

## Reading Sample

This sample chapter provides an overview of the analytics capabilities of SAP S/4HANA Cloud. The chapter explains the main concepts distinguishing embedded analytics and side-by-side analytics, followed by an overview of the main personas and the analytics functionality that supports them. Finally, it concludes with information on the architecture of SAP S/4HANA Cloud analytics and integration with other SAP Analytics solutions.



"Analytics"



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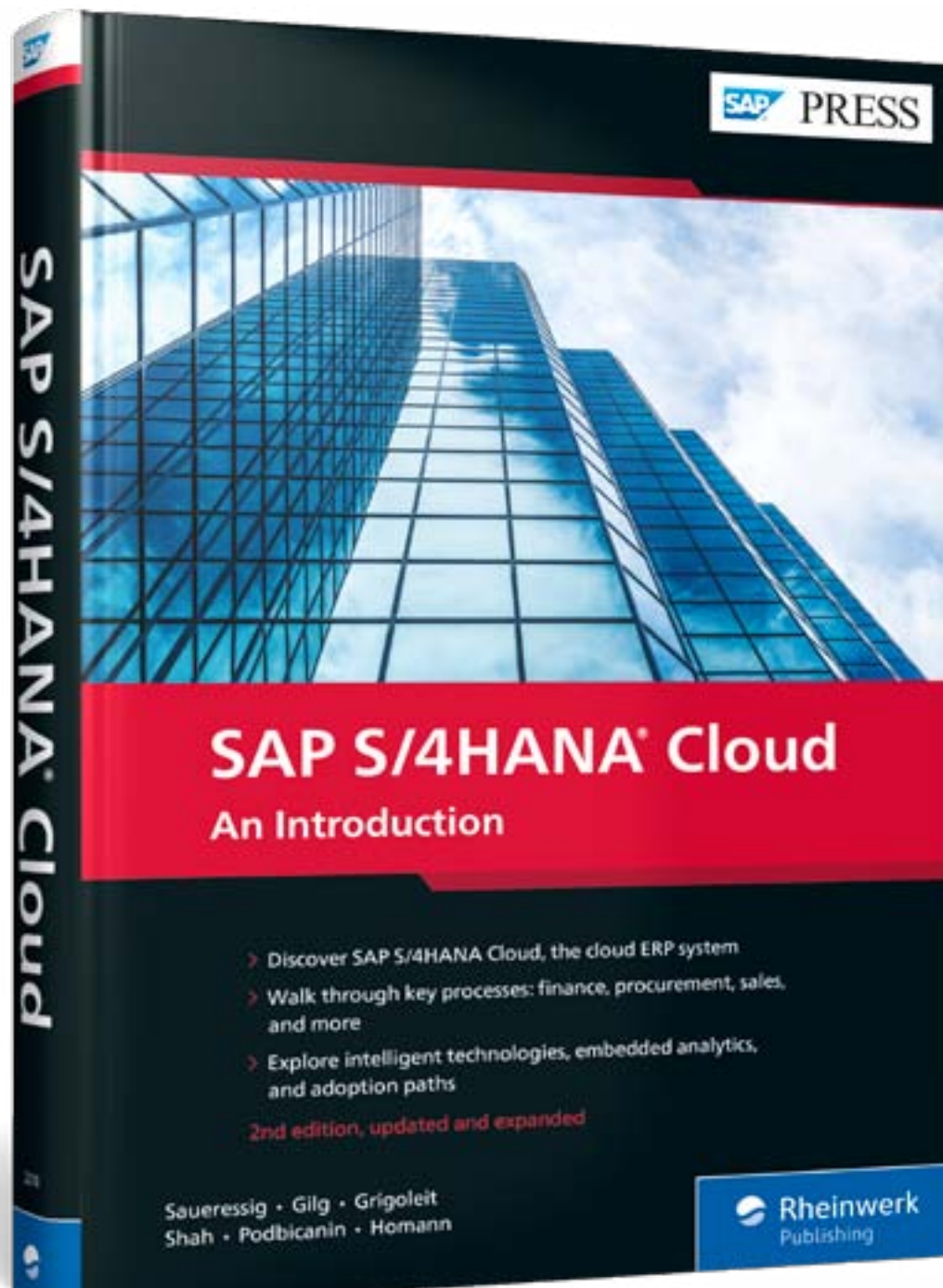
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## Chapter 5

# Analytics

*SAP S/4HANA Cloud comes with embedded analytics capabilities to integrate transactional and analytical operations in one database. These capabilities are complemented by enterprise analytics to support scenarios for data warehousing, business intelligence, enterprise planning, and augmented analytics by integrating analytics solutions like SAP Analytics Cloud.*

This chapter is an overview of the analytics capabilities available with SAP S/4HANA Cloud. You'll learn how these capabilities can help users collect the right insights and trigger the right actions. The chapter explains the main concepts distinguishing embedded analytics and side-by-side analytics, followed by an overview of the main personas and the analytics functionality that supports them. Finally, we'll conclude with information on the architecture of SAP S/4HANA Cloud analytics and integration with other SAP Analytics solutions.

### 5.1 Embedded Analytics and Enterprise Analytics

Modern business software like SAP S/4HANA Cloud is intended to holistically support business processes in order to make them more efficient, more effective, more agile, and in general more intelligent. Delivering on those promises means translating them into concrete features and qualities of an enterprise resource planning (ERP) solution that organizations want, such as the following:

- **Integrating transactional and analytical operations in one database**  
Why should transferring data to another place be necessary just to run an analytical query on it?
- **Providing insights and analysis based on real-time data**  
Why should users accept looking at outdated data, which focuses on the problems of yesterday instead of today?
- **Ensure a consistent look and feel for the solution across various modules and roles and between various analytical and transactional activities**  
Why should the look and feel of a table that shows transactional data be different from a grid that displays the result set of an analytical query?

- **Providing information based on real-time, operational data with embedded machine learning at crucial steps in the business process**

Why should a business process be interrupted for a decision to be made when decision support based on machine learning can help ensure smooth continuous operations?

- **Enabling extensibility options for extending the delivered solution in any direction while attending to business-specific ways of value creation and process design**

Why should companies wait for another report to be shipped by a software vendor when creating it tailor-made to their own organization's needs is significantly faster and less work than negotiating with the software vendor?

SAP S/4HANA Cloud is ready to deliver these qualities, enabled by the following main technical ingredients:

- The SAP HANA database, which provides real-time access to data, an in-memory analytics execution engine, and built-in machine learning capabilities
- The SAP Fiori user experience (UX), described in detail in Chapter 4, Section 4.1, that unifies the look and feel across transactional and analytical activities of the user and brings into one user interface (UI) supporting functions such as intent-based navigation, enterprise search, digital assistants, personalization, and a blending of transactional and analytical parts
- SAP Analytics Cloud, embedded edition, for premium analytical features such as dashboards and multidimensional reports, which avoids additional hassle because the entire setup and lifecycle of the integration is automated and managed by SAP
- Integration with other SAP solutions and especially with analytics offerings from SAP related to data warehousing

As shown in Figure 5.1, the high-level analytics strategy for SAP S/4HANA Cloud and all its ingredients allows you to achieve the following goals:

- Provide embedded insights within the solution to optimally support business users in defined business processes with decision support and the most relevant information at their fingertips
- Integrate SAP S/4HANA Cloud into the enterprise intelligence offerings such as SAP Analytics Cloud and SAP BW/4HANA
- Provide real-time access to solution data as well as replicating and perhaps blending data with multiple other sources for end-to-end (E2E) enterprise intelligence

In the following sections, we'll explore how SAP provides significant value when using SAP S/4HANA Cloud through a combination of *embedded analytics*, enabled by SAP Fiori and SAP Analytics solutions, and *enterprise analytics*, using the full set of solutions provided by the SAP Analytics portfolio.

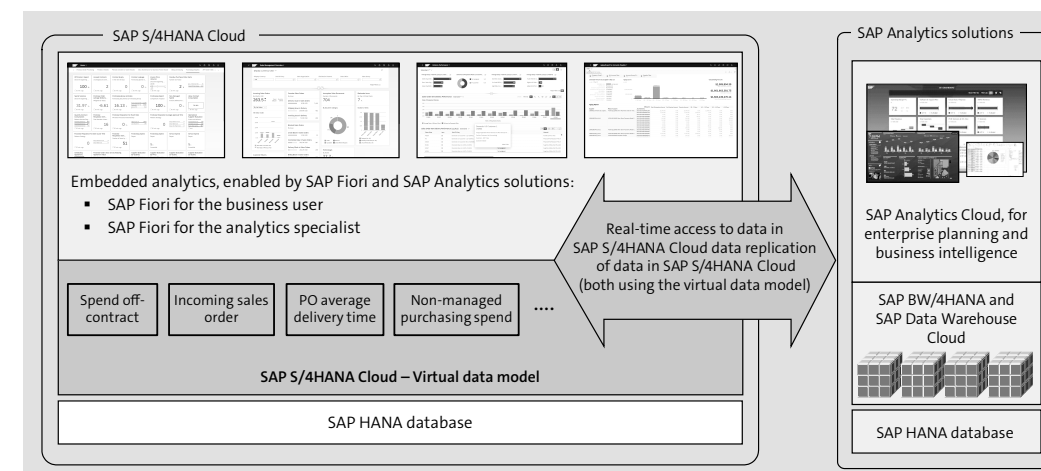


Figure 5.1 Analytics Ingredients of SAP S/4HANA Cloud

### 5.1.1 Embedded Analytics Enabled by SAP Fiori and SAP Analytics Cloud

Our experience, gained over many years of discussing analytics with many companies, has revealed that no one-size-fits-all approach can address all the various analytics needs of all users. Instead, analytics in the context of business software is a multifaceted, complex topic that must address a multitude of different work styles, use cases, and requirements and must be adaptable to the needs of different industries, geographies, local rules, and the often highly individual ways in which enterprises run their value-creation processes.

However, over the years, certain patterns for addressing those complex needs have evolved. Table 5.1 lists some common examples.

Use Case and Requirements	Analytical Solution
A quick overview of a larger number of certain business objects and their attributes, such as a list of sales orders and their statuses, values, customers, and contact persons	<i>List and filter apps</i> that allow you to set filters and sort data and perhaps provide drilldown capabilities from an entry in the list to further details.
Output and provisioning of data in a highly formatted publication, such as financial reports for consumption by investors as PDFs or printouts	<i>Pixel-perfect reports</i> , which can be designed by combining the data from the backend system with formatting options similar to other software solutions for word processing, presentations, or spreadsheets.

Table 5.1 Analytical Use Cases and Respective Solutions

Use Case and Requirements	Analytical Solution
Explorative analysis of multidimensional data, often without a defined goal in mind, such as detecting patterns in yield and scrap data for various plants, materials, and the production line over time	<i>Apps based on pivot tables</i> , as known from spreadsheet solutions. These allow users to display data with multiple lead columns, multiple header columns, and automated subtotal calculations as well as enabling filtering, slice-and-dice operations, and drill-down capabilities, allowing you to navigate from a cell in the pivot table grid to further details.
A quick and holistic overview about a process, a department, or a line of business (LOB), perhaps for assessing the overall situation and potential issues in the order-to-cash process	<i>Embedded dashboards</i> with multiple pages, bringing together data from various LOBs or even various solutions.
Decision support in E2E business processes, such as dealing with blocked orders	<i>Hybrid analytical-transactional apps</i> that provide analytical information and visualizations in the same place where corrective action can be triggered, based on the decisions made by a business user.
Sharing insights based on data in an ERP application with colleagues that have no access to this system, such as sharing project profitability analysis with consultants	<i>In-place analytical apps</i> and add-ins in office software—such as spreadsheets, word processing, or presentation software—with direct access to real-time data on the ERP backend.
Real-time overview of crucial key performance indicators (KPIs) including status indication and alerting	<i>KPI framework</i> that provides a central KPI catalog and the option to visualize the highly condensed information represented by a KPI's values, status, and trend information in various places of the UI, with progressive disclosure of more and more detailed data.
Proactively understanding potential sources of future issues	<i>Embedded predictive apps</i> that come with predefined machine learning models, trained by your organization on its own data.
Planning and simulation on self-defined data structures that are not necessarily identical to the operational data tables	<i>Planning and simulation apps</i> based on a planning platform that offers the modeling of adequate data structures for planning as well as the back-and-forth integration with the business data of the ERP backend.

