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Each enterprise has its own criteria that influence the selection of the system architecture. For example, business and organizational issues must be considered, as well as software and hardware specific aspects.

4 Factors Influencing System Architectures

An enterprise’s individual situation considerably affects the selection of an appropriate system architecture. The three-dimensional globalization model includes all aspects leading to an appropriate and tangible target architecture. In this chapter, we’ll describe the three globalization dimensions process, organizations, and products. Moreover, we’ll introduce facts, methods, tools, services, and recommendations for different system architectures.

4.1 General Considerations

Before the IT department of a large global enterprise can determine an appropriate system architecture, numerous prerequisites must be met. Generally, it is not sufficient if this task is only assigned to the IT department of the company or an external IT service provider. Rather, globalization concerns the entire enterprise, from top management to end users, because ultimately, they have to work with the global IT solution.

Therefore, the enterprise as a whole must support a global solution. Normally, it is not enough (or even doomed to failure) if only the IT department actively promotes a global project without the support of management and the employees. This often depends on the global structure of an enterprise — whether the individual countries and departments work
Factors Influencing System Architectures

independently, and make and implement their decisions on a local basis, or whether the business processes and its IT implementation have been globalized right from the onset. Take a look at the current situation, and a wide variety of scenarios can be seen: You can find enterprises that are real 'global players' with distinct global organizations. Their applications and business processes are modeled and implemented globally to enable central coordination and implementation of the individual requirements coming from different countries and departments.

But you can also find large international enterprises that have completely different organizations. Even though they operate globally in many different countries, their individual systems are mainly independent of each other. These enterprises also have global business strategies with economic backgrounds; however, the modeling of global and harmonized business processes, and the IT implementation hardly exist, if at all. In the individual countries or departments, the managers and local employees focus on local implementation and optimization of businesses. Communication and planning with corporate headquarters is mainly limited to business-relevant aspects, such as sales, market penetration, and promotional activities. The globalization of the enterprise and IT take a back seat.

How do enterprises understand the term “globalization,” and how do they approach it? This is very interesting. Interpretations and explanations can differ considerably, as you can see in the following answers from a survey, in which employees of different international enterprises explain their personal concepts of globalization:¹

- “For us, globalization means to buy and sell enterprises in order to be a global market player.”

- “For us, globalization means to implement business processes on a global scale. In Japan, incoming orders should be processed in the same way as in California.”

- “Globalization means to be able to deploy employees at any global location without requiring training. Business processes are supposed to be identical at all locations.”

¹ See http://service.sap.com/globalization.
"For us, globalization means to operate a central, single-instance system, and to provide all business data in a central and standardized manner."

"For us, globalization is to reduce costs by introducing shared service centers — for example, a call center for support or a shared service center for financial services."

As you can see, enterprises can have different focuses with regard to globalization. Interesting answers cite "globally identical business processes" and "central single-instance systems" as a suitable architecture for global IT solutions. The other answers also tell you that globalization in all areas of an enterprise makes sense — that means both in business-relevant and process areas, and organization and employee areas, as well as in IT. In order to achieve a successful global IT solution, including an appropriate architecture, the enterprise and all its areas must be ready for globalization. This means that the IT department can’t develop the global IT solution and its system landscape architecture independently, but must collaborate closely with the persons responsible for applications, processes, and human resources, as well as top management.

Often, it has been generally assumed that it’s IT’s sole responsibility to plan, implement, and operate the global IT solution of an enterprise or to implement the required changes of an existing IT solution and architecture. This can be the case, and often leads to improved efficiency and reduced costs, for example, by consolidating and reducing systems.

Ultimately, the IT department is, however, often not able to influence the business processes determined by the company. These processes, however, are decisive for the efficiency and costs of an IT solution. If a process within an enterprise has inefficient modeling — for example, orders are processed differently in every country, although only minor legal differences exist for the various countries, which means different approaches are not mandatory — overall costs for the enterprise are high, and these costs cannot be significantly reduced, even if the best IT team and hardware are available.

In this case, a higher-ranking intervention is required within the framework of change management. Here, you first must globalize and optimize the unfavorable process (e.g., order processing) by introducing a
company-wide, uniform process. Then you can enable country-specific changes before it is integrated into the IT solution. It goes without saying that uniform order processing is easier to implement in a central architecture than a multiple distributed one.

Global players have already implemented central SAP system landscapes in many countries and departments across many time zones, and are familiar with the SAP system challenges posed by globalization — and they know how to overcome these challenges. But which solutions are used by other international enterprises that have not yet obtained globalization on a high level — companies whose processes are highly diversified, and whose teams in various countries work independent of each other?

Obviously, the major challenges for international corporations are not IT and software, although this is still a general assumption. Imagine the following real scenario.

**Example: Introducing a new country**

An enterprise wants to introduce a new country with a new language, or change from a decentralized to central architecture with multiple countries and languages. The management consults IT experts to obtain information. For example, the existing or consolidated system must be converted to Unicode, because this is required for parallel operation of the various languages with different character sets. (See Chapter 2 for details on Unicode.)

After management decided on the Unicode conversion (and if applicable, system consolidation), the project managers and users assume that this process is complete and start planning for Unicode conversion. At a later point, they find out that master data, including names and addresses, are not automatically translated as originally assumed. End users in the ‘new’ country complain about the lack of support, and that, without any new development, it is not possible to create quarterly reports that include sales figures for the newly introduced country. In this case, the necessary Unicode conversion was technically implemented correctly by the IT department. Now the problem is that the users assumed that Unicode automatically translates the master data for the applications — which of course is not the case. They also forgot to improve the support organization in conjunction with the introduction of the new country. Neither was there any global report that could simply be extended for the new country; this resulted in extensive new development.
In addition to IT-specific questions about hardware and software, you also have to consider process modeling, project management, change management, organization of global rollouts, and support, as well as how to combine all these aspects into one solution.

4.2 Three-Dimensional Globalization Model

We can conclude that three main aspects or dimensions are crucial for enterprise globalization and must therefore be taken into account: product-relevant aspects, organizational aspects, and aspects relating to business processes. The efficiency of a global IT solution depends on how these dimensions are globally defined within the enterprise. This, in turn, affects the selection of an appropriate system architecture.

4.2.1 First Dimension: Product

The first dimension of globalization describes all product-relevant aspects of the deployed software in combination with the IT environment. Here, the focus is to what extent the software product can support different countries and languages, as well as general functions of internationalization and globalization. Depending on the scope of functionality this results in different aspects that influence conception, system architecture, supported hardware, and additional IT-specific issues. For a global IT solution, the software must support applications, processes, data, and business practices for global implementation and operation, and provide sufficient functionality to support legal regulations and business practices of the individual countries.

SAP ERP\(^2\) and other SAP Business Suite products support this dimension by providing an integrated software solution that meets these requirements. In addition to global and international aspects, such as Unicode for supporting all languages in the system, uniform maintenance of business data, central reporting, but also global tools and infrastructure, e.g.,

\(^2\) See \url{http://service.sap.com/erp}. 
a central ABAP development and customizing environment, there are multiple country versions available (see Section 2.11) that support legal regulations and business practices of the respective countries, and which can be fully integrated into a global software solution.

4.2.2 Second Dimension: Organizations

The second dimension describes the global organizations of an enterprise and defines how these are globally established for different activities. The organizations comprise different teams within the enterprise, including management, process supervisors, project teams, support teams, IT operations teams, service providers, and end users. The global project teams plan, design, and implement global IT solutions with a centrally oriented approach (ideally the global template), and closely work with other teams that are responsible for modeling business processes and their changes. The global teams can integrate the individual local conditions and requirements of the countries into business processes and the global IT solution by collaborating with local or virtual teams.

The support teams play a very critical role within a global IT solution. They are responsible for smooth 24/7 support and operation around the world. Teams with global expertise are established to optimally exploit the skills of globally active employees and distribute it within the enterprise. These experts work, for example, in the research and development department or are responsible for training.

4.2.3 Third Dimension: Processes

The third dimension describes all aspects concerning modeling and changes in an enterprise’s business processes. A global IT solution is only practical if the company can harmonize and standardize different local processes and data.

This sound simple, but in practice, this is probably the most complex dimension, because the changes affect business processes and practices.
of the entire enterprise and cannot, in most cases, be implemented easily.

Imagine a global company that produces consumer products that are manufactured differently in every country and have different product attributes. The business processes concerning these products or goods, however, are very similar in every country — for example, the sale or purchase order of goods. Therefore, you can model a global process, despite the obvious differences, and at the same time leave sufficient leeway for local specifics.

Change processes, such as restructuring and process-related changes, considerably influence business activities. Here, it is of major importance to coordinate changes globally. As we already mentioned, local situations and specifics of respective countries must be taken into account and implemented as required. Global IT processes are critical within a global IT solution. They include user support and data center operation, which is frequently outsourced to third-party service providers.

