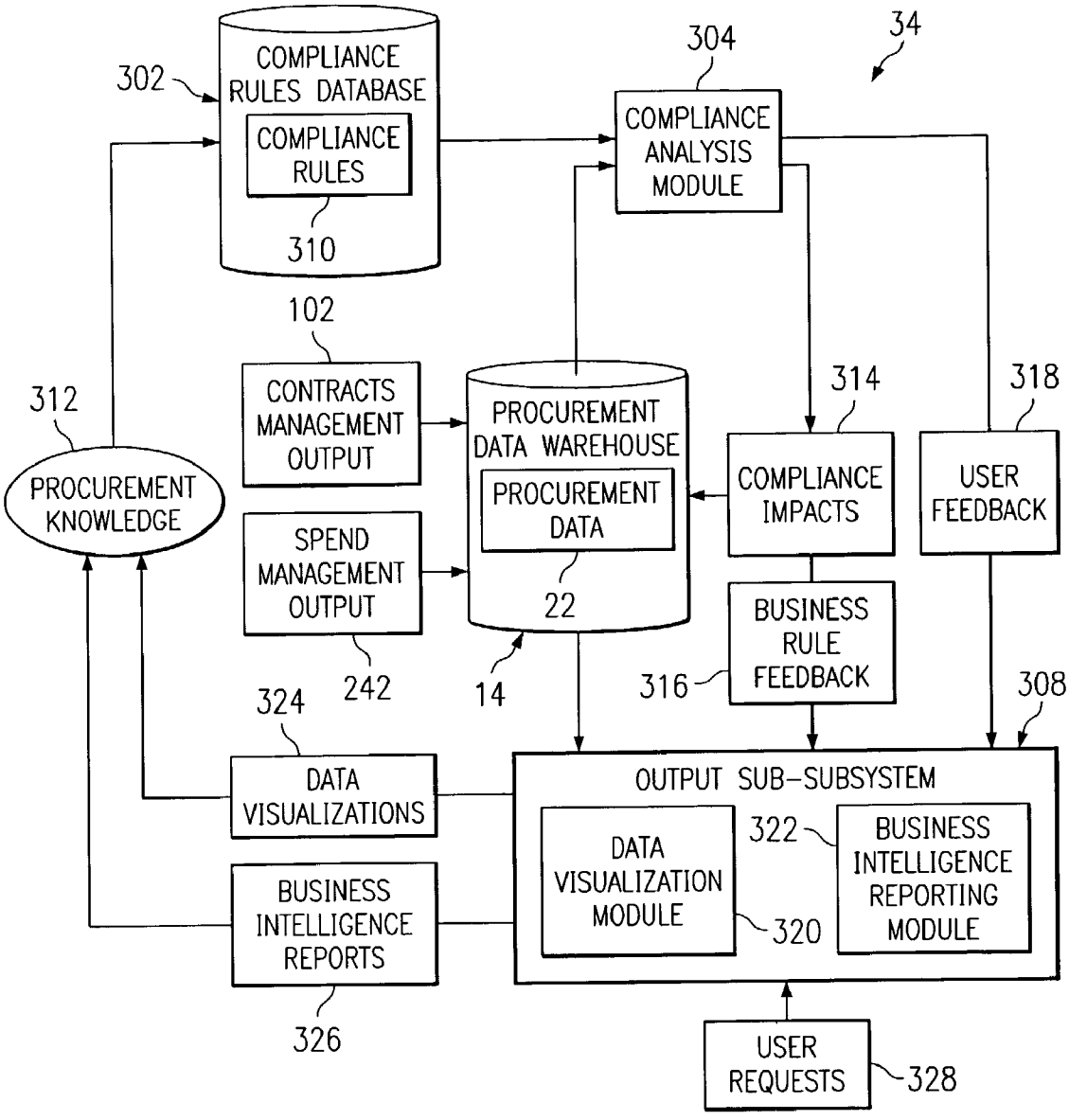

COMPLIANCE RULES DATABASE
COMPLIANCE RULES
310
302
304
34
COMPLIANCE ANALYSIS MODULE
102
CONTRACTS MANAGEMENT OUTPUT
PROCUREMENT DATA WAREHOUSE
PROCUREMENT DATA
22
312
PROCUREMENT KNOWLEDGE
SPEND MANAGEMENT OUTPUT
242
14
314
COMPLIANCE IMPACTS
318
USER FEEDBACK
316
BUSINESS RULE FEEDBACK
308
324
DATA VISUALIZATIONS
OUTPUT SUB-SUBSYSTEM
DATA VISUALIZATION MODULE
322
BUSINESS INTELLIGENCE REPORTING MODULE
320
BUSINESS INTELLIGENCE REPORTS
326
USER REQUESTS
328

FIG. 11

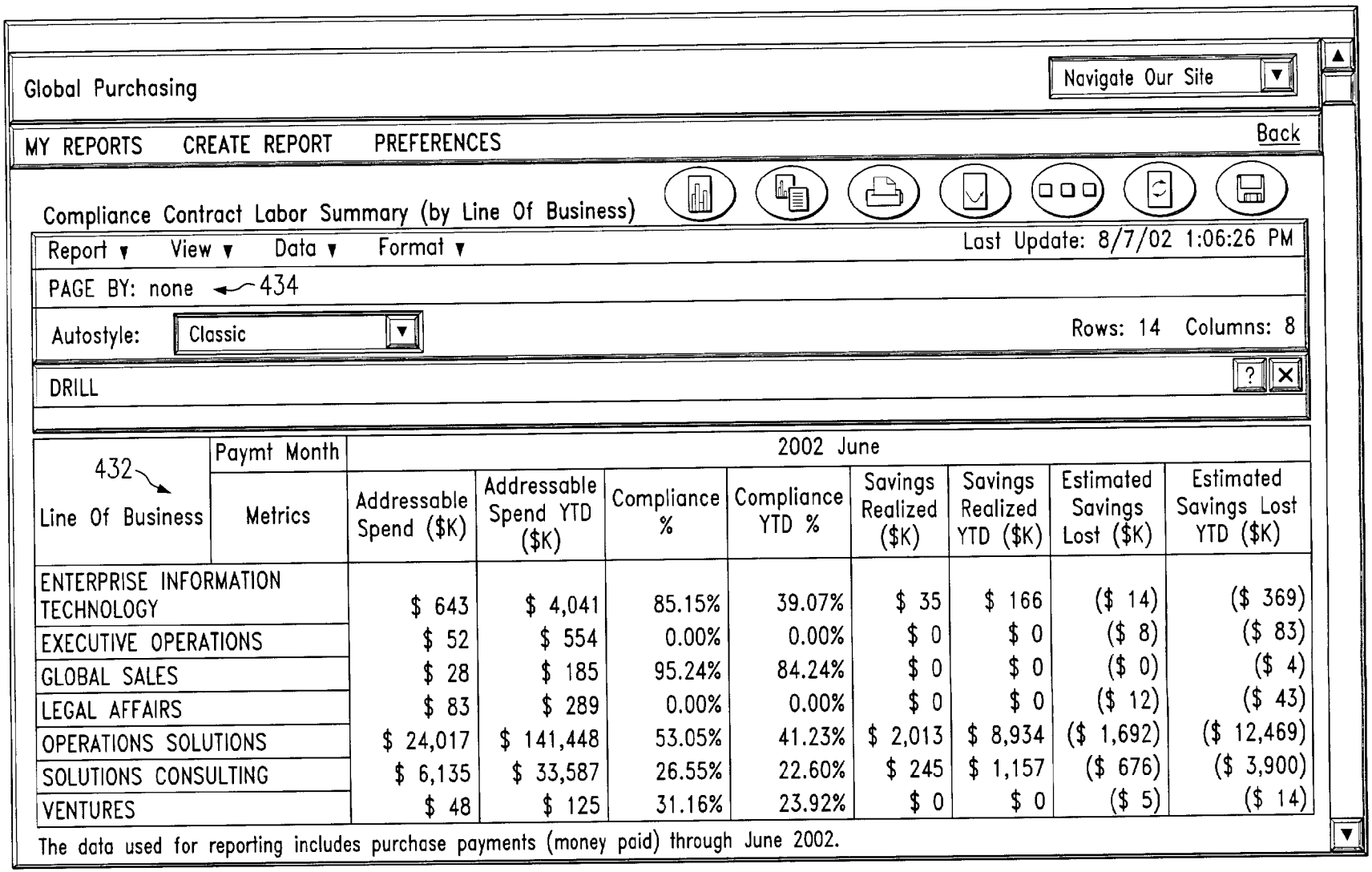

Global Purchasing
Navigate Our Site
MY REPORTS
CREATE REPORT
PREFERENCES
Back
Compliance Contract Labor Summary (by Line Of Business)
Report
View
Data
Format
Last Update: 8/7/02 1:06:26 PM
PAGE BY: none
434
Autostyle:
Classic
Rows: 14 Columns: 8
DRILL
432
Line Of Business
Paymt Month
Metrics
2002 June
Addressable Spend ($K)
Addressable Spend YTD ($K)
Compliance %
Compliance YTD %
Savings Realized ($K)
Savings Realized YTD ($K)
Estimated Savings Lost ($K)
Estimated Savings Lost YTD ($K)
ENTERPRISE INFORMATION TECHNOLOGY $ 643 $ 4,041 85.15% 39.07% $ 35 $ 166 ($ 14) ($ 369)
EXECUTIVE OPERATIONS $ 52 $ 554 0.00% 0.00% $ 0 $ 0 ($ 8) ($ 83)
GLOBAL SALES $ 28 $ 185 95.24% 84.24% $ 0 $ 0 ($ 0) ($ 4)
LEGAL AFFAIRS $ 83 $ 289 0.00% 0.00% $ 0 $ 0 ($ 12) ($ 43)
OPERATIONS SOLUTIONS $ 24,017 $ 141,448 53.05% 41.23% $ 2,013 $ 8,934 ($ 1,692) ($ 12,469)
SOLUTIONS CONSULTING $ 6,135 $ 33,587 26.55% 22.60% $ 245 $ 1,157 ($ 676) ($ 3,900)
VENTURES $ 48 $ 125 31.16% 23.92% $ 0 $ 0 ($ 5) ($ 14)
The data used for reporting includes purchase payments (money paid) through June 2002.

FIG. 12

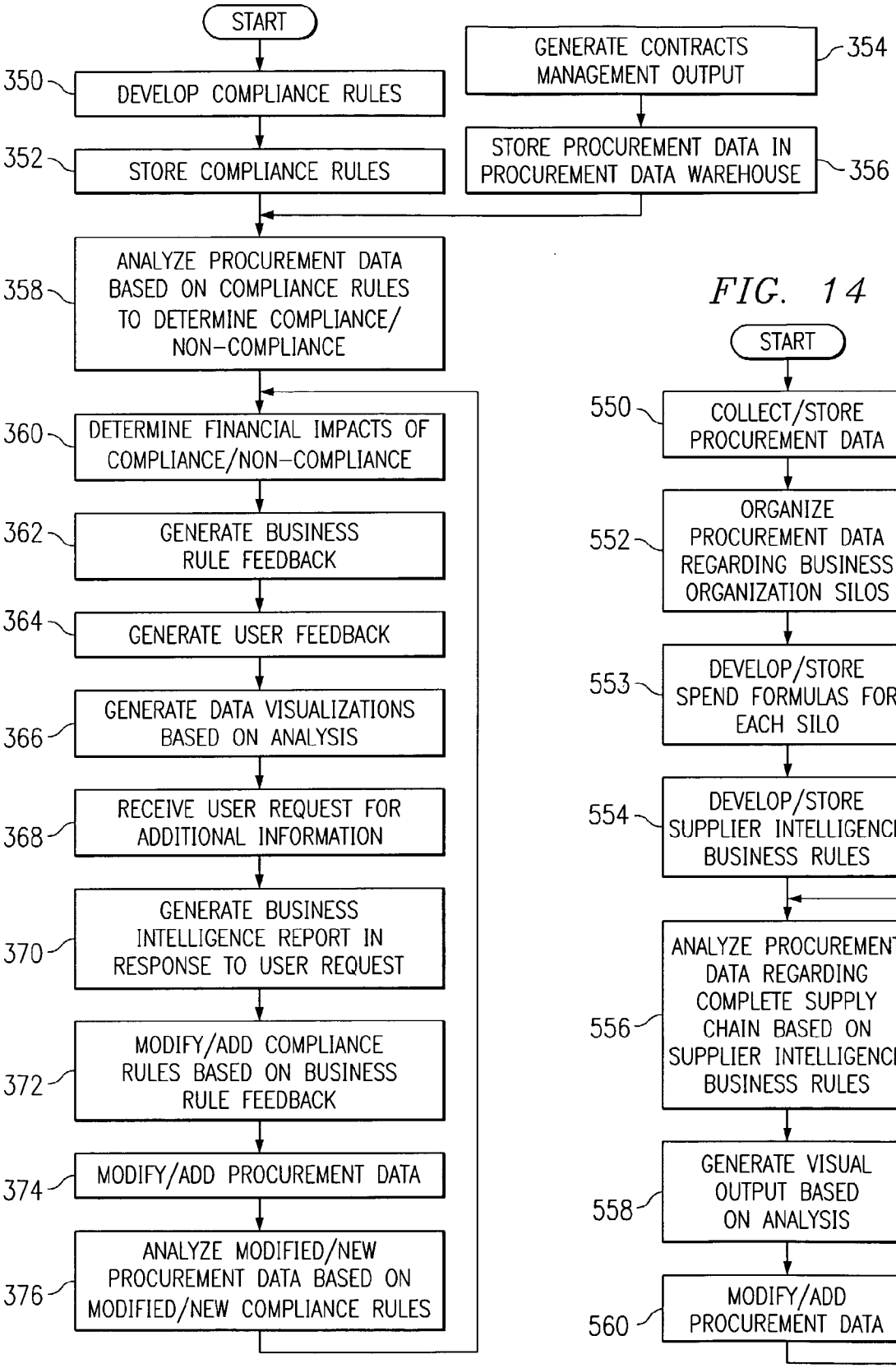

START
350
DEVELOP COMPLIANCE RULES
352
STORE COMPLIANCE RULES
GENERATE CONTRACTS MANAGEMENT OUTPUT
354
STORE PROCUREMENT DATA IN PROCUREMENT DATA WAREHOUSE
356
358
ANALYZE PROCUREMENT DATA BASED ON COMPLIANCE RULES TO DETERMINE COMPLIANCE/ NON-COMPLIANCE
360
DETERMINE FINANCIAL IMPACTS OF COMPLIANCE/NON-COMPLIANCE
362
GENERATE BUSINESS RULE FEEDBACK
364
GENERATE USER FEEDBACK
366
GENERATE DATA VISUALIZATIONS BASED ON ANALYSIS
368
RECEIVE USER REQUEST FOR ADDITIONAL INFORMATION
370
GENERATE BUSINESS INTELLIGENCE REPORT IN RESPONSE TO USER REQUEST
372
MODIFY/ADD COMPLIANCE RULES BASED ON BUSINESS RULE FEEDBACK
374
MODIFY/ADD PROCUREMENT DATA
376
ANALYZE MODIFIED/NEW PROCUREMENT DATA BASED ON MODIFIED/NEW COMPLIANCE RULES

FIG. 14

START
550
COLLECT/STORE PROCUREMENT DATA
552
ORGANIZE PROCUREMENT DATA REGARDING BUSINESS ORGANIZATION SILOS
553
DEVELOP/STORE SPEND FORMULAS FOR EACH SILO
554
DEVELOP/STORE SUPPLIER INTELLIGENCE BUSINESS RULES
556
ANALYZE PROCUREMENT DATA REGARDING COMPLETE SUPPLY CHAIN BASED ON SUPPLIER INTELLIGENCE BUSINESS RULES
558
GENERATE VISUAL OUTPUT BASED ON ANALYSIS
560
MODIFY/ADD PROCUREMENT DATA

