

and respective IT systems into components, providing reusability and modularity. Componentization, in this context, applies not just to software systems, but also to the business units across the enterprise and the organization of the enterprise in question. Implementing an SOA project involves not just a consideration of how the project is implemented in an IT infrastructure setting, but in the end, it also results in a business transformation process across the whole enterprise.

To accomplish your project, you first need a roadmap to guide the strategy for your SOA adoption. To build your SOA adoption roadmap, you need to identify who is involved in the SOA project. These individuals should come from the contributing cross-business-unit teams. The actual teams you involve will depend on the level of SOA adoption you choose (see Section 4.2).

Depending on business value analysis and the consequent prioritization of business objectives and services, the team defines “what to do,” “how to do it,” “who should do it,” and “how success is measured.” The SOA project team creates the rules, processes, metrics, and organizational structures needed for effective planning, decision-making, steering, and controlling the SOA endeavors. They define the common business service model, the common core processes and business components involved in the SOA project, and the core set of assets that they will use.

Building a suitable team for an SOA project requires a careful avoidance of making radical changes to existing team strategies because such changes can unduly disrupt the culture in the workplace. However, at the same time, the teams need to align with the SOA goals, which usually cut across business units. In addition, the SOA project might need to adopt a management structure—especially at larger IT shops with substantial project goals—to manage the development processes for implementing components or to expose existing applications or legacy functions in terms of the appropriate service granularity.

Achieving the right organizational structure is one of the critical challenges in implementing SOA. At organizations new to SOA, one often encounters strong resistance to change that keeps the focus on short-term successes rather than directing appropriate business transformation to align with the business challenges.

Mature SOA organizations, on the other hand, span business lines and the boundaries of roles while achieving interdisciplinary coordination. However, starting small can help to mitigate risk by allowing you to choose a well-scoped and focused services-integration project that has a modest plan for organizational evolution. A cross-unit, organization structure can address all the aspects of the SOA. Based on our experience, this structure should include the following:

- *SOA business transformation architecture council*: This team is in charge of gathering the business requirements, performing business domain analysis and process engineering analysis, and identifying the necessary business components, services, and process modules. Instead of following a strict top-down approach, the council should use a mixed approach in blending top-down, bottom-up, and goal-based

methods to ensure appropriate services identification. In particular, this team ensures that the exposed granularity of the defined services matches the business requirements and specifications—matching business components to IT components as services. More details on granularity issues and associated services layers are described in Chapter 5, “Aspects of Analysis and Design.”

- *SOA technical architecture board*: This team ensures the alignment of business and IT, following industry and enterprise standards, and technically ensures that exposed services match the requirements for evolution and reusability as defined in the general guidelines for the enterprise IT development. Its members are well versed in emerging industry trends, state-of-the-art technologies, and standardization efforts. They are responsible for framing the technical enterprise architecture blueprints (the master IT plan for the enterprise), identifying niche architecture patterns, and promoting reusability principles. They work closely with the SOA transformation team.
- *Component design and development centers*: These are the usual IT teams. They provide design and development of the components and processes, along with new skills such as business process modeling (see Chapter 5). This team delivers a solution design outline, high- and low-level design abstractions, service-oriented analysis and design (the essential aspects of which are described in Chapter 5), and various test phases such as unit, integration, system, and acceptance tests.
- *Operations center*: Finally, there is a production team in charge of the services components operational aspects. These aspects include managing quality of service, enforcing business and service-level agreements, managing the security context, charging back services, and assuring revenue. The team is responsible for rolling out the service, performing regular maintenance, and providing overall system management.

This model for organizing teams is derived and distilled from our experience in projects at midsize to larger enterprises. Often, depending on the maturity level of the IT organization, existing installations can be redefined or transformed to support the SOA projects. After these teams have been identified, you can proceed to creating your adoption roadmap.

Based on their definitions and the associated expert knowledge, each team has a certain scope of decision-making. Depending on the size of the enterprise, the scope, the reach of the project, and the institutionalized IT governance structures, the individuals assigned to the teams can vary. Section 4.3 further explains the need for SOA governance.

4.2 SOA Adoption Roadmap

An SOA strategy should not be a big-bang replacement of an existing IT environment; rather, it should be a progressive and evolutionary roadmap. Often an overall replacement is impossible when the majority of people in the IT organization are busy maintaining the running systems. Therefore, the roadmap should reflect an iterative process.