For smooth operation you must ensure that sophisticated company-wide processes are defined, and service level agreements (SLAs) must be established if you outsource processes to service providers. SLAs help you determine how fast and to what extent problems or service requests must be handled by the service provider. For planning, implementing, and developing global IT solutions, ideally you have global IT processes and procedures that enable central development and configuration of new projects, as well as maintenance of existing production systems. This is directly linked with the system architecture, because the central architecture or shared services architecture promotes central development of these processes. Of course, this process must offer options for implementing local adaptations or individual applications without any effects on the global solution.

Figure 4.1 shows the three-dimensional globalization model.
4.3 Business Processes

In addition to IT issues, project management, and change management, the *modeling of business processes* is another critical topic for the globalization of a system landscape. You can’t just implement efficient enterprise globalization within IT; you must also consider optimized business processes supported by management. This specifically applies to the optimal selection of the global IT solution architecture. Technical and IT-infrastructure aspects play a critical or even decisive role for selecting the architecture, but only at first glance. IT technology, hardware, worldwide networks, security, and availability have become very sophisticated and powerful, providing enterprises with all architecture options. In the past, arguments were often cited that related to the technology, like “We can’t introduce central single instance, because the network connection to the end users is too slow, and we need the entire night for the online backup in our U.S. data center so that the users in Asia are impaired.”
These views might still be valid in some cases, but are no longer the general rule.

If no specific architecture is absolutely required due to product-related factors (we will detail this later), processes and enterprise organizations play a decisive role in finding a common solution that relies on close cooperation with the process and IT experts and teams. Here, a process-oriented approach makes sense.

First you must analyze and model the business processes of the enterprise, ideally using appropriate modeling tools that can be implemented using graphics software, like Microsoft® Visio®, or software products specifically designed for modeling processes, such as ARIS. At this point, it has not yet been determined (and is not yet relevant) how the processes will be implemented using IT technology, which software components will be used and how often, or which systems will be deployed. The business strategy and process architecture of the enterprise can be described centrally and holistically. This is particularly important for large global enterprises and can be considered a prerequisite.

Today, however, there are conflicts of interests between the various departments of an enterprise, particularly between business-related and application-oriented or process-oriented teams on the one hand and IT teams on the other. This results in the following problems, which often lead to interference with, or even failure of an efficient global IT solution, and consequently the optimal architecture.

Problem Number One: Design and modeling of business processes
The process experts and managers don't speak the same language as the IT teams; consequently they don't collaborate. They often have different opinions regarding the same targets. Frequently, process managers and IT teams use different concepts and incompatible tools; in short, they work at cross-purposes. Consequently, you can lose a lot of time and money in implementation projects, because internal coordination, which is also referred to as an alignment between system and IT, can only be partly achieved or not at all. The more locations and departments are affected, the more these factors multiply in a global enterprise.
Factors Influencing System Architectures

Problem Number Two: Process configuration
Often, there are only minor or no connections between process flows and logistics, and technical IT implementation. Frequently, the company-wide methodology, transparency, and uniform process documentation is missing. For new requirements or changes, suitable solutions or parts thereof are not reused; standardization and corporate governance is lacking. In addition to Problem Number One, this is the most frequent reason why a global enterprise is not able to use a central single-instance architecture, even though the technical prerequisites are available.

Problem Number Three: Process integration
There are often many different systems and interfaces, due to a highly decentralized architecture. For the integration of distributed applications, no standardized approaches exist. Each interface and respective solution is individual, which results in numerous specific solutions for A2A (Application to Application), B2B (Business to Business), and industry-specific solutions. There is neither a joint process repository or process management for cross-system and intercompany applications.

Problem Number Four: Process ownership
Often, employees of the business departments don’t have the experience or skills to automate processes. Local business departments are not flexible enough to align the global enterprise without changing the entire process. Required changes and problems with process flows are often passed on to the central IT department, whose employees are not able to solve them all.

Enterprise architects are essential in global enterprises. They play a key role in designing business processes and IT, because they act as intermediaries. Here, they take an active part in the development and optimization of business models and flows, and participate in the design process for the optimal IT architecture. They form a link between business and IT, and provide comprehensive know-how on business processes, applications, data, and technology. In this way, enterprise architects support the approach of globally designing business processes and help the

3 For further information on enterprise architects, refer to Paul Kurchina, “Design the present and future of IT.” SAP Info, German, Home, E-Paper No.144.
company find appropriate IT solutions with the optimal architecture. Figure 4.2 shows a model for collaboration within a global enterprise. In order to combine IT and business, the business experts and analysts on the business side and the enterprise architects on the IT side form a special team and central contact point to actively promote collaboration between IT and business. This ensures that business and IT always work together to find joint solutions, and at the same time can concentrate on their core tasks.

![Figure 4.2 Business and IT as a Team Within an Enterprise](image)

To ensure that this joint team can collaborate efficiently, appropriate tools and methods must be provided to link business process modeling with IT solution implementation. For this purpose, you can deploy SAP Business Process Management (BPM), which is well-suited for a global enterprise. We’ll present BPM in the following section.
4.4 Business Process Management

The connection of business processes with global enterprise strategies and IT implementation is of high significance for the management of new and ever-changing business areas. Business process management constitutes a continuous and flexible adaptation of business processes, their organization, and the IT landscape to market requirements. With BPM, enterprises can continuously adapt and optimize their business processes and scenarios to new requirements.\(^4\)

To find and implement the optimal architecture for a global IT solution, harmonization of IT landscapes constitutes a great challenge for enterprises. The problem with many IT landscapes is their growing, increasingly complex structure. In the worst case, a high number of decentralized systems exist that are integrated only to a limited extent. Enterprise mergers and splits pose great challenges for IT departments. Within a short period of time, IT systems and their architecture must be adapted and optimized to the new business structure. Identifying business-critical systems becomes more complicated, and consequently, efficient cost reductions can only be achieved with great difficulty or not at all. This situation is improved for the long term and IT development and maintenance costs are sustainably reduced only when business teams and IT aligned with global targets and business processes work closely together. Business process management is a well-suited and efficient instrument to achieve this difficult IT target. BPM ranges from analysis and optimization of business processes to implementation in software, and to automatic control and measurement of processes by means of key figures. Therefore, BPM is a self-contained cycle.

BPM comprises the following basic steps. After the business strategy has been determined and described, the business processes are designed (modeled) and implemented in the IT department, as well as measured and analyzed using key figures, also called "key performance indicators" (KPI). Weak points can be quickly determined, and optimization can be derived

through analysis and monitoring during operation. Using these optimization potentials is iterative and is not supposed to be a one-time activity. Over time, only a self-contained cycle enables sustained and long-term advantages. We can therefore consider this a real business process life cycle. The success of BPM depends on the general willingness of an enterprise, the process orientation, and the continuity with which it is operated.

BPM particularly assists you in modeling business processes that include users with different roles and tasks — especially outside IT — and in optimizing communication with IT experts. The business process models can be created at different abstraction levels — that is, business process level, configuration or implementation level, as well as execution level. Various integration options are provided. You can model and configure company-specific, internal business processes as well as the critical end-to-end processes between separate, heterogeneous applications and systems, as well as those beyond company boundaries. Figure 4.3 shows an overview of BPM.

**Figure 4.3** Use of Business Process Management

### 4.4.1 Tools for Business Process Management

You are provided with numerous tools and methods for business process management. We’ll describe how BPM can be usefully deployed
in a global SAP system that is based on the SAP NetWeaver platform to achieve an optimal global IT solution. We’ll present the ARIS for NetWeaver platform as a special tool that enables you to use holistic BPM for a global SAP solution.\(^5\)

The ARIS platform provides you with tools for the entire business process management’s required periodic changes and improvements. This enables you to manage not only your operative business processes, but also the entire BPM process, itself.

ARIS for NetWeaver supports integration of business process modeling with the implementation of global IT solutions on SAP Business Suite components.\(^6\) Because this software is aligned for the analysis and description of business processes and their feasibility on SAP Business Suite components, it is well-suited for supporting the third dimension of globalization, which is beneficial for finding the appropriate architecture for the global IT solution. ARIS for NetWeaver includes a description of the (business) process architecture — from business models to executable processes, and beyond system boundaries, based on SAP NetWeaver process infrastructure (PI).\(^7\)

ARIS for NetWeaver works at three process levels:

1. At the top-most level (process architecture model) you can create a rough overview of the company from a business point of view — that is, without any technical context. Based on this overall process architecture, the process strategy is determined; in other words, you don’t take the concrete system landscape and IT architecture into account yet. By designing the process architecture, however, you can set the course for the company’s determining a completely global process, such as central purchasing or distributed processes.

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\(^5\) The ARIS platform (Architecture of Integrated Solutions) provides integrated software products to support enterprises in the continuous improvement of business processes. (More information is available at www.aris.de.) All phases of a BPM project are covered, from strategy definition to process design and migration of the models to IT, to controlling the executed processes.


\(^7\) See http://service.sap.com/xi.
2. At the next level (process configuration model), processes are described that were designed especially for customizing and configuration. SAP Solution Manager provides the required reference processes. You can synchronize these process models between ARIS for NetWeaver and SAP Solution Manager. Because SAP Solution Manager knows the functions and processes of the individual Business Suite components, and provides them via the reference processes, you can map the modeled processes from ARIS on the given IT landscape at this level. Here, you functionally define the architecture of the system landscape.

