CHAPTER 8

Procurement and Spend Analytics
Procurement and Spend Analytics tracks a purchase from the time the purchase requisition has been drafted or the replenishment order comes from the MRP (Material Requirements Planning or Material Resource Planning) until the good is received, undergoes incoming QA, and is either paid for or returned. This module also interacts with Supply Chain and Order Management Analytics because goods received are often put into inventory. It also interacts with other Oracle Business Intelligence Applications as we will discuss in the “Cross-Functional Analysis” section of this chapter. Procurement and Spend Analytics are equally applicable to the procurement of goods as to services. They are also often as applicable in a public sector or nonprofit organization as they are in a corporate setting. In addition, they are equally applicable for direct procurement and indirect procurement. Direct procurement buys direct materials and services—namely, the materials and services used to build the final product or products bought for resale. Indirect procurement procures everything else (for example, office supplies or janitorial services).

Procurement and Spend Analytics helps customers procure in two major ways:

- They make it easier to aggregate purchases (or “spend” as procurement people call it) across the organization. When the organization understands its total spend of a commodity, Procurement can go to the market and negotiate the largest possible discount because it can confidently promise a much larger quantity purchase.

- They make it easier to monitor the vendor’s performance against the contract, allowing deviations to be detected and rectified more quickly, thus helping ensure that the savings are achieved without compromising quality or timeliness.

**Description of the Business Process**

For indirect procurement, typically the process goes something like this:

1. Someone fills out a requisition specifying what is to be bought.
2. Management approves the requisition (or not).
3. Procurement issues a purchase order to buy the product or service from an approved vendor, usually per a pre-negotiated contract,
or the requester buys it directly from a punch out to an approved vendor’s store.

4. The vendor accepts the purchase order (or not).
5. The product or service is received.
6. The product or service is accepted or returned.
7. The invoice is received.
8. The invoice is approved for payment.
9. The invoice is paid.

Direct procurement can be much more varied. Most notably, though, it does not start with a requisition. It usually starts with the MRP system requesting a replenishment or with a vendor initiating a shipment based on rules provided by the customer (so-called vendor managed inventory, or VMI). Procurement often does not issue an individual purchase order for each MRP replenishment or VMI replenishment. A blanket purchase order is drawn down.

Figures 8-1 and 8-2 describe parts of what procurement goes through. The first figure describes what procurement does when attempting to source a category. The second figure describes how goods and services—particularly indirect goods and services—get procured. Although strategic sourcing is

![Diagram](image-url)
Business Benefits
Organizations derive business benefits from Procurement and Spend Analytics by paying less for procured goods and services. This can arise from several sources:

- More of the organization’s spend goes through a contract, reaping the lower contracted price. Often spend that does not go through an existing contract for a commodity is called “maverick spend.”

- Products more often match the user’s requirements. For example, does someone who only sends e-mail and does word processing need an engineering workstation? Alternatively, if someone buys something underpowered, it can wear out prematurely, for example, a truck repeatedly being overloaded.

- When procurement goes to the market, it can negotiate based on the largest anticipated spend because it knows it has collected spend
from across the organization. This process is often called “strategic sourcing.” The larger the spend, the better price Procurement can negotiate.

- Because it is easier for Procurement to collect spend, it can strategically source commodities it could not in the past either because it did not have time or because the effort was not worth the potential savings.
- It is easier to identify and collect rebates and discounts that do not appear on an invoice.
- Procurement can more quickly and easily identify deviations in vendor performance and take action to rectify them.

We often see that organizations can take anywhere from 0.8 percent to over 10 percent off procured materials and services tracked by Procurement and Spend Analytics. Consequently, if the people in your procurement department believe that this type of analysis can help them analyze how they spend money, the ROI on this analytic application is one of the easiest to justify.

**NOTE**
This benefit is in addition to the benefit described in Chapter 5 because cost center managers avoid buying goods and services they do not, or no longer, need.

**Key Stakeholders**

The procurement department is your major customer, all the way from individual buyers to the vice president of procurement or chief procurement officer. They own the data. They do the analysis. They are responsible for delivering the results. There may not be many users for this application, but each one can drive a huge amount of value. The value does not come from laying off buyers but by making them more productive. Here are some benefits if we free up time for them:

- They can source more commodities.
- They can monitor vendors’ performance more closely.
They can monitor the market better to see whether a new competitor has come in who can give them a better price or better terms.

