Chapter Ten

COMPLEX SYSTEMS AND COLLECTIVE ADOPTION:
The Role of Networks and Partnerships as an Endogenous Mechanism to Reduce Dynamic Transaction Costs in the Context of Systemic Innovations

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1. INTRODUCTION

A systemic innovation is one whose value, or private and social "return on investment", depends on its adoption by a number of economic agents: for example, the adoption of the experimental method by the scientific community in the 19th century,1 quality standards, new inventory-management practices, and electronic data-interchange networks. Note that all these innovations facilitate either intellectual or logistical and physical coordination. In each case, the value of the innovation is therefore highly dependent in its collective adoption.

In a complex system, the collective adoption of an innovation can be extremely costly; this fact is expressed by the concept of "dynamic transaction costs". Dynamic transaction costs (DTCs) are the costs of persuading, negotiating, coordinating and teaching outside suppliers, clients or even rivals manufacturing the same kind of products (Langlois, 1992). When a large corporation wishes to adopt a just-in-time order and delivery system, it must have the support of all its suppliers, help them transform their organizational system, and so on. These are DTCs.

These costs can be so high that they actually hinder innovation (the collective adoption of a systemic innovation) and, in some cases, result in vertical integration (when the innovation concerned is particularly significant).

DTCs constitute a plausible rationale for vertical integration, especially in a context of frequent technological and organizational change. Silver (1984) contended that, rather than devoting effort to catching the attention of suppliers and distributors and converting them to new methods, the innovating firm may find it cheaper to acquire the capabilities necessary to
produce its own inputs. In other words, instead of incurring high DTCs, integrating multiple production stages may represent a superior organizational structure for coordinating systemic changes. When developing a mass-production system, for example, Henry Ford and his engineers were forced to develop certain special-purpose machinery themselves, as it would have cost more to have it made by outside suppliers (Langlois and Robertson, 1989).

The “flip side” of DTCs is constituted by dynamic governance costs: it may prove expensive to transform internal capabilities in order to adapt them to new standards or technologies when suitable capabilities are available on the market. For example, a company specializing in mechanics will not necessarily integrate electronics capabilities and skills if these already exist elsewhere.

To establish a link with the problem of networks, alliances and partnerships in innovation, DTCs must be endogenized. DTCs can be reduced, depending on the characteristics of the networks and partnerships of the industrial sector concerned.

We would argue that the historical importance and development of networks plays a role in reducing DTCs in an environment of systemic change, and that this, in turn, allows innovation to spread in a concerted manner. We therefore define a network as an institutional mechanism aimed at lowering DTCs in a context of systemic innovation. This definition will be illustrated by means of three case studies representing increasingly complex systems based on the varying centralized nature of decisions on innovation.

2. ABILITY OF A LARGE CORPORATION TO COORDINATE SYSTEMIC CHANGE

Here, the degree of complexity is still low, as the system is fairly centralized —for example, when a large corporation decides to have its subcontractors adopt an electronic data interchange network (David and Foray, 1994).

However, DTCs can be high if suppliers are not prepared (especially from an organizational point of view) for systemic change. In each case, the early establishment of a partnership between the initiating firm and its suppliers will make it possible to reduce DTCs endogenously.

For example, Kelley and Arora (1996) present the case of a group of leading companies (Xerox, Motorola, Kodak, Texas Instrument, Digital, Chrysler) that created a consortium for supplier training and established regional training centers dealing with quality control and cost-effective methods for small suppliers. Asheim and Isaksen (2000) discuss a policy instrument called “knowledge intensive industrial clustering”, developed in Limburg, the Netherlands, which aimed at supporting policy for upgrading a big company’s network of suppliers (in this case, Océ, a multinational copier