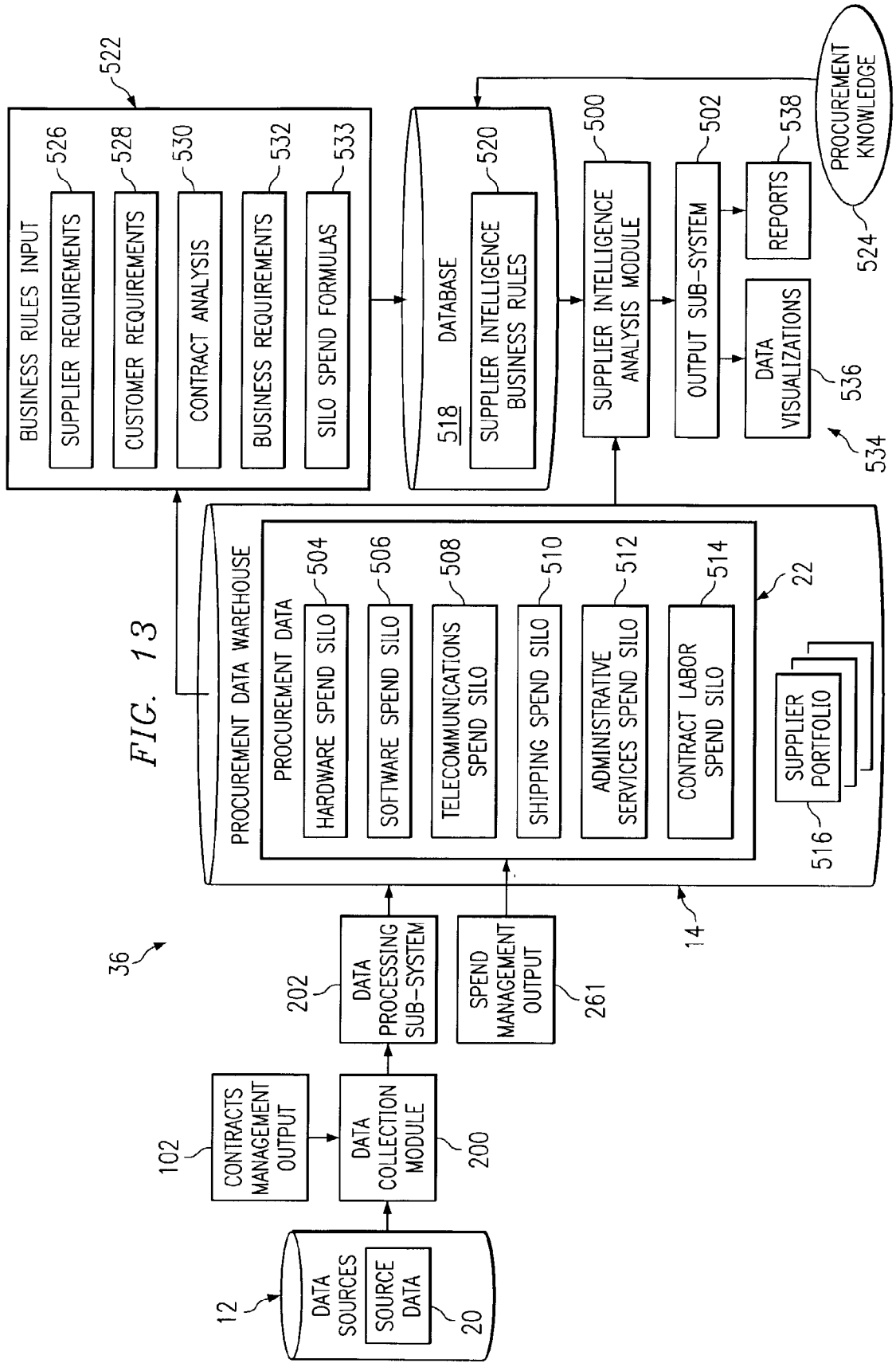
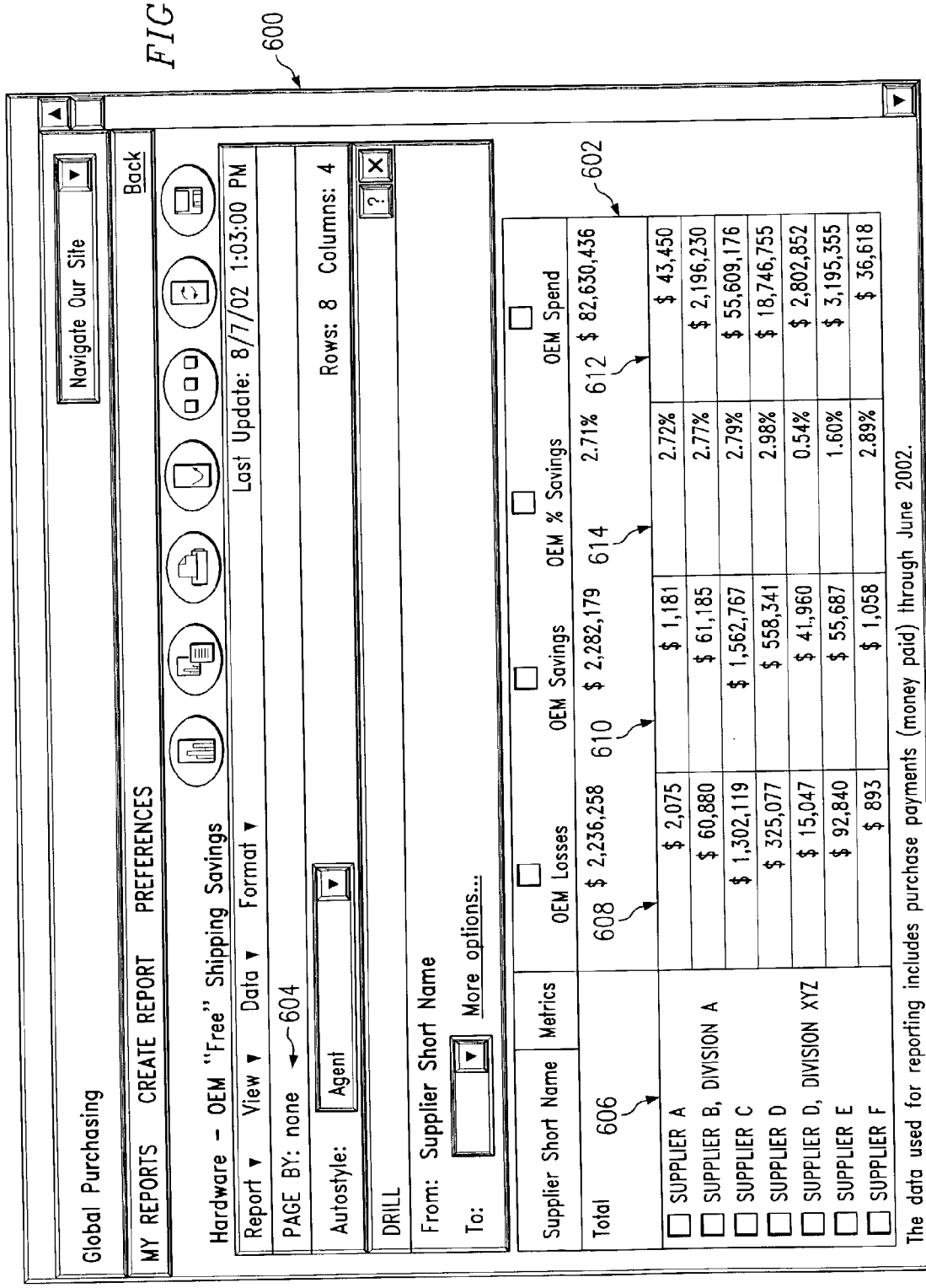

12
DATA SOURCES
SOURCE DATA
20
102
CONTRACTS MANAGEMENT OUTPUT
DATA COLLECTION MODULE
200
202
DATA PROCESSING SUB-SYSTEM
SPEND MANAGEMENT OUTPUT
261
36
14
PROCUREMENT DATA WAREHOUSE
PROCUREMENT DATA
HARDWARE SPEND SILO
504
SOFTWARE SPEND SILO
506
TELECOMMUNICATIONS SPEND SILO
508
SHIPPING SPEND SILO
510
ADMINISTRATIVE SERVICES SPEND SILO
512
CONTRACT LABOR SPEND SILO
514
22
SUPPLIER PORTFOLIO
516
BUSINESS RULES INPUT
SUPPLIER REQUIREMENTS
526
CUSTOMER REQUIREMENTS
528
CONTRACT ANALYSIS
530
BUSINESS REQUIREMENTS
532
SILO SPEND FORMULAS
533
522
518 DATABASE
SUPPLIER INTELLIGENCE BUSINESS RULES
520
SUPPLIER INTELLIGENCE ANALYSIS MODULE
500
OUTPUT SUB-SYSTEM
502
REPORTS
538
DATA VISUALIZATIONS
536
534
PROCUREMENT KNOWLEDGE
524

FIG. 13

FIG. 15


600
Global Purchasing
Navigate Our Site
MY REPORTS CREATE REPORT PREFERENCES
Back
Hardware - OEM "Free" Shipping Savings
Report ▼ View ▼ Data ▼ Format ▼
Last Update: 8/7/02 1:03:00 PM
PAGE BY: none
604
Autostyle: Agent
Rows: 8 Columns: 4
DRILL
From: Supplier Short Name
To:
More options...
602
606
608
610
614
612
Supplier Short Name
Metrics
OEM Losses
OEM Savings
OEM % Savings
OEM Spend
Total
$ 2,236,258
$ 2,282,179
2.71%
$ 82,630,436
SUPPLIER A
$ 2,075
$ 1,181
2.72%
$ 43,450
SUPPLIER B, DIVISION A
$ 60,880
$ 61,185
2.77%
$ 2,196,230
SUPPLIER C
$ 1,302,119
$ 1,562,767
2.79%
$ 55,609,176
SUPPLIER D
$ 325,077
$ 558,341
2.98%
$ 18,746,755
SUPPLIER D, DIVISION XYZ
$ 15,047
$ 41,960
0.54%
$ 2,802,852
SUPPLIER E
$ 92,840
$ 55,687
1.60%
$ 3,195,355
SUPPLIER F
$ 893
$ 1,058
2.89%
$ 36,618
The data used for reporting includes purchase payments (money paid) through June 2002.

SYSTEM AND METHOD FOR MANAGING SPENDING

RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application Serial No. 60/344,440, entitled "BANK OF KNOWLEDGE," filed Oct. 23, 2001, which is hereby incorporated by reference.

TECHNICAL FIELD OF THE INVENTION

[0002] This invention relates in general to supply chain management and, more particularly, to a system and method for managing spending associated with a procurement process.

BACKGROUND OF THE INVENTION

[0003] Financial pressures continue to provide business executives with opportunities to reduce expenses while generating revenue growth. Procurement decisions, such as purchasing decisions regarding particular products, suppliers, and shipping of purchased products, often have a substantial impact on a business organization's financial bottom line, providing opportunities for reducing expenses as well as increasing revenue. In addition, such procurement decisions often influence the organization's general operation and the quality of goods or services procured by the organization.

[0004] Procurement decisions are often complex and involve the analysis of heterogeneous information, which may be constantly evolving, over a period of time. For example, such information may include large volumes of product data, purchaser (or client) requirements, supplier constraints, legal regulations and contractual terms and obligations. Contractual terms and obligations may originate from contracts between the business organization and its various suppliers. Some business organizations may deal with hundreds or even thousands of suppliers, and may therefore have hundreds or thousands of supplier contracts active at any particular time. These supplier contracts define the business terms and conditions between the business organization and the many suppliers.

SUMMARY OF THE INVENTION

[0005] In accordance with the present invention, systems and methods for managing spending associated with a procurement process are provided.

[0006] According to one embodiment, a method of managing spending is provided. The method includes collecting procurement data from a plurality of data sources. The procurement data includes information regarding a plurality of procurement events. One or more of the data sources having an associated source-specific product catalog. The method further includes storing a global catalog specifying, for each of a plurality of products, mapping relationships between source-specific product attributes specified by the one or more source-specific product catalogs and one or more generic attributes specified by the global catalog. The method further includes mapping the source-specific attributes associated with products identified by the collected procurement data to the corresponding generic attributes based on the mapping relationships. The method further includes analyzing a portion of the collected procurement data, including identifying information regarding particular products based on the generic attributes associated with the one or more products. The method further includes automatically generating a visual output based on the analysis of the collected procurement data.

[0007] According to another embodiment, a system for managing spending is provided. The system includes a data warehouse, a global catalog module, a data analysis module, a data visualization module. The data warehouse is operable to collect procurement data from a plurality of data sources. The procurement data includes information regarding a plurality of procurement events. One or more of the data sources has an associated source-specific product catalog. The global catalog module is operable to store a global catalog specifying, for each of a plurality of products, mapping relationships between source-specific product attributes specified by the one or more source-specific product catalogs and one or more generic attributes specified by the global catalog. The global catalog module is further operable to map the source-specific attributes associated with one or more products identified by the collected procurement data to the corresponding generic attributes based on the mapping relationships specified by the global catalog. The data analysis module is operable to analyze a portion of the collected procurement data regarding one or more procurement events associated with a procurement issue. The analysis includes identifying information regarding particular products based on the generic attributes associated with the one or more particular products. The data visualization module is operable to generate a visual output regarding the particular procurement issue based on the analysis of the collected procurement data regarding the one or more procurement events.

[0008] Various embodiments of the present invention may benefit from numerous advantages. It should be noted that one or more embodiments may benefit from some, none, or all of the advantages discussed below.

[0009] One advantage is that procurement information may be automatically collected from a variety of heterogeneous data sources, such as operational systems and manual data sources (such as spreadsheet files), for example, into a common procurement data warehouse. The collected procurement data may then be analyzed to generate a variety of outputs indicating various details of particular procurement events or groups of procurement events. In particular embodiments, various analyses may be performed to identify, or to allow users to identify (from interpreting output generated based on such analyses), the effects of particular procurement events or decisions on other procurement activities or decisions, or on the total cost of a procurement process or supply chain. Such analyses may be more effective, accurate, faster and/or less expensive than traditional methods used to attempt such complex analyses.

[0010] Another advantage is that a number of source-specific product catalogs associated with various data sources of the procurement data may be merged into a common, global product catalog in order to provide consistent identification of products and services. Such consistent identification of products and services may be important for effectively analyzing a set of procurement data including data received from various different data sources.

[0011] Yet another advantage is that various business opportunities may be automatically identified based on the

analyses of the collected procurement data and/or information automatically extracted from a set of supplier contracts using text mining techniques. In many cases, such business opportunities would be extremely difficult to identify by human management of the procurement data and supplier contracts. Such business opportunities may include opportunities to reduce costs (such as by obtaining or enforcing discounts, for example), increase revenue generation (such as by obtaining or enforcing refunds, rebates or margins, for example) and reduce legal exposure due to non-compliance with contractual terms, for example.

[0012] Still another advantage is that individual and corporate business entities directly associated with various procurement events may be tracked in the procurement data warehouse. In addition, related business entities may be identified and associated with each relevant procurement event. Thus, for example, purchasing activity regarding a particular supplier or procurement process may be reported and analyzed at both the parent and subsidiary level. Such business relationships may be automatically identified, tracked and updated based on business relationship information received periodically from a business information provider, such as DUN & BRADSTREET, for example.

