Chapter III introduced standards for Web service specification, such as WSDL and SOAP. With the use of such standards, Web service designers can model the functionality of a service in terms of inputs and outputs, thus allowing the consumers of the service to understand what to expect (and what not to expect) from the service, before actually using it. As we have said already, a Web service offers some well defined functionality to its consumers, which, however, due to the very essence of the Web service, has a rather focused and narrow scope. The reason is that, in general, we aim to develop Web services that are as much useful as possible for a wide range of consumers. Thus, the Web service becomes a reusable building block for something more complex such as a business service. It is unlikely that a business level service can be provided by a single Web service. Instead, a complex business service has to be layered on top of several Web services that coordinate with each other to deliver the business service. The capability for coordination however, is not unique to Web services. Business resources (people, activities, equipment, etc.)
must be coordinated to deliver processes (Dayal, Hsu, & Ladin, 2001). Business processes themselves must be coordinated within a single company or even across several companies, in order to deliver higher level business results such as the fulfillment of a supply chain.

Web services were conceived originally as stand-alone computing entities, thus the service standards discussed in Chapter III do not consider the aspect of coordinating collaborating services. However, these standards were soon augmented with new proposals about how Web services can coordinate with each to deliver complex functionality. Thus, this chapter aims to explain the following things:

- What is business process coordination and why it is needed?
- What is coordination at the Web services level and its different flavors such as orchestration and choreography?
- What languages and standards exist for Web services coordination?
- Present in more detail the most significant of these standards, namely the Business Process Execution Language for Web services (BPEL4WS, or BPEL for short).

**Business Process Automation**

*Business process automation* can be defined as the use of information technologies (more specifically business process management, workflow management, and enterprise integration software) to partially or fully automate the execution and management of business processes. Organizations strive to integrate and automate their business processes such as order processing, procurement, claims processing, inventory management, and administration in order to improve efficiency and speed to market (Ghalimi & McGoveran, 2004). The basis of business process automation is event/trigger-based synchronisation of business activities. When an activity starts, terminates, or ends abruptly due to an error/exception, an event needs to be generated to notify other activities that are potentially affected by the change of state in this activity. For example, the successful completion of a sales activity where a product has been sold to a customer needs to generate an event that will trigger a manufacturing activity/process to manufacture the sold product. The system(s) that coordinate such activities are the basis for business process automation and management. Increasingly, such systems are implemented using the technologies of Web services, as we shall see in the rest of this chapter.