Table 5.1 Analytical Use Cases and Respective Solutions (Cont.)

Use Case and Requirements	Analytical Solution
Rule-based decision automation and exception handling	<i>Situation Handling apps</i> , which can automatically detect critical business situations based on manually created situation templates or by using machine learning algorithms to derive critical situations for data of past events. In addition, these apps suggest adequate follow-up actions based on the analysis of previous user decisions.

Table 5.1 Analytical Use Cases and Respective Solutions (Cont.)

Let's look at the real people for whom such use cases are relevant in their daily work and examine a few examples where SAP S/4HANA Cloud delivers functionality to address typical analytical use cases:

- A *material planner* is responsible for stock availability analysis for just-in-time (JIT) calls of components and therefore needs to view the mapping of requested components to JIT calls. For the necessary alignment with shipping specialists, transport planners, and production planners, access to real-time information for accurate decisions is needed. The SAP Fiori app in SAP S/4HANA Cloud for this purpose is the Stock Availability Analysis for Just-In-Time Calls app (F3923).
- A *collection supervisor* who wants to assign new collection cases to colleagues in the collections team needs information on the values of open cases and the remaining capacity of the team before making an informed decision. The SAP Fiori app in SAP S/4HANA Cloud for this purpose is the Supervise Collections Worklist app (F2375).
- A *salesclerk* responsible for resolving blocked orders needs criteria such as the order value, the expected profit, and a prediction of a customer's payment behavior to decide which orders to focus on. On the basis of this information, the salesclerk might increase a customer's credit limit to unblock an order. The SAP Fiori app in SAP S/4HANA Cloud for this purpose is the Sales Order Fulfillment Issues app (FO029A).
- An *inventory manager* needs real-time data to ensure forecast and inventory accuracy and must deal with outliers on a stock identifier level. The SAP Fiori app in SAP S/4HANA Cloud for this purpose is the Inventory KPI Analysis app (F3749).

These examples represent only a tiny fraction of the more than 400 predefined analytical applications in SAP S/4HANA Cloud. A person responsible for a task relies on the availability of context-dependent, aggregated information for making correct decisions. Providing such information on the fly is the main purpose of the embedded analytics infrastructure in SAP S/4HANA Cloud.



What all these examples have in common is that they are all integral parts of the embedded analytics functionality of SAP S/4HANA Cloud. In this context, *embedded* refers to the following qualities:

- **Embedded on the database level**

No separate analytical storage of data, access only to real-time live data (the analytical data is transactional data), and necessary transformations are performed through the virtual data model (VDM)

- **Embedded on the UI level**

Using the same UI technology (and sometimes even the same UI screen) to render transactional data and analytical information

- **Embedded into business processes**

Role-based access to analytical artifacts, using intent-based navigation and thus implementing an insight-to-action working style

In addition, SAP S/4HANA Cloud of course allows you to create your own analytical artifacts for any type of report or KPI.

### 5.1.2 Enterprise Analytics Using SAP Analytics Solutions

With so many analytical features available as part of the embedded analytics in SAP S/4HANA Cloud, an often-asked question is whether additional analytics solutions are still needed. The answer to this question is a clear “Yes.”

In contrast to embedded analytics, enterprise analytical applications are built and deployed independently of SAP S/4HANA Cloud, generally on dedicated analytical platforms like SAP Business Warehouse, SAP Analytics Cloud, and SAP Data Warehouse Cloud. These kinds of solutions complement SAP S/4HANA Cloud’s embedded analytics features and can be grouped into the following areas:

- Data warehousing and data management
- Business intelligence
- Enterprise planning
- Augmented analytics

Figure 5.2 shows an overview of SAP’s offerings in enterprise analytics:

- SAP Analytics Cloud covers business intelligence, planning, and augmented analytics. The latter uses machine learning technology to provide intuitive visualizations and additional artificial intelligence (AI)-generated insights to make the data easier to understand.
- Data management and data warehousing capabilities are provided through SAP Data Warehouse Cloud and SAP BW/4HANA.

- For on-premise use, SAP also offers the SAP Business Planning and Consolidation (SAP BPC) application and the SAP BusinessObjects Business Intelligence (BI) suite, as well as popular products such as SAP Analysis for Microsoft Office and SAP Lumira.

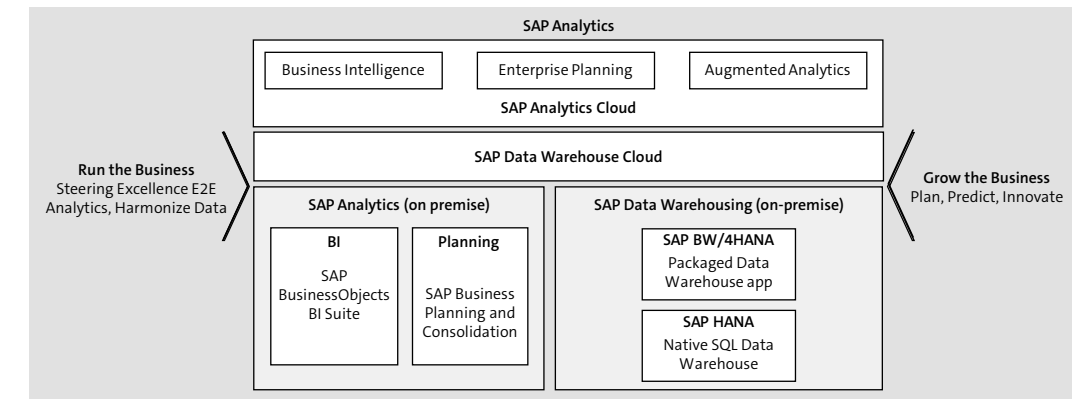


Figure 5.2 Enterprise Analytics Offerings from SAP

These solutions consume data from SAP S/4HANA Cloud and other software either remotely through live connections or by replicating the data into an adequate data storage. Thus, many additional analytics use cases can be implemented that would otherwise not be available with embedded analytics, such as the following:

- **Cross-application analytics**  
Reports and dashboards that combine data from multiple different business solutions
- **Historized data (also known as enterprise memory)**  
Taking data snapshots and storing high volumes of time series data for occasional long-term analysis
- **Planning on self-defined data structures**  
Top-down enterprise planning, typically using aggregated, managerial levels for capturing the plan data instead of operational planning on the document level
- **Integration of SAP data into the customer-specific enterprise analytics architecture**  
Freedom of choice regarding the UI for visualizing the data, if a company has its own business intelligence solution, and freedom of choice regarding the storage of data

A financial analytics dashboard in SAP Analytics Cloud, like the one shown in Figure 5.3, provides a great example of the insights that can be achieved with enterprise analytics as described.



Figure 5.3 Financial Analytics Dashboard in SAP Analytics Cloud

This dashboard uses data from SAP S/4HANA Cloud and SAP SuccessFactors not only to show the data side-by-side in separate charts or tables, but also to calculate business ratios such as **Operating Expenses/FTE**, where the numerator is based on data from SAP S/4HANA Cloud and the denominator is based on data from SAP SuccessFactors solutions. The data models needed to implement this logic and to semantically bring together the right data from both solutions reside in SAP Data Warehouse Cloud; the visualization of the dashboard uses SAP Analytics Cloud. The required services to provide the data are implemented on the respective backends.

For SAP S/4HANA Cloud, you'll use analytical queries based on the core data services (CDS) in the ABAP programming language. These analytical queries provide the data in real time, without replication into SAP Data Warehouse Cloud. For SAP SuccessFactors solutions, the data is provided through an Open Data Protocol (OData) service that replicates data into SAP Data Warehouse Cloud.

This data lifecycle may seem rather complex, but we deliberately chose a complicated example to prove that you can create new insights across solution boundaries even if neither complete semantical alignment of data nor a unified way of providing the data exists, but you still need a smooth and insight-rich experience for the business user.

Now that we've explored the important differences between embedded analytics and enterprise analytics and provided a high-level overview on their specific value, the following section looks more deeply into the functionalities in embedded analytics for two main user types that are the focus of embedded analytics: the business user and the analytics specialist.

## 5.2 Embedded Analytics in SAP S/4HANA Cloud

To systematically explain the rich feature set included in embedded analytics in SAP S/4HANA Cloud, we must look at user roles that are in focus and at the main use cases those user roles need support for. Therefore, the following sections first discuss the specifics of the business user (which is not a business role in a technical sense but rather a certain type of persona) and the analytics specialist (which is, in fact, delivered as a business role template with SAP S/4HANA Cloud: SAP\_BR\_ANALYTICS\_SPECIALIST). In the same context, we'll then provide an overview of the main features enabled by embedded analytics.

### 5.2.1 Business User Persona

The best way to imagine a business user persona for embedded analytics is to think of this person as someone like you or one of your colleagues: Every now and then during your workday, you have to perform certain tasks in a solution like SAP S/4HANA Cloud. Perhaps you need to check the salary of an employee, order new equipment, enter a sales order, post a general ledger document, or review the budget situation of the cost center you're responsible for. Those tasks are usually a mix of activities that are transactional (posting, approving, rejecting, entering, etc.) and analytical (reviewing, analyzing, checking, etc.). In other words, business users are people who perform tasks in an ERP application that are part of a business process.

Analytical insights can be made available to users in a variety of ways. The analytical demands of user roles sometimes differ quite substantially, and so do the embedded analytics offerings of SAP S/4HANA Cloud. For example, the needs of a manager role usually involve highly condensed information, perhaps in the form of a KPI already displayed on the SAP Fiori launchpad. A manager might also need the status of the KPIs compared to a target value, trends in the KPI, and potentially further comparison values. This user role could drill down to a dashboard that shows detailed information about the KPI extrapolated into relevant dimensions (by time, organizational unit, material, etc.) while also providing a comprehensive overview of a situation to the manager. In contrast, the needs of a person in a sales back office are quite different. To resolve blocked orders, this user role may also start with highly condensed information in a KPI but then will quickly need to access potential blocking reasons and handle them. Handling in this case may include removing a billing block, changing a credit limit, adding missing information to the delivery, and so on.

In all of these cases, and many more, embedded analytics in SAP S/4HANA Cloud supports business users by providing the right information at the right time and the right place, thereby increasing user productivity and overall process efficiency.

Implementing embedded analytics from a UX perspective generally follows these guiding principles:

■ Information first and progressive disclosure

Inform the user as efficiently as possible and always offer additional information—for example, by breaking down a number into relevant dimensions or by allowing the user to navigate to other reports, including other KPI apps, such as the Spend Variance app (F1377).

■ Insight to action

Wherever possible, provide the option to directly take action after the user makes a decision based on the provided information. For example, let's say a user needs to assign a supplier as the source for purchase requisition. Allowing the user to directly perform this task from within a chart displaying all possible suppliers, along with their main KPIs, would be ideal, as is the case in the Manage Purchase Requisitions app (F1048).

