

# SAP Plant Connectivity 2.2: Wire to the Outside World for SAP Business Suite-Applications – Learn the Basics



## Applies to:

SAP Business Suite 7 including Enhancement Packages, SAP Plant Connectivity 2.2. For more information, visit the [Manufacturing homepage](#).

## Summary

This document describes basic principles for connecting external data sources like machines, process logic controllers, and spreadsheets to SAP Business Suite applications with the help of SAP Plant Connectivity (PCo) 2.2. It's the first part of a set of documents that provide more details about implementing.

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## Author Bio



Dr. Uwe Dittes made his PhD in chemistry at the University of Heidelberg, followed by certification as technical operation manager (Chamber of Commerce [IHK]). He worked several years in chemical and pharmaceutical industry (development & production). Dr. Dittes joined the development Organization of SAP in 2001. He has a strong expertise in ERP core manufacturing (SAP PP-PI, SAP PP-SFC) and Business Suite application integration with SAP plant connectivity (PCo). He has also been working as external lecturer at the Baden-Württemberg cooperative State University (State) in Mannheim, teaching fundamentals of SAP ERP, lean production, cloud computing, and mathematics.

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## Foreword

"Is there an easy solution?" If the world of machines and control systems encounters the ABAP world of SAP Business Suite applications, this often leads to goose bumps, the increased occurrence of grey hair, shaking of the head, or at worst outbursts. All that you wanted was simple and quick exchange of some data, bits or bytes with the SAP world, without the need to set up a zoo of applications and systems. SAP users, consultants and developers, which have successfully managed this kind of data exchange are then easily able to work on projects of the caliber of a manned mission to Mars.

## SAP Business Suite and the Outside World

All around the globe SAP Business Suite applications play an important role in many companies that produce goods or services. A great advantage of using these applications is that the exchange of data within the SAP Business Suite (exceptions confirm the rule here) proceeds in an integrated manner. The closer one however approaches the level, in which the actual production processes run the SAP system itself holds the less information. Economically relevant data can be found at the manufacturing level in a diverse manner outside the SAP Business Suite: There users are entering values in spreadsheet programs and machines, production systems and warehouse management systems communicate with each other.

Companies could optimize such end to end scenarios only if data between the outside world and SAP Business Suite are quickly and easily exchanged. Data of the outside world comes from external data sources. SAP Business Suite applications can't consume such data in a direct manner. This requires a kind of information brokers between data source and SAP application. To outsiders, the exchange of information by information brokers often seems to proceed in a conspiratorial way to expire, which is reminiscent of the way of working of agents and spies.

Additionally data integration gets more difficult because exchangeable information exists in different formats and structures, for example:

- Protocols in textual format used by warehouse management systems
- Data points that allow a transfer of real-time value in automation technology
- Exchange of information via programming interfaces such as OLEDB

In accordance with industry standards some data sources use sometimes their own product-specific language dialects. This represents an additional challenge of solutions that have been developed for the integration of SAP and non-SAP world. What irons in the fire does SAP still have?

## Irons in the fire

Your suggestions and wishes have motivated us to meet these challenges. SAP Plant Connectivity - shortly referred to as PCo - is the answer to the above challenges by SAP. It enables you to easily set up a connection between applications of the SAP Business Suite with external data sources such as weighing systems, production machines, OPC servers or process control systems.

## Speed up Innovation - Set of Documents

Initially SAP only offered an implementation guide that describes how to connect external data sources to Business Suite with SAP Plant Connectivity (PCo) Release 2.2. It contains all required information for setting up these connections in a packed way.

- Implementation Guide is part of SAP note 1576651 and could be updated without further notice.