3. At the process-execution model level, SAP components and non-SAP components communicate via SAP NetWeaver PI. SAP NetWeaver PI offers a standardized Business Process Execution Language for Web Services (BPEL4WS), which enables you to display business process logic in a standardized manner in XML format and integrate it in the runtime environment. For our architecture discussion, this is not very important, because third-party systems are integrated only to a minor extent, if at all.

Figure 4.4 shows an overview of BPM and ARIS for NetWeaver.
**ARIS and SAP Solution Manager**

SAP Solution Manager supports the integration and implementation of SAP Business Suite projects. It provides integrated content, reference processes, tools, and procedures that reduce the project effort, and are required for both efficient implementation and productive operation of an SAP solution. At the operative level, for example, SAP Solution Manager offers a central Business Process Management (BPM) tool for monitoring global SAP solutions; which you can use to follow both technical system data and business processes flow via different systems and interfaces. Additional functions of SAP Solution Manager include a support desk with local note database, automatic forwarding of serious problems to SAP Global Support, and other functions for supporting the entire life cycle of an IT solution. SAP Solution Manager offers roadmaps for SAP Business Suite reference processes, which enable you to introduce efficient BPM for the entire IT solution or parts thereof. For further information on SAP Solution Manager you can refer to [http://service.sap.com/solutionmanager](http://service.sap.com/solutionmanager) and to specific documentation in [http://help.sap.com](http://help.sap.com) • SAP Solutions • Solution Manager.

In order to efficiently exploit process-oriented procedures with SAP Solution Manager and BPM you must establish a relationship between global business processes and SAP solutions. Because a pure modeling tool like ARIS only works at an abstract level (i.e., it does not establish any connection to the actual IT solution), you must carry out another step after the modeling process to map the business process model on the existing IT components. For example, you can implement a company-specific sales process on an SAP ERP, SAP CRM, or a suitable non-SAP component. ARIS for NetWeaver provides such a tool that enterprises can use to select the modeled business scenarios and processes that they want to support using the SAP solutions. For this purpose, SAP Solution Manager offers reference processes via business roadmaps that can be customized during implementation, and used for operation and business process monitoring.

To efficiently use this tool, you must exchange or synchronize the modeled processes and additional configuration content between ARIS for

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NetWeaver and SAP Solution Manager (see Figure 4.5). Here, the SAP reference models are integrated with the ARIS process architecture, and customized according to customer requirements and business processes. These are then incorporated in a detailed requirements specification or business blueprint, which then forms the basis for a SAP Solution Manager project. There, the technical implementation and model customizing is done.

**Figure 4.5** Synchronization Between ARIS and SAP Solution Manager

This ensures that the IT solution is geared toward the company’s business processes as closely as possible and not the other way around. On this basis, you can align the SAP standard processes and functions with existing enterprise processes, and adapt them, if possible.

**Central Customizing using SAP Solution Manager**

From the adapted business process (which should be implemented by the IT department, and which was created by aligning the adapted ARIS business process model with SAP solutions and scenarios in SAP Solu-
tion Manager as a business blueprint), you can directly configure and customize the deployed SAP components. This means that there is no direct connection between an enterprise’s process world and IT world. SAP Solution Manager enables direct navigation for the customizing functions of respective SAP Business Suite components via the business blueprint. You can also make settings that are processed in the three-system landscape via the SAP components transport system. This central function is particularly beneficial for a global IT solution that uses many different components, and assists you to support global projects and rollouts efficiently. We’ll discuss this in Section 5.4, where we’ll also explicitly detail the global template approach for a corporate rollout, which Solution Manager is very useful for.

Figure 4.6 shows a concrete example of how an FI application process (which can originate from an ARIS model in the business blueprint) is connected directly with the implementation guide of the linked SAP ERP system. This is required to carry out configuration or customization (Transaction SPRO) of account groups.

![Process-Oriented Configuration from SAP Solution Manager](image)
4.5 Organizations

Depending on the degree of globalization of an enterprise you can implement a global IT project more or less efficiently. Many global players recognized the necessity for globalization a long time ago, and they knew how to successfully implement their enterprise objectives by using a global IT solution. Particularly companies and enterprises that have worked locally or independent at different locations recognize the current need for globalization.

Often, medium-sized companies that are suppliers for large, multinational enterprises are forced to follow the globalization trend, for example, due to expansions in China, where a plant is opened for manufacturing car spare parts. Consequently, the existing IT solution must be extended. In our example, an existing SAP implementation must be introduced in China.

Depending on the enterprise’s degree of globalization, this project cannot be solely implemented by the IT department. Initially, the processes must be modeled in such a way that the business activities can be performed efficiently in China and implemented in the IT department. For this purpose, you can use the procedures and tools described in the previous section. Equally important, or even essential, is the presence of appropriate, organizational units of the enterprise, which can successfully implement global projects and activities — from planning to implementation, to operation and support. Therefore, organizations must include global teams that collaborate on a worldwide scale and bring together both remote and local expertise. But how can this be achieved?

4.5.1 Corporate Governance

High demands are placed on the top management of a global enterprise. Frequently, global enterprises are large and listed on the stock exchange. To ensure success on the international market, management must promote the trust of its global employees as well as its investors, customers, business partners, and the general public. In this regard, definition of and compliance with sound corporate governance is a good instrument. This is particularly important for a global enterprise, because the entire
strategy, plans, and objectives must be implemented globally. A high
degree of standardization and harmonization must be achieved, while
simultaneously, all local organizations and employees must be taken into
account.

Corporate governance generally comprises all international and national
values, and basic principles for a sound and responsible corporate man-
agement that is valid for both employees and top managers. Corporate
governance doesn't comprise internationally uniform rules, but only
some acknowledgement of basic international principles, country-spe-
cific concepts, and responsible management. In addition to coun-
try-specific corporate governance provisions, there also exist some cross-
national, industry-specific regulations.

Corporate governance features a multilayer structure, and includes man-
datory and voluntary measures: compliance with laws and regulations,
adherence to acknowledged standards and recommendations, and develop-
ment and adherence to company-specific guidelines. Another aspect
of corporate governance is the definition and implementation of man-
agement and control structures. Typical characteristics of sound corpo-
rate governance include:

- A functioning management;
- Protecting the interests of different groups — for example, the special
  interests of employees in the various countries;
- Target-oriented collaboration of management and management
  supervision;
- Transparency in corporate communication;
- Appropriate handling of risks; and
- Management decisions with an orientation toward long-term added
  value.

Sound corporate governance ensures responsible, qualified, transparent
management oriented toward long-term success. It is supposed to pro-
vide a basis for not only the organization, its members, and owners, but
also for external interest groups. Corporate governance concerns not
only management, but all managing teams within the organizations of
an enterprise, also.
One special aspect of sound corporate governance can be applied to globalization: the way global central interests of a corporate group are harmoniously combined with the local interests and objectives of individual countries. This can be achieved with a sound global corporate culture, which we’ll explain in the following section.

### 4.5.2 Global Corporate Culture

For a global enterprise that comprises locations and divisions around the world, it is a major challenge to establish an organization that can support the globalization of the enterprise in all areas. Only if the enterprise and all of its employees and business partners are prepared to follow the globalization path can all prerequisites be met to efficiently implement global strategies and objectives. This requires a global corporate culture that is accepted and implemented by all employees at all locations. It doesn’t matter from which perspective you look at the globalization of an enterprise. You will see that the aspects of centrality, consistency, and harmony always take center stage.

This requires establishing global, centrally acting teams and processes. On the other hand, each location and country must have teams and processes with sufficient scope for decision-making processes at the local level. For example, there could be legal regulations, or more or less mandatory business practices in a country that must be respected by the corporate headquarters.

But not only the business-relevant or technical facts are critical. In fact, corporate employees must be integrated with the global enterprise. But this will only be successful if they don’t have to give up their values, cultures, or ways of living. Consequently, corporate headquarters and global teams must show good manners by respecting culturally influenced behaviors, traditions, and so on of specific countries and regions, and integrate them into their organizations accordingly.

A special issue is the language used within a company. Obviously, communication within the organizations of a global enterprise should be in one language; in most cases it is English. Of course, local teams can communicate in their respective languages. In some countries, even this can lead to problems regarding local acceptance. In Japan or Russia, for
example, English is hardly ever used among the general public and is only spoken by people with higher education. These local and cultural specifics affect the procedures and decisions of employees. Therefore, global teams that comprise international members have to observe certain rules with regard to communication and collaboration, both in meetings and in telephone or videoconferences.

On the other hand, respect for local behavior and traditions must not become too intense. In other words, the formation of local teams that hardly pay attention to global targets and projects of the enterprise, and (only) consider local interests when making decisions or solutions should be prevented. ‘Local kings’ in various countries or regions are not suited for a global enterprise. This can occur particularly if an enterprise and all of its organizations have shifted from a decentralized independent structure to a global structure.