[0013] Other advantages will be readily apparent to one having ordinary skill in the art from the following figures, descriptions, and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] For a more complete understanding of the present invention and for further features and advantages, reference is now made to the following description, taken in conjunction with the accompanying drawings, in which:

[0015] **FIG. 1** illustrates an example procurement data management system in accordance with an embodiment of the present invention;

[0016] **FIG. 2** illustrates an example architecture and operation of a contracts management component of the procurement data management system of **FIG. 1**;

[0017] FIGS. **3A-3B** illustrate a display of an example output generated by the contracts management component of **FIG. 2**;

[0018] **FIG. 4** illustrates an example method of managing contracts in accordance with an embodiment of the present invention;

[0019] **FIG. 5** illustrates an example method of developing, testing and modifying linguistic rules used to extract information from electronic contracts in accordance with an embodiment of the present invention;

[0020] **FIG. 6** illustrates an example architecture and operation of a spend management component of the procurement data management system of **FIG. 1**;

[0021] **FIG. 7** illustrates an example data analysis module for use in the spend management component of **FIG. 6**;

[0022] **FIG. 8** illustrates an example method of managing procurement spending in accordance with an embodiment of the present of the invention;

[0023] **FIG. 9A** illustrates a display of an example output generated by the spend management component of **FIG. 6**;

[0024] **FIG. 9B** illustrates an example data visualization generated by the spend management component of **FIG. 6**;

[0025] **FIG. 10** illustrates an example architecture and operation of a compliance management component of the procurement data management system of **FIG. 1**;

[0026] **FIG. 11** illustrates a display of an example output generated by the compliance management component of **FIG. 10**;

[0027] **FIG. 12** illustrates an example method of managing compliance with business compliance rules in accordance with an embodiment of the present invention;

[0028] **FIG. 13** illustrates an example architecture and operation of a supplier intelligence component of the procurement data management system of **FIG. 1**;

[0029] **FIG. 14** illustrates an example method of managing supplier intelligence in accordance with an embodiment of the present invention; and

[0030] **FIG. 15** illustrates a display of an example output generated by the supplier intelligence component of **FIG. 13**.

DETAILED DESCRIPTION OF THE DRAWINGS

[0031] Example embodiments of the present invention and their advantages are best understood by referring now to **FIGS. 1 through 15** of the drawings, in which like numerals refer to like parts.

[0032] **FIG. 1** illustrates an example procurement data management system **10** in accordance with an embodiment of the present invention. In general, system **10** is operable to facilitate procurement decisions by extracting, integrating, analyzing, and disseminating business-critical information from a variety of heterogeneous information sources. In particular embodiments, system **10** is operable to extract procurement information from multiple sources, collect the data into a common data warehouse, compare current business events (such as purchases, for example) with information in the common data warehouse in order to generate business recommendations or discover business opportunities. In a particular embodiment, system **10** is operable to extract otherwise hidden value from both existing, as well as new, businesses. For example, system **10** may be operable to supply decision-makers with inferences and information that is otherwise hidden, enabling such decision-makers to make better procurement decisions based on a large collection of information.

[0033] As shown in **FIG. 1**, procurement data management system **10** may include one or more purchasing data sources **12**, a procurement data warehouse **14**, an information management system **16**, and a knowledge integration interface **18**. Information management system **16** comprises various components, including a contracts management component **30**, a spend management component **32**, a compliance management component **34**, and a supplier intelligence component **36**.

[0034] Purchasing data sources **12** may be operable to store, or otherwise have access to, various source data **20** regarding any number of historical procurement events and/or business entities. The terms "business entity" and "business organization" as used throughout this document

includes any individual or group of individuals associated with any type of for-profit or non-profit business enterprise.

[0035] Purchasing data sources **12** may include operational applications, manual source data applications (such as spreadsheet files, for example) and/or various other data sources suitable to store or have access to information regarding procurement events. In some embodiments, purchasing data sources **12** may include one or more databases or applications operable to support operational systems. For example, a particular purchasing data source **12** may include an on-line transaction processing (OLTP) system, a teleprocessing monitor, a data management system (such as a DB2, ORACLE, or SYBASE system, for example) and may have capabilities for on-line data entry and batch processing. In particular embodiments, source data **20** associated with purchasing data sources **12** generally includes structured, as opposed to unstructured, data. It should be understood that various purchasing data sources **12** may be physically and geographically distributed.

[0036] Source data **20** may include information from purchase orders (such as information regarding suppliers, products, prices, refunds, rebates, margins, and dates, for example), invoices, general ledger account information (such as general ledger account codes, for example), a listing of procured products and services, where such procurements are made, who is responsible for making such procurements, payment information, and any other type of information regarding historical procurement events. It should be understood that the term "products" as used throughout this document includes both goods and services, whether or not accompanied by the term "services."

[0037] Procurement data warehouse **14** may include a collection of procurement data **22**, which may include source data **20** received from one or more purchasing data sources **12**. As shown in **FIG. 1**, one or more processing tools **24** may be used to facilitate the transportation of such source data **20** from purchasing data sources **12** to procurement data warehouse **14**. Processing tools **24** may include data extraction, transformation, and loading (ETL) tools operable to extract source data **20** from purchasing data sources **12**, transform or otherwise process such source data **20**, and load such source data **20** into procurement data warehouse **14**. Such ETL tools are described in greater detail below with reference to ETL tools **220** of **FIG. 6**. Processing tools **24** may also include one or more additional tools operable to process source data **20**, such as various data mapping and classification tools, as described in greater detail below with reference to data processing sub-system **202** of **FIG. 6**.

[0038] Procurement data **22** may also include data received from information management system **16**. For example, procurement data **22** may include data extracted from electronic procurement contracts by contracts management component **30** of information management system **16**, as discussed below in greater detail. It should be understood that procurement data warehouse **14** may be operable to exchange various information with information management system **16** in order to generate outputs **38** enabling users (such as procurement decision-makers, for example) to make better purchasing decisions, indicated by reference numeral **40**. It should be understood that the term "user" as used throughout this document refers to any person or group of people associated with a procurement process or business entity, such as business rule experts, subject matter experts, business analysts, data analysts, managers, system administrators, purchasing or spending decision-makers, or business consultants, for example.

[0039] Knowledge integration interface **18** may be operable to bring together supplier information **26**, purchaser information **28**, and the various components of information management system **16** in order for such information to be processed to generate various outputs **38**. In particular embodiments, knowledge integration interface **18** includes an interface and a set of utilities and routines that bring together supplier information **26**, purchaser information **28** and the components of information management system **16**. For example, knowledge integration interface **18** may be operable to receive or extract particular supplier information **26** and determine where to route the particular supplier information **26** such that the supplier information **26** may be presented to a user in a format such that the user may discover hidden value or particular business opportunities.

[0040] Supplier information may include various information regarding any number of suppliers, such as spending patterns with particular suppliers, information regarding supplier alignment, and information regarding compliance and/or non-compliance with agreements made between particular suppliers and the purchasing organization, for example.

[0041] Purchaser information may include various information regarding the purchasing business organization, such as information regarding particular business opportunities, such as information regarding opportunities for reducing expenses and/or generating revenue.

[0042] **FIG. 2** illustrates an example architecture and operation of contracts management component **30** of system **10** in accordance with an embodiment of the present invention. Contracts management component **30** may include one or more various sub-components. For example, in the embodiment shown in **FIG. 2**, contracts management component **30** includes a document processing sub-component **40**, a data extraction sub-component **42**, a linguistic rules development sub-component **44**, and a data processing sub-component **46**. Document processing sub-component **40** may be generally operable to convert (by digitizing) paper contracts into electronic contracts. Data extraction sub-component **42** may be generally operable to extract relevant information from the digitized electronic contracts based on a set of linguistic rules. Linguistic rules development sub-component **44** may be generally operable to analyze business issues to determine such linguistic rules. Data processing sub-component **46** may be generally operable to analyze information extracted by data extraction sub-component **42** to generate various types of output, indicated generally by reference numeral **48**.

[0043] Document processing sub-component **40** may include a scanning module **50**, a digital images database **52**, and an optical character recognition module **54**. Scanning module **50** may be operable to scan or otherwise process one or more paper contracts **56** to generate digital images **58** of the one or more paper contracts **56**. Digital images **58** may be stored in digital images database **52**. Paper contracts **56** may include contracts stored on paper, microfiche, microfilm, aperture card, or any other format in which the text of

the contracts is not computer-editable. Optical character recognition module **54** is operable to convert the digital images **58** associated with each paper contract **56** into an electronic contract **58**, such that the text of the electronic contract **60** is computer-editable. For example, optical character recognition module **54** may convert digital images **58** into electronic contracts **60** based on patterns of pixels in digital images **58**. Each electronic contract **60** may be stored in an electronic contracts database **62** of data extraction sub-component **42**. It should be understood that electronic contracts **60** comprise computer-editable, but unstructured, text.

[**0044**] Data extraction sub-component **42** may include electronic contracts database **62**, a text mining module **64**, an extracted information database **66**, a data organization database **68**, and a linguistic rules database **70**. As discussed above, electronic contracts database **62** is operable to store electronic contracts **60** received from document processing sub-component **40**. Text mining module **64** may include text mining tools, or software, **72** and may be operable to analyze electronic contracts **60** to extract relevant information **74** based on a set of linguistic rules **76** stored in linguistic rules database **70**. Text mining tools **72** may be operable to automatically identify, group, and map key concepts within a large volume of unstructured textual data. Text mining tools **72** may include lexical processing and information clustering operable to extract key phrases and identify relevant relationships within electronic contracts **60**.

[**0045**] In particular embodiments, text mining tools **72** may include Natural Language Processing (NLP) technologies to extract relevant information **74**. Using NLP technologies, documents may be transformed into a collection of concepts, described using terms discovered in the text. Thus, text mining tools **72** may be operable to extract more information than just picking up keywords from textual data. For example, text mining tools **72** may be operable to extract facts, determine their meaning, resolve ambiguities, and determine an author's intent and expectations.

[**0046**] In particular embodiments, text mining tools **72** may include software developed for use in contracts management component **30** and/or may include one or more commercially available software products, such as text mining software available from CLEARFOREST CORP. It should be understood that the term "text mining" as used throughout this document includes both data mining and text mining. In other words, "text mining" is intended to refer to the extraction of particular information from both data and unstructured text (or "free text"). Thus, for example, text mining module **64** may be operable to extract relevant information **74** from both data and text.

[**0047**] Data organization module **68** may be operable to organize and/or otherwise process extracted information **74** stored in extracted information database **66**. Such organization and/or other processing may include sorting, categorizing, filtering, cleansing, merging, or deleting information, for example.

[**0048**] Extracted information database **66** may also include one or more contract pointers **76**. Each contract pointer **76** may be linked to one or more particular portions or items of extracted information **74** and may point to one or more corresponding electronic contracts **60**, or portions of one or more electronic contracts **60**, stored in electronics contracts database **62**. For example, a particular contract pointer **76** may be linked to a particular contract term included within extracted information **74** and may point to the specific clause in a particular electronic contract **60** from which the particular contract term was extracted. In particular embodiments, contract pointers **76** may be generated by text mining module **64** or data organization module **68**.

[**0049**] Linguistic rules **76** include logical constructs, or statements, that may be used to analyze textual information, or data, in natural language format, such as text in English, French or Japanese, for example. The extraction of relevant information **74** from electronic contracts database **62** using text mining tools **72** may include both syntactic analysis as well as semantic analysis. Thus, linguistic rules **76** may be provided for performing both syntactic analysis and semantic analysis.

[**0050**] Syntactic analysis includes identifying or understanding the location of particular pieces of information, such as characters or words, for example. Thus, an example linguistic rule at the syntactic level may search for blank spaces between characters in order to locate each word in a group of words. As another example, syntactic linguistic rules may be used to locate particular parts of speech, such as verbs, nouns and adjectives, within a group of words. As yet another example, linguistic rules concerning syntactic analysis may utilize a dictionary to check and/or correct spellings of particular words.

[**0051**] Semantic analysis involves trying to understand the meaning of a word or group of words, such as a phrase, sentence or paragraph, for example. Example linguistic rules **76** at the semantic level may utilize a dictionary to understand the meaning of particular words. Semantic linguistic rules **76** may also utilize a thesaurus to look up synonyms to extend the semantic analysis.

[**0052**] Each linguistic rule **76**, including both syntactic and semantic rules, may perform either shallow parsing or deep parsing. Shallow parsing involves analysis limited to a single sentence, while deep parsing involves analysis extending across more than one sentence or paragraph. Deep parsing may be used to resolve ambiguities in a particular text. For example, linguistic rules designed for deep parsing may be able to distinguish between the use of the word "acquisition" to refer to a business relationship ("company A is in acquisition discussions with company B") or to a product ("company A manufactures data acquisition systems") by analyzing one or more prior and/or subsequent statements to resolve the ambiguity.

[**0053**] Linguistic rules **76** may be designed to extract one or more pieces or items of information related to a particular business issuer or parameter from an electronic contract **60**. For example, one or more linguistic rule **76** may be designed to extract telephone/fax number information from an electronic contract **60**, which may include information concerning each identified telephone/fax number, such as the number itself, whether the number is for a home phone, office phone, cellular phone, mobile phone, or fax machine, and the name of the person and/or company associated with the number. First, one or more linguistic rules may be designed to locate each telephone/fax number within the electronic contract **60**. For example, such linguistic rules **76** may look for any three consecutive numbers followed by a dash or period and followed by four consecutive numbers. The

linguistic rules **76** may also look at the text preceding the first three numbers to identify three additional consecutive numbers that may be located within parenthesis or followed by a period or hyphen. Such linguistic rules **76** may be used to extract telephone or fax numbers from electronic contract **60**. One or more additional linguistic rules **76** may then be used to identify the type of each identified telephone or fax number. For example, one or more linguistic rules **76** may be designed to search the five words prior and subsequent to each identified number for words identifying the type of each identified number, such as "office,""home,""cell,""mobile,""pager,""fax" or "facsimile," for example. One or more additional linguistic rules **76** may also be used to identify a person and/or company associated with each identified number. For example, one or more linguistic rules **76** may be designed to search the sentence prior to and subsequent to each identified number for any person or company name. Thus, such linguistic rules **76** may be used to extract various information associated with each identified telephone or fax number. Such information may be linked and/or stored together within extracted information database **66**.

[**0054**] Automatically extracting relevant information **74** from electronic contracts database **62** using text mining tools **72** based on linguistic rules **76** allows the extraction of relevant information from a large volume of unstructured text and/or data sources in a relatively small period of time, and avoids the need to manually search such information to extract the relevant portions. For example, in particular embodiments, text mining module **64** may be operable to extract relevant information **74** from several thousand electronic supplier contracts **60** within a few hours, based on various factors such as the size of the electronic contracts **60** as well as the number and complexity of linguistic rules **76**, for example.

[**0055**] Linguistic rules **76** may be developed or generated by linguistic rules development sub-component **44**. One or more knowledge acquisition sessions, indicated by reference numeral **80**, may be used to identify one or more business issues, or needs, **82**. Each knowledge acquisition session **80** may include a structured interview designed to understand a particular business process, as well as why the particular business process is performed in a particular manner. For example, a particular knowledge acquisition session **80** regarding a procurement or supply management process may include an interview to discern the details of the process, as well as why the process is performed in a particular manner, in order to identify a set of relevant business issues **82**.

[**0056**] Business issues **82** may include a variety of issues associated with a particular business process, which may include a variety of issues regarding contracts associated with that business process. For example, in a situation concerning a procurement process and procurement contracts, business issues **82** may include issues such as financial obligations, rebate opportunities, refund opportunities, margin opportunities, type of license (such as software, for example), volume commitment, warranty period, term of agreement, transfer of license terms, authorized agency terms, maintenance notices, pricing, and contract termination notification, for example.

[**0057**] One or more relevant business parameters **84** may be identified for each business issue **82**. For example, supposing margin opportunities is identified as a business issue **82**, one or more parameters relevant to identifying and/or describing particular margin opportunities associated with a set of contracts may be identified as relevant parameters **84**. Such relevant parameters **84** may include the name of the supplier, the name of the product, and the amount of the margin, for example.