Based on material we used for creating mentioned implementation guide we offer a set of documents containing more detailed information. This allows you to get a smooth first contact and rapid ramp-up of your knowledge. After studying these documents you'll be able to embed you external data sources into your SAP Business Suite applications with little effort of time and money. You get suggestions, tips and tricks so that you safely work around the cliffs and reefs on the way to data integration. To make a possible steep learning curve for you, second document of this series gives you a quick introduction, which shows you how a SAP application can exchange data with the outside (non-SAP) world in just a few steps. For this you don't have to program a row of ABAP source code. Following documents of this series will provide you with knowledge

to master even more challenging requirements, without having to write extensive and complex implementations of ABAP:

Part 1: Learn the basics

Part 2: Quick start how to connect external data sources to Business Suite

Part 3: Data Access using Queries

Part 4: Notification Scenarios

Part 5: Realize OLEDB Queries

Part 6: Create Queries for Custom Agents

Part 7: Error Handling and Logging

Part 8: Tips and tricks

Inside our documents you find sections on architecture and technology. These sections are dedicated to those of you who want to know more about what is hidden under the hood of PCo.

Let yourself be carried away into this new world.

## **SAP Plant Connectivity (PCo) – Mediator between the Worlds**

The data exchange between the external data sources and PCo is carried out using PCo agents and agent instances.

- An agent is a NET-DLL Assembly component that can set up a connection between a data source and PCo.
- An agent instance is a user-defined configuration of an agent that enables the data flow.

Until recently, only the SAP applications SAP Manufacturing Intelligence and Integration (SAP MII), SAP Manufacturing Execution (SAP ME) and SAP Extended Warehouse Management (SAP EWM) were able to use the options provided by SAP Plant Connectivity (PCo). For applications of the SAP Business Suite, the corresponding PCo functionality was not available until now.

With the introduction of an ABAP-based integration layer, which forms part of the SAP NetWeaver system, the range of applications for PCo has now also been extended to SAP Business Suite applications.

The data transfer between systems of the Business Suite and the PCo agents is based on RFC function calls (TCP/IP). Every PCo agent is first assigned the corresponding RFC destination in the Business Suite system. Business Suite applications that exchange data with PCo agents execute the corresponding methods of SAP NetWeaver.