When it comes to IT, this can mean the IT infrastructure is comprised of several local data centers and teams that are merged into one central data center at the corporate headquarters. But this also means that the local IT teams must change their tasks or even lose their positions. This is a very sensitive issue that must be handled carefully to be successful. The employees concerned must be assigned appropriate tasks and positions, and be integrated with the new global teams, especially because they have local expertise that is essential for the new global team. But if the local teams are taken by surprise, the transformation will not be accepted, and the global IT project will not be supported constructively.

Summing it all up, it can be said that you have to keep a balance of global and local teams within the organization of a global enterprise that represents and implements global interests and standards. At the same time, these teams should respect the local regulations and customs of the individual countries. Figure 4.7 illustrates how these concepts relate to the IT of an enterprise.

At this point, we want to give you some tips and tricks that were tried and tested in many complex global IT projects. The problem is, on the one hand, you must focus on harmonization and standardization with regard to global solutions. On the other hand, you must remain flexible and adaptable enough to quickly and efficiently integrate deviations
from the standard and local specifics. In the following list, we provide recommendations for a global standard.

**Global Corporate Culture**
- Process Harmonization
- Global Data Standards
- Consolidation of Infrastructure
- Global Reporting Tools
- Common Corporate Culture

**Local Culture in the Countries**
- Localized Processes
- Specific Local Data
- Respect for Cultural Traditions and Behavior

You have to find the right balance:
- The focus should be on the common corporate culture while simultaneously respecting and considering local specifics
- Groups of “local kings” don’t work for a global enterprise

**Figure 4.7** Balance of Global and Local Organizations

**Recommendations for Global Standards**
- First, focus on the business processes, then on IT (in many cases, it’s the other way around).
- Get support from top management.
- Create small teams with process owners (steering committees).
- Implement decisions as soon as they are made.
- Determine clear limits for standardization.
- Stick as closely to the standard as possible.
- Special requests are only permissible via the steering committee and for positive business cases.
- Implement small steps and quick successes for large projects.
- Be very patient.
Support and data center teams play a very significant role for successful global IT solutions. If you want to operate the IT solution centrally as a single instance, you must specifically prepare these teams and their organizations on the running operation, as well as for the support of the central solution. But also regarding any other IT architecture operated by a global enterprise, specific requirements and prerequisites must be determined for its support and data center. We’ll describe these requirements in the next section.

4.5.3 Requirements of the Support Organization

Operating a global solution demands high support requirements with regard to the specification of service and support processes. Only if the entire support organization or a third-party service provider of an enterprise is structured globally can the global solution operate successfully. Here, the emphasis is not on the architecture of the system landscape, but on qualified training of the support team, its global teamwork, and the efficient functioning of all support processes.

The support organization has to face the following challenges: It must be organized on a global scale, and subdivided into a first level for end-user contact in case of problems, a second level for complex issues, and further levels for specific problems. A great challenge for a globally active enterprise is to provide support to every single user in any part of the world, with the same quality and at the same expertise level. But how can a global support organization efficiently provide global, 24/7 support?

For global enterprises, centralized regional and continental support centers have proven successful. For example, in America, EMEA (Europe, Middle-East and Africa) and the Asia-Pacific region, support works during the daytime of the respective region, and transfers support to the next support organization during an overlap phase to provide efficient, 24-hour operation. This is also referred to as the “follow-the-sun” model (see Figure 4.8).

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Three global regional support centers work during the daytimes of the respective region with minor overlaps for support transfer.

![Diagram showing support centers in Philadelphia, Walldorf, and Singapore with their operating hours]

All Times in Central European Time (CET)

**Figure 4.8** Global 24-Hour Support of a Global IT Organization

The following illustrates the requirements expected of a global support organization:

<table>
<thead>
<tr>
<th>Requirements of Global Support Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>▶ Global support must be available 24/7.</td>
</tr>
<tr>
<td>▶ Global teams must be able to collaborate without any geographical or cultural boundaries.</td>
</tr>
<tr>
<td>▶ All members of the support team must be trained well and must be able to integrate themselves into a global team.</td>
</tr>
<tr>
<td>▶ The support organization must be able to support the IT solution in the given architecture. If this architecture changes — for example, due to system consolidation from decentralized to central — the support team must adapt itself quickly to the new system landscape.</td>
</tr>
<tr>
<td>▶ There must be no barriers with regard to language; the enterprise should determine one global enterprise language (in many cases, English) in which all members are fluent.</td>
</tr>
<tr>
<td>▶ For optimal support of local end users, the support teams must provide sufficient local experts who can communicate with the end users in their local languages, and who know the local specifics well.</td>
</tr>
</tbody>
</table>
Factors Influencing System Architectures

4.5.4 Data Center Requirements

The safe and efficient operation of the data center is a critical area for an enterprise. Here, all vital processes based on sophisticated information technologies come together. Many enterprises have to determine whether they want to run their own data center or if it is more efficient to outsource applications, systems, and processes — in other words, transfer the responsibility for the operation and infrastructure to service providers as a whole or in part. The general trend is to outsource IT and data center operation to owned IT subsidiaries or to external data center service providers.

Outsourcing means to employ the hosting services of a specialized data center service provider. These services must be exactly adapted to the requirements of the enterprise. Hosting services must be able to keep pace with the global orientation and future growth of the enterprise. This requires a service provider with the appropriate know-how, experience, modern technological infrastructure, and ability to respond to changing requirements.

The data center that operates the global IT solutions, whether company-owned or third-party, must meet the following requirements:

<table>
<thead>
<tr>
<th>Requirements of Data Center Service Providers</th>
</tr>
</thead>
<tbody>
<tr>
<td>▶ Professional and state-of-the-art data center equipment with regard to both hardware and software for the support of the entire data center operation.</td>
</tr>
<tr>
<td>▶ Selection of the appropriate hardware for the target architecture of the global IT solution chosen by the enterprise.</td>
</tr>
</tbody>
</table>
Requirements of Data Center Service Providers

- Flexibility regarding changes — for example, in case of restructuring, company mergers, or splits, and the resulting changed system landscapes.
- High performance.
- Fast and secure global network connections from/to the data center for all enterprise locations.
- High security and availability of global IT solutions.
- Data security.
- Alternative data center in case of emergency (disaster recovery center), including fast switchover times.
- Transparent costs.
- Professional services and support: there are various service categories, depending on the SLA — from purely technical, basic support to different variants of application support.
- Compliance with service standards, such as service level agreements and ITIL (IT Infrastructure Library).

It is very important that both the support organization and the data center comply with customary IT service standards. This is particularly essential (even decisive) for large global enterprises that have a complex, global IT solution for selecting the optimal architecture. Because running global solutions without interruption demonstrates the success of the implementation, you must ensure an appropriate high level of service and support. Therefore, the following sections will describe two selected service standards that have gradually established themselves.

4.5.5 Service Level Agreements

An SLA comprises clearly defined and measurable service and performance agreements spelled out between a service provider (in this case the IT subsidiary of the enterprise or an external data center of a hosting partner) and the service recipient (here, the global enterprise).\(^\text{10}\) Due to its detailed nature, the service has a clearly defined obligation. Most service level agreements address typical services for information technology, such as computing power, network bandwidths, and support

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hotline availability. These factors are of utmost importance for an enterprise's global IT solution and architecture. If, for example, an enterprise operates a central single-instance system, the service level agreements must define the global network bandwidths. These services are critical to success, and consequently, their quality is defined in the SLA.

By means of precise, comprehensible definition of services, the service level agreement has the following effects on a global enterprise:

<table>
<thead>
<tr>
<th>SLAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Level Agreements</td>
</tr>
<tr>
<td>▶ Expenses can be assigned by cause to the areas that incur the highest costs, according to the quality received and quantity required.</td>
</tr>
<tr>
<td>▶ Transparency with regard to services and costs result in a more sensible handling of the services provided.</td>
</tr>
<tr>
<td>▶ Both the services and distribution of tasks is clearly defined, and therefore, frictional losses can be reduced.</td>
</tr>
<tr>
<td>▶ Services are compiled according to the requirements of the internal customer; therefore, you can optimize the respective process chains and reduce costs.</td>
</tr>
<tr>
<td>▶ (Partial) services can be separated and outsourced.</td>
</tr>
</tbody>
</table>

Whether it is a single task or an entire process, you should always specify the basic principles and scope of services in these agreements. This way, both parties (service provider and recipient) have a sound basis for checking the services rendered:

▶ **Required availability of the service**
For the service recipient, this means that employees can work efficiently, for example. For the service provider, this means the computers must be operational. In any case, it is crucial to define the service levels. You require a contractually documented description of the activities, and reaction or response times for specific services. You must also specify all critical aspects, and all issues that are excluded from the service.

▶ **Measurement methods**
You also have to define and establish measuring tools and methods to check compliance with the SLAs.
Response time
This is the time between user action of the user and the system response, including all processing and reaction time. In a central single-instance system, the response time is the entire runtime between input of an end user at any location and the system response at the local PC of the respective end user — in other words, the total network runtime and the system time for the user’s activity.

Support reaction time
This is the time between support’s receipt of an incident and problem message and reaction to that problem, within a specified scope.