They can interact with the product development department more to ensure that products are designed with what the market can provide in mind.

If you work in a manufacturing company, also check with the plant manager. This person often has a target margin to maintain. If you can help Procurement be more effective, the plant manager will benefit.

**Cross-Functional Analysis**

Often Procurement and Spend Analytics is combined either with Manufacturing Analytics or Order Management and Supply Chain Analytics for a better understanding of where the purchasing process or vendors are slowing down the production and distribution processes. It can also be combined with Field Service Analytics or Enterprise Asset Management Analytics to understand the performance of repair parts and contract labor in minimizing asset downtime.

Procurement and Spend Analytics can also be paired with Financial Analytics for two reasons:

- One can get a much more complete view of the accounts payable process than just looking at invoices and AP transactions, which are available in Procurement and Spend Analytics. Primarily, Financial Analytics adds information about balances and aging.

- Cost center managers use Financial Analytics to identify unnecessary spend and curtail it. With Procurement and Spend Analytics combined with Financial Analytics, cost center managers can target off contract spend more specifically, not just to curtail spend but to direct their employees to target it to preferred vendors. Also, as cost center managers cut their spending, the volume that procurement can target will fall. Both procurement and cost center managers need to work together to ensure Procurement is providing vendors the best estimates of ongoing spend.

Finally, one can use Procurement Analytics with Project Analytics. PeopleSoft and E-Business Suite, for example, have very comprehensive project accounting built into their Financials and Procurement modules. These help people in
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Project work understand what is driving their spending and their performance versus budget. It also lets them see how delays in procuring goods and services impact their ability to hit their milestones and budget numbers. To allow this feature to be used, though, people need to track project numbers in the ERP Procurement and Financials modules.

Subject Areas

Many of the subject areas for Procurement and Spend Analytics line up around parts of the procure-to-pay process. Others are used for ongoing maintenance of supplier relationships. One (Employee Expenses) is used to monitor what employees spend on their expense accounts. Together they track the information, money, and goods flow from when the goods or services are requisitioned, either by a person or an MRP system, until they arrive and are stocked or used and paid for.

Purchase Requisitions and Purchase Request Status

Purchase Requisitions and Purchase Requisition Status handle the parts of the process from the time the requisition is submitted until it is approved. They also help people track what takes the time to approve a purchase requisition. These subject areas, shown in Figures 8-3 and 8-4, look at what happens between when a purchase

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**FIGURE 8-3.** Procurement and Spend – Purchase Requisitions

**FIGURE 8-4.** Procurement and Spend – Purchase Request Status
requisition is issued and when the purchase order is issued. They look not just at the purchase requisitions themselves, but also statistics about the purchase requisition process, such as the following:

- Cycle times
- Numbers of requisitions
- Average lines per requisition

These help people in lines of business and procurement judge the efficiency of the approval process.

NOTE
Purchase Requisition Status only supports the Universal Adapter concept; therefore, to populate the current status on a purchase requisition, you would need to first write your own ETL to populate the staging tables of the BI Apps.

Purchase Orders
The subject area shown in Figure 8-5 tracks the procurement process from the time when a purchase order is issued until the goods are accepted or rejected upon receipt. It allows people from the procurement, supply chain, and manufacturing departments to understand the following:

- How long it takes to receive materials from vendors
- How the quality compares to what was expected
- How much was invoiced for goods and services
- How much the invoiced amount differed from standard costs
- How efficiently procurement processed purchase orders
- The numbers of vendors and locations being sourced from

In analyzing how procurement is saving money and is facilitating manufacturing and supply chain to do their jobs, this subject area is often at the center of the action. Take particular care, then, to ensure it is correct and verify that all expected fields are populated correctly from your source system(s).
In addition to metrics that help people understand each individual purchase order, this subject area contains many aggregate metrics that can be used to ascertain the efficiency and effectiveness of the Procurement department. These include the numbers of purchase orders, purchase order lines, the numbers of cost centers, and the purchase price variance. Oracle EBS and other ERPs support complex services procurement. Complex services procurement involves a contract for a set of services performed as part of one deliverable, usually as part of an engineering and construction or maintenance and overhaul project. However, it can be part of an IT procurement, for instance, converting a system from a legacy environment to a new environment. Often, there are milestone payments based on intermediate deliverables. Often these payments do not represent the whole value earned. Part is retained until the project is completed and the final deliverable accepted. Also, parts of the project may be financed. All these aspects of complex services procurement can be tracked with Procurement and Spend Analytics and, where applicable, Project Analytics.