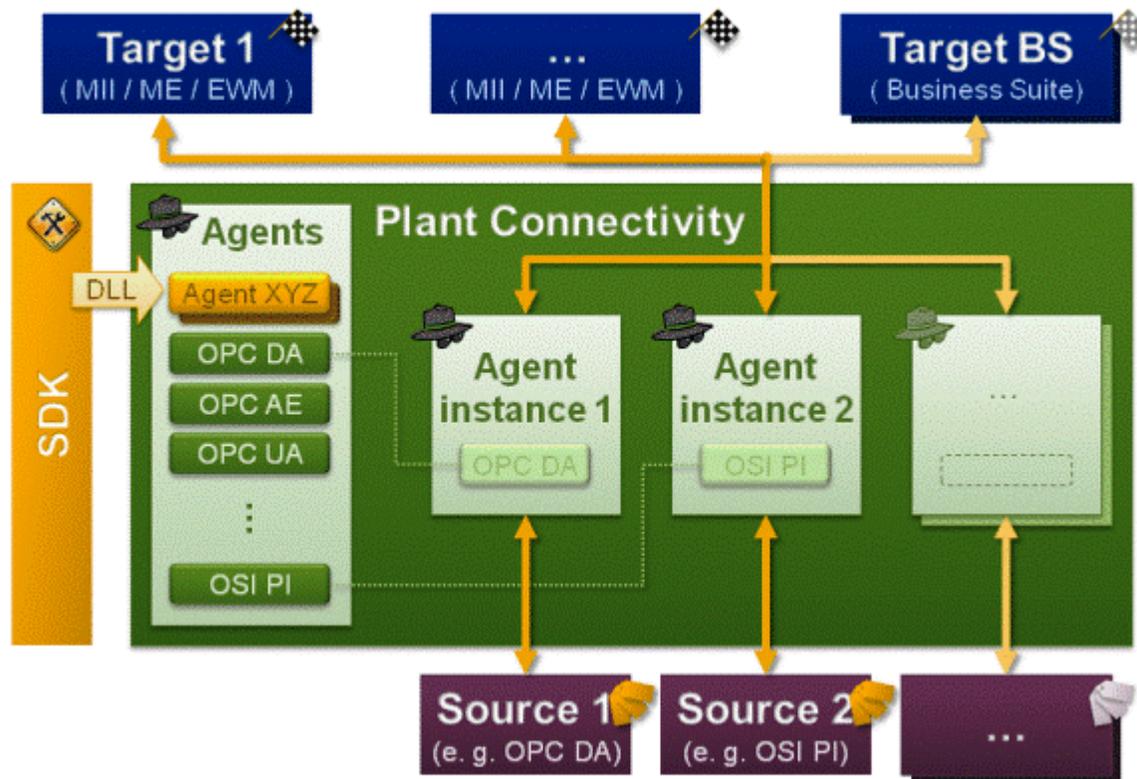


Figure 1: PCo Components

### System prerequisites

The following technical prerequisites are necessary in order to connect external data sources using SAP Plant Connectivity:

- Plant Connectivity starting with Version 2.2
  - Microsoft .Net-Framework starting with Version 3.5, SP1
- TCP/IP Communication between PCo and a system of the SAP Business Suite

Depending on the type of external data sources used, OPC data servers must also be installed and configured.

SAP systems require setup of ABAP integration layer before PCo can be connected to SAP Business Suite systems. Depending on the release status of SAP system, certain support packages of SAP NetWeaver Application Server ABAP have to be implemented as follows:

SAP Business Suite Release	SAP NetWeaver Release	NetWeaver Support Package
Business Suite 7 (ECC 6.00) including Enhancement Package 3 (ECC 6.03)	SAP_BASIS 7.00	At least SAPKB70024
Business Suite 7 Enhancement Package 4 (ECC 6.04)	SAP_BASIS 7.00 , Enhancement Package 1 (SAP_BASIS 7.01)	At least SAPKB70109
Business Suite 7 Enhancement Package 5 (ECC 6.05)	SAP_BASIS 7.00 , Enhancement Package 2 (SAP_BASIS 7.02)	At least SAPKB70208
Business Suite 7 Enhancement Package 6 (ECC 6.06)	SAP_BASIS 7.30 , Enhancement Package 1 (SAP_BASIS 7.31)	No SP required

## Licensing of PCo 2.2

Key feature of PCo 2.2 is the use of license keys for productive usage. If no valid license key is entered, PCo runs in demo mode: after a period of 30 minutes, PCo stops all active instances of the PCo agent. Also a red message in the menu bar of the PCo management console indicates that PCo is running without a valid license. All features of PCo are available in demo mode. Running PCo in demo mode is sufficient for free trial.

PCo has been an integral part of the following SAP applications for a long time:

- SAP Manufacturing Integration and Intelligence (SAP MII)
- Manufacturing Execution (SAP ME), and
- Extended Warehouse Management (SAP EWM [Material Flow System])

For data exchange with SAP to use Business Suite applications PCo, was an emancipation of PCo as a stand-alone product. This new environment is reflected in the customized licensing model:

- Starting with PCo 2.2 valid license keys for productive use are required
  - without entering a valid license key PCo can only run in demo mode
- Customers using SAP applications of SAP MII, SAP ME and SAP EWM today or in future will receive free license keys for productive use of PCo on request
- PCo 2.2 is intended to replace SAP application SAP OPC data access (ODA). Customers, who already use SAP ODA, can order a special PCo license key. This license key activates PCo functionality that is required for ODA replacement. All other features of PCo 2.2 are executed in demo mode.
- SAP Business Suite customers who are interested in only to the functions of the SAP Business Suite Integration acquire an own PCo license key for productive use of PCo, unless you already use any of the above mentioned SAP products. License fees for this situation are very moderate - compared to the capabilities of.
- For free trial install PCo and use the entire functionality in demo mode.

## Programming Skills - What you should bring

Basics of ABAP programming are necessary for implementation of ABAP implementations. Knowledge of object-oriented programming (ABAP OO) facilitates the implementation of your own ideas in accordance with the sample templates. As a programming environment, you require access to the ABAP Workbench (transaction SE80) in your SAP system.