[**0058**] One or more linguistic patterns **86** may then be identified for each identified relevant parameter **84**. For example, supposing telephone number has been identified as a relevant parameter **84**, the associated linguistic patterns **86** may include the pattern of three consecutive numbers followed by a hyphen or period and further followed by four consecutive numbers, as well as the pattern concerning the presence of particular words such as "phone,""telephone,""fax,""facsimile,""cell,""mobile,""office," and "home" located within a particular number of words before and/or after a group of consecutive numbers, for example.

[**0059**] One or more linguistic rules **76** may then be generated, or written, for each identified linguistic pattern **86** in order to extract relevant information **74** regarding each relevant parameter **84** from electronic contracts **60** stored in electronic contracts database **62**. Linguistic rules **76** may be developed, tested, and revised using an iterative process, such as described in greater detail below with reference to **FIG. 4**.

[**0060**] Data processing sub-component **46** may be operable to process and/or analyze extracted information **74** in order to generate various types of output **48**. As shown in **FIG. 2**, data processing sub-component **46** may include one or more contracts applications **90**.

[**0061**] Contracts applications **90** may be operable to receive extracted information **74** and/or electronic contracts **62** (or portions thereof, such as particular sentences, clauses or paragraphs, for example) from electronic contracts database **62** and to process such information to generate one or more various outputs **48**. In particular embodiments, contracts applications **90** are operable to generate various outputs **48** based on requests **88** received from users, such as business analysts, for example.

[**0062**] Contracts applications **90** may also be operable to identify business opportunities associated with a procurement process. In particular embodiments, contracts applications **90** may be operable to analyze particular procurement data **22** with respect to particular extracted information **74** to determine whether a business opportunity is available. For example, contracts applications **90** may be operable to compare particular extracted information **74** regarding rebate opportunities from a particular supplier and particular procurement data **22** regarding purchases made form that supplier in order to discover potential or existing rebate opportunities. For example, if a particular supplier, Supplier A, contract specifies a rebate for spending $20,000 on product X, contracts applications **90** may be operable to identify, from analyzing procurement data **22** to determine the amount spent on product X from Supplier A, whether the rebate opportunity is available. In a particular embodiment, contracts application **90** may also be operable to generating a notification if it is determined that the business opportunity is available, and to communicate the opportunity notification to appropriate individuals (such as procurement managers, for example) or business entities.

[0063] In this manner, various business opportunities may be automatically identified by contracts management component **30** based on extracted information **74** that may not be efficiently identified by human management of supplier contracts. Such business opportunities may include opportunities to reduce costs (such as by obtaining or enforcing discounts, for example), to increase revenue generation (such as by obtaining or enforcing refunds, rebates or margins, for example) and to reduce legal exposure due to non-compliance with contractual terms, for example.

[0064] As shown in **FIG. 2**, contracts applications **90** may be associated with, or coupled to, an output sub-system **92** operable to generate various types of visual outputs that may be analyzed or interpreted by users, such as business analysts. In particular embodiments, output sub-system **92** includes a data visualization module **94** operable to generate various data visualizations **96** and a business intelligence reports **98** operable to generate business intelligence reports **100**.

[0065] Data visualizations **96** may include two-dimensional and three-dimensional visualizations, such those illustrated by FIGS. **3**A-**3**B, **9**A, **9**B, **11** and **15**, and may include a plurality of such visualizations through which a user may navigate using one or more navigation tools. Such navigation tools may be provided by contracts applications **90** or any other suitable application, and may include on-line browsers and search engines, for example. Data visualizations **96** may illustrate one or more areas of business opportunity which may be analyzed by a user, such as a business analyst, in order to further filter and isolate complex data in a manner that reveals particular patterns (such as spend patterns, for example) or business opportunities, such as described above regarding the rebate opportunity example. For example, a particular data visualization **96** may include a graph illustrating discount information regarding procurements from a particular supplier that may be analyzed by a business analyst to discover potential discount opportunities.

[0066] Business intelligence reports **100** may include textual reports (which may include pictorial representations) generated by business intelligence reporting module **98**. In a particular embodiment, contracts applications **90** are operable to receive a request **88** from a user based on the user's analysis of a particular data visualization **96**, for example, and to communicate with business intelligence reporting module **98** to generate an appropriate business intelligence report **100** based on particular extracted information **74** and/or electronics contracts **60** (or portions thereof).

[0067] In particular embodiments, output sub-system **92** is operable to provide searching or navigation tools allowing users to search or browse various outputs **48**, such as data visualizations **96** and/or business intelligence reports **100**. For example, in particular embodiments, output sub-system **92** may include a browser and/or a search engine allowing a user to search for particular contracts or portions of contracts and to view and navigate through the results of such searches.

[0068] In some embodiments, contracts applications **90** are operable to process extracted information **74** associated with a particular business parameter (such as a particular business issue **82** or relevant parameter **84**, for example) in order to generate one or more particular outputs **48** (such as a data visualization **96** or business intelligence report **100**) regarding that business parameter. For example, in a particular embodiment, contracts applications **90** are operable to receive, process and/or analyze particular extracted information **74** regarding potential rebates from a particular supplier in order to generate an output **48** that may be used to identify a rebate opportunity regarding a particular product.

[0069] As discussed above, contracts applications **90** may be operable to include electronic contracts **60** or portions of electronic contracts **60** (such as particular sentences, clauses or paragraphs of electronic contract **60***a*, for example) received from electronic contracts database **62** within various outputs **48**. For example, as shown in **FIG. 2, a** particular contract pointer **76***a* may be used to point to a particular electronic contract **60** stored in electronic contracts database **62**. The pointed-to electronic contract, shown as electronic contract **60***a*, may be forwarded to contracts applications **90** for processing. Contracts applications **90** may be able to include electronic contract **60***a*, or portions thereof, in a particular output **48**. For example, contracts applications **90** may allow a user to browse such electronic contracts **60**, or portions thereof, in order to identify relevant contract language, for example.

[0070] In addition to the various forms of output generated by output sub-system **92**, contracts application **90** may be operable to generate output data **102** to be imported into procurement data warehouse **14**. As shown in **FIG. 2**, procurement data warehouse **14** is associated with, or utilized by, each of spend management component **32**, compliance management component **34** and supplier intelligence component **36** of system **10**. Thus, in particular embodiments, as discussed below regarding **FIGS. 6, 10** and **13**, contracts management component **30** may be operable to extract relevant information **74** from electronic contracts **60** and process such extracted information **74** to generate output data **102** which may be used as an input by spend management component **32**, compliance management component **34** and/or supplier intelligence component **36** of system **10**. In an alternative embodiment, extracted information **74** may be received directly as input data by spend management component **32**, compliance management component **34** and/or supplier intelligence component **36** of system **10** without being processed by contracts applications **90**.

[0071] Contracts applications **90** and output sub-system (or particular functionalities thereof) may include separate entities or software modules or may be a collected set of modules, such as modules or functionalities provided by a particular software package, for example. For example, in a particular embodiment, data visualizations module **94** may comprise the software package MINDSET provided by SILICON GRAPHICS, INC., and contracts applications **90** and business intelligence reporting module **98** may comprise software modules or functionalities provided by a particular business intelligence software package provided by MICROSTRATEGY, INC.

[0072] FIGS. **3**A-**3**B illustrate a display **104** of an example output **48** generated by contracts applications **90** and/or output subsystem **92** of contract management component **30** in accordance with an embodiment of the present invention. Display **104** illustrates a variety of information regarding procurements and contractual arrangements between a par-

ticular business entity, XYZ Systems, Inc., from a particular supplier, ABC, Inc. For example, display **104** includes a supplier spend section **106**, a supplier contract documents section **108**, and a supplier contracts event section **110**.

[**0073**] As shown in **FIG. 3**A, supplier spend section **106** may be operable to display a summary of spending made by purchaser XYZ Systems, Inc. from supplier ABC, Inc. In particular embodiments, supplier spend section **106** includes output generated by spend management component **32** of system **10**, as discussed below in greater detail with reference to **FIG. 6**.

[**0074**] Supplier contract documents section **108** may be operable to display a listing of each contract that defines a contractual arrangement between XYZ Systems, Inc. and ABC, Inc. In particular embodiments, such contracts may be identified, based on particular information **74** extracted from electronic contracts database **62**, by contracts applications **90** and/or by spend management component **32** of system **10**, as discussed below in greater detail with reference to **FIG. 6**.

[**0075**] As shown in **FIG. 3**B, supplier contracts event section **110** may be operable to display relevant portions, or clauses, of the contracts listed in supplier contract documents section **108**. Such contract portions may specify the relevant terms and conditions of the contractual arrangement between XYZ Systems, Inc. and ABC, Inc. In particular embodiments, the contract portions, or clauses, may be retrieved form electronic contracts database **62** by one or more contract pointers **76** linked to particular extracted information **74** regarding XYZ Systems, Inc. and/or ABC, Inc.

[**0076**] Display **104** may be displayed by an interactive user interface, such as in a WINDOWS environment, for example, such that a user may navigate through the display and select particular details for further analysis. In particular embodiments, display **104** is presented by an Internet browser and includes various icons, pull-down menus and/or hypertext items (which may include underlined and/or colored text, for example) that may be selected by a user to retrieve additional information regarding particular items. For example, as shown in **FIG. 3A, a** user may select the hypertext item **112** labeled "Global_Alliance_Agreement-.doc" to retrieve a display of the particular electronic contract **60** associated with that filename such that the user may browse through the text of that particular electronic contract **60**.

[**0077**] Returning to **FIG. 2**, in operation, contracts management component **30** may periodically update its various databases and modules. It should be understood that events described throughout this document as occurring "periodically" include events that occur at regular, irregular or random intervals and/or events that are triggered by the occurrence of various other events. For example, electronic contracts module **62** may periodically receive new electronic contracts **60**, such as electronic contracts **60** generated by document processing sub-component **40**. Text mining module **64** may periodically analyze electronic contracts database **62** to extract new relevant information **74**, to modify, replace, or delete existing relevant information **74** and/or to generate new or updated contract pointers **76**.

[**0078**] In particular embodiments, text mining module **64** is operable to extract relevant information **74** from at least the new electronic contracts **60** each time one or more new electronic contracts **60** are added to electronic contracts database **62**. In addition, text mining module **64** may be operable to extract new or updated relevant information **74** from some or all electronic contracts **60** stored in electronic contracts database **62** in response to a modification, addition or deletion of one or more linguistic rules **76** stored in linguistic rules database **70**. Linguistic rules **76** may be added, deleted or modified periodically, such as when a new business issue **82** is identified, for example. In a particular embodiment, text mining module **64** is operable to "remine," or re-analyze all of the electronic contracts **60** stored in electronic contracts database **62** to extract a new set of relevant information **74** each time one or more new electronic contracts **60** are added to electronic contracts database **62**. In this manner, the extracted information may be kept current and accurate.

[**0079**] **FIG. 4** illustrates an example method of managing contracts in accordance with an embodiment of the present invention. At step **150**, one or more paper contracts are scanned or otherwise processed to generate digital images of the paper contracts. At step **152**, the digital images may be processed using optical character recognition (OCR) techniques to generate an electronic contract corresponding to each paper contract. At step **154**, the electronic contracts are stored in an electronic contracts database.

[**0080**] At step **156**, one or more business issues relevant to a particular business process are identified from a knowledge acquisition session. Such business issues may include business issues relevant to a procurement process, such as margin opportunities, rebate opportunities or discount opportunities, for example. At step **158**, one or more relevant parameters are identified for each identified business issue. For example, the relevant parameters associated with a particular business issue may include product name, supplier name, price, quantity and relevant dates.

[**0081**] At step **160**, one or more linguistic patterns are generated or identified for each identified relevant parameter. Such linguistic patterns may include textual patterns in the natural language associated with each relevant parameter. At step **162**, one or more linguistic rules are written or generated based on the linguistic patterns identified at step **160**.

[**0082**] At step **164**, relevant information is extracted from the electronic contracts stored in the electronic contracts database based on the linguistic rules generated at step **162**. In particular embodiments, the extracted information may be sorted, organized, or otherwise processed based on one or more of the linguistic rules. At step **166**, one or more contract pointers may be generated to link particular pieces or items of the extracted information to corresponding electronic contracts, or portions of electronic contracts, stored in the electronic contracts database.

[**0083**] At step **168**, the information stored in the extracted information database may be updated, which may include adding new information, updating particular information, removing particular information and/or replacing particular information, for example. For example, if new electronic contracts are added to the electronic contracts database, relevant information may be extracted from the new electronic contracts using the linguistic rules, and such extracted relevant information may be added to the extracted infor-

mation database. As another example, if new linguistic rules are added, or if one or more of the existing linguistic rules are modified or removed, an updated set of relevant information may be extracted from the electronic contracts database based on the new or updated linguistic rules. Such extracted information may then be added to the extracted information database and/or may replace all or portions of the extracted information currently stored in the extracted information database.

[0084] At step **170**, some or all of the extracted information stored in the extracted information database may be processed and/or analyzed in order to generate a visual output. In particular embodiments, particular extracted information may be processed in order to generate a particular visual output. The visual output may include one or more electronic contracts (or portions thereof) received from the electronic contracts database that are associated with the particular extracted information being processed. Such electronic contracts (or portions thereof) may be identified by one or more of the contract pointers generated at step **166** which link such electronic contracts (or portions thereof) with the particular extracted information being processed.

[0085] At step **172**, it may be determined whether a business opportunity is available based on an analysis of the output generated at step **170**. For example, a business analyst may determined whether a rebate or discount opportunity is available based on an analysis of a table, chart, graph or report generated at step **170**. At step **174**, a notification regarding an identified business opportunity may be generated and communicated to one or more business entities or employees, such as a procurement manager, for example.

[0086] In particular embodiments, steps **150** through **154** regarding converting paper contracts into electronic contracts may be optional. For example, such steps may not be performed if the electronics contracts database receives contracts from various sources already in electronic format.

[0087] **FIG. 5** illustrates an example method of developing, testing, and modifying linguistic rules (such as linguistic rules **76**, for example) in accordance with an embodiment of the present invention. At step **180**, a set of sample information, such as a group of documents, is manually analyzed to identify information within the scope of a particular parameter. For example, a set of sample contracts may be manually analyzed to identify the number and textual locations of telephone numbers, product names, or company names. At step **182**, a baseline may be established based on the results of the manual analysis performed at step **180**, such as the number and textual location of each identified item of information falling within the scope of the selected parameter. For example, if a manual analysis was performed to identify telephone numbers in a set of sample information, the baseline may specify the number of manually identified telephone numbers, as well as each actual telephone number itself.

[0088] At step **184**, one or more linguistic rules are developed or written based on linguistic patterns associated with the selected parameter in order to automatically identify information following within the scope of that parameter. In particular embodiments, such linguistic rules may be developed as described above with reference to **FIGS. 2 and 4**.

[0089] At step **186**, the set of sample information is analyzed to automatically extract information regarding the selected parameter based on the one or more linguistic rules developed at step **184**. At step **188**, the results of the analysis performed at step **186** are analyzed. In particular embodiments, the information extracted at step **186** is compared with the baseline information determined at step **182** to determine the quality of the one or more linguistic rules.

[0090] In a particular embodiment, both the accuracy and the thoroughness of the automatically extracted information may be measured. Accuracy, or precision, represents a measurement (such as a percentage, for example) of the amount of automatically extracted information that matches the manually identified baseline information. For example, if ten sample items relating to a particular business parameter are manually identified and established as the baseline information, and the information automatically extracted based on the linguistic rules includes twelve items, eight of which match the manually identified sample items and four of which do not match the manually identified sample items, the accuracy of the automatically extracted information is 8/12, or 66.7%. In contrast, thoroughness is a measure of the amount of the baseline information that is identified by the automatic extraction. Thus, in example provided above, since the automatically extracted information identified eight of the ten manually identified sample items, the thoroughness of the automatically extracted information is 8/10, or 80%.

[0091] At step **190**, it is determined whether to adjust one or more of the linguistic rules based on the analysis performed at step **188**. In a particular embodiment, such determination may be based at least in part on the accuracy and thoroughness of the automatically extracted information determined at step **188**.