An enterprise has several options for entry points into a service-oriented architecture. These options identify how much the SOA model penetrates into the business and defines levels of adoption. The options are as follows:

- *Initial adoption:* Enterprises that want to reduce risks initially go through a technology validation and a readiness assessment that analyze the technical and business impact in a defined scope. Eventually, the business and technical value realized from this scope can be extrapolated to actual implications for the organization; this usually translates into a deeper commitment to move to SOA. It involves early pilot tests consisting of creating and exposing services from business operations contained in new or existing applications. These tests are used for an early validation of several decision points such as the following:
 - *The capability to transform existing legacy systems.* This might include technical solutions such as messaging, adapters, and connectors, or it might lead to partnership with vendors that can provide products for a service-oriented integration.
 - *The non-functional requirements capabilities* such as performance, security, manageability, and the availability of tooling.
 - *The organizational structure required* to support an evolution of the enterprise, especially one that addresses skills gaps and institutes governance structures.
- *Line-of-business adoption:* At this level, the enterprise will identify a line of business and prioritize processes where the agility and flexibility that SOA offers will increase business value. Of course, the enterprise might have already defined these priorities or have a critical business issue to resolve. In these cases, you still need to assess the SOA applicability to solve the important issue. This involves a broader initial assessment phase and the identification of key metrics and critical success factors.
- *Enterprise adoption:* This level of adoption involves the construction of a business view of a service-oriented enterprise, with a complete prioritization of projects based on business value followed by the architecture and implementation phases. You need to categorize enterprise activities into separate business domains and components that constitute the enterprise. This categorization might already exist within an enterprise or an industry model (for example, the telecommunication eTom model from the TeleManagement forum) that has already-established categories. At this stage, you should establish an SOA governance council with the required empowerment to monitor, define, and authorize changes to services within the enterprise.
- *Enterprise-and-partner-network adoption:* At this level, there is a broad transformation of existing business models or the deployment of new business models involving not only the enterprise, but also its business partners, suppliers, or customers. The enterprise can then select the roles that are appropriate for delivering its value, becoming a service provider, consumer, broker, aggregator, matchmaker, or any combination of those roles.

For each of the prioritized business services and components, the roadmap follows the typical phases of IT project development, with inception, elaboration, implementation, and test and production phases, as typified in the Rational Unified Process™. However, each of these phases includes new activities that relate to the service component identification and realization. Figure 4.1 depicts an overall view of a roadmap, looking at the adoption stages and corresponding activities. This diagram is not exhaustive but gives an indication of potential steps you can follow.