■ Exception-based working style

Show the user what really needs attention and help them avoid irrelevant data. This principle is shown in the Supervise Collections Worklist app (F2375).

5.2.2 Functions for Business Users

All these principles and business user requirements have found their way into the tools and features that we'll explore in the following sections. For each of these app types, SAP S/4HANA Cloud comes with several predefined apps that address specific user needs and support certain process steps. As you'll see in Section 5.2.3, you'll also have access to all the tools you need to create your own custom apps, regardless of app type.

SAP Smart Business KPIs

SAP Smart Business KPIs come with two main parts: special KPI tiles on the SAP Fiori launchpad, as shown in Figure 5.4, and a generic drilldown app that provides further information on the KPI, as shown in Figure 5.5.

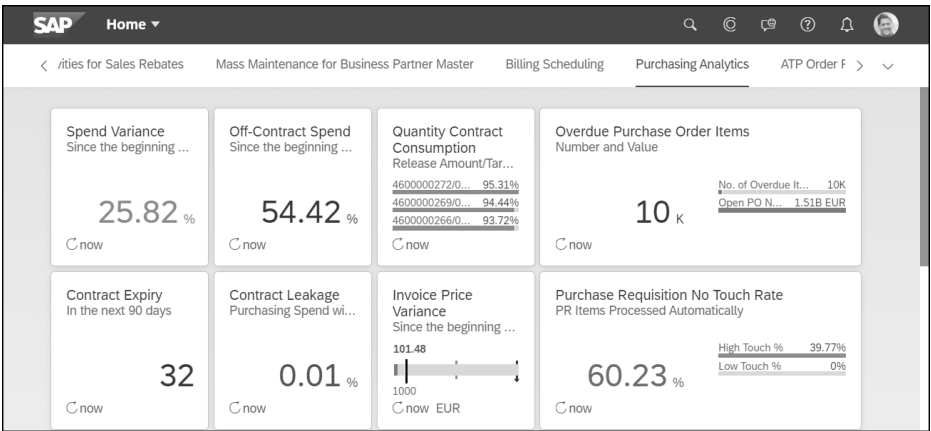


Figure 5.4 KPI Tiles on SAP Fiori Launchpad

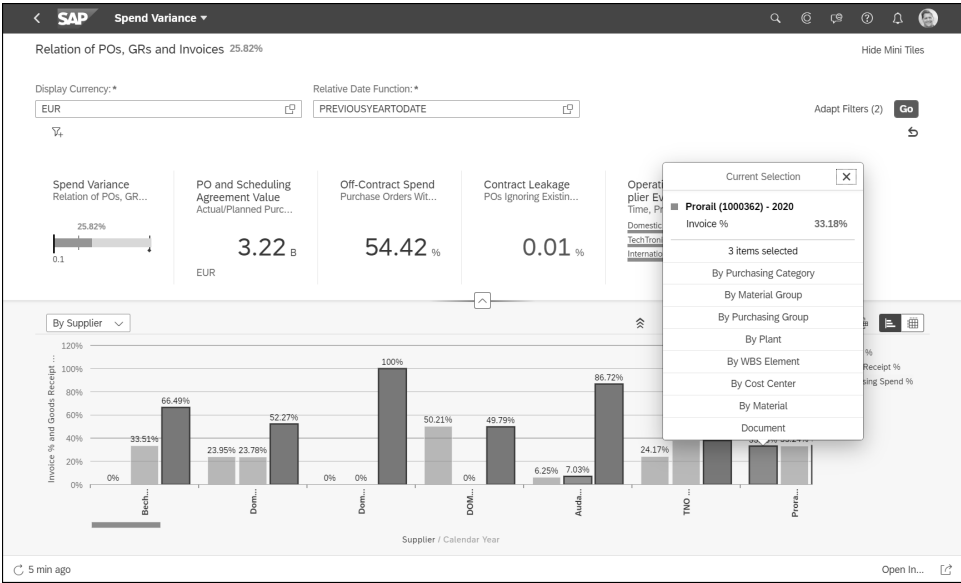


Figure 5.5 Generic Drilldown App for KPIs

The generic drilldown app, which opens when clicking on a KPI tile, usually contains several predefined views to help you analyze the KPI in more detail, such as through a disaggregation of the numbers into relevant dimensions. In the example shown in Figure 5.5, the initial view enables you to drill down to the KPI by supplier. This predefined KPI, the Spend Variance app (F1377), comes with further predefined views: **By Purchasing Category**, **By Material Group**, **By Purchasing Group**, **By Plant**, **By WBS Element**, **By Cost Center**, **By Material**, and **Document**. Even beyond these predefined views, a business user can change the drilldown capabilities of the KPI by whatever dimensions are available in the underlying OData service. If the chart type needs to be changed, a user can select another type from the 30 available chart types. In addition to the usual line, bar, and column charts, chart types include combined line-bar, combined line-column, donut, pie, scatter plot, bubble, and waterfall charts, as well as several stacked chart types, to name the most important chart types. If displaying the data in a table is more appropriate, a user can switch from any chart type to display the data in a table.

Following the *insight-to-action* principle, a user can navigate to other apps. Having selected a certain data point in the chart or the table, additional navigation options are available by clicking on the **Open In...** link in the lower right of the screen, shown in Figure 5.5.

Various types of KPI tiles exist, ranging from a simple number tile to more complex, wider tiles containing additional information. Status information is displayed through the coloring of the numbers. This status is based on comparisons between actual values and thresholds that can be set when configuring the KPI and can be personalized by

saving a personal variant of the KPI. Threshold values can be given in absolute terms or through a comparison to another calculated value (which must be available through the same OData service that also supplies the actual KPI). As with all SAP Fiori launchpad tiles, KPI tiles can also be rearranged freely, be hidden, or be organized into other SAP Fiori launchpad groups or into the home group of the user.

Overview Pages

An SAP Fiori overview page is a special type of SAP Fiori app. This kind of app comes with a predefined set of cards with different purposes. The data displayed on all the cards of an overview page is determined by the filters set in the filter bar. From overview pages, based on the insight-to-action paradigm, users can also navigate to further apps, such as reports, KPI details, or transactional apps. The sequence of cards and which ones are shown or hidden can be saved, together with the selected filters, in a personal view variant.

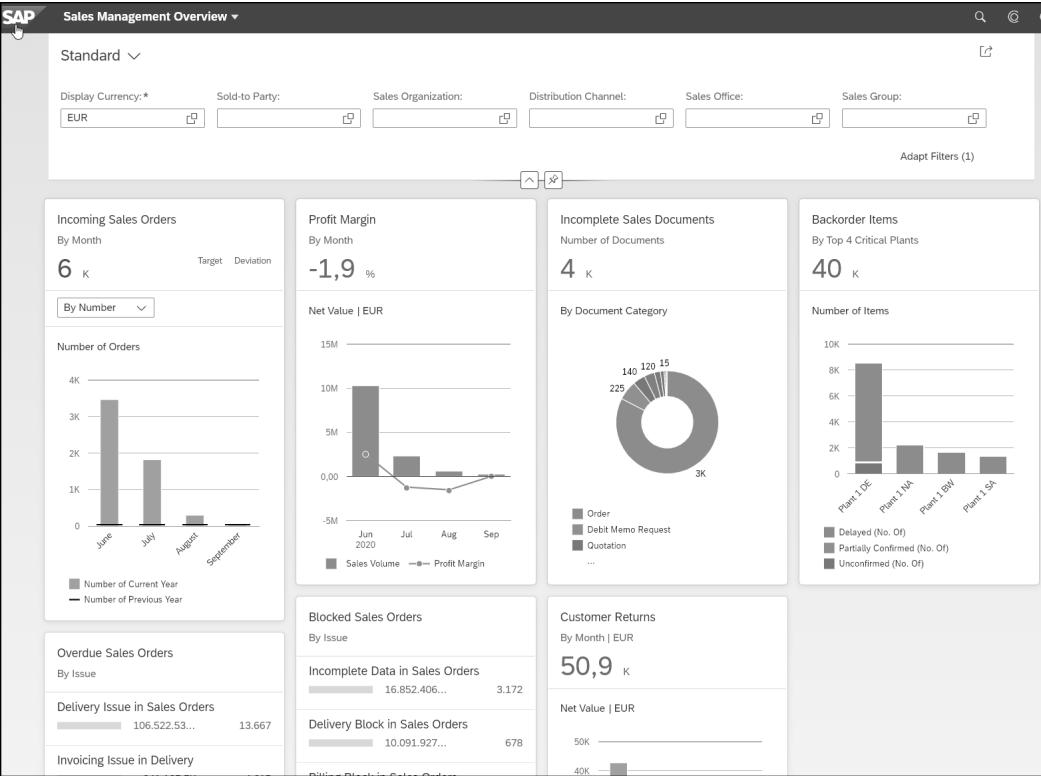


Figure 5.6 Overview Page Sales Management Overview

Let's demonstrate this capability by looking at the overview page of the Sales Management Overview app (F2601), shown in Figure 5.6. The app comes as part of the sales manager role (SAP\_BR\_SALES\_MANAGER) and features seven predefined cards:

- **Incoming Sales Orders** provides sales orders organized by number of orders or by net value. From this card, a user can navigate to the Sales Orders—Flexible Analysis app.
- **Profit Margin** shows a combination of net profit and net sales volume by month. Clicking on the header opens the Sales Volume—Profit Margin app.
- **Incomplete Sales Documents** shows the number of incomplete sales orders by inquiries, quotations, orders, credit and debit memo requests, returns, orders without charge, and contracts. Navigation from this card leads to the Incomplete Sales Documents app.
- **Backorder Items** lets a user find the status of items that are delayed, partially confirmed, and not confirmed, sorted by the most critical plants. Clicking on this card navigates to the Sales Order Items—Backorders app.
- **Blocked Sales Orders** shows a list of blocking reasons, the net number of blocked orders, and the number of affected sales orders by blocking reason.
- **Overdue Sales Orders** provides a list of blocking reasons, this time for overdue sales orders. Clicking on the header of the card or on a single line leads the user to the KPI detail app that displays all blocking reasons or the blocking reason selected in the card.
- **Customer Returns** shows numbers for the net value of customer returns of the current year compared to the net value of customer returns of the previous year. Clicking on this card navigates to the Customer Returns app.

In addition to the Sales Management Overview app, SAP S/4HANA Cloud comes with more than 40 other predefined overview pages. Details about these apps, and all other SAP Fiori apps, are available in the SAP Fiori apps reference library under <https://fiori-appslibrary.hana.ondemand.com>.

Analytical List Pages

Another SAP Fiori app type is the analytical list page, shown in Figure 5.7. By combining analytical elements, such as the visual filter bar and the chart area, with the direct access to operational data on a document level in the lower section, this app type ideally supports the information-first and insight-to-action principles and encourages an exception-based working style. Therefore, the analytical list page is the right choice to support users who work on large volumes of objects and who need powerful options to analyze the overall situation before taking action.

Let's look at some of the features of this type of app by exploring the Supervise Collections Worklist app (F2375), shown in Figure 5.7. This app was made for the role of the accounts receivables manager and is included in the business role template SAP\_BR\_AR\_MANAGER. The app supports users in this role by helping to make sure that all customers with open collection items are assigned to a collection specialist. To do so, the



collection supervisor or accounts receivable manager gets information about the customers that are not yet assigned, such as their status, their criticality, and the amounts at stake. Thus, in the case of a shortage of collection specialists, the most important items are assigned first (exception-based working and information-first principle).