To create your own types of PCo agents, you need basic knowledge about .Net or C# programming. SAP supports the development of its own types of agents through a software development kit (SDK). It can be integrated into .Net development environments like Microsoft Visual Studio 2008.

## Technical Details about Data Exchange with Business Suite Applications

PCo is programmed in C# and uses the widely used Microsoft.NET framework as the basis for the communication infrastructure.

- Installation of PCo application includes only 30 MB of data and is easy to perform.

PCo communicates via agents with the external data sources.

- PCo provides various agents for connecting common data sources
- Development of own customer-specific agents is supported by a sophisticated development environment (SDK), which is shipped together with PCo

PCo from version 2.2 uses a newly developed ABAP integration layer which belongs to SAP Basis (NetWeaver ABAP) for data transfer with SAP Business Suite applications.

- Remote function calls (RFC) with network protocol type TCP/IP enable communication
- PCo agents are linked to Business Suite applications via RFC destinations
- Business Suite applications call methods of the SAP NetWeaver integration layer to exchange information with the PCo agents
- In case external data source raises events PCo agents can automatically transfer event data to SAP Business Suite systems for further processing by Business Suite applications.

Coding elements located in SAP NetWeaver integration layer offer following advantages:

- Clearly arranged interfaces of ABAP class methods
  - Comprehensible interface parameters that allow simple implementation of method calling in ABAP coding
- Continuous concept for enhancements
  - No changes of existing method interfaces are necessary in case new data types are required for external data sources
  - Customer specific enhancement options for authorization checks during activity execution
- Sample implementation for notification procedure which is ready to use
- Integrated processing of messages and errors
  - Messages and errors that are raised by external data source or PCo are passed through to the calling Business Suite application and can be handled there individually.
- Deployment of reusable helper methods and functions to connect to application log functionality, as well as formatting and converting data.

For integration scenarios, a troubleshooting can be quite expensive if there is no way to monitor the overall data flow in completely. When using PCo, this problem does not exist: On the one hand PCo offers features for logging communication of PCo agents to the external data sources. On the other hand, the corresponding ABAP NetWeaver functionality uses the application log of the SAP standards.

## Possibilities of Data Exchange between PCo and SAP Business Suite Applications

Basically the combination of PCo and integration layer of ABAP NetWeaver offers two ways for exchanging data between SAP Business Suite applications and external data source:

1. SAP application accesses external data by sending a request to external data source via PCo. PCo returns result of the request (PCo: Query) back to calling SAP application.
2. SAP application responds selectively to events generated by the external data source. In this case PCo sends an alert (PCo: notification) to the SAP applications that previously registered (subscribed) to this event.

