# Chapter 4.21
# Knowledge Integration

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## INTRODUCTION

In most organizations, specialized knowledge is dispersed over organization members (Tsoukas, 1996). Organization members have different educational backgrounds and working experiences and develop different perspectives. Yet, the development and production of complex goods and services normally requires the application of multiple disciplines and perspectives. Therefore, the integration of knowledge is an important task for managers and other organization members (Carlile, 2002; De Boer, Van den Bosch, & Volberda, 1999; Galunic & Rodan, 1998; Grant, 1996a, 1996b; Kogut & Zander, 1992; Okhuysen & Eisenhardt, 2002; Ravasi & Verona, 2000).

Knowledge integration has to be realized through the actions of the specialists involved, but knowledge management professionals can facilitate this task. Several mechanisms can be deployed to realize knowledge integration. An important question is what instrument is suited for what circumstances, for example, which knowledge integration mechanisms fit an exploration strategy and which mechanisms fit an exploitation strategy (March, 1991). If organizations do not explore, they can get stuck in a suboptimal or deteriorating situation. In contrast, if organizations do not exploit, they will have high costs and low incomes. Yet, exploitation and exploration require contrasting approaches to knowledge integration.

The next section presents the theoretical background on the topic of knowledge integration. Subsequently, we describe the knowledge integration mechanisms that can be found in the literature and basic conditions for the successful utilization of these mechanisms. We introduce a framework that distinguishes knowledge integra-

tion mechanisms, which can be used to assess the value of particular mechanisms for different situations. This framework is applied in a discussion of the knowledge integration approaches that are required for exploration and exploitation. The concluding section suggests directions for future research.

## BACKGROUND

Several disciplines have contributed to the study of knowledge integration. Economists and strategy theorists formulated the outlines of a knowledge-based view of the firm (Demsetz, 1991; Grant, 1996b; Galunic & Rodan, 1998; Kogut & Zander, 1992; Nelson & Winter, 1982; Teece, Pisano, & Shuen, 1997). They have built upon work in organization science, including the information processing perspective (Galbraith, 1973; Tushman & Nadler, 1978) and earlier work on the differentiation and integration of tasks (Lawrence & Lorsch, 1967; Thompson, 1967). Disconnected from those studies, social psychologists studied the effectiveness of knowledge integration under different conditions in experimental studies (e.g., Hollingshead, 1998; Stasser, Stewart, & Wittenbaum, 1995; Wegner, 1987). Combining insights from these disciplines, the problem of knowledge integration can be sketched as follows.

The development and production of complex goods and services requires a wide and expanding range of technological, marketing, and organizational knowledge (Demsetz, 1991; Grant, 1996a, 1996b; Tsoukas, 1996). For example, Ford not only needs a competency in road vehicles and engines, but in 15 other major technological fields as well, including chemical processing, metallurgy, semiconductors, and instruments and controls (Granstrand, Patel, & Pavitt, 1997). In addition to the breadth of knowledge involved, the depth of technologies—their analytical sophistication—also is increasing (Wang & Von Tunzelmann, 2000).

A single individual cannot have the breadth and depth of knowledge required for the development and production of most goods and services. Individuals have restricted learning capacities (Simon, 1991). Furthermore, due to the situatedness of learning processes (Lave & Wenger, 1991), individuals are only able to become experts in fields in which they are actively involved. Finally, learning processes are characterized by an increasing rate of return (Levinthal & March, 1993). That is, the more knowledge one has in a particular field, the easier it is to learn something new within that field. For these reasons, individuals have to specialize in a certain field in order to develop the level of expertise required. It is through the specialization of individuals in different fields, and hence the differentiation of knowledge, that an organization is able to acquire both the required breadth and depth of knowledge (Carlile, 2002; Marengo, 1993; Wegner, 1987).

When the knowledge required for innovation or production lies dispersed across individuals, departments, and organizations, a fundamental task for organization members and management is to integrate that knowledge. The differentiation of knowledge creates a need for knowledge integration. We define knowledge integration as "the process in which different pockets of knowledge, which are valuable for a particular organizational process and held by different organization members, are applied to that organizational process." As we will discuss next, this process can be realized through several mechanisms.

## KNOWLEDGE INTEGRATION MECHANISMS

Six different knowledge integration mechanisms can be found in the current literature: (1) sequencing, (2) decision support systems, (3) direction, (4) thinking along, (5) group problem-solving, and (6) knowledge transfer. These mechanisms can be used separately and in combination with each