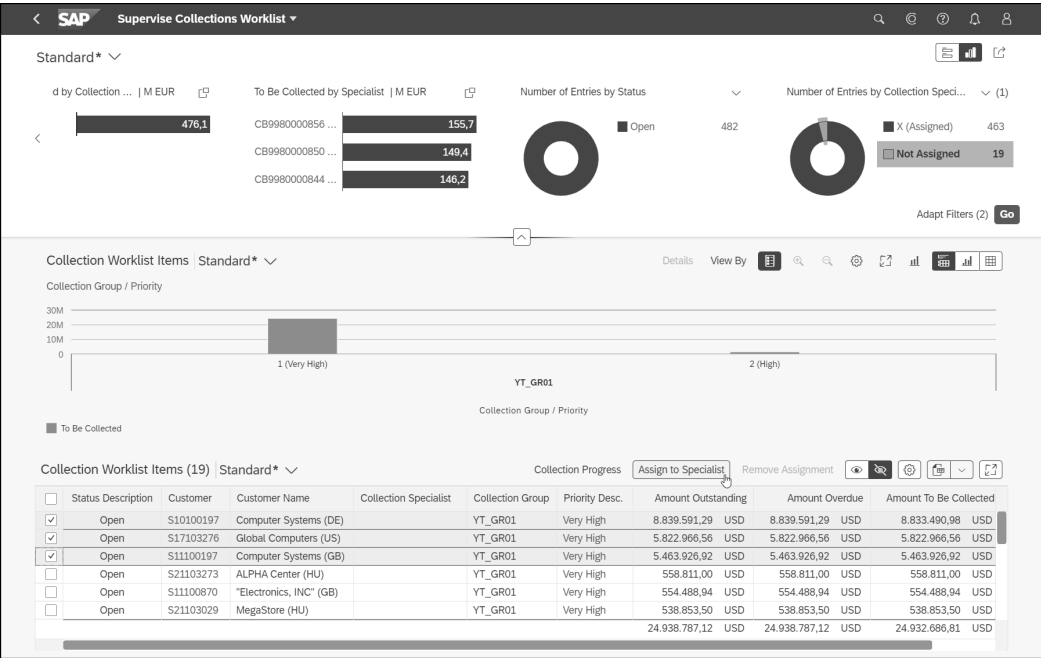


Figure 5.7 Analytical List Page

The insight-to-action principle is implemented by the proximity of analytical and transactional activities that are combined in this app:

- **Analytic activities**
  - Assess open collection items and their assignment to a collection specialist
  - Analyze overdue or to-be-collected invoice amounts, days in arrears, and other indicators
  - Analyze the collection progress using the Collection Progress app (F1738), comparing the amount to be collected with the payments promised by customers
- **Transactional activities**
  - Assign collection supervisors to collection items
  - Remove collection supervisors from collection items

These activities are supported by a couple of standard features and functions the analytical list page always provides, regardless of whether the actual app is the Supervise Collection Worklist or any other of the predefined analytical list page apps:

- Compact filters for defining complex filter conditions.
- Visual filters, like those shown in Figure 5.7, for quick selection of data.
- Collapsing of the filter section or the chart to open more screen space.
- Personalization options for the chart in the settings dialog.
- Personalization of the table section, which includes the selection of visible columns, sort orders, sequence of columns, grouping, and additional filters.
- Saving of all settings in personalized views. Filter, chart, and table settings are all stored in variants. Independent of each other, table settings can be stored in a table variant, chart settings in a chart variant, and the entire page setting in a page variant.
- For chart and table settings, ability to make the saved views public, thus making them available to all users of the same app.
- Ability to make a specific variant the default to be initially shown when opening the app.

### Multidimensional Reports

The idea behind a multidimensional report is best explained as a highly elaborate pivot table, much like those in common spreadsheet programs. Embedded analytics in SAP S/4HANA Cloud provides a powerful pivot table-based app type that supports multiple dimensions. It can be seen as the best solution for use cases that require you to arrange and aggregate data in various ways. Flexible drilldown capabilities enable you to analyze the data from multiple perspectives, as shown in Figure 5.8.

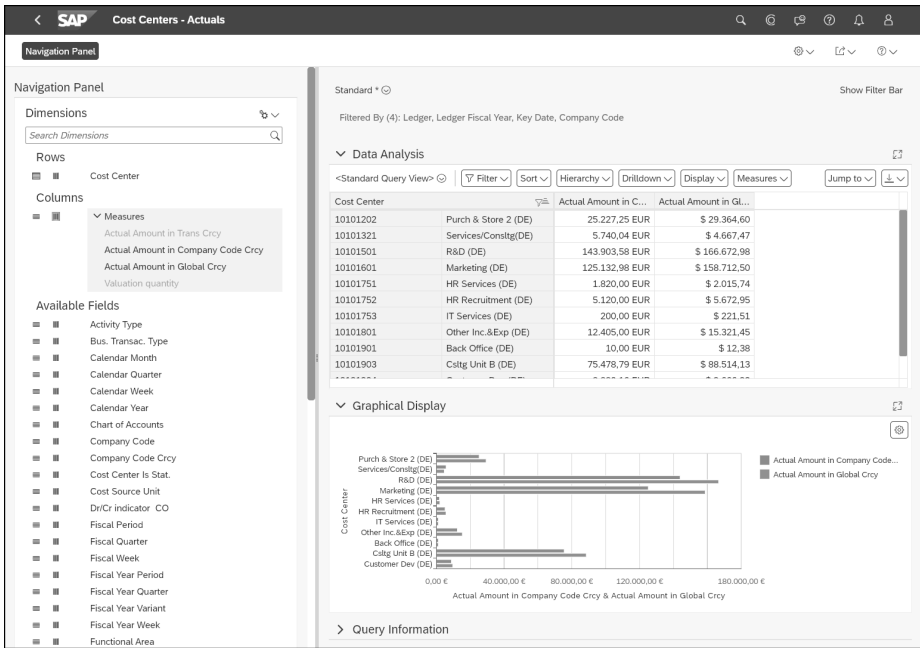


Figure 5.8 Multidimensional Report

In SAP S/4HANA Cloud 2202, more than 130 multidimensional reports are available for different LOBs, mostly in the finance and controlling areas. The features that all apps of this type share include the ability to change drilldown levels and adjusting the layout of the data, including filtering the data, as well as display options for tables and charts. In addition, you can save your own personal variants of views and navigate to other apps in keeping with the insight-to-action principle. Additional features include Microsoft Excel export or pausing the refreshing of the data to allow multiple navigation steps without waiting after each step for the result set to refresh. All dimensions that are available in a multidimensional app can be used for filtering. (Before doing so, the desired dimension may need to be added to the filter bar.) In the Cost Center—Actuals app (F0963), shown in Figure 5.8, measures can be analyzed using over 40 dimensions.

Dashboards

The use case for *dashboards* is all about providing a comprehensive and visually optimized overview of information about a certain business topic. Manager roles benefit the most from specific features enabled by dashboards. In SAP S/4HANA Cloud, this use case is implemented by bundling selected features from SAP Analytics Cloud with SAP S/4HANA Cloud via a deep, seamless integration and automated codeployment of the SAP Analytics Cloud solution with every tenant of SAP S/4HANA Cloud. This integration also includes the automated synchronization of users. Note that SAP Analytics Cloud, embedded edition does not offer all features of “enterprise” (standard) SAP Analytics Cloud.

In SAP Analytics Cloud, dashboards are referred to as *stories*. Figure 5.9 shows an example of a predefined story: the Treasury Executive Dashboard app (F4316). This app is part of the treasury risk manager role (SAP\_BR\_TREASURY\_RISK\_MANAGER).

Following the principle of progressive disclosure, this story starts with an overview of the liquidity situation on the **Liquidity** page. Using the map on the left, you can filter the numbers by country by clicking on the shape of, for example, Germany. All the data shown in the stories using SAP Analytics Cloud, embedded edition, is real-time data from SAP S/4HANA Cloud, as in any other embedded analytics report. No replication or duplication of data in any way is required.

In dashboards as well, users are supported by several standard features available in all apps of this type, such as the following:

- As in any other embedded analytics report, intent-based navigation is available for semantic objects on the dashboard. Calling up the context menu by right-clicking on a data point—such as a customer ID, supplier ID, material ID, or other business entity—opens a list of apps to which you can navigate while at the same time transferring the ID from which you started the navigation.
- User-specific settings for parameter values and filters can be saved in a personal page variant. In addition, using the **Save As** function creates a new SAP Fiori launchpad tile

in the home group of the user. Clicking on this tile will start the app with personalized settings.

- In charts, a user can make on-the-fly value comparisons after clicking on, for example, a column in a chart and then hovering the cursor over another column within the same chart.
- In tables, additional functions are available in the context menu, accessed by right-clicking on a cell in the table. An interesting feature is the on-the-fly ranking of records in the table: A new column can be added quickly to show the ranking of the entries in the table according to the numbers in the selected column.
- In the context menu of a table, you’ll also find the option to export the data into comma-separated values (CSV) format or as a Microsoft Excel spreadsheet.

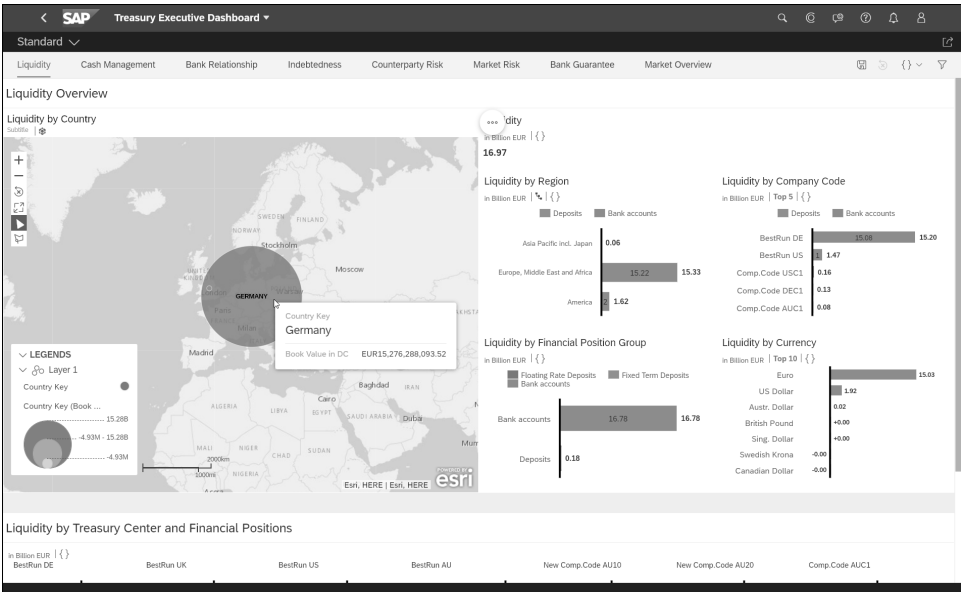


Figure 5.9 Dashboard Based on SAP Analytics Cloud, Embedded Edition

As mentioned earlier, SAP S/4HANA Cloud comes with more than 400 predefined analytical apps, most of them of the types explained in this section, along with some free-style analytical SAP Fiori apps. However, as business needs can be quite diverse and often specific solutions are needed, SAP S/4HANA Cloud, embedded edition was built with the assumption that you’ll want to create your own reports of various types. We’ll explain in the following sections how to create your own reports.