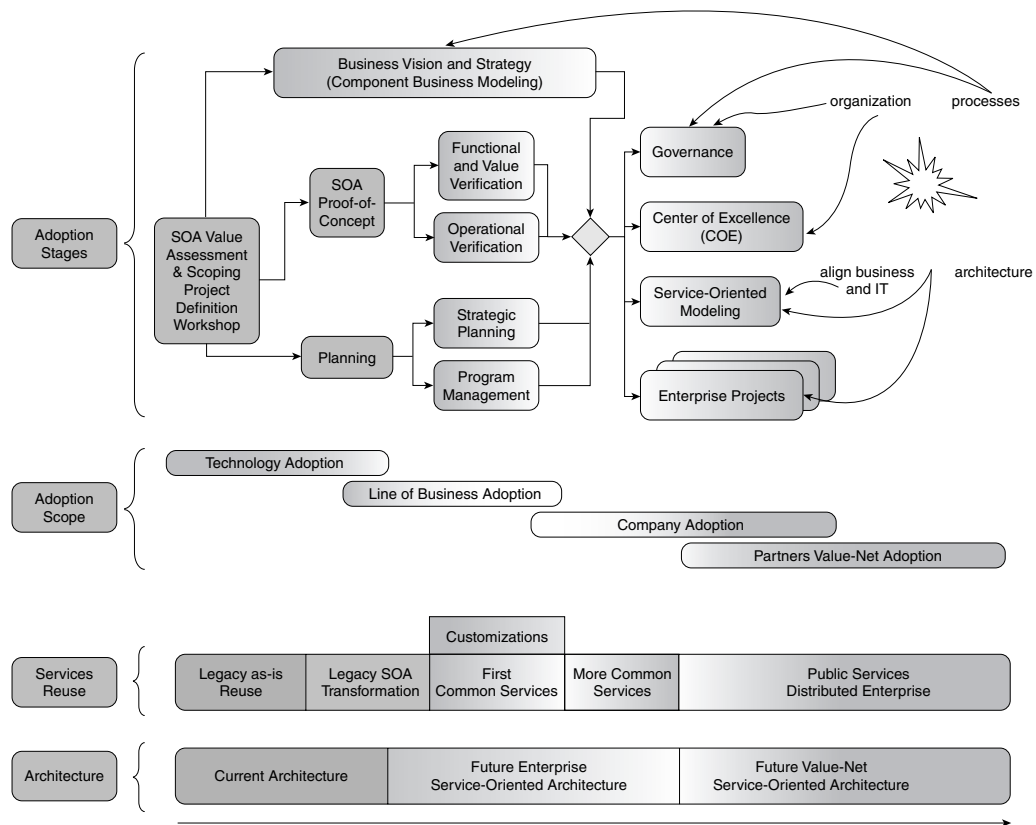


Figure 4.1 A typical service-oriented architecture roadmap.

4.3 The Need for SOA Governance

Enterprises using SOA can adapt to target broader connectivity and increased revenues; on the other hand, doing so requires restructuring applications for greater flexibility and lower costs. This requires the alignment of the business and IT value chain, as described in Chapter 2, “Explaining the Business Value of SOA.” With this evolution, the enterprise will also need to adapt the way the business and IT units interlock and define a new way of reflecting business requirements in terms of IT applications. For this reason, organizational governance plays a more prominent role than before. The following sections provide guidance on establishing key governance functions for operating an SOA.

4.3.1 SOA Governance Motivation and Objectives

The business operations and the underlying IT infrastructure in an organization must react very quickly to rapidly respond to new business opportunities. Business units have to prioritize new IT services that have to be designed and managed as part of highly integrated and complex enterprise architecture. To achieve this, we discuss in the following sections a set of key governance functions for a successful SOA roadmap.

Governance provides an overarching structure to prioritize and then support the enterprise business objectives on a strategic, functional, and operational level. The governance model defines “what to do,” “how to do it,” “who should do it,” and “how it should be measured.” It defines the rules, processes, metrics, and organizational constructs needed for effective planning, decision-making, steering, and control of the SOA engagement to meet the enterprise business needs and challenging targets. As previously indicated, the SOA project team is responsible for creating this governance model.

The following are key questions that can help define the appropriate governance structure:

- What business change does the enterprise expect from SOA? Is it a better use of its existing infrastructure at lower costs, does it target new business and interaction models, or does it target both?
- Which roles, responsibilities, structures, and procedures exist to allow business prioritization and IT funding, planning, steering, and decision making?
- How can you develop skills and leadership competency?
- Which principles and guidelines are necessary to optimize the alignment of business and IT?
- What is the appropriate way to structure the business-to-IT relationship while keeping consistency and flexibility to allow the organization to quickly adapt to new changes?
- What is the appropriate level of standardization of services, the service definition, and the description?
- How do you control and measure services and service providers? What key business performance indicators do you need to monitor? Who should monitor, define, and authorize changes to existing services?
- How do you decide on a sourcing strategy for services?

We believe that an accepted and formalized governance model is crucial to successfully achieve business objectives, so we will define important governance functions in the following sections. For fast and high-level acceptance, it is essential to start from the existing enterprise structure and adapt it to the SOA roadmap.

To provide architectural governance, you need an organizational structure to help identify all necessary roles and responsibilities. Based on our experience, it is quite useful to establish an SOA *center of excellence (COE)* to control the SOA roadmap and to support large and complex projects. The COE is responsible for keeping the SOA-based implementation aligned with the business requirements on a strategic, tactical, and operational level. It requires authority over technical artifacts such as architecture blueprints, enterprise templates, and design assets.

4.3.2 An SOA Governance Model

In her IBM developerWorks article, Yvonne Balzer describes an SOA governance model on which we based our considerations. SOA governance is an evolution of the ideas of IT governance, introducing a greater business involvement in supporting IT service components. There are different definitions of IT governance, but the IT Governance Institute's definition gives a good general overview:



The IT Governance Institute's Definition of IT Governance

IT governance is the responsibility of the board of directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes to ensure that the organization's IT sustains and extends its strategies and objectives.