[0092] If it is determined at step **190** to adjust one or more of the linguistic rules or to add one or more new linguistic rules, such linguistic rules may be modified and or added at step **192**. At step **194**, the set of sample information may be analyzed again, based on the modified and/or new linguistic rules, to extract information associated with the relevant parameter, such as described above with reference to step **186**.

[0093] At step **196**, the results of the analysis performed at step **194** are analyzed. In some embodiments, such analysis includes determining the accuracy and thoroughness of the information extracted using the modified and/or new linguistic rules, such as described above with respect to step **188**. In addition, in a particular embodiment, the information extracted at step **194** (based on the modified and/or new linguistic rules) is compared with the information extracted at step **186** (based on the original linguistic rules) to determine the effect of the modifications and/or additions to the linguistic rules performed at step **192**. Such comparison may be performed to determine whether any information extracted at step **186** and determined at step **188** to be properly identified information (in other words, automatically extracted information determined to match manually identified baseline information) was not extracted at step **194** using the modified and/or new linguistic rules.

[0094] The method may then return to step **190** to determine whether to further adjust or add one or more of linguistic rules based on the results of the analysis per-

formed at step **196**. Steps **190** through **196** may be repeated until it is determined that the linguistic rules are sufficiently accurate and/or thorough.

[**0095**] It should be understood that in particular embodiments, contracts management component **30** may include various software embodied in computer-readable media and operable to perform all or portions of the functions and/or methods described above with respect to FIGS. **2-5**. Such software may be concentrated in a particular software package or distributed in any number of software modules, programs, routines, or other collections of code, which may or may not be geographically distributed.

[**0096**] **FIG. 6** illustrates an example architecture and operation of spend management component **32** in accordance with an embodiment of the present invention. In the embodiment shown in **FIG. 6**, spend management component **32** includes a data collection module **200**, a data processing subsystem **202**, procurement data warehouse **14**, a data analysis module **206**, a data visualization module **208**, and a business intelligence reporting module **210**.

[**0097**] Data collection module **200** may be operable to receive or extract source data **20** regarding historical procurement events from a variety of purchasing data sources **12** via a communications network **218**. Data sources **12** may include a variety of heterogeneous data sources, such as operational applications **212**, manual source data applications **214** (such as spreadsheet files, for example) and/or other data sources **216** suitable to communicate information regarding procurement events. In some embodiments, particular operational applications **212** may include an on-line transaction processing (OLTP) system, a teleprocessing monitor, a data management system (such as a DB2, ORACLE, or SYBASE system, for example), and/or may have capabilities including on-line data entry and batch processing, for example.

[**0098**] One or more data sources **12** may be co-located or geographically distributed. In addition, as shown in **FIG. 6**, data sources **12** may be coupled to data collection module **200** via communications network **218**. Communications network **218** may, in particular embodiments, include one or more local area networks (LANs), metropolitan area networks (MANs), wide area networks (WANs), portions of the Internet, or any other appropriate wireline, optical, wireless, or other links. It should be understood in particular embodiments, any or all of the various components of procurement data management system **10** (such as components, subsystems, databases, and modules, for example) may be connected to each other by communications network **218** or any suitable communications network.

[**0099**] As discussed above with reference to **FIG. 1**, source data **20** may include information from purchase orders (such as information regarding suppliers, products, prices, refunds, rebates, margins, and dates, for example), general ledger account information (such as general ledger account codes, for example), a listing of procured products and services, where such procurements are made, who is responsible for making such procurements, payment information, and a variety of other information regarding historical procurement events.

[**0100**] Data collection module **200** may also be operable to receive contracts management output **102** generated from contracts management component **30**. As discussed above, contracts management output **102** may include processed and/or unprocessed extracted information **74** automatically extracted from various electronic contracts **60** (for reference, see **FIG. 2**). In this manner, spend management component **32** may use particular output of contracts management component **30** as an input used in generating the output of spend management component **32**.

[**0101**] Each purchasing data source **12** may have one or more associated product catalogs **244**, each product catalog **244** identifying each of a set of products by one or more source-specific attributes, such as model and part number, for example. Thus, a particular product may be referenced by different purchasing data sources **12** (or even within a particular purchasing data source **12**) using different attributes (such as different part numbers), depending on the particular source-specific catalogs **244** used by the various purchasing data sources **12** to identify the product.

[**0102**] Data collection module **200** may include one or more processing elements operable to process source data **20** received or extracted from various purchasing data sources **12**. In the embodiment shown in **FIG. 6**, data collection module **200** includes extraction, transformation and loading (ETL) tools **220**. ETL tools **220** may be operable to enable the collection of source data **20** from many purchasing data sources **12** efficiently. In general, ETL tools **220** may include extraction tools, transformation tools, and loading tools for the extraction, transformation and loading of source data **20**. The extraction tools of ETL tools **220** may be operable to identify purchasing data sources **12**, identify source data **20** to be extracted, schedule the extraction of source data **20**, and facilitate the transportation of the source data **20** to be extracted.

[**0103**] The transformation tools of ETL tools **220** may be operable to perform integration, integration processing data conversion, data mapping, data cleansing, data quality processing, and/or data aggregation processing of various source data **20**. Integration may involve eliminating inconsistencies in data received from multiple sources, converting data into a consistent, standardized format, and sorting and merging transformed data into a single data set for loading into procurement data warehouse **14**. Integration processing may include adding time elements and new keys, converting common data elements into a consistent form, translating dissimilar codes into a standard code, converting physical data types into formats, and/or sorting data into a new sequence. Data conversion may include converting data representations (such as converting data from EBCDIC to ASCII, for example), converting operating systems (such as from UNIX to WINDOWS NT), and/or converting the data type. Data mapping may include mapping data elements from source tables and files to destinations fact and dimension tables, adding fields for unique keys and time elements, and/or using default values in the absences of source data. Data cleansing may include converting data from different sources into a single consistent data set operable to be analyzed, adhering to a particular standard for establishing codes, domains, formats, and naming conventions, and correcting data errors and filling the missing data values. Data quality processing may include selecting data from the best of multiple sources by using a selection criteria to qualify a source application to ensure that only acceptable data is forwarded to procurement data warehouse **14**. Data

aggregations includes generating summarized data for use in aggregate and dimension tables. Thus, in particular embodiments, the transformation tools are operable to generate metadata (in other words, "data about data") regarding source data **20** received or extracted from various purchasing data sources **12**.

[**0104**] The loading tools of ETL tools **220** may be operable to load extracted source data **20** into data processing subsystem **202**. In particular embodiments, the loading tools may utilize structured query language (SQL) for loading source data **20**. In particular embodiments, ETL tools **220** may be provided in a commercially available package, such as "POWER MART" provided by INFORMATICA, "DATA MART BUILDER" provided by ORACLE, "NOMAD" provided by AONIX, or "SAS DATA WAREHOUSE" provided by SAS INSTITUTE, for example.

[**0105**] Data processing subsystem **202** may be operable to process source data **20** collected or extracted by data collection module **200** before or after such source data **20** is loaded into procurement data warehouse **14** as procurement data **22**. In the embodiment shown in **FIG. 6**, data processing subsystem **202** includes a classification module **224**, a global catalog module **226**, a business entity identification module **228**, and a business entity relationships database **230**.

[**0106**] Classification module **224** may be operable to categorize and/or subcategorize each procurement event based on one or more business rules **232**. In particular embodiments, classification model **224** is operable to provide a global procurement classification system and to classify all procurement events according to the global classification system regardless of the classification systems used by each data source **214** and/or **216**. Business classification rules **232** may be based on the product or service purchased, the business purpose of the transaction, the financial nature of the transaction, or any other attribute associated with a transaction. In a particular embodiment, business classification rules **232** are developed based on a variety of procurement knowledge **234**, such as knowledge available to particular system experts or business analysts regarding a particular business's needs, desires, or future plans, for example.

[**0107**] Global catalog module **226** may be operable to store a global product catalog specifying, for each of a global set of products, one or more generic attribute fields as well as mapping relationships between the one or more generic attribute fields and various source-specific product attributes specified by one or more source-specific product catalogs **244**. For example, for a particular product, the global catalog may specify a generic part number as well as mapping relationships between the generic part number and various part numbers specified for that particular part by various source-specific product catalogs **244**.

[**0108**] Global catalog module **226** may be operable to utilize the global product catalog to map the various source-specific attributes associated with particular products to the generic attributes specified by the global product catalog for those products. Thus, in particular embodiments, global catalog module **226** may be essentially operable to merge any number of source-specific product catalogs **244** to provide consistent identification of products and services. In addition, the global product catalog may provide a comprehensive list of all products and services procured by a particular business entity.

[**0109**] Business entity identification module **228** may be operable to identify and track the business entity or entities specified by each procurement event as well as one or more business entities having a particular relation to such business entity or entities specified by each procurement event. For example, business entity identification module **228** may be operable to identify a particular supplier specified by a procurement event as well as the corporate parent and/or subsidiaries of the particular supplier specified by the procurement event. Business entity relationships database **230** may be operable to store various business relationships among sets of two or more related business entities, such as business entities having some type of ownership relationship, for example.

[**0110**] Thus, for example, business entity relationships database **230** may store business relationships between a parent corporation and a subsidiary of the parent corporation. Business entity identification module **228** may be operable to identify a procurement event specified by procurement data **22** relating to the subsidiary corporation (such as information regarding a purchase made by the subsidiary). Business entity identification module **228** may then identify, based on business relationships stored in database **230**, the parent corporation of the subsidiary, and associate the parent corporation with the procurement event. If a user then requests information concerning the procurement event, or the spending behavior of the subsidiary, spend management component **32** may be operable to provide such information to the user (such as by generating a data visualization or report, for example) regarding both the subsidiary and the parent corporations.

[**0111**] One or more business relationships stored in business entity relationships database **230** may be received from a business information provider **246**. For example, in particular embodiments, business relationships may be received automatically by one or more on-line business information providers, such as DUN & BRADSTREET, for example. Business entity identification module **228** may be operable to utilize business entity relationships database **230** to help identify business entities that are directly and/or indirectly related to particular procurement events. As discussed below in greater detail, identifying the business entities directly and/or indirectly related to particular procurement events may allow a user to obtain a report or data visualization illustrating particular procurement information regarding two or more related business entities, such as a parent corporation and its subsidiaries, for example.

[**0112**] Procurement data warehouse **14** may be operable to receive data from data processing subsystem **202** as procurement data **22**. In particular embodiments, new procurement data **22** may be added to procurement data warehouse **14** and/or some or all of the procurement data **22** currently stored in procurement data warehouse **14** may be modified, replaced and/or deleted periodically. For example, in a particular embodiment, procurement data **22** may be automatically updated each time source data **20** associated with one or more purchasing data sources **12** is updated, after such updated source data **20** is extracted by data collection module **200** and processed by data processing subsystem

202. Thus, in some embodiments, procurement data warehouse **14** may provide a comprehensive, real-time collection of all procurement data associated with a variety of purchasing data sources **12**.

[**0113**] Data analysis module **206** may be operable to analyze particular procurement data **22** stored in procurement data warehouse **14** in order to generate various output **250** that may be used by a user, such as a spending decision-maker, to make effective spending decisions. Such output may include results of an analyses regarding various procurement issues, such as spending associated with a particular procurement process, for example. In particular embodiments, for example, data analysis module **206** may perform an analysis and generate an associated output regarding a particular procurement process, the procurement of particular products or services, purchases made by particular business entities (or particular divisions thereof) and purchases made from particular suppliers, for example, such as how much is being spent on particular products or services, how much is being spent by particular business entities (or particular divisions thereof), in which geographic areas is the spending occurring, from which suppliers are particular products or services being purchased, and who is making and/or authorizing particular spending decisions, for example.

[**0114**] In particular embodiments, data analysis module **206** may be operable to perform both focused spending analyses (such as evaluating spending by particular divisions or units of a business entity, spending on particular products or services, or spending from a particular supplier, for example) as well as global, or broad, spending analyses (such as evaluating spending by the overall business entity, spending on all products and services, or spending from all suppliers, for example).

[**0115**] In addition, data analysis module **206** may be operable to perform a variety of analyses periodically in order to track performance in particular business areas. For example, data analysis module **206** may be operable to periodically (such as each time procurement data **22** or extracted information **74** is updated, for example) compare portions of procurement data **22** with portions of extracted information **74** to automatically track performance regarding a particular business opportunity. For example, each time new procurement data **22** is added to procurement data warehouse **14**, data analysis module **206** may be operable to analyze the current total spending on a particular product to determine whether a particular rebate opportunity (as specified by a supplier contract, for example) is available, or how much additional spending would trigger such a rebate opportunity. In addition, data analysis module **206** may be operable to generate a notification regarding the results of such periodic analyses and communicating such notifications to particular business entities or individuals associated with such business entities, such as individuals responsible for making procurement decisions, for example.

[**0116**] In addition to the various forms of output generated by output sub-system **252**, data analysis module **206** may also be operable to generate output data **242** to be imported into procurement data warehouse **14** and/or used by other components of procurement data management system **10**. For example, as shown in **FIG. 2**, procurement data warehouse **14** is associated with, or utilized by, compliance management component **34** and supplier intelligence component **36** of system **10**. Thus, in particular embodiments, as discussed below regarding **FIGS. 10 and 13**, data analysis module **206** may be operable to generate output data **242** which may be used as an input by compliance management component **34** and/or supplier intelligence component **36** of system **10**.

[**0117**] In some embodiments, data analysis module **206** may also be operable to determine the effect or influence of particular procurement activities or decisions on various other procurement activities or decisions. For example, data analysis module **206** may be operable to determine the financial effect of purchases made by one division of a business entity on another division of the business entity.

[**0118**] Data analysis module **206** may be operable to identify business opportunities associated with a procurement process, such as opportunities to reduce spending, or increase rebates, discounts or refunds, for example. In particular embodiments, data analysis module **206** may be operable to compare, contrast, or otherwise analyze particular procurement data **22** to determine whether a business opportunity is available. For example, data analysis module **206** may be operable to compare particular procurement data **22** (such as particular contracts management output **102**, for example) regarding rebate opportunities from a particular supplier with particular procurement data **22** regarding purchases made form that supplier in order to discover potential or existing rebate opportunities, such as described above with reference to contracts application **90** of contracts management component **30**. In addition, data analysis module **206** may also be operable to generating a notification if it is determined that the business opportunity is available, and to communicate the opportunity notification to appropriate individuals (such as procurement managers, for example) or business entities. In particular embodiments, the various types of analyses that may be performed by data analysis module **206** may be more effective, accurate, faster and/or less expensive than traditional methods used to attempt such complex analyses.

[**0119**] In analyzing procurement data **22**, data analysis module **206** may be operable to identify information regarding particular products or services based on the generic attributes associated with, or mapped to, the products according to global catalog module **226**, as discussed above. For example, data analysis module **206** may be operable to identify all procurement data **22** related to a particular product using the generic attributes associated with, or mapped to, that product by global catalog module **226**.

[**0120**] In addition, data analysis module **206** may be operable to perform various analyses and generate various outputs **250** based on information requests **248** made by users, such as system administrators or spending decision-makers, for example. For example, a user may communicate an information requests **248** to data analysis module **206** requesting a summary of spending on hardware by each division in a business entity from each of a number of suppliers. Data analysis module **206** may be operable to receive the request **248**, analyze procurement data **22** relevant to the request, generate a visual output, such as a three-dimensional graph or a report illustrating the requested spending summary, and communicate the visual output to the requesting user.

[0121] Data analysis module **206** may include a variety of analytical tools operable to perform a variety of data analysis, such as the types of analysis described above, for example. For example, in the embodiment shown in **FIG. 7**, data analysis module **206** includes one or more optimization tools **270**, one or more simulation tools **272**, forecasting and trends analysis tools **274**, and one or more statistical tools **276**. Optimization tools **270** may be operable to optimize a particular parameter based on a variety of inputs. For example, optimization tools **270** may be operable to determine how to optimize the total cost associated with a procurement process based on a variety of different spending decisions, such as which products and/or services to purchase from which suppliers, for example.