5.2.3 Analytics Specialist Persona

The role of an analytics specialist in SAP S/4HANA (technical role SAP\_BR\_ANALYTICS\_SPECIALIST) was developed with a certain persona in mind. Although an analytics

specialist performs some rather technical tasks, the person does not necessarily have an IT background and instead works in an LOB department such as finance, controlling, sales, procurement, or production management.

In addition, an analytics specialist usually has some of the following skills and know-how:

- A good understanding of how a certain business process in sales, purchasing, finance, and so on is best supported with monitoring and analysis
- Decent knowledge of the data structures of their LOB and therefore an understanding of how this data can be turned into meaningful reports

Besides creating new analytical objects, an analytics specialist is often involved in other activities, such as the following:

- Managing access rights to analytical information and authorizations for viewing certain pieces of the data within the team
- Engaging in implementation and change projects, especially in providing the status quo of available and needed reports while anticipating additional ones needed
- Providing ad hoc analysis by creating highly specific reports

To accomplish these tasks and responsibilities, analytics specialists can use a variety of tools, in the form of SAP Fiori apps covering various aspects and process steps relevant for this role. Thus, the typical SAP Fiori launchpad of an analytics specialist might look like the screen shown in Figure 5.10.

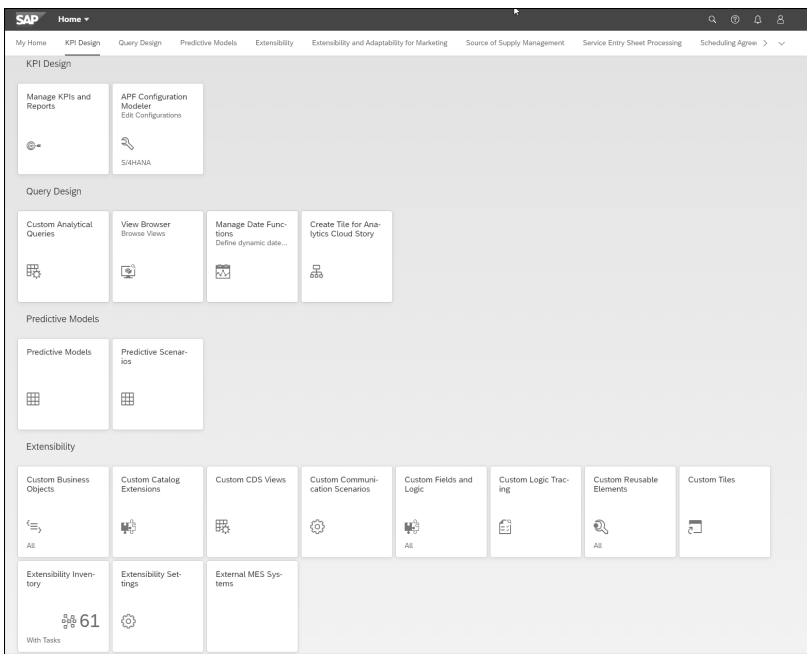


Figure 5.10 SAP Fiori Apps for Analytics Specialist

Initially, the role has the business catalogs listed in Table 5.2 assigned. You can assign additional business catalogs to the role or assign the business catalogs listed in Table 5.2 to other roles.

Business Catalog ID	Business Catalog
SAP_CA_BC_SSB_PC	Analytics—KPI Design
SAP_CA_BC_APF_MODELING_PC	Analytics—Analysis Path Framework Modeling
SAP_CA_BC_ANA_AQD_PC	Analytics—Query Design
SAP_BW_BC_UMM_PC	Analytics—Predictive Models
SAP_BW_BC_UMM_PSC_PC	Analytics—Predictive Scenarios
SAP_CORE_BC_EXT	Extensibility
SAP_CORE_BC_EXT_TST	Extensibility—Custom Apps and Services

Table 5.2 Business Catalogs Assigned to Analytics Specialist Role

Let’s now look at the functions for creating new KPIs and reports and examine some SAP Fiori apps provided for the analytics specialist role.

5.2.4 Custom Queries, Reports, and KPIs

In the following sections, we’ll first provide an overview of the process an analytics specialist would usually follow to create new queries, KPIs, and reports. We’ll then take a closer look at two of the most important SAP Fiori apps for an analytics specialist: the Custom Analytical Queries app and the Manage KPIs and Reports app. In the final section, we’ll show you how an analytics specialist can access an overview of all sorts of CDS views via the View Browser app.

Process Mapping

In reality, the steps required to create new reports, KPIs, queries, data sources, or other objects varies depending on whether existing objects can be reused. Therefore, the process shown in Figure 5.11 outlines the overall process if you’re starting from scratch.

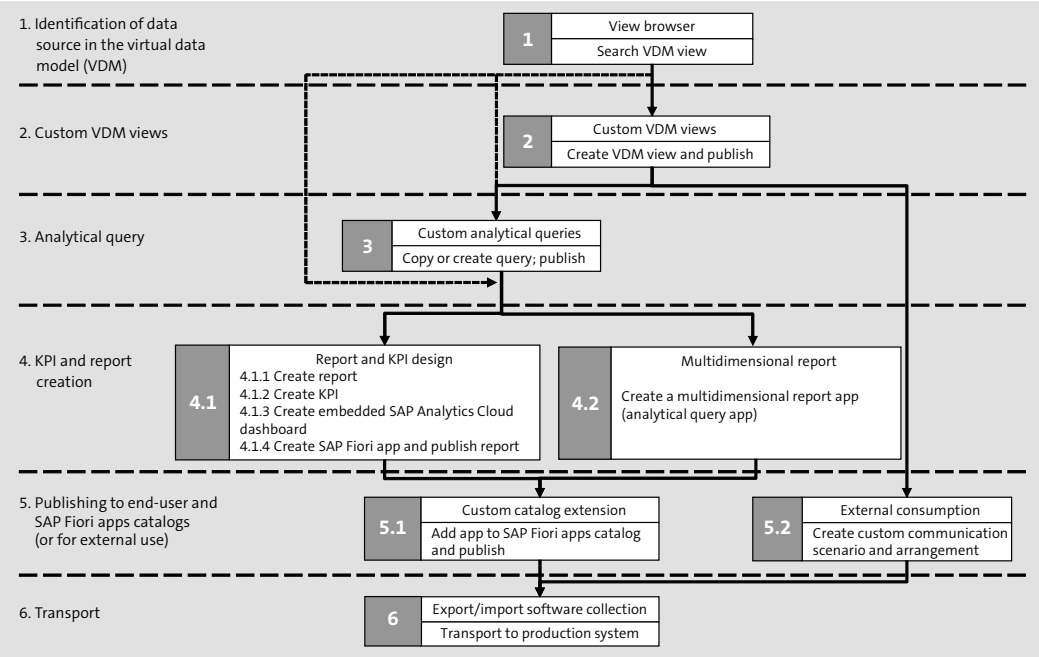


Figure 5.11 Typical Steps in Creation of New KPIs and Reports

Table 5.3 provides an overview of the SAP Fiori apps that support each process step.

Process Step	Task	SAP Fiori App
Identification of data source	1. Search for a certain VDM view as a data provider for a KPI or report	View Browser (F2170)
Custom VDM views	2. If needed, create a new VDM view of type data source (cube) and publish it	Custom CDS Views (F1866A)
Analytical query	3. Copy or create a query and publish it	Custom Analytical Queries (F1572)
KPI and report creation	4.1.1. Create report 4.1.2. Create KPI 4.1.3. Create embedded SAP Analytics Cloud dashboard 4.1.4. Create SAP Fiori app and publish report	Manage KPIs and Reports (F2814)

Table 5.3 Mapping of SAP Fiori Apps and Process Steps

Process Step	Task	SAP Fiori App
Multidimensional report	4.2. Create a multidimensional report app (analytical query app)	View Browser (F2170)
Publish	5.1. Add app to SAP Fiori catalog and publish	Custom Catalog Extensions (F1950)
	5.2. Create custom communication scenario and arrangement	Custom Communication Scenarios (F2177)
Transport	6.1. Transport to production system	Export Software Collection (F1433)

Table 5.3 Mapping of SAP Fiori Apps and Process Steps (Cont.)

A detailed description of each step is beyond the scope of this book. However, you can find more details in the SAP documentation for each app. A good starting point is the product assistance available at <https://help.sap.com>. Search for “S/4HANA Cloud” within the **Browse by Product** search. After selecting **SAP S/4HANA Cloud**, select the **Use** tab. Here you can find **Product Assistance** documents in different languages. Within your language-specific document, you can find **Analytics** documents in the **Manage Your SAP S/4HANA Cloud** section. In the following sections, we’ll briefly introduce some important apps for analytics specialists and describe their main features.

Custom Analytical Queries

Analytical queries are among the most important metadata objects in embedded analytics. These queries are used in multidimensional reports, SAP Analytics Cloud stories, and KPIs (through OData). Analytical queries are defined by using the CDS tools in the ABAP Development Tools (ADT) as the modeling environment. We’ll describe CDS in more detail in Chapter 8, Section 8.1.5.

To make creating a new query as easy as possible for an analytics specialist, the Custom Analytical Queries app (F1572) guides users through the main configuration steps, as shown in Figure 5.12.

In a typical case of creating a new query based on an existing data source, you would perform the following sequence of steps:

1. Select the data source on which the new query will be built. These data sources are also CDS views but of a different type (type cube). Data sources usually offer many measures and dimensions so that many queries with different purposes can be built on the same data source.
2. Select fields from the data source. The field selection must include at least one field of type *measure*.



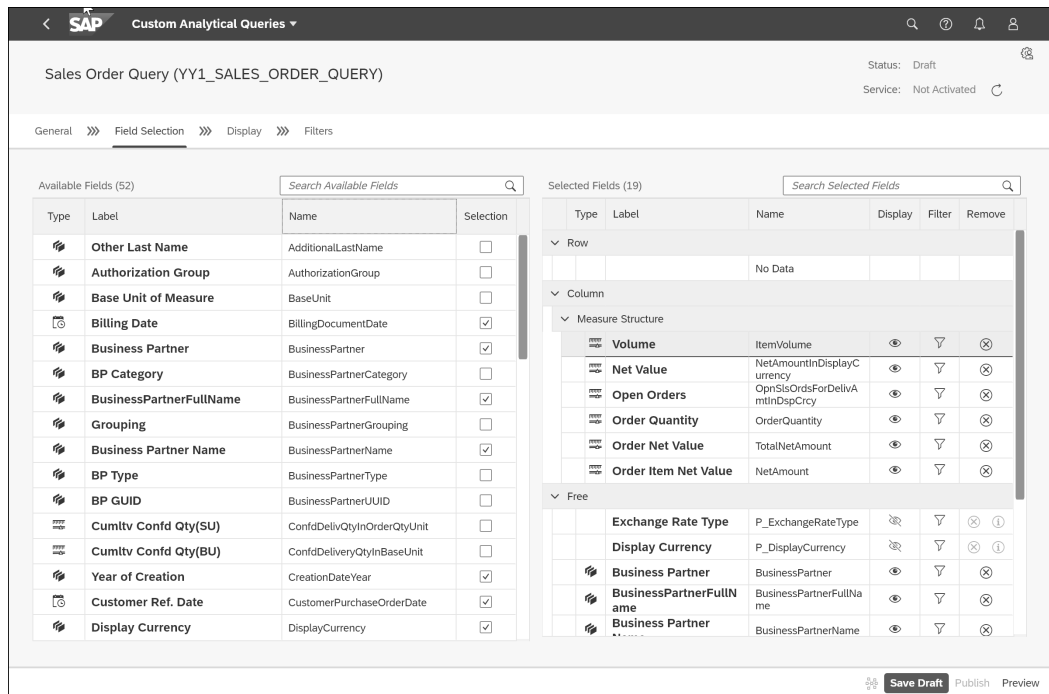


Figure 5.12 Custom Analytical Queries App

3. An optional but recommended step is to fine-tune selected fields for the specific purpose of the query—for example, by assigning a different label for a field. A field labeled **Business Partner** in the data source could be named **Customer** in the query. In addition, you can set properties for sorting, display of key or text, scaling factors, and decimal places.
4. Optionally, you can define calculated measures and restricted measures. A custom *calculated measure* can use existing measures in a query or other custom calculated measures in the same query. For that, a formula editor is available in the app. With a *restricted measure*, you can automatically filter the data for a selected dimension. For example, a restricted measure such as **Revenue in Year 2021** could be based on the measure **Revenue**, which is restricted by the dimension **Fiscal Year** to the value **2021**. Thus, the meaning and the data in a restricted measure can be fixed by an analytics specialist and would not depend on the filter settings a business user makes.
5. Another optional but recommended step is to define filter settings based on the purpose of the query. An analytics specialist can set hidden filters to restrict the data shown in the query. In addition, the business user can set the filter values and combine these values with a default value set by the analytics specialist, which can be overwritten by the business user.

