3 Organizational Effectiveness of Information Systems

3.1 Introduction

Information technology (IT) and information systems (IS) are indispensable for organizations. Companies use enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), workflow packages, financial management packages, inventory management packages, and other systems. Information systems are becoming part of business. In order to develop business processes with IS in this ever-changing global economy, analysis and design of business processes should be undertaken with the effectiveness of information systems.

The common purpose of information systems methodologies is to analyze, design, and implement information systems suitable for business process. Methodologies use diagrammatic tools for business processes, such as data flow diagrams [2,11], data models [1,4,19,20], event-driven process chains [6,16], tools in unified modeling language (UML) [21], and others.

Dynamic properties like the lead time or inventory level of a business process are not contained in the product of such a methodology. Scheer [16] gave a complete data model for business process engineering, but the analysis of dynamic properties is still open.

Implementation of ERP has a similar problem. For example, in the material file of an ERP, the lead time for the production of a material should be entered manually by a materials requirements planning (MRP) controller based on past experience. The new business process with customized ERP is believed to have shorter lead time, but no one knows its accuracy.

The questions posed in this chapter are:

1. What organizational effectiveness can IS provide?
2. How are IS, business processes, and organizational goals interrelated?

The effectiveness of IS is becoming more and more important for companies to compete and survive. The basic function of IS is to provide data sharing. However, a conceptual basis on which the function of IS can be positioned in organizations is required. Because a business process is often formed across cor-
porate boundaries, the basis should also be applicable to virtual and global organizations that are made possible by IS. In the case of control engineering, the dynamic property of the object is analyzed, the desired property is set as a goal, and then a control device is designed to achieve the goal. For example, an electronic circuit is first described by differential equations. In order to get a stable and optimal response, a feedback mechanism is often used. The strength of the feedback is calculated based on the analysis, and finally, some electronic circuit implements the feedback. In the case of business processes, information systems like ERP are actually controllers of business processes. Figure 3.1 shows the situation.

Business transaction system is a model of business processes that uses IS [15]. It has a model file system and is a discrete-event system as a whole. Because it has a state transition mechanism, dynamic characteristics can be found [11].

To investigate the function of IS in organizations, this chapter employs the coordination theory of organizations originated by Mesarovic et al. [9] and Mesarovic and Takahara [8]. According to the recent development made by Takahara [18], the concept of the “task system” of organizational operation is introduced here. Because this chapter focuses on IS in business processes, a task transaction system that is a specific task system and is derived from a business transaction system is formulated. Then, using the coordination mechanism for a general task system, coordination variables and some coordinability conditions are specified that lead to a coordination organization. The concept of coordinability defined by the coordination organization provides us with an important relation between the function of IS and the organizational goal.

3.2 Model of Business Process: Business Transaction System

This section provides an explanation of the concept of business transaction systems that has been proposed as a model of business processes [11,15].

A business transaction system is a multicomponent discrete-event system with both static and dynamic structures. The static structure consists of activities and connecting queues of objects, which can be depicted as an activity interaction diagram (AID) that is isomorphic to a data flow diagram that has been used in many information methodologies [2]. The connecting queues are described as a