Sanctions
These are determined in case of insufficient performance. Here, sanction-relevant and sanction-irrelevant services (service levels) must be clearly distinguished within the scope of the contract. You also must consider that different SLAs can be allocated with different sanctions.

Environmental conditions
These define which services are to be rendered by the service provider within the scope of the SLA and how they can be checked.

Flexibility
Changes in the basic conditions must be taken into account. If, for example, the number of work centers changes due to expansion in new countries, or if the hardware of a system landscape (architecture) changes, you must adapt the SLAs accordingly.

When compiling an SLA, you must first define its scope and specify who is supposed to render which services. You must determine the service level requirements and define the key figures. For global IT solutions, you can determine several SLAs, which can result in insufficient transparency for complex business processes and applications. Therefore, you shouldn’t created very complex SLAs, but only the most critical. In some cases, ‘simple’ service level agreements are sufficient. For example, you can agree that the support team of the service provider is supposed to respond to the error message within a specified period of time, regardless of what the problem is or from where it was sent.
Another critical standard for IT services is the IT Infrastructure Library, which the service organizations of a global enterprise should make use of.

**4.5.6 ITIL Standard**

The *IT Infrastructure Library* (ITIL) is an internationally acknowledged, de-facto standard for professional IT service management, which describes IT codes of practice as a manufacturer-independent set of rules. Its objective is to establish quality management for IT services to enhance the efficiency and profitability of IT in support of enterprise objectives and business requirements. In addition, risks in providing IT services are to be minimized, and best-practice procedures are to be implemented efficiently. Consequently, ITIL enables targeted, process-oriented, user-friendly, and cost-optimized provision of IT services. Figure 4.9 shows an overview of the ITIL standard structure, including various defined areas.

![Figure 4.9 Overview of ITIL Standard Structure](image)

The ITIL is a set of rules (standard or IT library), comprising a series of modules, or disciplines, that enable enterprises to improve their use of

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IT resources and ensure better-quality IT services. A critical aspect in this matter is the reference to core businesses of an enterprise or the organization and the concentration of IT services on the best-possible support of business processes. IT service management means that you can monitor and control the quality and quantity of IT services in a targeted, business process-oriented, user-friendly, and cost-optimized manner.

Within ITIL, both the individual IT service disciplines (e.g., problem management) and interfaces to other IT service disciplines are described, such as the interaction of problem management and configuration management. Although you can immediately benefit from the practical experiences of various disciplines contained within ITIL, real success can only be achieved if you build your entire IT service gradually in accordance with ITIL.

ITIL is a combination of two core disciplines, service support and service delivery, which constitute two different levels. We won’t go into detail here; interested readers should refer to the literature on ITIL. The task of the service support is to support IT services during the running of operations (at the operational level). These IT services provide direct support for IT operation. In simple terms, this can be considered ‘hotline support,’ and extended by the following individual disciplines or modules:

- Service Desk (Helpdesk)
- Incident Management
- Problem Management
- Configuration Management
- Change Management
- Release Management

Service Delivery implements planning and control processes for professional implementation of IT services at a tactical level. Therefore, the objective of service delivery is to optimally meet, plan, and monitor the requirements of customers and IT. The goal is to achieve better customer orientation, and to render and offset expenses resulting therefrom in an economically optimal manner. Service delivery consists of the following modules:

In a nutshell, we advise IT service organizations of global enterprises to use the ITIL standards. This gains in importance as the IT solution architecture becomes more global and central.

### 4.6  Product

We previously learned how the modeling of global business processes and the formation of globally operating teams influence global IT solutions. To achieve a concrete system architecture that is suitable for a global IT solution, you must closely analyze the functionality and technical properties of the SAP software used. In Section 2.1, we explained that the software components used must meet the technical and functional requirements of a global solution. Often product-specific aspects restrict or even exclude the use of the originally intended architecture. Historically, global enterprises prepared a central single-instance architecture that considered the enterprise strategy and business processes. However, this central architecture failed, and the enterprises had to move to a decentralized approach, because certain software-specific prerequisites could not be met or entailed complex management.

A particularly tricky situation evolves if an enterprise wants to enter new markets and countries by using a productive SAP solution and then finds out that the existing combination of architecture and SAP software cannot be deployed — for example, when there is an expansion into China. In order to integrate the new country into a running SAP system, you must implement the country versions for both China and the Chinese language that is legally required. Say the running system is not
configured for SAP Unicode; it might be necessary to establish a separate decentralized system for China. This would mean a change toward a decentralized architecture. For this reason, you must initially analyze all product-specific and software-related aspects, and align them with the enterprise plans.

In the following sections, we'll describe which functional and technical aspects, and basic structure of the used SAP software components must be taken into account to determine the appropriate architecture or adapt the existing architecture if global IT solutions have changed. We'll discuss concrete problems — for example, whether a central single-instance system is feasible for an SAP ERP system in a given SAP release, using a specific number of countries, languages, and industry solutions; or how the introduction of a new country version can affect an existing architecture. We'll also detail how an existing SAP solution must be modified to maintain the current architecture using new requirements, and when it is recommended or mandatory to change an existing architecture. In the subsequent sections, we'll analyze the following basic aspects of global IT solutions and their influence on the system architecture:

- Cross-application internationalization aspects:
  - Technical language support and language combinations
  - Time zones
- SAP release and availability of country versions, industry solutions, and add-ons
- SAP release and combination of country versions, industry solutions, and add-ons
- Maintenance of SAP components and SAP support packages
- Integration of SAP Business Suite components

The following descriptions will always assume a central single-instance architecture as the target architecture for a fully integrated solution. We'll also consider under which product-specific and software-related conditions the enterprise must plan and operate a central architecture global IT solution, or whether decentralized systems must be introduced. We'll only discuss software components in SAP Release 4.6C or higher, and won't detail older releases for which the SAP standard maintenance
has expired, though there might be some exceptions for the discussion on upgrades.

### 4.6.1 Technical Language Support and Language Combinations

Language support is an issue that is critical for all global enterprises, and affects the entire global IT solution, and its integration into internal and external systems.\(^{12}\) The global solution must be able to technically support all required languages, regardless of how the languages are used. This may include, for example, active input by the end user, installation of translations for all or specific applications, or data exchange with internal or external international business partners via various interfaces.

To process text in a local language within the global IT solution of the enterprise, the system landscape must support these languages technically correct. This means that you must be able to enter text in the local language correctly, including the entire alphabet, all characters, and their writing direction, straight into the system, as well as save, display, change, and print these documents. Because the enterprise uses its global solution in many countries, all local or official languages of these countries must be supported in the system. Even if an enterprise has established English as the global communication language and requires no translations of the user interface, the local languages are still mandatory in most countries due to legal regulations or local business practices.

So, if you combine multiple countries in a central architecture (or a regional or partially central architecture with multiple countries in one region, such as for Asia), you must ensure that all languages for these countries can be combined without any technical problems, independent of the SAP standard software, industry solutions, country versions, external add-ons, and customer developments. Chapter 2 gave detailed information on this topic. An SAP Unicode system is the only technically perfect language solution. You can also use a single code-page system in which all Western European languages and restrictions are accepted

for integration with Java-based applications.\textsuperscript{13} However, this constitutes a (perhaps very) serious problem, because in global IT solutions, you often must combine languages with different character sets. Older SAP releases, without the Unicode-supported, mixed code page solution (MDMP), are no longer supported as of ERP 6.0.\textsuperscript{14} Table 2.6 (Chapter 2) shows an overview of the various options for technical language support. The language support is implemented across applications and systems. Consequently, it has top priority for the selection of the architecture.

Here is a short summary for language support with Unicode and non-Unicode systems:

- An unrestricted central architecture for global IT solutions is only possible using an SAP Unicode system.
- A central architecture is also possible if you only use languages of a single code page, a valid SAP language key, and accept potential limitations. Adding a new language might not be possible.
- The MDMP solution, which is not recommended and no longer supported as of ERP 6.0, only enables limited use of a central architecture.
- New languages with new character sets or language keys can only be supported in SAP Unicode. Consequently, decentralized systems are required for new languages if you don't deploy Unicode.

### 4.6.2 Time Zones

If you apply the global IT solution in countries or regions with different time zones, the software and system architecture must be able to meet time zone-specific requirements.\textsuperscript{15}

In Chapter 2, we explained how SAP software support differs over time zones. The time zone functionality mainly depends on the design of the business processes and requirements of the global IT solution expected by the end users in the various countries. For a uniform global SAP solution, the following time zones definitions are relevant:

\textsuperscript{13} Details can be found in SAP Note 73606 and references.
\textsuperscript{14} Details can be found in SAP Note 79991 and references.
\textsuperscript{15} See http://service.sap.com/globalization.
Factors Influencing System Architectures

▶ System time zone
All technical server components of the system landscape have a system time zone. This includes the location of the data center, the server hardware (e.g., system clock), the operating system of the database and application server of the SAP system, the SAP basis modules and services, as well as other technical components. As a general rule, all technical components of an SAP system should only be operated in one time zone. This means, for example, that the SAP database must have the same time zone as the application server for the background operation of the same SAP system. But this also means that the time zones of the systems must be identical for directly integrated SAP Business Suite components — for example, SAP ERP and SAP NetWeaver BI.