The purpose of IT governance is to direct IT endeavors to ensure that IT performance meets the business objectives so that the following occurs:

- *IT alignment with the enterprise results in the promised benefits being realized.*
- *IT enables the enterprise so that opportunities are exploited and benefits are maximized.*
- *IT resources are used responsibly.*
- *IT-related risks are managed appropriately.*

SOA governance incorporates the control of the enterprise model as a set of standardized modular business components and processes, and the prioritization of those based on business value. In summary, the SOA governance model is a combination of organizational structure, joint processes, and relationships that are based on accepted ground rules called *governance principles* and the strategic direction.

4.3.3 Strategic Direction and SOA Governance Principles

To sustain the focus on business needs, it is essential to define the strategic direction for developing an SOA. Both business and IT units need a common understanding of the business strategy and objectives. Governance principles and guidelines form the

fundamental basis for any decisions. They shape the solution area and define how business and IT units collaborate. Everyone involved should carefully understand and agree upon these principles, from executive management to individual project personnel.

According to E.G. Nadhan in his EDS Solutions Consulting position paper of April 2003, "SOA Implementation Challenges," there are two main governance approaches:

- *Central governance* is optimized for the enterprise. The governance council has representation from each business domain and from technology subject matter experts. The central governance council reviews the addition or removal of services, as well as changes to existing services, before authorizing their implementations.
- *Distributed governance* is optimized for the distributed teams. Each business unit has control over how it provides the services within its own organization. This requires a functional service domain approach. A central committee can provide guidelines and standards.

Each guiding principle should be defined with a rationale explaining the business reasons and implications. The specific principles for architecture design or service definition, for example, can be derived from these guiding principles. In addition, a common understanding of a structured approach from business to IT is fundamental for defining the architecture. You will find different methodic approaches such as process orientation, business functions, or even component modeling like IBM's Component Business Model approach.

4.3.4 Empowerment and Funding

The move to SOA is a paradigm shift driven by the need for more flexible business models, greater integration, and a stronger business and IT alignment. This evolution might face resistance within an organization, which can turn it into just a simpler result of implementing Web services on a small scale rather than a move toward the benefits of a true SOA. In truth, a successful SOA project can happen only with the strong support of senior executives, identified funding, and proper empowerment of the SOA governance body.

One of the pitfalls is the institution of a rubber-stamp governance body or one that has a mere consultative role and cannot enforce its recommendations. At the end of the day, the governance body needs to have proper practical control of project funding.

Rule of Thumb

The governance body needs to have proper practical control of project funding.

4.3.5 Managing the Risk of an SOA Roadmap

When embarking on an SOA roadmap, the first action of the governance body should be to develop an initial *readiness and risk assessment*. The governance body should then periodically update this assessment during the development lifecycle. Figure 4.2, an