For project-based services, complex services procurement can be tracked as part of Project Analytics or by itself in Procurement and Spend Analytics. You can look at schedules, overall completion rates, and the performance of in-house services and materials with Project Analytics, which you cannot
do with just Procurement and Spend Analytics. However, with Procurement and Spend Analytics, over and above what you can do to monitor the orders, receipts, and invoices having to do with such a contract, you can monitor prepayments and retainage from a contract. You can also monitor the amounts financed.

**Purchase Receipts**

The subject area shown in Figure 8-6 provides many complex KPIs (Key Performance Indicators) that the Purchase Order Item subject area does not. It goes beyond just looking at individual purchase orders and purchase receipts to focus on KPIs that monitor price, quality, quantity, and timeliness. Here are some examples:

- Amounts received early, late, or on time
- Changes in received amounts versus a year ago
- Average days late for shipments received late
- Numbers of return transactions, return amounts, and return quantities
- Prices for goods received

Procurement people use this as they review the suppliers’ performance and as they review the volumes they want to suggest to the suppliers they will buy.

This subject area also adds to the ability to track complex services procurement by including amounts and quantities of goods received that are part of a complex services agreement.

**Purchase Cycle Lines**

Like the Purchase Receipts subject area, the subject area shown in Figure 8-7 contains complex KPIs used to judge the performance of a procurement
organization or of vendors supplying your organization goods and services. These include the following:

- Percent received early, on time, or late.
- Cycle times for purchase requisition to approval, purchase requisition approval to purchase order approval, and purchase order approval to purchase receipt.
- Metrics concerning comparing prices paid to standard costs, such as PO amount at purchase price, PO amount at standard cost, and percent price variance.
- The supplier score. Although Oracle has provided a standard definition of this metric—a combination of percent received early, percent received on time, percent received late, and PO cost variance—organizations often build this according to their own definition. This definition is stored in the Business layer of the RPD. The RPD describes the mapping between the data in the data warehouse (physical layer) through the business layer into the presentation layer, which users see when they want to build queries.

These metrics are invaluable in helping the supply chain, manufacturing, and procurement people understand what drove variances from standard costs and what caused inventory shortages.

**Invoice Lines**

By now, we have modeled requisitioning, ordering, and receiving goods and services. The next step in the process is to receive and pay the invoices. At this point, you know whether or not people bought products from preferred vendors using contracted prices. The subject area shown in Figure 8-8 also introduces a dimension table containing information about projects and tasks. This is used to assign purchases to different projects, as discussed in the “Cross-Functional Analysis” section. Besides measuring the
efficiency of the invoicing process, it also introduces metrics to measure how much spend could be addressed with better compliance. Some of these metrics include:

- Payables leakage amount and year-ago payables leakage amount
- Invoice price variance, year ago, and percentage change
- Average invoice unit price and year-ago average invoice unit price
- Benchmark price and supplier benchmark price

Metrics such as these help procurement departments benchmark their performance and understand how much more effective they could be in cutting costs. Facilitating this type of analysis typically drives much more value than figuring out how to process a few more invoices a day does. Moreover, it does so without cutting employees.

**Supplier AP Transactions**

This subject area tracks how the organization pays its suppliers (see Figure 8-9). It contains information based on accounts payable (AP) transactions, such as the number and the frequency with which they are paid early or late. Unlike the AP subject area in Financial Analytics, this subject area does not include balances or aging. However, it is based on the same fact table. In Procurement and Spend Analytics, the Supplier AP Transactions table only has the following dimensions licensed:

- W_XACT_TYPE_D
- W_PARTY_D
Supplier Performance

Procurement and Spend Analytics let a procurement department conduct periodic reviews of its suppliers with much less effort than it does today. Today, it may take Procurement several days or even more than a week to prepare for a review with a supplier. During this time, Procurement should gather information about the following:

- How well the vendor has performed against its obligations regarding, timeliness, quality, and cost.
- How well the company is doing to meet its objectives as to the quantities purchased and adequacy of notice given.
We often find that, although a contract may state that the goods will be shipped, for example, 30 days after receipt of order, the customer requests delivery two weeks after the order is issued. When the shipment shows up three weeks later, is it early, late, or on time?