▶ End-user time zone
You can set a time zone in the user master data of the SAP system. This time zone is static, and is usually the time zone of the office where the end user works. Dynamic adaptation without manual intervention is not possible — for example, for business trips to another country of the enterprise. In many SAP standard applications, this local time zone enables you to see the end user’s local time and work in this time zone instead of in the system’s time. However, this is not always possible. Particularly in technical applications, you are often displayed the system time, for example, for background processing or system log display. You can compose your own developments by means of a special ABAP function library for time zones.

▶ Business object time zone
Each business object that is assigned with an address in the SAP application automatically has the time zone of the geographical location. For example, a business object can be a plant, a company code (location of the organizational unit of the enterprise), or the location of the customers or vendors. If transactions using business objects stretch across several time zones, this must be considered by the relevant applications. It might be necessary, for example, to correctly calculate the date.

16 A “business object” is an abstraction of business partners, organizations, and their locations and means, which are required to execute the business processes.
Imagine, for example, that the data center with the SAP system is located in the U.S. Pacific (UTC-8) time zone. A subsidiary in New Zealand (UTC+12) (we will ignore daylight saving time and standard time for the sake of simplification) wants to calculate the FI month-end closing for June on July 1, local time. In this case, the application must recognize that the month of June is already over in New Zealand, whereas there are still some hours left for the SAP system in the U.S. Or, if an employee in New Zealand is on vacation as of July 1, the SAP HCM application must not enter June 30 as the first day of leave, as would normally be displayed by the system. The business object time zone is particularly used for the SAP Business Suite components SAP CRM and SCM. If you want to carry out availability checks for a specific date, it must relate to the location of the plant, and not the location of the SAP system.

Whether the applications in an enterprise's global IT solution are time-zone critical or not depends on the individual situation, and on realistic and pragmatic requirements. It is neither possible nor realistic to make every date and time field in each application time-zone dependent. Most end users of a global enterprise are aware of the time zone issue, because they collaborate with colleagues on other continents.

### Prerequisites for Time Zone Support

<table>
<thead>
<tr>
<th>Time zone support</th>
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<tbody>
<tr>
<td>The influence of time zones on the system architecture can be summarized as follows:</td>
</tr>
</tbody>
</table>

- Time zones are generally supported in the SAP software; consequently they are not obstacles for a central architecture. Depending on the individual requirements of the global IT solution, you must check, however, whether the support is sufficient for the individual requirements and global processes of the enterprise. If this is not the case, and no solution can be found you must create decentralized systems with different time zones. System integration must consider the different time zones for critical applications.

- All technical server components of a system landscape must have the same time zone. We recommend selecting the time zone UTC for the system components, which does not require changeover between daylight saving time and standard time.
Prerequisites for Time Zone Support

- Regarding the operation and maintenance of a central system, you must take into consideration that there is no daytime or nighttime, because global end users use the system 24/7. If you can’t implement this and no other solution is possible, you must introduce decentralized systems that can be installed at a central data center location and be configured with the desired time zone. In real life, it can make sense in such a case to implement a decentralized regional architecture for the individual continents.

4.6.3 SAP Release Strategy

The SAP release strategy determines which functions and solutions are contained in the software components of a specific release. It is very important for the IT department of a global enterprise to implement extensive planning that is adapted to the business strategy to ensure that the release of the software solution meets both the global solution and system architecture requirements. If the system architecture has to be changed due to new requirements (e.g., expansion into new countries, introduction of industry solutions and add-ons, upgrades, Unicode conversions, currency conversions, etc.), this must be identified as quickly as possible and implemented. In real life, however, this is not done. The results are usually some questionable ‘quick and dirty’ workaround solutions that are supposed to circumvent necessary upgrades.

The ideal case for an enterprise’s global IT solution would be if the SAP product version used comprised all necessary functions in the standard version. (By product version, we mean a product of the SAP Business Suite in a specific SAP release — for example, ERP 6.0, including all components.) If so, (and depending on the specific product), you can assume that a global solution can be implemented with a single instance and can be maintained with moderate expenditure. The matter can become complex if you require additional software components to meet the requirements of the global IT solution. It even becomes more critical if industry solutions and country versions are required that are not contained in the SAP standard version, or cannot be activated by means of simple or moderate configuration. Then you have the problem of installing additional add-on components that may have serious effects on the existing systems.

solution. You can obtain further information about the availability of all SAP applications at http://service.sap.com/pam.

<table>
<thead>
<tr>
<th>Tip</th>
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<tbody>
<tr>
<td>Generally, the following rule applies:</td>
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<tr>
<td>More than one (complex) add-on to the SAP standard software in a central SAP system can be problematic and should therefore be carefully analyzed or avoided!</td>
</tr>
</tbody>
</table>

Of course, there are some cases in which an add-on has little to no effect on the existing solution. But even for modification-free add-on country versions, you must carry out specific analyses in case of more than one add-on. This is necessary to check whether technical or functional conflicts might occur. In turn, it depends on the concrete global IT solution, and SAP can’t give general information in this regard. Another problem is that you can’t expect different add-on functions to match and supplement each other, even if there are not technical conflicts. There is often a misconception that the combination of industry solution and an add-on country version automatically results in a ‘country version of the industry solution,’ which is not the case. This can only be achieved if the industry solution has a country version, itself.

### 4.6.4 Industry Solutions

Chapter 2, Table 2.1 presented an overview of the SAP industry solutions. In principle, industry solutions are additional software components that are installed and activated for the existing standard software. For this purpose, the standard software is adapted to enable the execution of industry-specific functions.

An industry solution often entails severe technical consequences: It can’t be uninstalled or combined with most of other industry solutions. This seriously affects architecture considerations. If an enterprise wants to operate several SAP industry solutions, it must set up an SAP system for each solution. Consequently, only a decentralized approach is possible.

Some industry solutions were accepted for the SAP standard — for example, SAP Retail for 4.6C or SAP EH&S (Environment, Health & Safety) for
R/3 Enterprise. As a result, they can be deployed like any other standard software component and used for a central solution.

The release of SAP ERP 6.0 includes a new innovation that transfers virtually all industry solutions to the SAP standard software by introducing the new ‘switch framework architecture.’\textsuperscript{18} However, you can only activate 1 of 12 industry solutions to keep to the technical restriction: ‘one solution per system.’ The advantage of this innovation is in significantly improved maintenance and future upgrades. The solutions that are technically implemented in SAP ERP 6.0 by means of SAP Enterprise extension sets enable multiple use and consequently can be combined in a central system. Table 4.1 shows an overview of the single and multiple activated industry solutions in SAP ERP 6.0.\textsuperscript{19}

<table>
<thead>
<tr>
<th>Single Use</th>
<th>Multiple Use (Combinations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP ECC Industry Extension Healthcare 6.0</td>
<td>SAP ECC Enterprise Extension Consumer Products 6.0</td>
</tr>
<tr>
<td>SAP ECC Industry Extension Chemicals 6.0</td>
<td>SAP ECC Enterprise Extension Defense Forces &amp; Public Security 6.0</td>
</tr>
<tr>
<td>SAP ECC Industry Extension Contract Accounting 6.0</td>
<td>SAP ECC Enterprise Extension Financials 6.0</td>
</tr>
<tr>
<td>SAP ECC Industry Extension Discrete Industries &amp; Mill Products 6.0</td>
<td>SAP ECC Enterprise Extension FERC: Regulatory Reporting 6.0</td>
</tr>
<tr>
<td>SAP ECC Industry Extension Insurance 6.0</td>
<td>SAP ECC Enterprise Extension Financial Services 6.0</td>
</tr>
<tr>
<td>SAP ECC Industry Extension Media 6.0</td>
<td>SAP ECC Enterprise Extension Global Trade 6.0</td>
</tr>
<tr>
<td>SAP ECC Industry Extension Mining 6.0</td>
<td>SAP ECC Enterprise Extension Human Capital Management 6.0</td>
</tr>
<tr>
<td>SAP ECC Industry Extension Oil &amp; Gas 6.0</td>
<td>SAP ECC Enterprise Extension Incentive &amp; Commission Management 6.0</td>
</tr>
<tr>
<td>SAP ECC Industry Extension Public Services 6.0</td>
<td>SAP ECC Enterprise Extension Industry-Specific Sales Enhancements 6.0</td>
</tr>
</tbody>
</table>

Table 4.1  Single- and Multiple-Use SAP Industry Solutions in ERP 6.0

\textsuperscript{18} See http://service.sap.com/erp.