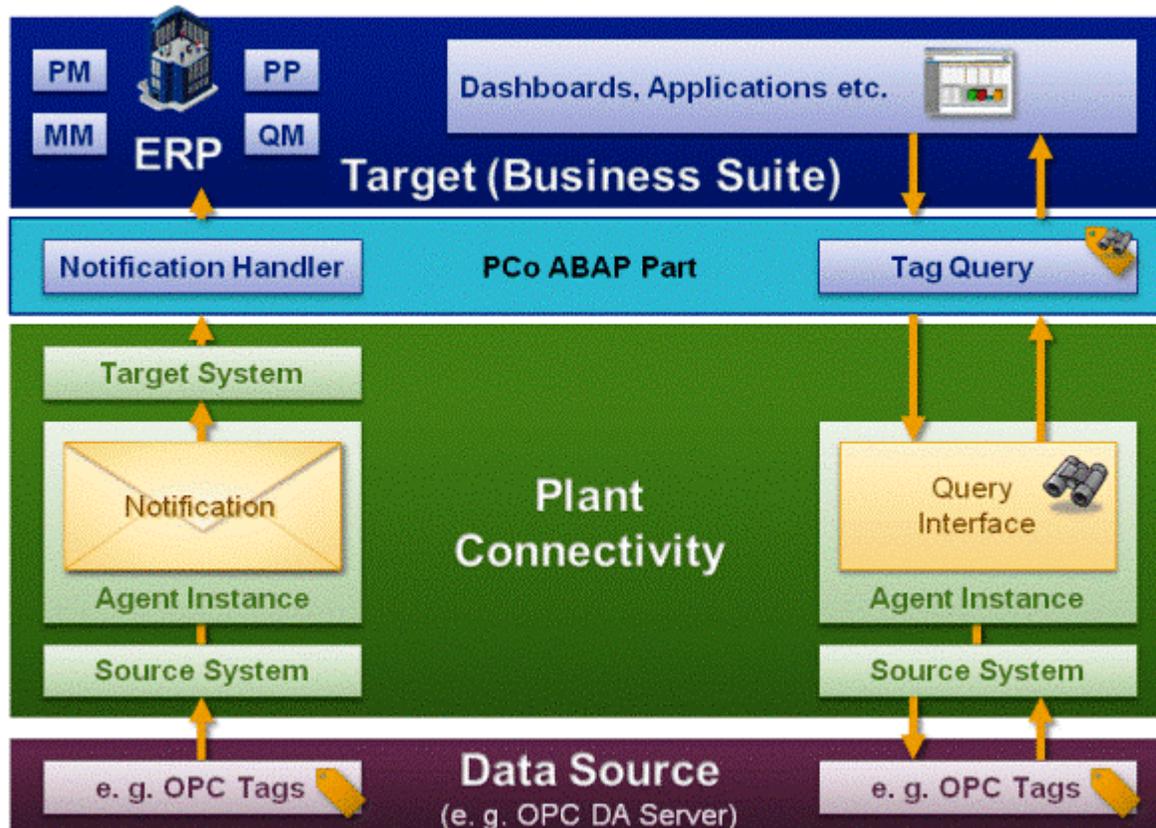


Figure 2: Overview of Query and Notification Scenarios

### Exchange of Data by Querying (PCo Queries)

Business Suite applications can start requests to external data sources for getting their data. These queries may be used to read or change data point values that belong to the external data sources. PCo agent instance which is linked to the external data source receives the query and determines the query results. Then PCo returns results and error messages to the calling Business Suite application.

Query content has to follow the rules of SAP MII protocol language so PCo agents can process it. Creating such queries doesn't require knowledge of the protocol language elements: SAP offers suitable methods of the NetWeaver integration layer as wrappers. Applications that call these methods only have to valuate method parameters and evaluate query results and log messages afterwards.

PCo offers three types of queries:

- Queries relating to data points/tag
- Queries of database content, as well as
- Text queries with freely definable text-like content.

Part 2 and Part 3 of our set of documents cover PCo queries in more details.

## Event-Triggered Exchange of Data (PCo Notification)

Notifications are often used for monitoring (business) processes. Production shutdowns and accidents have to be prevented. Therefore it must be ensured that information about failures and critical situations are quickly transferred to the right places in a company that care for problem solving. Another area of application covers automated confirmation of data from production execution to SAP Business Suite systems.