[0122] Simulation tools **272** may be operable to perform various simulations (such as "what if" analyses and alternative-decisions analyses, for example) based on a set of assumed procurement decisions. For example, simulation tools **272** may be operable to select a set of hypothetical procurement decisions regarding a procurement process or event, and analyzing the financial effects of such hypothetical procurement decisions. Simulation tools **272** may also be operable to determine the total cost associated with the procurement process or event based on the set of hypothetical procurement decisions, which may be then used by optimization tools **270** and/or forecasting and trends analysis tools **274**.

[0123] Forecasting and trends analysis tools **274** may be operable to analyze particular trends in procurement data **22**, such as trends regarding spending decisions, and to make forecasts based on such trends. For example, forecasting and trends analysis tools **274** may be operable to forecast spending on particular products or services from particular suppliers based on historical procurement data. Forecasting and trends analysis tools **274** may cooperate with optimization tools **270**, simulation tools **272** and/or statistical tools **276** in order to generate forecasts.

[0124] Statistical tools **276** may provide statistical analysis of procurement data, which may be used by optimization tools **270**, simulation tools **272** and/or forecasting and trends analysis tools **274**. In a particular embodiment, statistical tools **276** include tools operable to identify aggressions **282**, trends **284**, forecasts **286**, and clustering of data **288**.

[0125] Data analysis module **206** may include separate entities or software modules or may be a collected set of modules, such as modules or functionalities provided by a particular software package, for example. For example, in a particular embodiment, data analysis module **206** may include business intelligence software provided by MICROSTRATEGY, INC.

[0126] Referring again to **FIG. 6**, output subsystem **252** may be operable to generate human-readable output **250** illustrating the results of various analyses generated by data analysis module **206**. For example, output subsystem **252** may be operable to generate human-readable output illustrating a summary of spending on hardware by each division in a business entity from each of a number of suppliers.

[0127] In the embodiment shown in **FIG. 6**, output subsystem **252** includes a data visualization module **256** and a business intelligence reporting module **254**. Data visualization module **256** may be the same as or similar to data visualization module **94** discussed above with respect to contracts management component **30** shown in **FIG. 2**. For example, data visualization module **256** may be operable to generate a variety of data visualizations **260**, such as advanced graphics, charting and three-dimensional images, for example, that may help users (such as business analysts or procurement decision-makers, for example) identify key factors affecting spending. In particular embodiments, data visualization module **256** may also provide various tools allowing the user to manipulate and navigate through the various data visualizations **260**, such as described above regarding output subsystem **92** shown in **FIG. 2**.

[0128] Business intelligence reporting module **254** may be the same as or similar to business intelligence reporting module **98**. Business intelligence reporting module **254** may be operable to generate a variety of business intelligence reports **258** regarding compliance and/or non-compliance impacts determined by data analysis module **206**. In a particular embodiment, data visualizations module **256** may comprise the software package MINDSET provided by SILICON GRAPHICS, INC., and business intelligence reporting module **254** may comprise a business intelligence software package provided by MICROSTRATEGY, INC.

[0129] **FIG. 8** illustrates an example method of managing procurement spending in accordance with an embodiment of the present of the invention. At step **262**, various source data regarding historical procurement events may be extracted or collected from a variety of data sources. The data sources may be heterogeneous, and may include operational applications, manual source data applications (such as spreadsheet files, for example), as well as information automatically extracted from a set of electronic contracts (such as extracted information **74** discussed above with reference to **FIG. 2**). In particular embodiments, one or more of the data sources may have an associated source-specific product catalog, each identifying a set of products by one or more source-specific attributes, such as part number for example. The source data may be collected using one or more data collection tools, such as a set of extraction, transformation and loading (ETL) tools.

[0130] At step **264**, a set of business classification rules operable to categorize and/or sub-categorize particular procurement events may be generated and/or stored. The set of business rules may be developed based on the procurement knowledge of one or more business rules experts, for example.

[0131] At step **266**, a global product catalog may be generated and/or stored. In particular embodiments, the global product catalog may specify generic attribute fields for each of a global set of products, as well as mapping relationships between the generic attribute fields and various source-specific product attributes specified by the source-specific product catalogs discussed above.

[0132] At step **268**, a set of business entity relationships may be identified, stored and/or tracked. Such business entity relationships may include ownership or other defined business relationships, such as a parent-subsidiary or joint venture relationship, for example. In particular embodiments, some or all of the business entity relationships may be automatically received from a business information provider, such as DUN & BRADSTREET, for example. At step **270**, the source data collected at step **262** may be processed

according to various business classification rules, product attribute mapping relationships, and/or business entity relationships generated and/or stored at steps **264**, **266** and **268**. For example, the source data may be classified by the set of business classification rules regardless of various classification systems used by the various data sources. In addition, the source-specific attributes associated with particular products specified by the source data may be mapped to the generic attributes specified by the global product catalog in order to provide consistent identification of products and/or services. In addition, business entities directly and/or indirectly related to particular source data may be identified based on the business entity relationships. For example, procurement data regarding a particular supplier may be organized together and linked to procurement data regarding various other suppliers or other business entities determined to be related to the particular supplier based on the business entity relationships.

[**0133**] At step **272**, the source data processed at step **270** may be stored as procurement data in a procurement data warehouse. At step **274**, at least a portion of the procurement data may be analyzed to generate a variety of outputs regarding procurement spending. In particular embodiments, such outputs may include one or more data visualizations and/or business intelligence reports which may be used by a user, such as a spending decision-maker, to make effective spending decisions. In a particular embodiment, a user may identify, based on an analysis of a particular data visualization, a particular factor or parameter of interest, and generate an information request for additional information regarding the factor or parameter of interest. Information regarding the factor or parameter of interest may be collected from the procurement data warehouse and included in an business intelligence report communicated to the requesting user.

[**0134**] In particular embodiments, the various output generated at step **274** may also include analysis results operable to be used by one or more other components of procurement data management system **10**, such as compliant management component **34** and/or supplier intelligence component **36**. In this manner, various output of spend management component **32** may be used as input by one or more other components of system **10**.

[**0135**] At step **276**, the procurement data stored in the procurement data warehouse may be periodically modified and/or new procurement data may be periodically added. For example, in particular embodiments, the procurement data may be modified based on a modification or addition to the collected source data, one or more of the business classification rules, the global product catalog, or the business entity relationships. In particular embodiments, the procurement data stored in the procurement data warehouse may be modified automatically and in real time. The method may then return to step **274** to analyze the new and/or modified procurement data. In this manner, spending analyses may be performed periodically and in real time based on the procurement data currently stored in the procurement data warehouse.

[**0136**] It should be understood that in particular embodiments, spend management component **32** may include various software embodied in computer-readable media and operable to perform all or portions of the functions and/or methods described above with respect to FIGS. **6-8**. Such software may be concentrated in a particular software package or distributed in any number of software modules, programs, routines, or other collections of code, which may or may not be geographically distributed.

[**0137**] **FIG. 9A** illustrates a display **290** of an example output **250** generated by data analysis module **206** and/or output subsystem **252** of spend management component **32** in accordance with an embodiment of the present invention. Display **290** illustrates a variety of information regarding patterns and behavior of spending on products and/or services from a particular supplier, Company A. For example, display **104** includes a spending summary section **292** operable to display the results of a spending analysis performed by data analysis module **206**. Spending summary section **292** may indicate particular spending behaviors broken down by any of a variety of parameters. For example, as shown in **FIG. 9**A, spending summary section **292** indicates annual spending by a particular business entity, broken down by master supplier (Company A) and further by each supplier associated with the master supplier or by divisions (Divisions A, B, C and D) of the master supplier.

[**0138**] Like display **104**, display **290** may be displayed by an interactive user interface, such as in a WINDOWS environment, for example, such that a user may navigate through the display and select particular details for further analysis. In particular embodiments, display **290** is presented by an Internet browser and includes various icons, pull-down menus and/or hypertext items (which may include underlined and/or colored text, for example) that may be selected by a user to retrieve additional information regarding particular items.

[**0139**] For example, as shown in **FIG. 9A, a** user may select any of a variety of parameters from a pull-down menu **294** to retrieve a display of information relevant to the selected parameter. Thus, a user may select "Location" from pull-down menu **294** to retrieve a display of particular spending information broken down by geographic location. As another example, a user may select the hypertext item **296** labeled "Company A, Division A" to retrieve a more detailed display of purchases made from Division A of Company A.

[**0140**] **FIG. 9B** illustrates an example data visualization **400** generated by output subsystem **252** of spend management component **32** in accordance with an embodiment of the present invention. In general, data visualization **400** illustrates amounts spent on hardware products from each of a number of suppliers by each of a number of organizational divisions, or levels, of a purchasing organization.

[**0141**] Data visualization **400** includes a three-dimensional graphic **402** and a data point detail **404**. Three-dimensional graphic **402** comprises a scatter chart having a number of business divisions (US-Southwest, Japan, etc.) along a first axis, a number of suppliers (Supplier A, Supplier B, etc.) along a second axis, and a number of data bars extending along a third axis at various intersections of business divisions and suppliers. The height of a data bar located at the intersection of a particular business divisions and a particular supplier is proportional to the amount spent by the particular business divisions on products and/or services from the particular supplier. For example, the height of data bar **406** is proportional to the amount spent by the

US-Midwest division of the purchasing organization on products and/or services from Supplier K.

[0142] Graphic **402** may also indicate whether particular expenditures are approved or non-approved, or compliant or non-compliant. For example, all data bars related to non-approved or non-compliant expenditures may be shaded or colored differently than approved or compliant expenditures, which may be indicated by a key or legend **408**. Thus, a user may imply from graphic **402** shown in **FIG. 9B** that all procurements made from Suppler F are non-approved procurements.

[0143] In a particular embodiment, data point detail **404** may display various information, such as a numerical quantity, associated with a particular selected data bar. For example, as shown in **FIG. 9**B, if a user positions a cursor or pointer over data bar **406**, data point detail **404** may display information regarding data bar **406**, such as the name of the business divisions and supplier corresponding with data bar **406**, and the numerical amount of money represented by data bar **406**.

[0144] Like display **104**, data visualization **400** may be displayed by an interactive user interface, such as in a WINDOWS environment, for example, such that a user may navigate through the display and select particular details for further analysis. In particular embodiments, data visualization **400** is presented by an Internet browser and includes various icons, pull-down menus and/or hypertext items (which may include underlined and/or colored text, for example) that may be selected by a user to retrieve additional information regarding particular items.

[0145] **FIG. 10** illustrates an example architecture and operation of compliance management component **34** of system **10** in accordance with an embodiment of the present invention. Compliance management component **34** is generally operable to monitor compliance with a set of strategic business rules regarding the procurement of particular products and services. In particular embodiments, compliance management component **34** is operable to access large amounts of heterogeneous data from multiple sources to identify the who, what, where, when and why of non-compliance, quantify the impact of such non-compliance, and communicate such information to business decision-makers who may have the knowledge and/or authority to correct the non-compliance. In addition, compliance management component **34** may be operable to monitor the effectiveness of the business rules themselves and to modify such business rules in response to changes in the business climate and supplier community in order to maximize business opportunities.

[0146] In a particular embodiment, compliance management component **34** may include procurement data warehouse **14** including various procurement data **22**, a compliance analysis module **304**, a compliance impacts model **306** and an output subsystem **308**. As discussed above with reference to **FIG. 6**, procurement data warehouse **14** may include a variety of procurement data **22**, which may include source data **20** received from one or more purchasing data sources **12**.

[0147] Procurement data warehouse **14** may also be operable to receive contracts management output **102** generated by contracts management component **30**. As discussed above, contracts management output **102** may include information **74** automatically extracted from various electronic contracts **60** (see **FIG. 2** for reference). In this manner, compliance management component **34** may use particular output of contracts management component **30** as an input for performing analyses and/or generating outputs associated with compliance management component **34**.

[0148] In addition, procurement data warehouse **14** may be operable to receive spend management output **242** generated by spend management component **32**. As discussed above, spend management output **242** may include results of procurement or spending analyses performed by data analysis module **206** of spend management component **32**. In this manner, compliance management component **34** may use particular output of spend management component **32** as an input for performing analyses and/or generating outputs associated with compliance management component **34**.

[0149] Compliance rules database **302** is operable to store a set of compliance rules, or business compliance rules, **310** that specify specific attributes and values of procurement events that must be achieved in order for a particular procurement event to be considered compliant. In particular embodiments, compliance rules **310** also specify how to calculate the financial impact of non-compliance with particular compliance rules **310**.

[0150] Compliance rules **310** may be developed or written by business rules experts and/or subject matter experts based on a set of procurement knowledge **312** available to such business rules experts and/or subject matter experts. Procurement knowledge **312** may include a set of requirements regarding which suppliers to buy goods or services from based on a number of various factors, forecasted conditions, current and historical performance measurements, subject matter expert (SME) intelligence about businesses or industries, and current economic conditions, for example. In a particular embodiment, business rules experts and/or subject matter experts may use such procurement knowledge **312** to develop compliance rules **310** operable to determine whether a purchaser is buying goods or services from approved or non-approved suppliers.

[0151] Compliance analysis module **304** may be operable to automatically analyze procurement data **22** regarding one or more particular procurement events to determine whether the one or more procurement events are compliant or non-compliant according to one or more compliance rules **310**. For example, compliance analysis module **304** may be operable to determine whether particular procurements were made from approved or non-approved suppliers based on one or more compliance rules **310**. Compliance analysis module **304** may also be operable to determine the financial impact **314** of compliance and/or non-compliance with particular compliance rules **310**. For example, for procurement events (such as particular purchases from a particular supplier, for example) determined to be non-compliant, compliance analysis module **304** may determine the financial impact **314** of such non-compliance based on one or more compliance rules **310**.

[0152] The financial impact **314** of compliance or non-compliance of a particular procurement event, as determined by compliance analysis module **304**, may be stored in procurement data warehouse **14** as an additional attribute associated with the particular procurement event. As shown

in **FIG. 10**, compliance analysis module **304** may also be able to generate business rule feedback **316** and user feedback **318** based on an analysis of particular procurement data **22** according to one or more compliance rules **310**. Business rule feedback **316** provides various feedback regarding the effectiveness of particular compliance rules **310**. For example, business rule feedback **316** may include feedback regarding situations in which non-compliance procurement events actually provide a financial advantage, as well as feedback regarding particular procurement events that are not covered by the set of compliance rules **310**. Business rule feedback **316** may allow a user or system administrator to easily monitor the effectiveness of particular compliance rules **310** and to adjust or fine tune them accordingly.

[**0153**] User feedback **318** may include reasons for non-compliance of a particular procurement event as well as recommendations regarding actions to be taken to correct the non-compliance situation. Thus, user feedback **318** may assist a user or a system administrator in understanding the nature of a particular non-compliant procurement event. In particular embodiments, user feedback **318**, including reasons for non-compliance as well as information necessary or helpful to correct the situation, may be communicated throughout an organization, or at least relevant parts of an organization. For example, in a particular embodiment, user feedback **318** may be communicated to all procurement decision-makers within an organization by an automatically-generated e-mail notification or report.

[**0154**] Compliance analysis module **304** may include a variety of analytical tools operable to perform various compliance analyses. For example, compliance analysis module **304** may include some or all of the analytical tools discussed above with reference to data analysis module **206** shown in **FIGS. 6 and 7**. Thus, in particular embodiments, compliance analysis module **304** may include one or more optimization tools, simulation tools, forecasting and trends analysis tools, and statistical tools.

[**0155**] Output subsystem **308** may be operable to generate output regarding the compliance and/or non-compliance of particular procurement events. In particular embodiments, output subsystem **308** may be operable to generate output in response to a user request **328** for particular compliance information. For example, output subsystem **308** may be operable to generate human-readable output indicating whether particular procurement events are compliant or non-compliant, the financial impact (both positive and negative) of such compliance or non-compliance, as well as particular business rule feedback **316** and user feedback **318** generated by compliance analysis module **304**.

