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Learning Capacity as an Industry Capability

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Abstract:

Industrial learning (i.e., interorganizational creation, diffusion and management of information assets) is portrayed as an industry capability which is differentially accessed by firms depending on their absorption capacity and relative bargaining power, both of which are determined by their complementary resources. IT enhances industrial learning by improving communication capabilities and optimizing incentive systems. IT also enables individual firms' appropriation and exploitation of industrial learning to the extent that it leverages complementary firm resources.

Introduction

According to the resource-based view, strategic advantage accrues from a firm's superior and inimitable resources (including capabilities). This view is used to portray industrial learning (the interorganizational creation, diffusion and management of information assets) as an industry capability that can be differentially accessed by firms depending on their absorptive capacity and relative bargaining power. Industry learning is conceptualized as having four dimensions: innovativeness, cooperation, communication, and measurement precision.

Information asset creation, diffusion and management are industry capabilities that confer competitive advantage to firms having more absorptive capacity and bargaining power resulting from their complementary resources. (Foss & Eriksen, 1995) IT ubiquity contributes to industrial learning by facilitating measurement precision and comparisons, by enabling collaborative innovation and the diffusion and management of this innovation between individual workers and among firms in an industry. IT enhances firms' competitiveness to the extent that it leverages their complementary resources, thereby conferring superior absorptive capacity and bargaining power.

Breitschneider & Wittmer (1993) show that the rate at which a firm adopts micro computer technology varies depending on the sector within which it operates. Bobrowski & Breitschneider (1994) attribute these differential diffusion rates to an industry's inherent density of communication channel linkages and to the cooperative interorganizational relationships that result.

Learning industries, i.e., those characterized by experimentation with diverse ideas and by rapid feedback as to experimental results, seem to be the most innovative, most dynamic (Foss & Eriksen, 1995). Perhaps learning firms that comprise them are more competitive. "The firm's competitive advantage rests with its ability to 'out-learn competitors'" (Leonard-Barton, 1992:32, in Sitkin, et.al. , 1994:550). "A particularly strong statement of this is Senge's (1990) comment that 'the only enduring source of competitive advantage is the ability to learn' " (Levinthal, 1995:22). This dynamic diversity, this innovativeness, helps assure effective positioning in an uncertain environment (Sitkin, Sutcliffe and Schroeder, 1994).

The next section presents such industry innovativeness as an enhancer of organizational efficiency and effectiveness, to the extent that individual firms possess complementary resources, which determine firms' absorptive capacity, as well as bargaining power in appropriating industry learning. The third section considers communication and cooperation as components of industrial learning, and discusses their facilitation by IT. The fourth section discusses measurement precision's contribution to innovativeness, communication and cooperation.

Innovativeness

Perhaps learning industries are more efficient and more diverse. Following a "population ecology of ideas" rationale, one can surmise that firms' selection of the fittest ideas from a maximally diverse and innovative "industry idea pool" will evolve an industries to the most efficient, most effective technologies for given environmental contingencies. An alternate analogy is Churchman, et.al.'s (1957) generic conceptualization of "the problem" as being the difference between a problem-solver's wants and her environment's capacity to provide for those wants. The problem solution then involves the evaluation and choice from among her set of alternatives (Preston, 1991). The more diverse and complete the alternative set, the more optimal the problem solution, given any environmental context.

Industrial learning can thus be construed as an industry capability, a network externality that improves an individual member firm's competitiveness to the extent that the firm is able to exploit it to improve efficiency, raise entry barriers and eventually appropriate rents from it (Foss & Eriksen, 1995). This differential appropriation and exploitation depend on a firm's complementary resources, e.g., competence of its R&D staff, competence of its management, its existing knowledge (tacit and explicit) base, its market share, its history, its culture, its geography, its relationships, etc.

Industry learning capacity can also be seen as a liability, in that strategic advantage in this dynamic environment is fleeting, as new and better ideas quickly dissipate across organization borders, and a firm becomes unable to control its innovation. This diffusion allows competition, which soon shifts the innovation from a strategic advantage to a "strategic necessity," as the innovator and its competitors bid away the profits. Customers consequently appropriate most of the benefits. (Clemons & Row, 1991; Hitt &Brynjolfsson, 1996) But, the diffusion of efficiency-enhancing innovation across firm borders to strategic partners, or to otherwise benevolent firms in the value chain, may also enhance the entire value chain's efficiency, and thus confer indirect benefits to the original innovative firm.

One could use the cooperative game theoretic concept of Shapley values when modeling how firms divide among themselves this "shared good." A firm's Shapley value is the product of its probability of inclusion in any given coalition and its contribution to each potential coalition. Firms having greater complementary assets and capabilities are able to contribute more (compared to other industry members), and are thus more likely to be included in coalitions and projects. They also have higher reservation points, or better alternative uses for their capabilities and resources and will consequently wield more bargaining power as measured by higher Shapley values. As they have more bargaining power and more "absorptive capacity", these firms will be likely to also command a larger share of the industry's knowledge. Thus, one could propose that these firms having more complementary assets (enhanced by IT) would be more efficient and effective.