- Whether price escalators or deflators are being applied appropriately.

If a procurement department can hold reviews quarterly, for example, instead of annually, they and the vendor can identify and rectify problems before they get out of hand. If Procurement can target second-tier as well as first-tier vendors, they can improve their relations with those vendors. This improvement in timeliness, quality, and cost can then help make lines of business more effective as well as lower costs. Some organizations also make supplier scorecards available to their suppliers, not as static reports, but as interactive dashboards. Providing suppliers dashboards will help ensure that the supplier and customer both have the same view of the supplier’s performance. In this way, there will be fewer surprises during supplier reviews.

There are no metrics in the Supplier Performance subject area (shown in Figure 8-10) that do not appear in other subject areas. This subject area exists because it drives a particular need—namely, improving supplier performance.

Given how this subject area is used, Oracle supplies the metrics needed for this purpose, including the following:

- Percent and quantity received early, late, and on time.

In this metric, genuine lateness is not separated from when the customer requested shipment outside of contract guidelines. Although there is no explicit support for contracts, this metric is date driven, for example, requested date versus received date.
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- PO cost variance
- Percent accepted and rejected
- Purchase cycle time and receipt cycle time
- Supplier score

**Procure to Pay**

The subject area shown in Figure 8-11 contains only metrics found in other subject areas. It does, though, allow for monitoring the whole procure-to-pay process. It contains a subset of quantity and monetary value metrics that allow organizations to monitor the flow of goods from requisition, if any, through purchase order to receipt and invoice. For an organization looking at the whole process as an overview, from the point of view of the supplier, the product, and the receiving location, this subject area is a good place to start.

**Employee Expenses**

Finally, Oracle provides an Employee Expenses category (see Figure 8-12). This is useful not only by itself, but also with Project Analytics and HR Analytics. This cross-functional analysis helps identify what is contributing to a project’s cost as well as what types of people may not be following corporate guidelines as to preferred airlines, hotels, and car rental companies. At Siebel, Tom Siebel had on his personal dashboard a list of the top 10 employees by employee expenses. Unless there was a very special...
situation (for example, working on a consulting project far away from home),
it was a very uncomfortable list to be on.

This subject area looks at actual, approved, and requested expenses
and items related to filing expense reports, for example, time to file, time to
approve, and time to reimburse. More importantly, Employee Expenses allows
expenses to be sliced by many dimensions, including the following:

- Cost Center
- Employee and Employee Organization
- Approver
- Expense Source
- Project and Project Expenditure Type and Task
- GL Account
- Payment Method
- Adjustment Reason
- Time

Typical Configurations
and Customizations

Procurement and Spend Analytics can be implemented in a fairly
straightforward manner. Mostly, you must make sure that the appropriate
hooks are enabled in the ERP system. For example, if you want to tie
expenses to projects, ensure that project numbers and task numbers are
coded on the ERP. If your organization uses p-cards, ensure the p-card files
are fed into the ERP.

People often enrich their data with UNSPSC codes. The UNSPSC is an
organization under the auspices of the United Nations that organizes products
into product families. This lets procurement departments identify close
substitutes and also identify products related to one another. Closely related
products should be easier for the same buyer to source because the markets
should be similar. This can be done manually, by asking vendors to do it, or
by sending out the data to a third-party provider. Procurement and Spend Analytics supports UNSPSC codes.

**Strategic Sourcing**

Although strategic sourcing is not yet formally supported, you can use the existing Procurement and Spend Analytics to help a procurement department with a strategic sourcing initiative. You can use the existing Purchase Orders or Purchase Receipts subject area to gather information on the entire spend for a commodity, the vendors currently providing it, and their current timeliness, quality, and cost performance. This information helps Procurement know how much it can advise vendors to plan for as it draws an RFP or ITT in British English, (Request for Proposal and Invitation to Tender, respectively) for a commodity. Procurement departments often spend months gathering the spend before putting out an RFP. Historic spend data provided by the Purchase Orders or Purchase Receipt subject areas can also highlight which vendors should be short listed and which should not be offered the opportunity to bid.