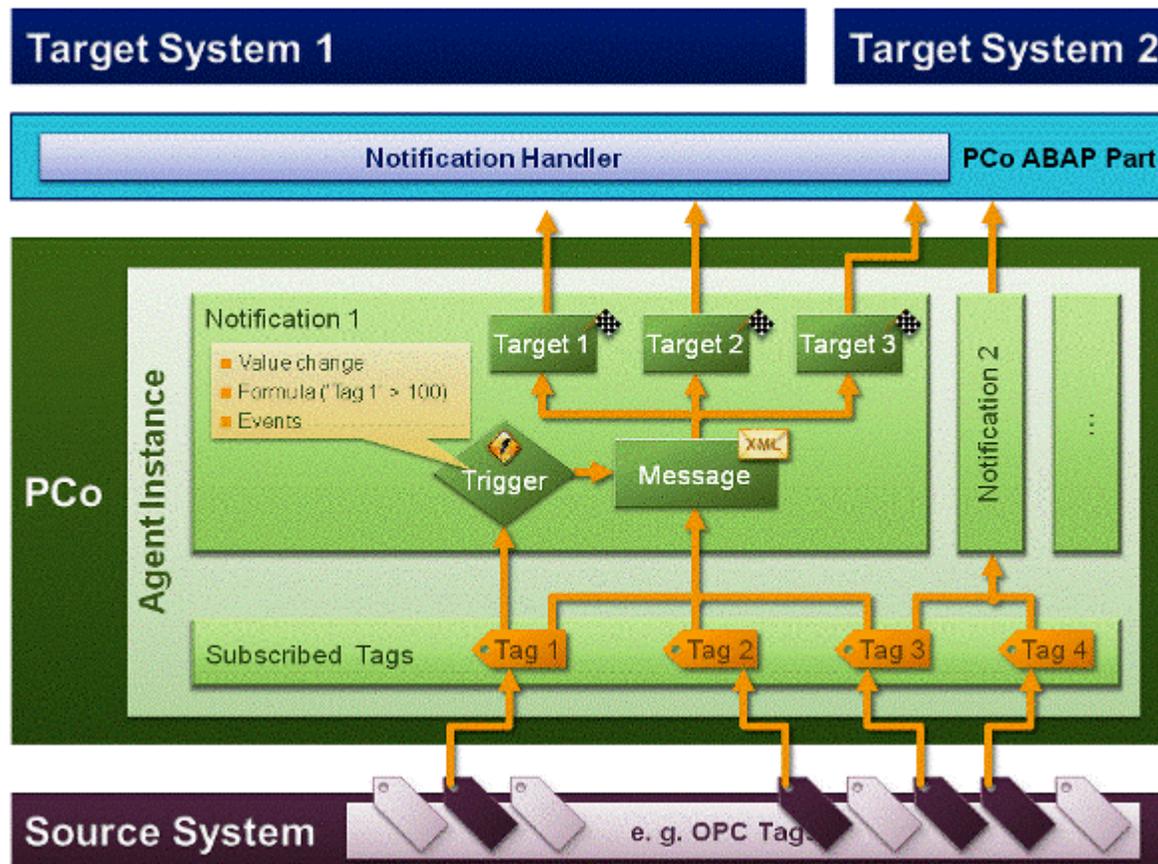
### Processing Notifications

Notification is an object that contains the target, the conditions, and a message body, so that PCo could send a message when a particular event occurs on the target system.

PCo agents have to create subscriptions of data points before data point values can be sent to recipients by notifications. In case predefined trigger conditions are fulfilled PCo sends notification to assigned notification destinations. Notifications can be maintained via PCo management console. But it is also possible to set subscriptions via SAP Business Suite applications (remote subscription). In contrast to the subscription via management console it isn't necessary to deactivate selected PCo agent instance during remote subscription procedure.

When a user-defined complex event occurs that meets the conditions, a notification message in XML format is created and sent to the target system.

The system evaluates notifications at run time, which the evaluation is based on the respective configuration.



**Figure 3: Schematic Representation of Notification Process**

SAP provides a sample report (RPCO\_BS\_INT\_TEST) that also allows execution of remote subscriptions and demonstrates processing of notifications. Details can be found in part 2 of this set of documents.

## Application Handle

To ease communication between Business Suite applications and PCo each application defines a so-called "application handle". This term refers to a system-wide unique ID for the application. This application handle is passed to PCo when queries are executed. It consists of two different parts:

- APPLICATION: free definable, integrated name for the application, which starts PCo query or processes notification data, for example:
  - PRODORDCON (production order confirmation)
  - MAINTMSGCR (creation of maintenance notifications)
  - WEIGHINFO1 (Information about the weighing process)
- HANDLE: free definable content (maximum 80 characters), which can provide more information about the context of your application, for example:
  - Order confirmation: Plant, order category, confirmation number
  - Maintenance notification: Plant, equipment ID
  - Weighing process: Location, equipment ID, type of scale

Application handle is also transferred to PCo during subscription for value changes of data points (tags). Please note:

PCo groups subscribed data points with the help of the application handle.