\textsuperscript{19} Table 4.1 refers to SAP ERP 6.0 standard solution without SAP Enhancement Packages. For more information see http://service.sap.com/erp.
### Single Use

<table>
<thead>
<tr>
<th>SAP ECC Industry Extension Retail 6.0</th>
<th>SAP ECC Enterprise Extension Joint Venture Accounting 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP ECC Industry Extension Telecommunications 6.0</td>
<td>SAP ECC Enterprise Extension PLM 6.0</td>
</tr>
<tr>
<td>SAP ECC Industry Extension Utilities, Waste &amp; Recycling 6.0</td>
<td>SAP ECC Enterprise Extension Public Sector Management 6.0</td>
</tr>
<tr>
<td></td>
<td>SAP ECC Enterprise Extension Retail 6.0</td>
</tr>
<tr>
<td></td>
<td>SAP ECC Enterprise Extension SCM 6.0</td>
</tr>
<tr>
<td></td>
<td>SAP ECC Enterprise Extension Travel Management 6.0</td>
</tr>
</tbody>
</table>

**Table 4.1** Single- and Multiple-Use SAP Industry Solutions in ERP 6.0 (Cont.)

### 4.6.5 SAP ERP Country Versions

For country versions, the technical requirements are similar to industry solutions if you want to combine several versions in one system.20 Regarding the global IT solution, however, there is one major difference: An enterprise usually belongs to one specific industry and consequently requires only one industry solution — in technical terms, only one add-on if the functions of the standard software are not sufficient. For country versions the situation is completely different. The global enterprise is active in many countries around the world and therefore requires many country versions in the IT solution at the same time.

As you already learned in Section 2.1, the SAP product strategy enables continuous extension of the number of country versions in all SAP Business Suite components and provides them in the SAP standard software. All standard countries are technically compatible and can be combined arbitrarily in the central system. These are ideal prerequisites for the single-instance architecture. You must note, however, that arbitrary language combinations are only possible in an SAP Unicode system due to the language support required for the country versions. If Unicode is not available, you might not be able to implement a single-instance architecture.

Let us take a look at the life cycle of a country version: The development and number of SAP country versions, as well as their inclusion in the

---

standard software, is dynamic and follows the SAP release strategy. Initially, a new country version is only provided as an add-on that is developed, delivered, and maintained by SAP or partners. When the country version reaches market readiness, a decision is made as to whether or not the country is accepted into the SAP standard software. If so, the country version is integrated with the next SAP standard release of the Business Suite components. Consequently, the previous add-on country version requires a new installation of the current release or upgrade to the new SAP standard release in combination with a special migration, which is also referred to as a retrofit.21

**SAP Standard and Add-on Release Strategy**

Each add-on constitutes an individual software component with different versions or releases. As a result, there is a separate release strategy for each add-on, in addition to the SAP standard. One or more add-on releases are usually closely linked to an underlying SAP release. For upgrading an SAP product to the next higher release, you normally must upgrade the add-on, as well. This is done within the SAP standard upgrade procedure by using a special add-on upgrade CD-ROM in addition the standard upgrade. Therefore, for upgrades to the SAP standard product, you must carefully plan whether a suitable add-on release and a unique upgrade path exist for the new SAP release.

The transfer of an add-on country version (analogous to an industry solution or an arbitrary add-on) to the SAP standard is a specific feature and is referred to as a “retrofit.” Here, a special retrofit migration is implemented during the SAP standard upgrade in which all objects and data of the add-on country versions are migrated to the objects and data of the standard software. For SAP ERP, the last retrofits were carried out for the countries India (R/3 Enterprise) and Russia (ERP 6.0).

Table 4.2 shows the add-on release strategy for the SAP ERP FI-CO country versions in SAP Releases 4.6C to ERP 6.0/ECC 6.0; CEE is an add-on that includes multiple, mostly European country versions. We’ll explain this in the following sections in detail.

---

21 Using the new technologies — Extension Sets and Enhancement Packages (as of SAP ERP 6.0) — it is possible to introduce or transfer add-on country versions and other solutions to the SAP standard in an unchanged SAP release.
As you can see in the table, add-on countries are also integrated into the SAP CEE add-on package, in addition to the two retrofit countries, India (R/3 Enterprise) and Russia (ERP 6.0). We’ll describe this in the following section.

**SAP CEE Add-On**

In order to reduce the number of add-on country versions (not integrated in the SAP standard), it makes sense to provide multiple countries as a package in a technical add-on. The add-on then includes the technical conditions for combining all countries and languages. Technically, you can’t install countries and languages individually, but only a combination of all countries and languages, even if you only require one country for the global solution. The advantage of this is that the issue of combining multiple technical add-on components is avoided.

Two examples of these combination packages are the SAP CEE (Central Eastern Europe) add-on for combining multiple FI-CO country versions and SAP HR-CEE for combining multiple HCM country versions.22

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22 You can find more details on the SAP CEE add-on in Notes 520991 (CEE-Core or
Table 4.3 indicates the CEE add-on countries for FI-CO country versions, depending on the SAP and add-on release. This add-on includes multiple country versions for Eastern and Southeast Europe, Russia (standard as of ERP 6.0), and in some CIS countries, depending on the SAP ERP release. Because the character sets for the respective languages belong to different code pages — that is, the Eastern European or Cyrillic character set, and the Greek character set as of ERP 2004 — you should carry out the CEE add-on installation only in an SAP Unicode system for a central architecture. Otherwise, the issues for a non-Unicode system apply, and the CEE add-on will require decentralized systems.

<table>
<thead>
<tr>
<th>SAP ERP Release</th>
<th>CEE Release</th>
<th>BG</th>
<th>SR</th>
<th>GR</th>
<th>HR</th>
<th>KZ</th>
<th>RO</th>
<th>RU</th>
<th>SI</th>
<th>UA</th>
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<tr>
<td>46C</td>
<td>010_46C</td>
<td>X</td>
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</tr>
<tr>
<td>Enterprise</td>
<td>100_470</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
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</tr>
<tr>
<td>Enterprise</td>
<td>101_470</td>
<td>X</td>
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<tr>
<td>Enterprise</td>
<td>102_470</td>
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<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>ECC 5.0</td>
<td>105_500</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>ECC 5.0</td>
<td>106_500</td>
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<td>X</td>
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</tr>
<tr>
<td>ECC 6.0</td>
<td>110_600</td>
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<td>X</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

BG: Bulgaria  
GR: Greece  
HR: Croatia  
KZ: Kazakhstan  
RO: Romania  
RU: Russia, as of ECC 6.0 in SAP standard  
SI: Slovenia  
SR: Serbia  
UA: Ukraine

**Table 4.3** FI-CO Country Versions in the SAP CEE Add-On

FI-CO country versions) and 524073 (HR-CEE or HCM country versions), as well as in references.
The SAP HR-CEE add-on package includes multiple HCM country versions, including those in Eastern Europe, Russia (standard as of ERP 6.0), Turkey, and Colombia (depending on the SAP and add-on release). For technical reasons, the same limitations as for the CEE add-on apply. However, the countries and languages are different.

If you want to combine the two CEE and HR-CEE add-on packages in a central system, you must note that these are two different add-ons in the technical sense, and the operation might be restricted due to add-on-specific maintenance. These restrictions must be analyzed in detail.

### 4.6.6 Country Versions in Industry Solutions and Other SAP Business Suite Components

In the previous sections we described the SAP industry solutions and country versions separately, and always related them to the SAP Business Suite components containing either FI-CO or HCM country versions. You can find further information on this topic in Chapter 2 and Figure 2.2. Country versions also exist for other SAP Business Suite components and SAP industry solutions. However, they are not part of the SAP ERP country strategy, but can be determined individually for an SAP product version. This also applies to the availability of translations in local languages for the various product versions.

You can refer to the product documentation or contact SAP directly to determine which countries and translations are supported for which SAP Business Suite components, releases, and industry solutions, but you can't conclude that combining an SAP ERP country version and an industry solution within the same SAP system automatically means that the industry solution is functionally supported for that country. If an industry solution supports a specific country, you are either provided with industry-specific country add-ons, or the industry solution supports the country directly.

For influencing the architecture of a system landscape, the same issues apply as for the ERP country versions that were described in Section 4.6.5, "SAP ERP Country Versions."

- Combining country versions and industry solutions in SAP ERP
SAP release up to SAP ERP 2004: The combination of add-on country versions and industry solutions can result in technical conflicts and problems for continuous maintenance and future upgrades. Therefore, for a central architecture, it is only suitable to a limited extent and must be specified for special projects.

As of SAP Release ERP 6.0, the technical combination of an add-on country version and industry solution is generally possible due to the ‘Switch Framework’ functionality.

**Country versions in SAP Business Suite components and language support**

An unrestricted central architecture is only possible using an SAP Unicode system.

### 4.6.7 Expansion into New Countries and the Effects on the Architecture

An extremely critical question arises for global enterprises if they want to expand into new countries that must be implemented in an existing global solution with the given architecture. Expanding into new countries could seriously affect the project effort and the architecture of an existing IT solution, depending on the country and availability of SAP components. In the following sections, we’ll describe different typical scenarios, as well as their influence on the system architecture.