6. Review the query data.
7. Publish the query, deploy the query as an SAP Fiori app into a business catalog, and transport the entire configuration from the development system to the test or the productive system. For this step, other SAP Fiori apps are needed, which are all part of the analytics specialist role: the View Browser app (F2170), the Custom Catalog Extensions app (F1950), and the Export Software Collection app (F1433).

In particular, the last step of publishing, deploying, and transporting takes time but is required to make the newly created query available to the business user. When changes to the query are necessary later, you would make changes in the development system and repeat the final step of publishing, deployment into the business catalog, and transport to the productive system.

### Manage KPIs and Reports

The Manage KPIs and Reports app (F2814), shown in Figure 5.13, is the central place for the creation and maintenance of custom reports—in particular, the following report types:

- **KPIs**  
With this app, you can create KPI groups, place KPIs into those groups, define drill-down reports, and generate an SAP Fiori app tile for the SAP Fiori launchpad. The source for the data of a KPI is always an OData service, such as from an analytical query. For publishing the SAP Fiori app into a business catalog and transporting it to the productive system, other apps are needed (see Table 5.3, particularly tasks 5.1 and 6.1).
- **Analytical list page reports**  
Similarly, with this app, you can configure all the parts of an analytical list page report. You can select a data source (an OData service), configure the chart and the table area, and embed *KPI tags* (small areas in the header of the report that will display real-time values from selected KPIs). In this case, publishing and transporting the app is also performed in the various apps mentioned for creating and publishing KPIs.
- **Embedded SAP Analytics Cloud stories and data analyzer reports**  
With the latest addition to this app’s functionality, based on deep integration between SAP Analytics Cloud, embedded edition and SAP S/4HANA Cloud, not only can you review predefined, embedded SAP Analytics Cloud stories (as described in Section 5.2.2), but you can also create your own tailor-made apps of this type.

Further details of the functional scope of the Manage KPIs and Reports app are available at <https://help.sap.com> under **SAP S/4HANA Cloud • Manage Your SAP S/4HANA Cloud • Analytics**.

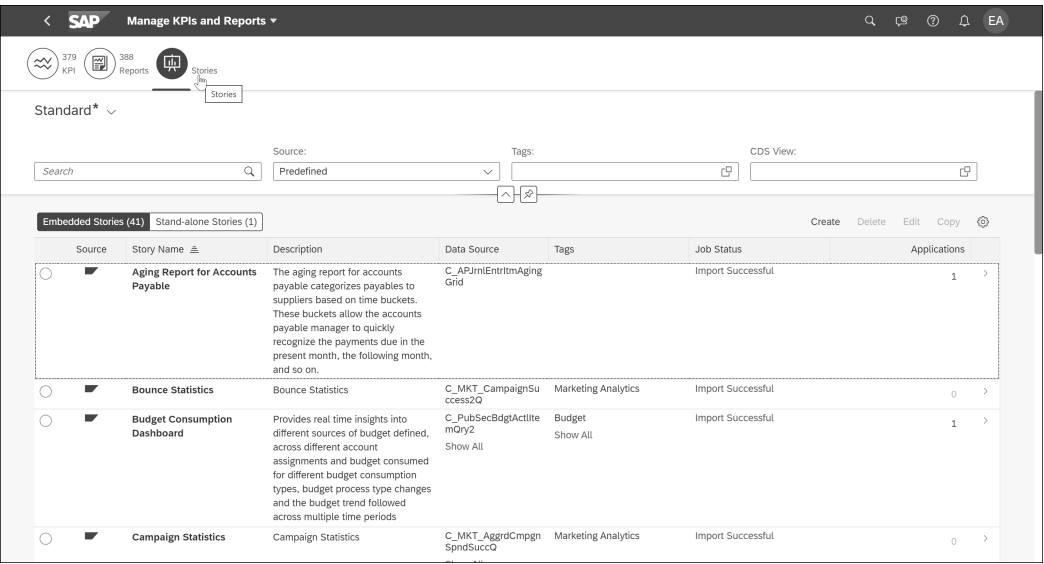


Figure 5.13 Manage KPIs and Reports App

### View Browser

Finally, let's look at an app not primarily focused on embedded analytics, but still quite important and helpful when dealing with ABAP CDS views, especially of the analytical query type or of type cube: the View Browser app (F2170), shown in Figure 5.14. This app is designed to address two main use cases:

- For a comprehensive overview of all available CDS views in the system, both pre-delivered by SAP and created by customers (see task 1 in Table 5.3)
- When creating an app for a multidimensional report (based on an analytical query), a report type we described earlier in Section 5.1 (see task 4.2 in Table 5.3)

To support the analytics specialist in these tasks, the View Browser app includes the following functionalities:

- Search for views by view ID, description, app components, ABAP CDS annotations, field names, database table names, and tags
- Add views to **Favorites** and assign tags
- Follow the associations and connections among views step by step
- Group, sort, and filter views
- Save personalized selections
- Download a list of selected views to Microsoft Excel
- Create and delete SAP Fiori apps based on analytical queries (multidimensional reports)

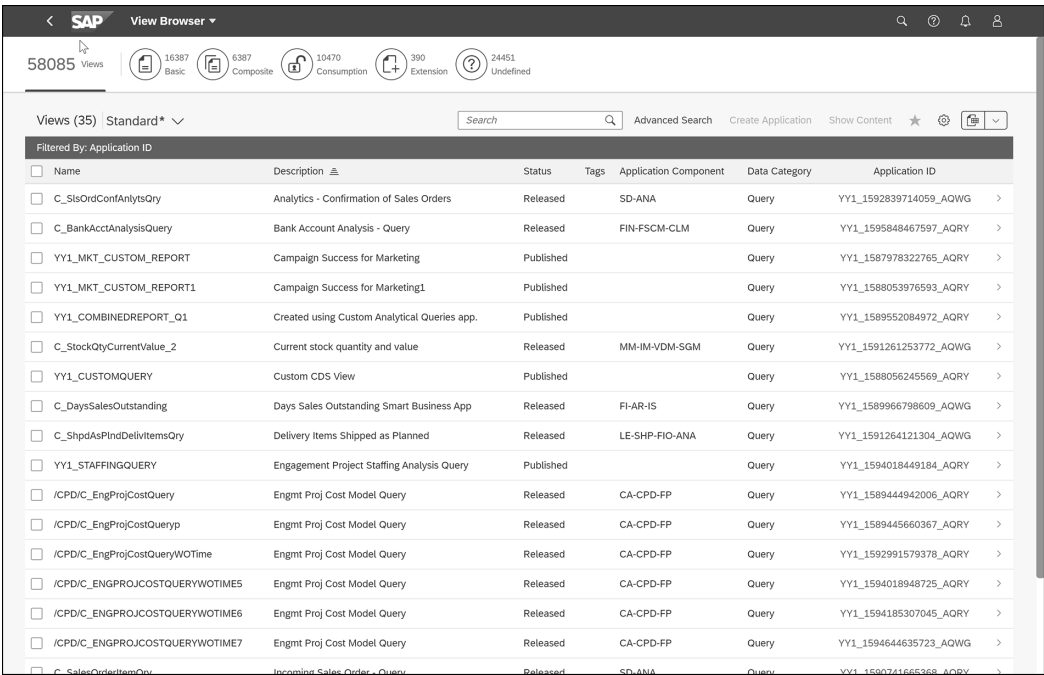


Figure 5.14 View Browser, Part of Analytics Specialist Role

Now that you understand the most important features and functions for business users and analytics specialists, in the next section we'll focus on the overall architecture of embedded analytics in SAP S/4HANA Cloud, as well as on the most relevant integration scenarios with other SAP Analytics solutions.

## 5.3 Architecture and Integration with Other SAP Analytics Solutions

The final section of this chapter on analytics is dedicated to a basic introduction to the high-level architecture of embedded analytics and the integration and connectivity to other SAP Analytics solutions.

### 5.3.1 Analytics Architecture of SAP S/4HANA Cloud

To start, let's look at a high-level overview of embedded analytics in SAP S/4HANA Cloud, focusing on the most important building blocks of the architecture, as shown in Figure 5.15.

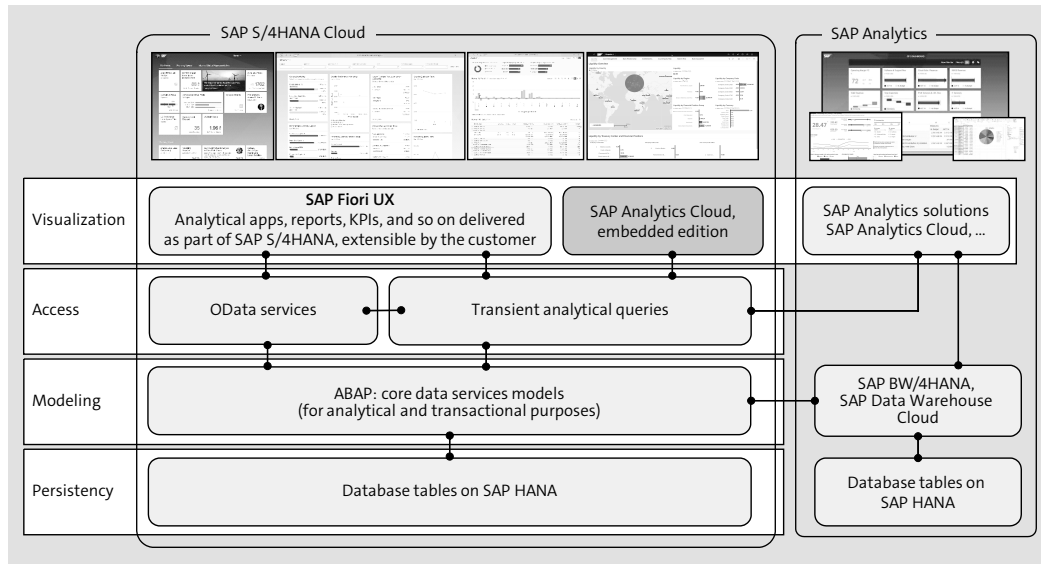


Figure 5.15 Embedded Analytics Architecture: Solution View

From bottom to top, the most important ingredients of embedded analytics are as follows:

■ **Persistency**

The entire SAP S/4HANA Cloud suite, as well as all parts of SAP Analytics solutions that are relevant in this context, run on the SAP HANA database only. For embedded analytics in SAP S/4HANA, no replication of data into any kind of analytical storage is required; thus, the transactional data is the analytical data. For cases where data from multiple sources must be consolidated or, in general, for use cases requiring a dedicated data warehouse solution, solutions like SAP BW/4HANA and SAP Data Warehouse Cloud offer their own storage concepts.