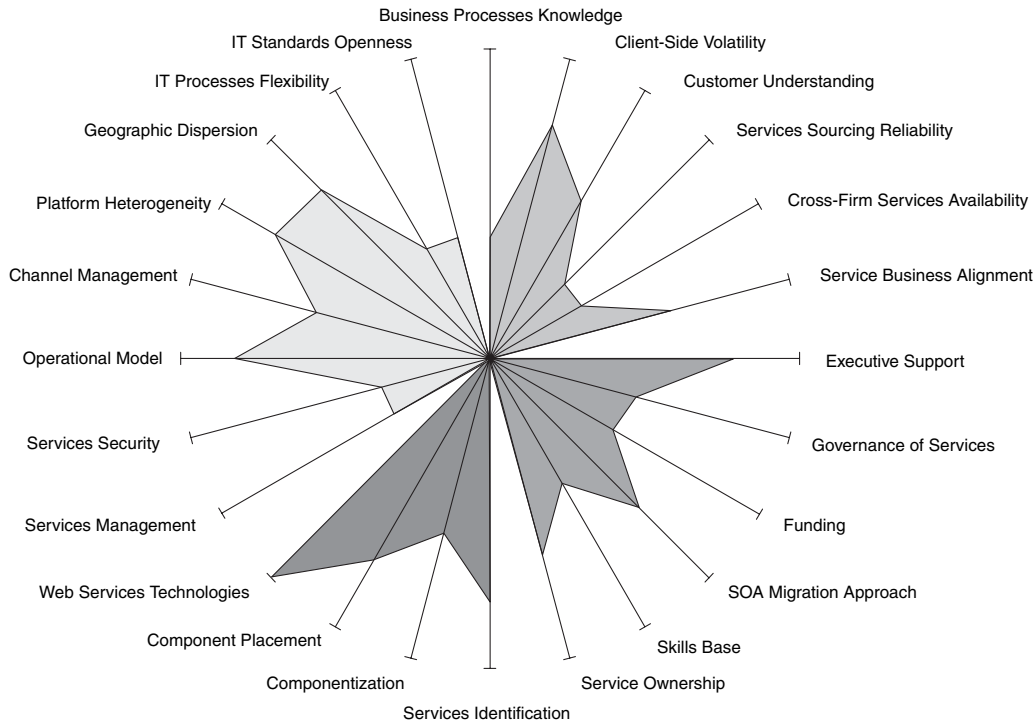


Figure 4.2 An SOA readiness and risk factor assessment.¹

example of this assessment, shows important aspects and criteria that need to be taken into account. The scale values and the specific criteria can be chosen based on the situation of the individual project. The goal of this assessment is to identify the business, organizational, and technical gaps and roadblocks between the current state of the enterprise and a future service-oriented business model.

This kind of assessment should balance the vision of the SOA-based solutions with the delivery capabilities of the IT department and should help establish specific a business case for the SOA for the organization. It includes both an evaluation of business readiness and one of IT readiness. It requires customer and partner understanding and determines if changes to the client's or partner's needs can be mapped to existing products or applications in a service-oriented fashion.

1. This was adopted from IBM internal SOA assessment practice and was modified by editors.

The assessment then suggests possible action plans, with focus on improving the less mature aspects of the enterprise relative to the SOA. As before, these improvements to develop the SOA should be executed in well-planned, incremental projects.

4.3.6 SOA Governance Processes

Governance processes are those needed for strategic business and IT planning and steering—for example, strategy development, IT technical planning, portfolio management, sourcing, innovation management, and architecture management. Any IT organization also needs processes that provide control. Depending on the size of the organization, these processes should be implemented at the appropriate level matching the size, from individuals to teams to departments or even larger. The following types of processes are essential for successful SOA adoption.

A business component identification and prioritization process:

- Defines a structured approach to model, identify, and prioritize business processes and services components.
- Provides formal definition of the business goals and key performance indicators that can be delivered by the architecture and implementation.

A business exception fallback process:

- Business process models can rarely be exhaustive. No one can preview each and every possibility that can happen in an enterprise. Therefore, there must be rules for exception handling that are set up and agreed to.
- This ensures that the concrete SOA solution architecture has to incorporate entry points that enable certain users or processes to bypass the normal, formalized processes and process exceptions. In a way, this gives another degree of flexibility for ad-hoc business process changes.

An architecture review and approval process:

- Defines a structured approach to review and approve changes to the existing SOA and to make decisions in accordance with the governance guidelines.
- Formal design and service evaluation reviews are key control points of SOA development for the installed governance units.

An architecture exception and appeals process:

- Provides means to appeal architectural decisions.
- Allows exceptions to the SOA architecture to meet unique business needs.

An architecture vitality process:

- Ensures that the SOA is maintained and communicated as new services are incorporated into the architecture.
- Variances to the architecture are documented and communicated.

An architecture communication process:

- Ensures that the SOA is available to all who need access.
- Promotes the understanding of the importance of the SOA.

Having outlined the process we now describe how to launch a governance model in practice.

4.3.7 Launching the Governance Model

The process we use to develop a governance model is a three-phased approach (see Figure 4.3). This *governance launch* model was adopted from Yvonne Balzer's developerWorks article "Improve your SOA project plans" and enhanced by the authors. The approach is based on time-constrained SOA engagements. The key to success is to begin to establish the governance functions from day one. To speed up this operation, you can launch the governance model in the following three steps:



Step 1: Operationalize

- Set the governance core functions in place, integrated with the enterprise's business operations.
- Perform the initial SOA assessment.
- Learn and adjust by doing by experiences and available assets, delivering quick results.
- This phase will need experienced practitioners.
- Define the next steps.

Step 2: Professionalize (Automate)

- Build up the necessary structures, processes, methods, and tools.
- Adapt experiences from the operational step.
- Initialize the service-oriented modeling and architecture practice.
- Gather experienced architects and method practitioners.

Step 3: Stabilize

- Teach and train the personnel to run the operation.
- Change from operations mode to coaching mode.
- Need to nurture coaching expertise.