Also, you can use the Supplier Performance subject area to collect the information needed for supplier reviews easily.

**What to Watch Out For**

Because you cannot control easily what your suppliers or engineers call a part, there may be a lot of duplication within your product files. As we have described before, the presence of dirty data in your ERP is no excuse to delay implementation. It is almost always better to make better decisions based on dirty data than superficial decisions based on no analytic environment. Also, you can use Spend Classification Analytics to fill in product categories and other missing attributes based on Oracle Data Mining.

Also problematic is having suppliers set up multiple times, either within a single ERP or across multiple ERPs. To view global spend by supplier, for example, there needs to be a way to link all the suppliers together. When your suppliers have the exact same name, OBIEE will automatically aggregate and group the spend by supplier. When names and other attributes are different, however, then a Master Data Management (MDM) strategy needs to be deployed. A quick way to handle this initially is to implement a cross-reference table and use this as a lookup to populate a supplier hierarchy on the existing Supplier dimension.
A common area of confusion concerns the scope of the type of spend tracked by Procurement and Spend Analytics. Mobile phone bill details, for example, are not tracked. This type of detail, even if provided in electronic (EDI) format, is not kept in the ERP procurement process or in employee expense lines.

A common question that comes up concerns support for Oracle EBS iStore. It has been our experience that this is simply an ecommerce front end to the Oracle EBS Procurement back end. Therefore, requisitions and purchase orders generated through EBS iStore would be pulled into Procurement and Spend Analytics.

**Spend Classification**

Spend Classification is a relatively new BI Application. It does not look like other BI Applications in that it does not consist of the usual four elements—namely, a data model, prebuilt ETL, metadata, and prebuilt dashboards, reports, and alerts. Also, unlike other BI Applications, it is highly tied to the Oracle database because it uses Oracle Data Mining as its data-mining engine. It, however, is not necessarily tied to an ERP Oracle produces. It can be run from data extracted from any ERP. It provides added functionality to people with Procurement and Spend Analytics, which is why we include it in this chapter. This is licensed separately; Procurement and Spend Analytics are a pre-requisite. Despite this application being relatively expensive per seat, an organization will not need to buy very many seats of it. Only the few power users who will build the models need have seats. Note that although this application uses Oracle Data Mining as its data-mining engine, you can still run it if your procurement systems were not written by Oracle and do not run on the Oracle database. In that sense, it keeps with the design specifications of all other Oracle BI Applications—that they not be confined to Oracle applications or database customers.

**Description of the Business Process**

When someone introduces a new product, often they will put in “Miscellaneous” or “Unknown” for a product category, or leave it blank. In any event, this description does not help Procurement consolidate spend. Without a good view of the organization’s spend, Procurement lacks the knowledge it needs to go the market and negotiate for the best possible terms. Spend Classification uses Oracle Data Mining to attempt to classify purchases.
Spend Classification can use the UNSPSC taxonomy, the taxonomy used in EBS, or a custom taxonomy.

**Operation**

Figure 8-13 illustrates the process flow for spend classification. As with most data-mining products, one first picks a set of data to “train” the data-mining algorithm. This data should be checked to ensure that the categories are both correct and consistent across the enterprise. For instance, if one unit of a bank considers an ATM (cash point) machine a piece of computer hardware, another should not consider it part of a building, just because it is built into a wall. This data set can either be extracted from data warehouse tables or uploaded from Excel. Often people will extract data from the data warehouse, classify it by hand, and then upload it to the spend classification engine. This sample of data needs to be broad enough that the Spend Classification engine can see examples of the types of goods and services that go into all major categories the enterprise uses. This data can come from purchase requisitions, purchase orders, or AP transactions. If a category is not represented in the training data, Spend Classification will not be able to guess how to classify it when someone goes to classify it on

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**FIGURE 8-13. Process flow for Spend Classification**

- Set classification confidence levels to match program objectives.
- Experts examine a very small number of exceptions.
a full run. Also, all descriptive fields should be filled in, allowing the Spend Classification engine to fill in the most descriptive fields on its full run.