■ **Modeling**

The data used in embedded analytical use cases has a one-to-one relationship with the transactional data in the database tables. A modeling layer is necessary to create all the important data transformations on the fly, without persisting the results of these transformations in the database. Typical transformation operations occur when turning highly normalized database tables into data structures that can be used for analytical purposes. Such models can become quite big and elaborate, as the partial dependency graph for the data source `I_BILLINGDOCUMENTITEMCUBE`, shown in Figure 5.16, amply proves.

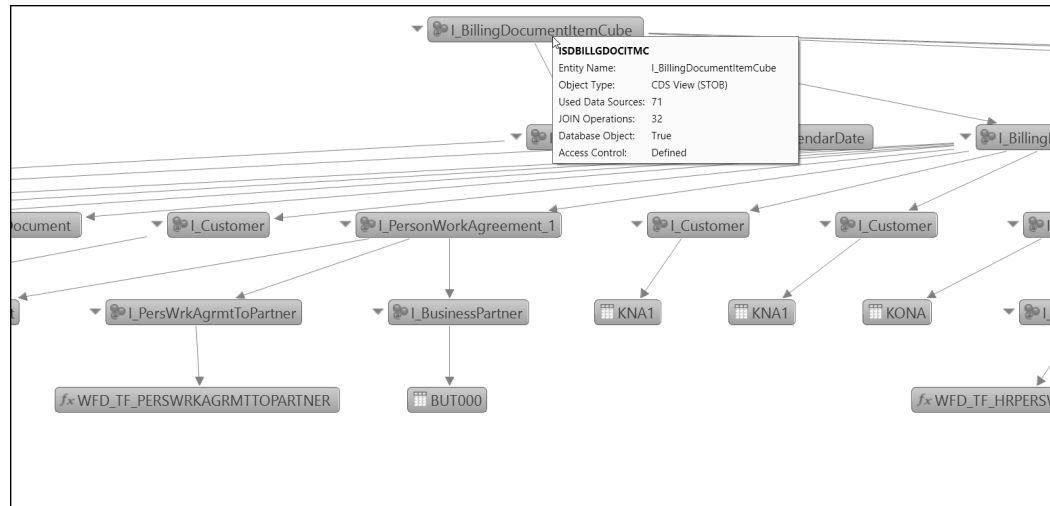


Figure 5.16 Partial Model of Data Source `I_BILLINGDOCUMENTITEMCUBE`

The modeling language in SAP S/4HANA Cloud is represented by ABAP CDS. This language is by no means restricted to analytical models and can serve as a general-purpose modeling environment for several different use cases, such as for enterprise search models, models for data extraction, and models forming the basis for OData services that supply data to transactional SAP Fiori apps. The entirety of CDS-based models in SAP S/4HANA Cloud constitutes the VDM, which enables an extremely high level of reuse of models for different—in the end, often quite different—purposes. For example, the `I_CALENDARDATE` model, which is used in the `I_BILLINGDOCUMENTITEMCUBE` data source, is also used in more than a thousand other CDS views.

■ **Access**

For SAP S/4HANA Cloud, two main ways of accessing data exist. The first is through the OData protocol, which is mainly used for transactional apps. However, OData services are also the access method for the data shown in KPIs (see Section 5.2.2). The second way, for analytical purposes, is through the Information Access (InA) protocol, an internal SAP protocol for retrieving multidimensional data from the analytical engine of ABAP, as shown in Figure 5.17, which in the case of SAP S/4HANA is embedded.

We'll explain the various types of analytical views in more detail in Section 5.3.2. For now, note that the models for analytical queries (which are built by using models for data sources as the basis) are also the basis for providing access to real-time data of SAP S/4HANA Cloud for SAP Analytics solutions. SAP Analytics Cloud can use transient queries generated from the definition of an analytical query to provide the necessary data in SAP Analytics Cloud stories without any change in the underlying CDS query view.

### ■ Visualization

The visualization of analytical data in SAP S/4HANA Cloud is based on the SAP Fiori UX and for certain use cases, like dashboards, based on SAP Analytics Cloud, embedded edition. To create a uniform UX when dealing with analytical data, KPIs, reports, and multidimensional analysis are based on apps with predefined feature sets offered for any implementation of those analytical artifacts. Two examples of such reports are the Trial Balance report and the Order Volume report.

For dashboards, SAP S/4HANA Cloud reuses the capabilities of SAP Analytics Cloud, embedded edition, for designing dashboards and for the runtime of a dashboard in a business context. For this, SAP S/4HANA Cloud comes with an SAP Fiori *wrapper app* for SAP Analytics Cloud dashboards. This wrapper uses an iFrame and a post-Message API to connect the SAP Fiori UX world to the SAP Analytics Cloud world from a UI perspective. Access to any kind of analytical analysis always depends on having an SAP Fiori app and on using the SAP Fiori launchpad, as shown in the top-left corner of Figure 5.17.

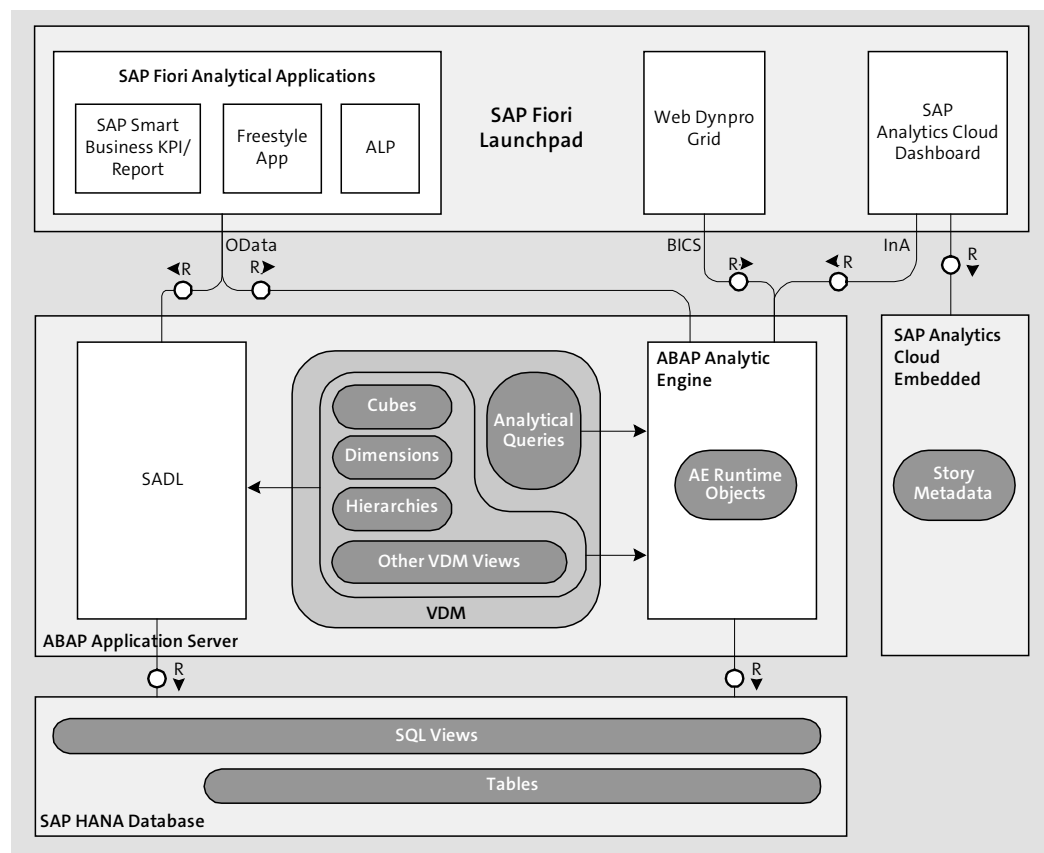


Figure 5.17 Embedded Analytics Architecture: Technical View

### 5.3.2 ABAP Core Data Services Used for Analytics in SAP S/4HANA Cloud

The CDS of ABAP is a major innovation of ADT in recent years. For an in-depth description of CDS, we recommend the book *ABAP CDS: Core Data Services for ABAP* (SAP PRESS, August 2019). Also, the product assistance for SAP S/4HANA Cloud has a good introduction to the most important concepts behind VDM and CDS. This resource is available at <https://help.sap.com> under **SAP S/4HANA Cloud • Extend and Integrate Your SAP S/4HANA Cloud • Extensibility • Virtual Data Model and CDS Views in SAP S/4HANA Cloud**.

In this section, we'll focus on a small preview of the overall features, functions, and use cases for ABAP CDS—specifically, the most important CDS view types for analytics, as shown in Figure 5.18.

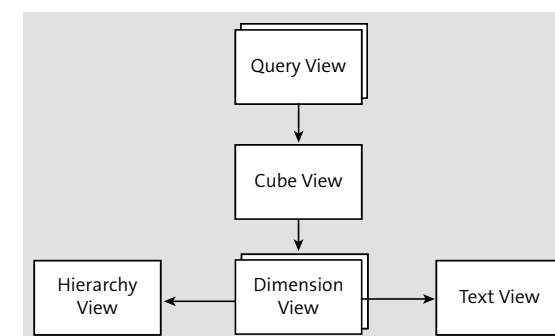


Figure 5.18 Overview of Relations among Analytical ABAP CDS Views

Let's look at each type of CDS view more closely:

#### ■ Cube views, or data sources

A CDS *cube view* is defined by the `@Analytics.dataCategory: #CUBE` annotation. This view type forms the center of a model, which consists of CDS views for fact data, related dimensions, hierarchies, and text. For better maintainability and a clearer design, especially of large cube views, the transactional data that becomes available through the cube view can be modeled in a separate view with the `@Analytics.dataCategory: #FACT` annotation. This other view, not shown in Figure 5.18, then becomes the basis for the actual cube view. Note that each field in a cube view is either of type measure, and is thus suitable for aggregation operations, or of type dimension, which can be used for grouping or as an attribute. The type of the field is determined by the `@Aggregation.default` annotation.

#### ■ Dimension views

CDS views for representing certain business objects with all their attributes—for example, purchase orders (POs), cost centers, employees, plants, sales orders, and so on—are called *dimension views*. These views are defined using the `@Analytics.dataCategory: #DIMENSION` annotation. The various fields of a dimension view (usually



the attribute fields of a specific business object) are not explicitly included in a cube view. Instead, by associating a cube view to a dimension view, those fields can be used as display attributes but are not available for grouping and filtering.

#### ■ Hierarchy views

Hierarchies are important structuring elements in many business contexts, such as the cost center hierarchy, the material hierarchy, or the hierarchy of the work breakdown structure (WBS) of projects. *Hierarchy views* are annotated with `@ObjectModel.dataCategory: #HIERARCHY`. These views specify parent-child hierarchies to be used with a dimension. A dimension can have multiple hierarchies, as is often the case for cost centers (`I_CostCenter`, hierarchy view `I_COSTCENTERHIERARCHY`) or general ledger accounts (`I_GLACCOUNT`, hierarchy view `I_GLACCOUNTHIERARCHY`). Hierarchies are important elements of many analytical query views.