Communication and Cooperation

Communication and cooperative industry norms are synergistic as enablers of industrial learning, i.e., communication facilitates cooperation, which further improves communication, etc. IT ubiquity enhances both. Gurbaxni and Whang (1991) say, "Modern IT . . . facilitates tighter interfirm links through information sharing and mutual monitoring." Clemons and Row (1992) suggest that IT has the effect of reducing the risk associated with the opportunism of a firm's trading partners, e.g., shirking, loss of resource control, *ex post* contract renegotiation, etc. This is due to IT's supplying the means for improved contract performance monitoring, for expedient payoff calculations, and its enablement of a firm's organizational memory.

This risk decrease shifts a firm's temporal horizon from finite to infinite, as illustrated by the prisoners' dilemma game. This device gets its name from the story: two conspirators were arrested and interrogated separately. Each was offered a plea bargain: if he would implicate his partner, and his partner didn't implicate him, he would go free, while his partner would spend ten years in prison. If he refused to implicate his partner, and his partner implicated him, he would spend ten years in prison, while his partner went free. If both refused to implicate the other, they would each serve one year in prison on trumped-up charges, and if each "copped a plea", both would spend five years in prison. Therefore, the best strategy for each to follow in a finite, i.e., one-shot game, is to fink on his partner (each will serve five years in prison). The infinite game version is one in which each partner plans to continue his partnership with the other, and if this relationship should end, it will be a surprise to both, as both will be worse off. Each, therefore is confident the other won't fink, and in the infinite game Nash equilibrium, both cooperate (each will spend one year in prison--as opposed to five, in the finite game).

IT encourages an infinite horizon, by enabling an organizational memory that transcends individuals' tenures with individual firms. Firms' reputations are maintained in the corporate memory. Thus, firms have an incentive to cooperate, in that trading partners will know their past behavior--i.e., do they cooperate or fink? IT also enables mutual monitoring of performance, so for instance, shirking (i.e., finking) can more surely and more quickly be punished. Payoffs may also be calculated more expediently, enabling more transparent strategy sets.

Cooperation and communication enhance industry innovativeness, in that they enable and expedite the interorganizational initiation, adoption, adaptation, acceptance, use and incorporation of information assets. Cooperation and communication also enable the development of, and standardization to, communication and measurement standards.

Measurement Precision

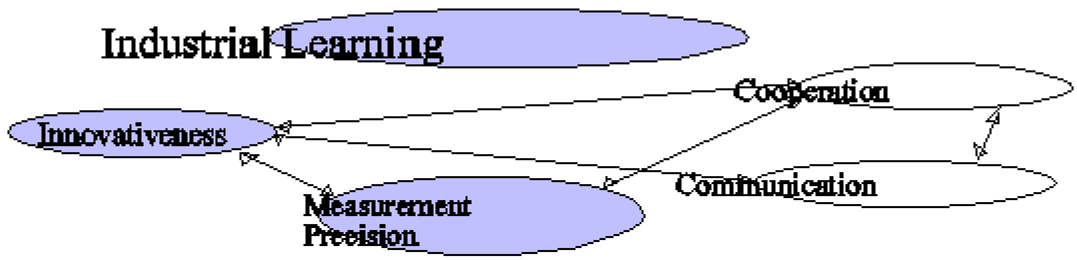
Mutual monitoring is further IT-enabled by measurement precision. Precise measurements allow actual performance to be measured, compared against expected or promised performance, and recorded in organization memory. This lessens the risk of opportunism by a trading partner, and thus improves the efficiency of inter-organizational incentive systems in the creation, diffusion and management of information assets.

Measurement precision enhances the creation of information assets, by enabling accurate monitoring and comparison of experimental feedback. It thus diminishes causal ambiguity, decreasing "information stickiness", knowledge tacitness or idiosyncracy to the extent that measurement systems provide precise, objective, universally understandable metrics with which to communicate.

Shapiro stressed the importance of universally comparable metrics in ". . . contrasting facility, process and product sustaining costs among the plants" (1995:11) in the application of activity-based costing methods to optimize such supply value chain decisions as "Which products, at what levels, should be manufactured at what facilities, using which resources and processes, to minimize total supply chain cost, or maximize supply chain net revenues over medium and long term planning horizons?" (1995:4)

Agency problems are also reduced to the extent that measurement precision lessens causal ambiguity, and to the extent that incentive systems aligned with partnership goal structures cause participants to view the partnership as an infinite game when each participant's payoff is maximized in the partnership. Thus each believes the relationship won't be unilaterally ended--i.e., the partners won't "fink." "One executive's statement sums it up: 'Why do I think it will last? Because we both have something to gain' " (Henderson, 1990: 10).

Measurement precision thus enhances innovativeness by providing the means for firms and individuals to better measure, record, compare and communicate experimental results. Measurement precision also enhances communication & cooperation as it provides the means for firms to communicate experimental results and aligns incentive systems to make firms more willing to cooperate in the creation and diffusion of information assets.



Conclusion Industries differ in the rate with which information assets are created, diffused and managed among constituent firms, i.e. in their rate of industrial learning. More optimal incentive systems and dense communication linkages will enhance innovativeness, communication, cooperation and measurement precision, four dimensions theoretically comprising "industrial learning". How effectively individual firms within an industry contribute to, and use, industrial learning depends upon the complementarity of their resources with those of the industry. This complementarity is enhanced by IT.

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