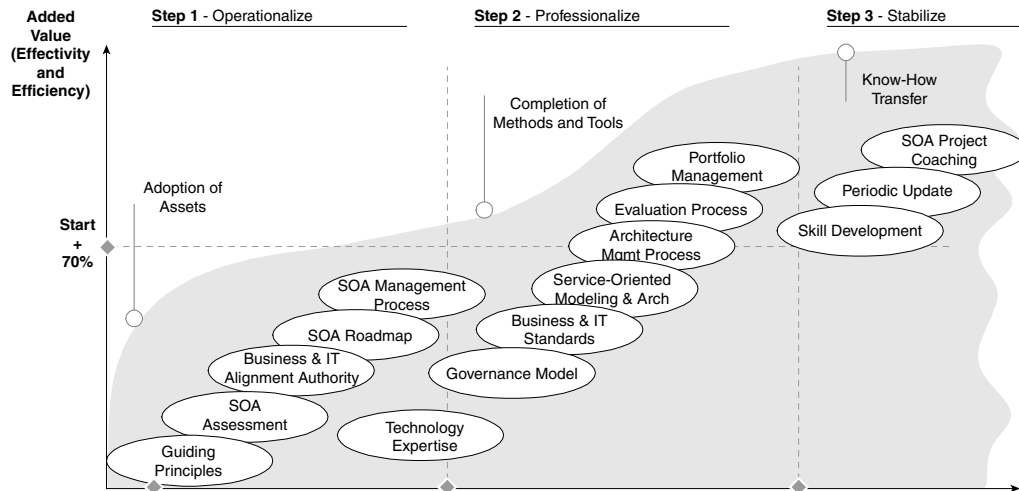


Figure 4.3 Launching the governance model.

4.3.8 Hints and Tips for Success

Even with strong governance, in the real world there are many roadblocks that prevent this type of evolution; thus, it is essential to build on solid ground. The following are some practical lessons we have learned from engagements:

- Set up rules and roles (discussed in Section 4.5) to organize and project-manage the SOA endeavor.
- Communicate regularly. SOA also involves corporate cultural change; therefore, to hurdle barriers, communication is critical, especially between lines of business and technology teams.
- Document each decision, constraint, and assumption to ensure transparency in decision-making and departmental buy-in.
- Define key deliverables and necessary toolsets or templates. These deliverables need to be readable by a variety of parties in the enterprise.
- Set up pragmatic tools for lifecycle management and versioning. Particularly see the discussion on long-lived business processes in Section 4.4.
- Assign a weight factor to each decision and then document and communicate those decisions and their weights.
- Continue to keep a strong sponsorship by all stakeholders and the buy-in of decision-makers.

4.4 SOA Technical Governance

With SOA, you can expect that business process cycles will be different from vendor product cycles. As a result, it is inevitable that, in the case of long-running or long-lived processes, you will need to support scenarios in which different versions of a business process exist concurrently on a changing infrastructure. Managing this challenge has implications throughout the project development lifecycle, not just for the runtime but also for the tools and methods used to define business processes within an enterprise.

You can manage the challenge of the dichotomy between business process cycles and product cycle by doing the following:

- Reducing the impact of changes by modularization
- Achieving middleware independence by defining the explicit process state
- Monitoring and handling business exceptions

Each of these topics is discussed in the following sections.

4.4.1 Reducing Impact by Modularization

Just as services can have different levels of granularity and permutations in the enterprise, processes also can have such granularity. This granularity appears when processes are designed as a composition of individual process modules. Each module offers a service interface and manages its own particular state internally. It then becomes much easier to change parts of the processes by developing new process modules that are selected from existing services using policies.

4.4.2 Achieving Middleware Independence with Explicit Process State

Current business process middleware engines maintain their process state internally. This dependency ties the process instances to the particular middleware engine, sometimes even to a particular version of the middleware. To avoid this, business process designers should elevate the explicit state beyond the engine level at each process step that leads to a waiting state until an external event arrives.

Thus, there is a need to be able to maintain and communicate state as distributed across the SOA. One particular programming model support for capturing these state descriptions is the set of specifications included in the WS-Resource Framework (as published on IBM developerWorks). These specifications allow the programmer to declare and implement the association between a Web service (a process module) and one or more identified, data-typed state components called *WS-Resources*.



4.4.3 Business Exceptions Monitoring and Handling

Even if the enterprise has spent a significant amount of time and effort to understand and model its business processes, undoubtedly unplanned business exceptions can still occur.