**The New Country Uses a Language with a New Character Set or New Code Page**

Due to the technical language support on SAP systems, you should analyze which languages and character sets are required for the new country. Whether or not a translation of the SAP software is available for this country plays a minor role, initially. Decisive factors include whether you must create company-specific documents (e.g., names, addresses, product descriptions, forms, reports, etc.) in the IT solution due to legal regulations, and/or whether you must use the local language due to the given business practices in order to be successful. (In Japan, for example,

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English is usually not accepted, and Japanese is an absolute must.) Then you must determine whether the new language is technically supported in the existing SAP system — in other words, the language key must be available and the character set or script of the language supported. Refer to Section 2.1.2, “Requirements of IT Users,” Table 2.6, and the book *Unicode in SAP Systems*, for detailed explanations.

When it comes to language support, we can distinguish between the following cases:

- **The global IT solution is an SAP Unicode system.**
  In an SAP Unicode system, this is always the case. In other words, the new language can be integrated into an existing SAP system without having to change the architecture.

- **The global IT solution is an SAP non-Unicode system.**
  Initially, you must determine whether the new language is technically supported. If not, you can either convert the existing system to Unicode or install a new decentralized system in Unicode. If the new language is technically supported in non-Unicode, you must differentiate the following cases:

  - The new language includes the same code page as the already installed languages, and a language key is available. Consequently, you can install the language directly into the global IT solution system. You can continue to use the central architecture.

  - If the language uses a new code page, the situation is more complex. The general recommendation is to convert the SAP system to Unicode prior to introducing the new country. Or, you can install a separate decentralized system with the new language and code page to implement the new country. The result is an architecture with a decentralized orientation.

We strongly recommend not implementing the new language by means of an MDMP (mixed code page) solution into an existing system in order to keep the central architecture. Even though MDMP is supported by SAP ERP components of older SAP releases (up to and excluding SAP ERP 6.0; for SAP ERP 2004, only after upgrading; and no integration in Java-
based SAP applications), there are considerable restrictions and (golden) rules, and there is a risk of data corruption (see Table 2.6).

The New Country is Available as an SAP Standard Country Version of the SAP Standard Component of the Productive IT Solution

This is an almost ideal case: You can implement the new country for the existing global IT solution with moderate effort while simultaneously maintaining the existing architecture. Here, the challenge is to add the new country without influencing or impairing the current, running applications or countries. Chapter 5, “IT Implementation of Architectures,” gives detailed descriptions of the required procedures and steps.

The New Country is Available as an SAP or Partner Add-on Country Version in the SAP Standard Component of the Productive IT Solution

This is a complex situation for which you must differentiate the following cases:

- The existing global IT solution already contains other technical add-on components.

  In this case, the general rule applies: You can’t simply combine multiple add-on solutions. This is only possible when you implement an individual, customer-specific project. You must analyze, solve, and maintain any conflicts that occur, individually. Future SAP standard upgrades either require significant adaptations or are not possible. In this case, you should install a new decentralized system for the add-on country.

- The global IT solution does not contain any other add-ons.

  In this case, you can implement the new add-on country version in the existing system. However, you should check and manually change possible modifications of the add-on solution that are described in the respective documentation. Moreover, here you must consider that the continuous maintenance of the combination of global IT solutions and add-ons with SAP support packages, stacks, and patches is subject to certain restrictions.\(^{24}\) If the add-on contains multiple country

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\(^{24}\) Here, SAP Enhancement Packages must be taken into account as of SAP ERP 6.0.
versions in one package (e.g., the new country is included in the SAP CEE add-on), this information applies for the entire package. Because of the languages with multiple character sets contained in the CEE add-on, you should consider the previously mentioned issue concerning technical language support and favor an SAP Unicode system.

**The New Country is Available as an SAP Standard Country Version in a Subsequent SAP Release of the Global IT Solution**

In this case, you should consider upgrading the existing global IT solution to the required SAP release, possibly in combination with Unicode conversion, so that you can add the new country while simultaneously maintaining the central architecture. Alternatively, you can keep the old release of the global IT solution and install a separate decentralized system in the required SAP release for the new country. This, however, will result in a transition to a decentralized architecture, and because of release differences, this might entail work-intensive integration of the new country with the old global IT solution release.

**There is no SAP or Partner Country Version for the New Country**

This case occurs more and more often in practice and can’t be solved completely. Even though new country versions are continuously developed in the SAP standard and as add-on solutions, it is not likely that all countries of the world can be included. Global enterprises, however, don’t want to skip countries that could constitute new markets. But what do you have to do in this case?

For technical language support, you can introduce a new country’s language in virtually all cases by means of an SAP Unicode system, because Unicode supports the character sets and scripts of all world languages. But a Unicode system features another very important function: In contrast to non-Unicode systems using 40 language keys, it provides several hundreds of language keys so that even without any character set problems, a Unicode system can become mandatory with the new language due to the language key.

To pragmatically solve the functional localization for the country version, you can apply the following frequently used practices:
Factors Influencing System Architectures

- **Analysis of the legal regulations in the respective country and comparison with existing SAP country versions**
  If you can find a suitable SAP country version, this can be used as a template for the new country and adapted (in cooperation with the IT development team) to new applications and developments.

- **Use in country clusters**
  A country cluster is a group of countries that have similar functional and legal requirements for the localization of enterprise software — for example, financial accounting. If the new country fits into an existing country cluster with the supported country versions, it is even easier to implement the new country in the global IT solution. Figure 4.10 shows an example of country clusters for the SAP ERP FI-CO country versions. Interestingly, the country groups partly comprise geographically distant regions.

- **Deploying separate translations**
  If you require a translation in the language of the new country, in part or in whole, which is not provided as an SAP translation, you can implement your own translation using the SAP Translation Workbench. The SAP Translation Workbench is described in Chapter 2.

Figure 4.10 Examples of Functional Country Clusters
4.7 Summary

This chapter described in great detail all factors that can influence the selection of the appropriate system architecture. The responsibility for selecting the architecture lies not only with the IT department of an enterprise, but with the global enterprise as a whole. The design of the global IT solution is determined not only by technical IT aspects, but also by the strategy of the entire global enterprise, the business processes, and the organization structure. Combined with the properties and functions of SAP software, you can establish direct criteria for the architecture.

The three-dimensional globalization model comprises product, organizations and process, and aspects that are all relevant for determining a successful target architecture. In order to start planning the global IT project at a business process level, it is important that the business and IT teams collaborate and use suitable tools. You have learned how business process modeling using ARIS for NetWeaver, in combination with SAP Business Process Management and SAP Solution Manager, can provide valuable services.

For a successful global IT project that uses the appropriate architecture, all organizations involved in the enterprise must meet specific requirements ranging from business-related to sociocultural issues. While a well-defined, strict corporate governance is vital for the global orientation of an enterprise, the global corporate culture must be able to respect the organizations and employees in all countries, including regional specifics, and integrate them into the global project. The support organizations must be well equipped for a global project. This includes global presence, 24/7 availability, extensive expertise, and support for end users in their respective country languages. The data center responsible for planning and operating global IT solutions can either be implemented by the global enterprise or outsourced to an external global service provider. The support and data center organizations should apply the common ITIL standard for application and IT service management, and determine well-defined SLAs for the service organization and the enterprise.

SAP software used for global IT solutions directly influences the system architecture by providing clear criteria and issues that either technically
allow a global single instance or require an architecture with decentralized orientation. Here you must consider application-independent internationalization aspects, support of country versions and industry solutions in SAP standard or as add-ons, the software release, and the integration of other SAP Business Suite components. We recommend using the current release, SAP ERP 6.0, or the current releases of other SAP Business Suite components (status 2008), because many functions and properties for the support of global solutions have improved considerably since previous releases.

Only an SAP Unicode system is suitable for unrestricted language support in a global system. Without Unicode, detailed analyses are required, or a decentralized architecture must be implemented. In SAP products, different time zones are supported to enable a worldwide, global solution. Because business processes and time-zone requirements can vary considerably, depending on the enterprise, you should carefully analyze whether the existing standard time-zone functionality is sufficient, whether you need customer developments, or whether a decentralized architecture with regional systems of different time zones is needed.

**Add-ons**

A very crucial criterion for global solutions and their maintenance is the use of add-ons for SAP standard software. If the necessary country version or industry solution doesn’t exist in the SAP standard and is available as an add-on, you must carefully check if and how installing the add-on can influence the global solution. In no case should you use multiple add-ons if the specific combination is not explicitly released. An add-on often impedes the continuous maintenance of the global solution, because it cannot always be ensured that the support package strategy of the standard software corresponds with the strategy of the add-on, which could result in dependencies and restrictions.

Future SAP release upgrades of the standard software must generally be implemented along with add-on upgrades. The new 'switch framework' technology (as of SAP ERP 6.0) comprises industry solutions in SAP standard to considerably facilitate maintenance. However, only 1 out of 12 industry solutions must be activated. SAP ERP country versions are continuously being extended, and add-on country versions are either migrated to the SAP standard (e.g., Russia for SAP ERP 6.0), or they are integrated in add-on packages, such as SAP CEE, which a combination
of multiple countries (technically an add-on). Consequently, it enables the combination of these add-on countries in the global system. Country versions for other SAP Business Suite components and industry solutions follow other release and availability strategies. However, the technical factors for a global solution — in particular, language support and add-ons — still apply.
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