Once Spend Classification has processed the training data, you can run the data mining engine on a larger set of data. Spend Classification will classify records where it finds a good enough match between the contents of its training data set and the record in question. It may fill in all fields—a “well-classified” record. It may fill in a subset of fields—a “semi-classified” record. If it cannot find a sufficiently high match for any field, it will mark the record as “unclassified.”

Once a classification run is complete, we recommend going through and checking a subset of the classified and unclassified records. This offers you the opportunity to override what Spend Classification has chosen. These revised records can then be classified as “approved.” Spend Classification will then use these to improve its model, which in turn allows it to improve its matching ability.

**How to Classify the Data**

Begin by splitting the data set into three parts—for training, validation, and testing. Then, for each language that the product data contains, download the training data set and cleanse it manually:

- Make all abbreviations and names consistent.
- Categorize items consistently.
- Use names in your taxonomy
- Identify any missing leaf nodes in the taxonomy and add records to the training data set for these. The more complete the leaf nodes are in your taxonomy, the more useful Spend Classification’s results will be.

Next, run the training dataset through Spend Classification and then run the validation data set through Spend Classification. Check the results of the validation data set by performing the following tasks:

- Correct the results as needed.
- Fill in any missing fields.
- Label these records as “Approved.”
After validating the model, test it with the test data set. This helps ensure that any changes made during validation stand up to an independent set of data. Then repeat this for all languages.

Run the validation data set and check the results. Spend Classification provides several graphs that show how successfully Oracle Data Mining was able to classify the records in the data set you gave it, given the training data set you provided and the degree of confidence you specified when you ran the model. It also shows the number of levels of hierarchy it was able to fill in. Then, you can manually override any results the data-mining algorithm made where you see mistakes. These overrides will be added to the model to help it improve in the future.

**Advanced Model Creation**

If you want to build your own model rather than use either the EBS or UNSPSC model, this feature lets you build your own. It does assume, though, that you have some familiarity with data-mining algorithms. A wizard guides you through the process of setting up the model. You specify the columns within a table to be used (input) and enriched (output) as well as the algorithm to be used for your training data set. Oracle does not give guidance as to which algorithm should be used. This is best left for scenarios not well handled by the default taxonomies.

**Integration with E-Business Suite iProcurement**

In iProcurement, you can use the results of a Spend Classification exercise to add category information to individual non-catalog items. In the profile options, set the Oracle Data Mining (ODM) model, the URL for the Web Service for the Spend Classification, and enable category classification on the non-catalog request page. Then perform the following steps:

1. Navigate to Shop.
2. Navigate to Non Catalog Request.
3. Add the item to the cart.
4. When the Category Selection Region displays, click Assisted.
By integrating Spend Classification with iProcurement, you can be assured that what has been discovered in Spend Classification becomes part of EBS and the two stay synchronized.

**Final Thoughts on Spend Classification**

We often find that well over half of purchase records have incomplete or almost totally missing information about the product being purchased. For Procurement to be able to conduct good strategic sourcing, it needs to have accurate figures about how much the organization is spending on different goods and services. Only then will it be able to use the organization’s entire buying power to get the best possible pricing. Also, only then will it be able to highlight where people are not buying on contract. When people do not buy on contract, our experience is that they pay about 15 percent more than the contract price. Spend Classification, especially when integrated into iProcurement, allows Procurement to understand how much people are spending and to monitor whether they are using the approved pricing. This helps to reap the 0.8- to 10-percent decrease in costs that truly effective procurement can bring to an organization.

**Conclusion**

Every organization—whether public sector or private sector, for profit or nonprofit—buys products and services. Ensuring the organization gets the maximum value for what it pays helps the organization expand its goals. Helping procurement ensure vendors deliver products at the agreed combination of price, quality, and timeliness helps the rest of the organization do what it is tasked with. The justification for this analytic application is one of the easiest to develop.

One of our customers was a small chain of Catholic hospitals. The CEO, a nun, summarized the issue well: “No money, no mission,” she said. With Procurement and Spend Analytics, you and your procurement department can help free up more money for your organization’s mission.