#### ■ Text views

No analytical report would be understandable without providing language-dependent texts for the business objects shown in the report as simply displaying the key values is usually not suitable for business users who may struggle to understand what they are looking at. *Text views* are defined by the `@ObjectModel.dataCategory: #TEXT` annotation and are connected to dimension views through the text association at the representative key field of the dimension view.

#### ■ Analytical query views

Analytical queries are not substantially different from other CDS views of the VDM. However, they need the analytic engine of SAP S/4HANA Cloud as a runtime environment for generating transient queries from the SAP Business Explorer (SAP BEx) tools out of the CDS model. These queries, which are not structurally different from the SAP BEx queries you may know from SAP Business Warehouse, are “transient” because the metadata of these SAP BEx queries is not stored on the database.

*Analytical query views* are annotated with `@Analytics.query: true`. These views provide access to the rich set of online analytical processing (OLAP) functions offered by the analytics engine. For this purpose, a special set of annotations under the `@AnalyticsDetails` domain are available. For example, the `@AnalyticsDetails.formula` annotation allows users to define restricted and calculated measures based on the other measures and dimensions available in the same query, which is not possible using the standard CDS view syntax. Analytical query views are always and exclusively created on top of cube views. Thus, analytical query views typically use only a subset of the fields from the cube view upon which they are built and potentially define additional restricted and calculated measures that are valid only within the query view.

### 5.3.3 Data Extraction to SAP BW/4HANA and SAP Data Warehouse Cloud

In Section 5.1, you learned that despite all the feature-rich embedded analytics in SAP S/4HANA Cloud, many use cases are addressed through a data warehouse solution—in particular, by either an on-premise SAP BW/4HANA solution or an SAP Data Warehouse Cloud solution. In both cases, the most important question is how the data from SAP S/4HANA Cloud is made available to the respective data warehouse solution. To extract data from SAP S/4HANA Cloud into SAP BW/4HANA or SAP Data Warehouse Cloud, you can use *extraction-enabled ABAP CDS views*.

These views are defined by the `Analytics.dataExtraction.enabled` annotation, plus potential further details in the annotation that trigger, for example, a generic delta extraction or that define whether deleted records from the source system should be extracted as well or not. An extraction through ABAP CDS views uses the operational data provisioning (ODP) framework, which acts as the central switchboard between ODP providers (such as an extraction-enabled CDS view in SAP S/4HANA) and the ODP consumer (such as SAP BW/4HANA).

For SAP S/4HANA Cloud, a data extraction through ABAP CDS views is the only way to get data into either SAP BW/4HANA or into SAP Data Warehouse Cloud. To extract data into SAP BW/4HANA, SAP S/4HANA Cloud behaves like an ODP source system. When extracting to SAP Data Warehouse Cloud, you can also use the Cloud Data Integration (CDI) adaptor. In either case, the same models can, in principle, also be used for *federated access* to SAP S/4HANA Cloud data, meaning that the data is not extracted but instead accessed directly in the source system.

Note that not all types of CDS views qualify for enabling extraction. For example, an analytical query is usually only meant for direct consumption in the SAP Fiori UX and does not qualify for SQL-like access to backend data and for data replication.

### 5.3.4 SAP Analytics Cloud

In this section, we'll provide an overview of SAP Analytics Cloud used in a side-by-side connection scenario, as well as SAP Analytics Cloud, embedded edition.

#### Using SAP Analytics Cloud in Connection with SAP S/4HANA Cloud

As shown earlier in Figure 5.15, the use of SAP Analytics Cloud in connection with SAP S/4HANA Cloud is part of the overall analytics picture for SAP S/4HANA Cloud. With this integration, you can realize scenarios beyond the scope of embedded analytics—for instance, when an analytics use case requires you to include data from other systems and sources.

SAP Analytics Cloud offers two types of connections to access data from other systems:

- **Import data connections**

Users can transfer data from a source system to SAP Analytics Cloud. Changes made to the data in the source system are not immediately reflected in the imported data, and thus SAP Analytics Cloud stories built on imported data reflect only the situation of the last import.

- **Live data connections**

Data from source systems can be retrieved directly (live). Any changes made to the data in the source system will immediately be reflected in an SAP Analytics Cloud story with a live data connection.

For both types of connections, SAP Analytics Cloud comes with a long list of standard connections, of course, including the ability to use SAP S/4HANA Cloud as a standard source.

A few predefined SAP Analytics Cloud stories are available as SAP Best Practices packages, which all make use of live data connections. Using SAP Analytics Cloud stories with live data connections is the easiest way for your organization to analyze SAP S/4HANA Cloud data in a story, after a connection with the system has been established and the relevant SAP Best Practices package has been downloaded from the SAP Best Practices Explorer website (<https://rapid.sap.com>). An example of this type of content is SAP S/4HANA Cloud Procurement content with SAP Analytics Cloud (scope item 29D), which is available through SAP Best Practices Explorer at <https://rapid.sap.com/bp/#/browse/scopeitems/29D>.

### SAP Analytics Cloud, Embedded Edition

As shown earlier in Figure 5.17, some services of SAP Analytics Cloud are also embedded in SAP S/4HANA Cloud, which greatly extends the embedded analytics options supported by SAP Fiori, with additional analytical capabilities supported by SAP Analytics Cloud. With this option, you can deliver predefined SAP Analytics Cloud story apps as integral parts of SAP S/4HANA Cloud roles, as described in Section 5.2.

This delivery method is possible because when you license SAP S/4HANA Cloud, you'll also get a connection between your development, test, and productive tenants and corresponding tenants of SAP Analytics Cloud, embedded edition. This connection, which is always a live data connection that will not transfer any data to SAP Analytics Cloud servers, is set up automatically and completely managed by SAP. This *codeployment* is included as part of the initial provisioning of SAP S/4HANA Cloud and is therefore available from the beginning. In addition, the necessary user management for SAP Analytics Cloud, embedded edition, is taken care of by the Identity Provisioning service, which is also codeployed when setting up the SAP S/4HANA Cloud and SAP Analytics Cloud tenants. The Identity Provisioning service takes care of replicating users

maintained in SAP S/4HANA Cloud (and only here) to the tenants of SAP Analytics Cloud, embedded edition.

SAP Analytics Cloud, embedded edition, exposes a subset of features required to create and run stories (dashboards) and multidimensional data analyzer reports within SAP S/4HANA Cloud. This is necessary because the entire lifecycle of all involved analytics objects is exclusively managed through SAP S/4HANA Cloud. Thus your company will not have access to, for example, the administrator UI for SAP Analytics Cloud.

Such a deep, prebuilt integration with SAP Analytics Cloud is available only for SAP S/4HANA Cloud. However, in the on-premise version of SAP S/4HANA, starting with release 2020, you can use a live data connection from SAP Analytics Cloud to your SAP S/4HANA backend and can then embed stories into the SAP Fiori wrapper app. These stories are created directly in SAP Analytics Cloud and are then embedded into the wrapper app via the Manage KPIs and Reports app of the analytics specialist role.

## 5.4 Summary

Now at the end of this chapter on analytics, let's summarize the main takeaways. In the context of an ERP solution such as SAP S/4HANA Cloud, analytics comes in many shapes and sizes and must address various, often quite different, if not contradicting, qualities, such as ease of use, variability, performance, and integration into transactional processes. To serve all of the potential analytical use cases, SAP S/4HANA Cloud uses a combination of embedded analytics powered by SAP Fiori and SAP Analytics Cloud and enterprise analytics using further SAP Analytics solutions such as SAP Data Warehouse Cloud, SAP BW/4HANA, and standard SAP Analytics Cloud. Those solutions are also the foundation for any cross-solution analytics that combines data from multiple SAP solutions and services in a single report.

Focusing on embedded analytics in SAP S/4HANA Cloud, two types of users are the centers of attention:

- Business users who will work on a regular basis with the data provided through KPIs and various types of reports. For this user type, SAP S/4HANA Cloud offers a variety of analytics options such as KPIs with generic drilldown capabilities, overview pages, analytical list pages, multidimensional reports, freestyle analytical SAP Fiori apps, and dashboards. SAP S/4HANA Cloud comes with over 400 predefined apps of this kind. New analytical apps are added on a regular basis.
- Analytics specialists who will create analytic apps tailored for your specific needs. SAP S/4HANA provides the necessary tools to the analytics specialist to create KPIs and various types of reports for the business user.

The main ingredients of embedded analytics in SAP S/4HANA Cloud are the SAP HANA database; the VDM based on ABAP CDS views; the SAP Fiori UI framework; and, in the

case of SAP S/4HANA Cloud, SAP Analytics Cloud, embedded edition. The latter is seamlessly integrated into SAP S/4HANA Cloud and offers essential features for using and creating dashboards.

Thus, SAP S/4HANA Cloud, embedded edition provides the necessary insights for business users working on certain process steps. SAP S/4HANA Cloud, embedded edition increases throughput and efficiency by following general principles like information-first/progressive disclosure, insight-to-action, and an exception-based working style.

In the next chapter, we'll explore the functional capabilities of SAP S/4HANA Cloud in great detail: support for business processes across all LOBs, such as procurement, manufacturing, logistics, sales and service, maintenance, and, last but not least, finance and risk management.

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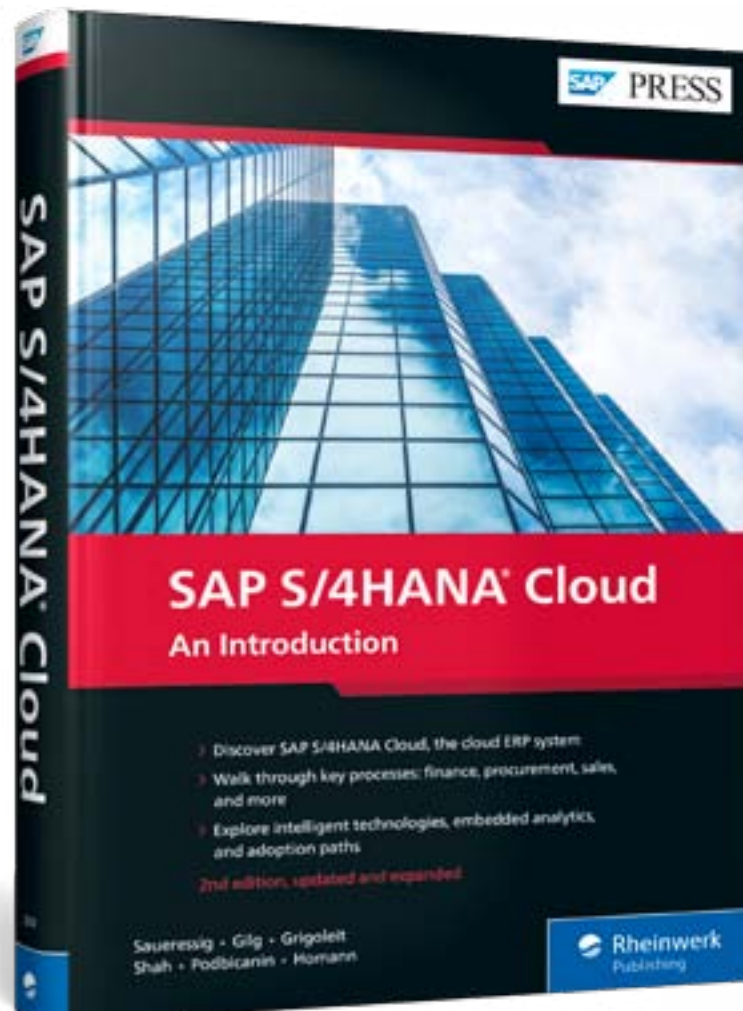
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