[**0156**] In the embodiment shown in **FIG. 10**, output subsystem **308** includes a data visualization module **320** and a business intelligence reporting module **322**. Data visualization module **320** may be the same as or similar to data visualization module **94** discussed above with respect to contracts management component **30** shown in **FIG. 2**. For example, data visualization module **320** may be operable to generate a variety of data visualizations **324**, such as advanced graphics, charting and three-dimensional images, for example, that may help users (such as business analysts or procurement decision-makers, for example) identify key factors affecting compliance and non-compliance. In particular embodiments, data visualization module **320** may also provide various tools allowing the user to manipulate and navigate through the various data visualizations **324**, such as described above regarding output subsystem **92** shown in **FIG. 2**.

[**0157**] Business intelligence reporting module **322** may be the same as or similar to business intelligence reporting module **98**. Business intelligence reporting module **322** may be operable to generate a variety of business intelligence reports **326** regarding compliance and/or non-compliance impacts determined by compliance analysis module **304**.

[**0158**] **FIG. 11** illustrates a display **430** of an example output generated by output subsystem **308** of compliance management component **34** in accordance with an embodiment of the present invention. Display **430** illustrates a variety of information regarding compliance and non-compliance with particular labor contracts. For example, display **430** includes a compliance analysis table **432** and a number of interactive tools **434**.

[**0159**] As shown in **FIG. 11**, compliance analysis table **432** displays a summary of compliance information regarding an organization, broken down by line of business of the organization. For example, compliance analysis table **432** displays a summary of various compliance metrics (such as "Addressable Spend YTD ($K),""Compliance % YTD, ""Savings Realized YTD ($K)," and "Est. Savings Lost YTD ($K)") for each line of business of an organization. In a particular embodiment, information displayed under the heading "Addressable Spend YTD ($K)" may be determined by spend management component **32**, and information provided under the heading "Compliance % YTD" may be determined based on contracts management output **102**. Thus, compliance analysis table **432** may provide an example of the interrelations between the various components of procurement data management system **10**.

[**0160**] Display **430** may be displayed by an interactive user interface, such as in a WINDOWS environment, for example, such that a user may navigate through the display and request additional analyses using interactive tools **434**. In particular embodiments, display **430** is presented by an Internet browser and includes various icons, pull-down menus and/or hypertext items (which may include underlined and/or colored text, for example) that may be selected by a user to retrieve additional information regarding particular items.

[**0161**] **FIG. 12** illustrates an example method of managing compliance with business compliance rules in accordance with an embodiment of the present invention. At step **350**, one or more compliance rules are developed or written based on a set of procurement knowledge, which may include knowledge regarding particular suppliers from which to purchase particular goods and services based on a variety of factors. At step **352**, the compliance rules may be stored in a compliance rules database.

[**0162**] At step **354**, contracts management output may be generated including, or at least based on, relevant information automatically extracted from a set of electronic contracts, such as extracted information **74** discussed above with respect to **FIG. 2**. At step **356**, a variety of procurement data may be stored in a procurement data warehouse. In particular embodiments, the procurement data includes at

least a portion of the contracts management outputs generated at step **354**. The procurement data may include various information regarding any number or procurement events, such as purchase order information and invoice information, for example.

[**0163**] At step **358**, procurement data regarding one or more particular procurement events may be analyzed to determine the compliance or non-compliance of one or more particular procurement events based on one or more of the compliance rules developed at step **350**. At step **360**, various financial impacts (both positive and negative) of the compliance and/or non-compliance of the particular procurement events may be determined. In a particular embodiment, such financial impacts are stored in the procurement data warehouse as an additional attribute associated with the particular procurement events.

[**0164**] At step **362**, business rule feedback may be generated according to the analysis performed at step **358**. Such business rule feedback may include feedback regarding situations in which non-compliance procurement events actually have a positive financial impact, as well as identifying procurement events that are not covered by the set of compliance rules developed at step **350**. As discussed below with regard to step **372**, the business rule feedback may allow an administrator or business rules expert to monitor the effectiveness of particular compliance rules and modify or add particular compliance rules accordingly. At step **364**, user feedback may be generated based on the analysis performed at step **358**. In particular embodiments, the user feedback indicates reasons for non-compliance of particular procurement events and provides recommendations for correcting such non-compliance situation.

[**0165**] At step **366**, one or more data visualizations may be generated based on the results of the analysis performed at step **358**. For example, such data visualizations may indicate whether their particular procurement events are compliant or non-compliant, the financial impacts determined at step **360** of such compliance and/or non-compliance, particular business rule feedback generated at step **362** and/or particular user feedback generated at step **364**.

[**0166**] At step **368**, a user, such as a business analyst, may identify, based on an analysis of particular data visualizations, a particular factor or parameter affecting compliance or non-compliance, and generate a user request for more information regarding that factor or parameter. At step **370**, information regarding the identified factor or parameter may be collected from the procurement data warehouse and included in a business intelligence report communicated to the requesting user. In this manner, a user may identify an interesting aspect of a data visualization, request additional information regarding the identified aspect, and receive an automatically generated business intelligence report including the requested information.

[**0167**] At step **372**, one or more of the compliance rules developed or written at step **350** may be modified based on particular business rule feedback generated at step **362**. For example, a subject matter expert may receive a data visualization at step **368** indicating, based on business rule feedback generated at step **362**, that a particular compliance rule is ineffective. The subject matter expert may then provide instructions or requirements to a system administrator or business rules expert for adjusting the ineffective compliance rule accordingly. As another example, a subject matter expert may receive a data visualization indicating, based on business rule feedback generated at step **362**, that a particular procurement event is not covered by any of the compliance rules stored in the compliance rules database. The subject matter expert may then provide instructions or requirements to a system administrator or business rules expert for adding one or more new compliance rules to cover such procurement events in the future.

[**0168**] At step **374**, the procurement data stored in the procurement data warehouse may be periodically modified and/or new procurement data may be periodically added. For example, in particular embodiments, the procurement data may be modified each time source data and/or contracts management output is added and/or modified, such as described above with reference to **FIG. 6**. At step **376**, a new or updated analysis regarding the compliance or non-compliance of particular procurement events may be performed based on new or updated procurement data regarding such procurement events and/or based on new or updated compliance rules. In a particular embodiment, the new analysis regarding the compliance or non-compliance of particular procurement events is performed each time the procurement data or compliance rules related to such procurement events is modified.

[**0169**] After the addition or modification of the procurement data at step **374**, the method may then return to step **360** to generate the various outputs associated with the compliance analysis performed at step **376**. In this manner, compliance analyses may be performed periodically and in real time based on the procurement data currently stored in the procurement data warehouse.

[**0170**] It should be understood that in particular embodiments, compliance management component **34** may include various software embodied in computer-readable media and operable to perform all or portions of the functions and/or methods described above with respect to FIGS. **10-12**. Such software may be concentrated in a particular software package or distributed in any number of software modules, programs, routines, or other collections of code, which may or may not be geographically distributed.

[**0171**] **FIG. 13** illustrates an example architecture and operation of supplier intelligence component **36** of system **10** in accordance with an embodiment of the present invention. In general, supplier intelligence component **36** allows a user to manage a large volume of supplier management information, including information regarding multiple suppliers, contractual issues, international regulations, new products and services, particular business needs and human elements, for example, to assist the user in making supplier management decisions. In particular embodiments, supplier intelligence component **36** is operable to analyze a large volume of information, such as products, prices, multiple purchase orders, geography, inventory and shipping costs, for example, to optimize supplier management decisions in real time according to a set of heuristics and business rules. For example, supplier intelligence component **36** may be operable to analyze the effects that decisions made by particular spend categories or divisions of a business entity have on each other based on a total-cost-of-ownership view. In this matter, supplier intelligence component **36** may be operable to analyze a supply chain more effectively than previous or existing systems.

[0172] Supplier intelligence component **36** may include procurement data warehouse **14**, a supplier intelligence analysis module **500**, a supplier intelligence business rules database **518**, and an output subsystem **502**. As discussed above with reference to **FIG. 6**, procurement data warehouse **14** may include a variety of procurement data **22**, including a variety of source data **20** from a number of data sources **12**, as well as a set of contracts management output **102**, which may include information automatically extracted from a set of electronic contracts, as discussed above with reference to **FIG. 2**. Source data **20** and contracts management output **102** may be collected and processed by data collection module **200** and data processing subsystem **202**, as discussed above with reference to **FIG. 6**, and stored in procurement data warehouse **14** as procurement data **22**.

[0173] Procurement data **22** may include spending information regarding a number of divisions, or silos, of a business organization. For example, as shown in **FIG. 13**, procurement data **22** may include spending data associated with a hardware spend silo **504**, a software spend silo **506**, a telecommunications spend silo **508**, a shipping spend silo **510**, an administrative services spend silo **512**, and a contract labor spend silo **514**. Within a particular procurement process, or supply chain, hardware spend silo **504** may be responsible for purchasing hardware, software spend silo **506** may be responsible for purchasing software, telecommunications spend silo **508** may be responsible for procuring and/or otherwise managing telecommunications, shipping spend silo **510** may be responsible for managing shipping of procured products, administrative services spend silo **512** may be responsible for procuring and/or otherwise managing various administrative services, and contract labor spend silo **514** may be responsible for purchasing and/or otherwise managing contract labor.

[0174] Particular procurement data may be categorized into one or more spend silos **504** through **514** based on a set of business classification rules, such as business classification rules **232** discussed above with reference to **FIG. 6**, for example. In a particular embodiment, each spend silo **504** through **514** includes information regarding each purchase of products and/or services made by that spend silo. In some embodiments, particular procurement data **22** regarding one or more of the spend silos **504** through **514** may be generated and/or categorized according to particular spend management output **261** generated by data analysis module **206** of spend management component **32**. For example, spend management output **261** may include results of an analysis regarding procurements made by particular divisions of a business organization, such as spend silos **504** through **514**. In this manner, spend management output **261** generated by spend management component **32** may be used as an input by supplier intelligence component **36**.

[0175] Procurement data warehouse **14** may also include a set of supplier portfolios **516**, each including information regarding a particular supplier, such as information regarding spending by line of business, savings by geography, supplier alignment information, and compliance by sourcing engagements associated with the supplier, for example.

[0176] Supplier intelligence analysis **500** may be operable to analyze particular procurement data **22** stored in procurement data warehouse **14** in order to optimize particular supplier management decisions based on a set of supplier intelligence business rules **520**. The set of supplier intelligence business rules **520** may be generated or written based on a variety of business rules input **522** and procurement knowledge **524**. Supplier intelligence business rules **520** may be stored in supplier intelligence business rules database **518**.

[0177] Business rules input **522** may include one or more supplier requirements **526**, customer requirements **528**, contract analysis **530**, business requirements **532**, and silo spend formulas **533**. Supplier requirements **526** may include information regarding pricing of products, sourcing terms and conditions, and spend information, for example. Customer requirements **528** may include information such as performance metrics for delivery of goods (such as a requirement for on-time delivery) and performance requirements regarding pricing, for example. Contract analysis **530** may include information such as contract terms and conditions, and payment terms, for example. Business requirements **532** may include information such as strategic sourcing rules and terms agreed upon by particular suppliers, for example. Silo spend formulas **533** may include formulas regarding each particular division or silo of a business organization for determining spending associated with that division or silo. Silo spend formulas **533** may be generated by business rules experts or subject matter experts, for example, based on a variety of procurement knowledge and historical procurement information. Procurement knowledge **524** may include forecasted conditions, current and historical performance measurements, subject matter expert (SME) intelligence about businesses or industries, and current economic conditions, for example.

[0178] In particular embodiments, supplier intelligence business rules **520** may interrelate various silo spend formulas **533** associated with any number of divisions, or silos, of the business organization. For example, a particular supplier intelligence business rule **520** may interrelate at least one silo spend formula **533** associated with first business division with at least one spend formula **533** associated with a second business division. Thus, supplier intelligence business rules **520** may be used by supplier intelligence analysis module **500** to identify the financial effects of procurement decisions made by one division of a business entity on one or more other divisions of the same business entity.

[0179] Supplier intelligence analysis module **500** may be operable to analyze procurement data regarding each spend silo **504** through **514** based on one or more supplier intelligence business rules **520** in order to generate a variety of outputs **534**. For example, supplier intelligence analysis module **500** may be operable to analyze a complete procurement process, or supply chain, including the spending behaviors of each spend silo **504** through **514**. In addition, supplier intelligence analysis module **500** may be operable to determine the financial effects of decisions made by particular spend silos on each other, based on procurement data **22** and supplier intelligence business rules **520**. For example, suppose shipping spend silo **510** negotiates a free shipping arrangement with a particular supplier. In response, the supplier may increase its price for particular products or services in order to account for the absorbed shipping costs. The price increases on such products may be included within the price for the products or services negotiated by hardware spend silo **504** with the supplier. In some situations, the

increase in spending by hardware spend silo **504** due to the price increases made by the supplier is greater than the amount saved by shipping spend silo **510** from the negotiated free shipping. Thus, the negotiated free shipping may actually increase the total-cost-of-ownership of the overall procurement process, or supply chain.

[**0180**] In this manner, particular divisions or silos of a business organization often make decisions that are financially advantageous to that division or silo, without realizing various disadvantageous financial effects on other divisions or silos of the business entity, or on the total cost associated with the procurement process or supply chain. By analyzing the total-cost-of-ownership associated with a procurement process or supply chain, supplier intelligence analysis module **500** is operable to identify such financial relationships between particular divisions or silos of the business organization and to suggest particular procurement decisions accordingly.

[**0181**] In particular embodiments, supplier intelligence analysis modules **500** may include a variety of analytical tools operable to perform various supplier intelligence analyses. For example, supplier intelligence analysis module **500** may include some or all of the analytical tools discussed above with reference to data analysis module **206** shown in **FIGS. 6 and 7**. Thus, in particular embodiments, supplier intelligence analysis module **500** may include one or more optimization tools, simulation tools, forecasting and trends analysis tools, and statistical tools, for example.

[**0182**] For example, supplier intelligence analysis module **500** may be operable to performing simulations based on a set of hypothetical procurement decisions. A particular simulation may include selecting a set of hypothetical procurement decisions regarding a procurement process (such as selecting particular products to purchase, from particular suppliers, and using particular types of shipping, for example) and determining various costs associated with the procurement process, as well as savings or losses as compared with simulations performed based on various other hypothetical procurement decisions. For example, supplier intelligence analysis module **500** may be operable to determining a total cost associated with the procurement process based on each simulation.

[**0183**] Output subsystem **502** may be operable to generate a variety of outputs **534** operable to assist decision-makers in making procurement decisions based on a total-cost-of-ownership view. For example, output subsystem **502** may be operable to generate various outputs **534** illustrating the effect of particular procurement decisions on the total cost associated with the procurement process, or supply chain.

[**0184**] In particular embodiments, output subsystem **502** is the same as or similar to output subsystem **252** of spend management component **32** or output subsystem **308** of compliance management component **34**. For example, output subsystem **502** may include a data visualization module operable to generate various data visualizations **536** and a business intelligence reporting module operable to generate various business intelligence reports **538** including results of analyses performed by supplier intelligence analysis module **500**.

[**0185**] **FIG. 14** illustrates an example method of managing supplier intelligence in accordance with an embodiment of the present invention. At step **550**, a variety of procurement data may be collected in a procurement data warehouse. The procurement data may include procurement source data collected from a variety of heterogeneous data sources, as well as particular output from contracts management component **30** and/or spend management component **32** of system **10**. The contracts management output may include, or be based on, relevant information automatically extracted from a set of electronic contracts, such as described above with respect to **FIG. 2**. The output from spend management component **32** may include results of one or more spending analysis performed by spend management component **32**, as described above with respect to **FIG. 6**.