- Application handle of subscribing Business Suite application is stored in subscription information.
- In case notifications are triggered for subscribed data points the system also transfers this application handle data as part of notification data. Business Suite applications that receive the notifications can then evaluate application handle information later.
  - Example: Processing manufacturing order confirmation via notifications becomes easier because application handle assigned to confirmation notification contains unique confirmation number. Details can be found in Part 4 (Notification Scenarios) of our set of documents.

## Assessment criteria for applications

### Expenses and Benefits

Integration of external data in Business Suite application logic only makes sense when efforts for data integration are reasonable low compared with their benefits. If this integration is implemented with the help of PCo following steps are necessary:

1. Identify use cases for the integration of external data in SAP Business Suite applications
2. Install PCo on a machine with MS Windows operating system
3. Maintain external data sources, and agent instances in the PCo management console
4. Maintain default configuration settings in the SAP Business Suite system
  - Create of RFC destinations for PCo agent instances
  - Assign of appropriate authorizations for Business Suite users
5. Implement ABAP method calls in the Business Suite applications
  - Use the predefined methods of NetWeaver ABAP integration layer for exchange of data on data points (tags), table and spreadsheet programs (OLEDB) and agent-specific capabilities
6. Start PCo agent instances via PCo management console
7. Start SAP Business Suite application

Integration of PCo in existing system landscapes is quite simple and allows a wide range of potential application scenarios. But not everything that is technically possible actually makes sense: In conjunction with SAP Business Suite applications PCo can demonstrate its strength when it is used as intermediary between outside world and SAP world. In general logic of related business processes is modeled and implemented by SAP Business Suite applications themselves. SAP Business Suite systems can act as leading systems from a business process perspective. Underlying IT systems play roles like controlling production execution or managing warehouses. PCo doesn't offer no sophisticated ways to model and implement business processes in PCo itself. For modeling and implementing business logic at shop floor level SAP provides products like SAP Manufacturing Intelligence and Integration (SAP MII) und SAP Manufacturing Execution (SAP ME).

Various factors have an influence on integration of SAP and non-SAP world in a company. Loose coupling between SAP systems and shop-floor IT systems is sometimes intended for political reasons. From perspective of production a tight coupling of their IT infrastructure to SAP IT infrastructure can cause problems during system maintenance periods. Strict separation of SAP and non-SAP world leads to problems when business decisions are planned and carried with the help of SAP applications that require as possible detailed data from the subsystems. The entire IT system environment in a company is inhomogeneous, the cost for the operation and maintenance of interfaces between the different components of the system are higher.

Communication interfaces to subsystems can cause high amount of annual costs. Costs increase when content and structure of these interfaces change frequently. Fees for software and user licenses have to be paid for sub systems as well as SAP Business Suite systems. For these reasons some companies choose a different strategy and implement a SAP-dominated rather centralist approach in their IT system landscape. Unified processes enable a standardized production with consistently high quality and reduce efforts and expenses that are caused by external audits and inspections. Seamless integration of all relevant machines and data sources of a company into SAP world is the basis for success.

Replacing subsystem programs against SAP Business Suite applications also allows further reduction of costs for user licenses. In SAP standard there are quite a lot of applications that are suitable for use in production and manufacturing: Especially in the area of ERP core manufacturing and process management (SAP application components for PP-PI-PMA\*) such applications are extensively used in various industries for over ten years. The integration of these SAP applications in SAP system landscape is very well solved.

Regardless of depth of integration SAP Plant Connectivity in version 2.2 can be implemented and deployed successfully. Be inspired by ideas and possibilities we provide in this set of documents.

## Related Content

[Efficient Searching Needles in a Haystack - Find XSteps Containing Process Messages and Function Modules](#)

[State of the Art Maintaining Process Instructions with XSteps - Available Functional Enhancements](#)

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