[**0186**] At step **552**, some or all of the procurement data may be categorized according to one or more divisions, or silos, of a business organization with which the procurement data is associated. The procurement data may be categorized by one or more business classification rules and/or may include particular output from spend management component **32** regarding particular analysis of spending or procurements made by one or more of the divisions or silos. In particular embodiments, each division or silo is responsible for managing the spending or procurements made by that division or silo. At step **553**, one or more silo spend formulas may be generated and/or stored. Each silo spend formulas may include formulas relating to each division or silo of a business organization for determining spending associated with that particular division or silo.

[**0187**] At step **554**, a set of supplier intelligence business rules may be generated based on a variety of business rules input and/or procurement knowledge. In a particular embodiment, the variety of business rules input includes supplier requirements, customer requirements, business requirements, and contract analysis. The business rules may be designed to optimize particular decisions within a procurement process, or supply chain, based on a large volume of information regarding the spending or procurement behavior of each of the business organization divisions or silos. In particular embodiments, the supplier intelligence business rules may be generated such that they interrelate various silo spend formulas (generated and/or stored at step **553**) associated with any number of divisions, or silos, of the business organization. For example, a particular supplier intelligence business rule may interrelate at least one silo spend formula associated with a first business division with at least one spend formula associated with a second business division.

[**0188**] At step **556**, the procurement data regarding some or all of the business organization divisions or silos may be analyzed based on the supplier intelligence business rules to generate various outputs that may be used to make efficient spending or procurement decisions based on a total-cost-of-ownership perspective. For example, a portion of the procurement data may be analyzed to determine the effect of decisions made by one spending division or silo on one or more other spending divisions or silos of the same business organization, based on a total-cost-of-ownership perspective.

[**0189**] At step **558**, one or more visual outputs may be generated based on the analysis performed at step **556**. Such visual outputs may include a variety of data visualization

and/or business intelligence reports, such as described above with respect to **FIGS. 6 and 10**.

[**0190**] At step **560**, the procurement data stored in the procurement data warehouse may be periodically modified and/or new procurement data may be periodically added. For example, in particular embodiments, the procurement data may be modified based on a modification or addition to the collected source data, contracts management output, spend management output, or one or more of the supplier intelligence business rules. In particular embodiments, the procurement data stored in the procurement data warehouse may be modified automatically and in real time. The method may then return to step **556** to analyze the new and/or modified procurement data. In this manner, supplier intelligence analysis may be performed periodically and in real time based on the procurement data currently stored in the procurement data warehouse.

[**0191**] It should be understood that in particular embodiments, supplier intelligence component **34** may include various software embodied in computer-readable media and operable to perform all or portions of the functions and/or methods described above with respect to FIGS. **13-14**. Such software may be concentrated in a particular software package or distributed in any number of software modules, programs, routines, or other collections of code, which may or may not be geographically distributed.

[**0192**] **FIG. 15** illustrates a display **600** of an example output **534** generated by supplier intelligence analysis module **500** in accordance with an embodiment of the present invention. Display **600** illustrates the financial savings and/or losses associated with free shipping of hardware provided by a number of different suppliers, based on a total-cost-of-ownership analysis of a supply chain.

[**0193**] Display **600** may include a supplier intelligence table **602** and a number of interactive tools **604**. In the example shown in **FIG. 15**, supplier intelligence table **602** includes a list of suppliers **606** providing free shipping for hardware OEM (original equipment manufacturer) products procured by a purchasing business organization, as well as a number of metrics indicating savings and losses associated with such free shipping. Such metrics may be determined by supplier intelligence analysis module **500** based on an analysis of procurement data regarding each spend silo **504** through **514** according to the set of supplier intelligence business rules **520**. Column **608** indicates financial losses incurred by the purchasing business organization as a result of the free shipping provided by each supplier **606**. For example, column **608** may indicate financial losses due to free shipping as compared to a total supply chain cost determined without free shipping. Such losses may be attributed to the supplier **606** increasing prices or reducing discounts associated with particular products in order to compensate for providing free shipping, for example. Thus, such losses may be realized by one or more spend silos **504** through **514**, such as hardware spend silo **504**, for example.

[**0194**] Column **610** indicates the amounts of saving associated with the free shipping provided by each supplier **606**, without accounting for various financial losses resulting from the free shipping, such as the losses identified in column **608**. For example, column **610** may indicate savings incurred by shipping spend silo **510** as a result of the free shipping, without accounting for losses incurred by hardware spend silo **504** due to increased prices or reduced discounts, for example. Column **612** indicates the total amount spent by the purchasing business organization on hardware OEM from each supplier **606**. Column **614** indicates a percentage savings of the total amount spent from each supplier **606** (as indicated by column **612**) due to savings realized by the free shipping provided by each supplier **606** (as indicated in column **610**).

[**0195**] Display **600** may be displayed by an interactive user interface, such as in a WINDOWS environment, for example, such that a user may navigate through the display and request additional analysis using interactive tools **604**. In particular embodiments, display **600** is presented by an Internet browser and includes various icons, pull-down menus and/or hypertext items that may be selected by a user to retrieve additional information regarding particular items or analysis.

[**0196**] Output **534** generated by supplier intelligence analysis module **500**, such as the output displayed in supplier intelligence table **602**, for example, may be used to make efficient spending or procurement decisions based on a total-cost-of-ownership, or a complete supply chain, perspective. For example, individuals responsible for making procurement decisions for a particular division or silo of the business organization may be able to make optimized decisions based on the total cost of a procurement process or supply chain, including realizing the effects of procurement decisions made regarding that division or silo on various other divisions or silos within the business organization.

[**0197**] Although an embodiment of the invention and its advantages are described in detail, a person skilled in the art could make various alternations, additions, and omissions without departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A method of managing spending, comprising:

collecting procurement data from a plurality of data sources, the procurement data including information regarding a plurality of procurement events, one or more of the data sources having an associated source-specific product catalog;

storing a global catalog specifying, for each of a plurality of products, mapping relationships between source-specific product attributes specified by the one or more source-specific product catalogs and one or more generic attributes specified by the global catalog;

mapping the source-specific attributes associated with products identified by the collected procurement data to the corresponding generic attributes based on the mapping relationships;

analyzing a portion of the collected procurement data, including identifying information regarding particular products based on the generic attributes associated with the one or more products; and

automatically generating a visual output based on the analysis of the collected procurement data.

2. The method of claim 1, wherein collecting procurement data from a plurality of data sources includes collecting information automatically extracted from a plurality of electronic contracts based on a set of linguistic rules.

3. The method of claim 1, wherein collecting procurement data from a plurality of data sources comprises:

storing a plurality of electronic contracts including unstructured textual data;

determining one or more linguistic patterns associated with a business parameter;

generating linguistic rules based on the one or more linguistic patterns; and

using text mining tools to automatically extract information regarding the business parameter from the unstructured textual data using one or more of the linguistic rules; and

collecting at least a portion of the automatically extracted information.

4. The method of claim 1, wherein:

the procurement issue concerns the procurement of a particular product; and

the visual output illustrates one or more details of the procurement of the particular product.

5. The method of claim 1, wherein:

the procurement issue concerns two or more procurement parameters; and

the visual output illustrates a relationship between at least two of the two or more procurement parameters.

6. The method of claim 5, wherein the visual output comprises a three-dimensional visualization illustrating the relationship between the at least two types of procurement parameters.

7. The method of claim 5, wherein:

the procurement issue concerns the procurement of two or more particular products; and

the visual output illustrates a relationship between the procurement of one of the particular products and the procurement of another of the particular products.

8. The method of claim 1, further comprising automatically identifying one or more business entities associated with each of the plurality of procurement events; and wherein:

the visual output illustrates one or more details regarding procurement events associated with at least one of the one or more business entities.

9. The method of claim 1, further comprising:

storing one or more business relationships among a set of two or more related business entities; and

automatically identifying, for a particular procurement event associated with a particular business entity of the set of related business entities, one or more related business entities based on the stored business relationships; and

wherein the visual output illustrates procurement information regarding at least two of the set of related business entities.

10. The method of claim 9, wherein:

the set of two or more related business entities comprises two or more business entities having made procurement purchases; and

the visual output illustrates information regarding procurements made by at least two of the set of related business entities.

11. The method of claim 9, further comprising automatically receiving the one or more business relationships from a business information provider.

12. The method of claim 1, further comprising automatically determining the one or more procurement events associated with the particular procurement issue.

13. The method of claim 1, further comprising automatically classifying each of the plurality of procurement events based on one or more classification rules;

14. The method of claim 1, wherein the automatically generated visual output comprises a plurality of visualizations which may be navigated through using automated navigation tools.

15. The method of claim 1, further comprising:

receiving a request for a business intelligence report, the request being initiated based on an analysis of the visual output;

analyzing at least a portion of the collected procurement data; and

automatically generating the business intelligence report in response to the request based on the analysis of the collected procurement data.

16. The method of claim 1, wherein collecting procurement data from a plurality of data sources comprises:

collecting procurement data from a plurality of data sources;

periodically receiving additional procurement data from one or more of the plurality of data sources; and

updating the procurement data based on the additional procurement data.

17. Software for managing spending, the software being embodied in computer-readable media and when executed operable to:

collect procurement data from a plurality of data sources, the procurement data including information regarding a plurality of procurement events, one or more of the data sources having an associated source-specific product catalog;

store a global catalog specifying, for each of a plurality of products, mapping relationships between source-specific product attributes specified by the one or more source-specific product catalogs and one or more generic attributes specified by the global catalog;

map the source-specific attributes associated with products identified by the collected procurement data to the corresponding generic attributes based on the mapping relationships;

analyze a portion of the collected procurement data, including identifying information regarding particular products based on the generic attributes associated with the one or more particular products; and

generate a visual output based on the analysis of the collected procurement data.

18. The software of claim 17, wherein collecting procurement data from a plurality of data sources includes collect-

ing information automatically extracted from a plurality of electronic contracts based on a set of linguistic rules.

19. The software of claim 17, wherein collecting procurement data from a plurality of data sources comprises:

storing a plurality of electronic contracts including unstructured textual data;

determining one or more linguistic patterns associated with a business parameter;

generating linguistic rules based on the one or more linguistic patterns; and

using text mining tools to automatically extract information regarding the business parameter from the unstructured textual data using one or more of the linguistic rules; and

collecting at least a portion of the automatically extracted information.

20. The software of claim 17, wherein:

the procurement issue concerns the procurement of a particular product; and

the visual output illustrates one or more details of the procurement of the particular product.

21. The software of claim 17, wherein:

the procurement issue concerns two or more procurement parameters; and

the visual output illustrates a relationship between at least two of the two or more procurement parameters.

22. The software of claim 21, wherein the visual output comprises a three-dimensional visualization illustrating the relationship between the at least two procurement parameters.

23. The software of claim 21, wherein:

the procurement issue concerns the procurement of two or more particular products; and

the visual output illustrates a relationship between the procurement of one of the particular products and the procurement of another one of the particular products.

24. The software of claim 17, further operable to identify one or more business entities associated with each of the plurality of procurement events; and

wherein the visual output illustrates one or more details regarding procurement events associated with at least one of the one or more business entities.

25. The software of claim 17, further operable to:

store one or more business relationships among a set of two or more related business entities; and

identify, for a particular procurement event associated with a particular business entity of the set of related business entities, one or more related business entities based on the stored business relationships; and

wherein the visual output illustrates procurement information regarding at least two of the set of related business entities.

26. The software of claim 25, wherein:

the set of two or more related business entities comprises two or more business entities having made procurement purchases; and

the visual output illustrates information regarding procurements made by at least two of the set of related business entities.

27. The software of claim 25, further operable to receive the one or more business relationships from a business information provider.

28. The software of claim 17, wherein:

the visual output comprises a plurality of visualizations; and

the software is further operable to provide navigation tools for navigating through the plurality of visualizations.

29. The software of claim 17, further operable to:

receive a request for a business intelligence report, the request being initiated based on an analysis of the visual output;

analyze at least a portion of the collected procurement data; and

generate a business intelligence report in response to the request based on the analysis of the collected procurement data.

30. The software of claim 17, wherein collecting procurement data from a plurality of data sources comprises:

collecting procurement data from a plurality of data sources;

periodically receiving additional procurement data from one or more of the plurality of data sources; and

updating the procurement data based on the additional procurement data.

31. A system for managing spending, comprising:

a data warehouse operable to collect procurement data from a plurality of data sources, the procurement data including information regarding a plurality of procurement events, one or more of the data sources having an associated source-specific product catalog;

a global catalog module operable to:

store a global catalog specifying, for each of a plurality of products, mapping relationships between source-specific product attributes specified by the one or more source-specific product catalogs and one or more generic attributes specified by the global catalog; and

map the source-specific attributes associated with one or more products identified by the collected procurement data to the corresponding generic attributes based on the mapping relationships;

a data analysis module operable to analyze a portion of the collected procurement data, including identifying information regarding particular products based on the generic attributes associated with the one or more particular products; and

a data visualization module operable to generate a visual output based on the analysis of the collected procurement data.

32. The system of claim 31, wherein collecting procurement data from a plurality of data sources includes collect-

ing information automatically extracted from a plurality of electronic contracts based on a set of linguistic rules.

33. The system of claim 31, further comprising:

a contracts database operable to store a plurality of electronic contracts including unstructured textual data;

a linguistic rule database operable to store linguistic rules generated based on one or more linguistic patterns associated with a business parameter;

a text mining module comprising text mining tools operable to automatically extract particular information regarding the business parameter from the unstructured textual data using one or more of the linguistic rules; and

wherein collecting procurement data from a plurality of data sources includes collecting at least a portion of the extracted information.

34. The system of claim 31, wherein:

the procurement issue concerns the procurement of a particular product; and

the visual output illustrates one or more details of the procurement of the particular product.

35. The system of claim 31, wherein:

the procurement issue concerns two or more procurement parameters; and

the visual output illustrates a relationship between at least two of the two or more procurement parameters.

36. The system of claim 35, wherein the visual output comprises a three-dimensional visualization illustrating the relationship between the at least two procurement parameters.

37. The system of claim 35, wherein:

the procurement issue concerns the procurement of two or more particular products; and

the visual output illustrates a relationship between the procurement of one of the particular products and the procurement of another one of the particular products.

38. The system of claim 31, further comprising:

a business entity identification module operable to identify one or more business entities associated with each of the plurality of procurement events; and

wherein the visual output illustrates one or more details regarding procurement events associated with the particular business entity.

39. The system of claim 31, further comprising:

a business entity relationships database operable to store one or more business relationships among a set of two or more related business entities; and

a business entity identification module operable to identify, for a particular procurement event associated with a particular business entity of the set of related business entities, one or more related business entities based on the stored business relationships; and

wherein the request concerns procurement events associated with at least one business entity of the set of related business entities; and

wherein the visual output illustrates procurement information regarding at least two of the set of related business entities.

40. The system of claim 39, wherein:

the set of two or more related business entities comprises two or more business entities having made procurement purchases; and

the visual output illustrates information regarding procurements made by at least two of the set of related business entities.

41. The system of claim 39, wherein the business entity identification module is operable to receive the one or more business relationships from a business information provider.

42. The system of claim 31, wherein:

the visual output comprises a plurality of visualizations; and

the data visualization module is further operable to provide navigation tools for navigating through the plurality of visualizations.

43. The system of claim 31, further comprising a business intelligence reporting module operable to:

receive a request for a business intelligence report, the request being initiated based on an analysis of the visual output;

analyze at least a portion of the collected procurement data; and

generate a business intelligence report in response to the request based on the analysis of the collected procurement data.

44. The system of claim 31, wherein the data warehouse is operable to collect procurement data from a plurality of data sources by:

collecting procurement data from a plurality of data sources;

periodically receiving additional procurement data from one or more of the plurality of data sources; and

updating the collected procurement data based on the additional procurement data.

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