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Prisoner's Dilemma and the Tower of Babel

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Introduction

The modern business paradigm, like the Tower of Babel, is being transformed by information technology-enabled communication capability, from one of competition to one of cooperation. This is illustrated by Miller, Roth and Kim's (1992) report, in which they compare and contrast the Boston University Manufacturing Futures Survey's results from its inception in 1981 with those throughout the 1980's and the most recent in 1990.

The survey was administered to approximately 200 American manufacturing executives, who in it ranked the importance of strategic manufacturing capabilities and the initiatives their firms are undertaking. The authors' results thus give a cross-sectional view of manufacturing priorities and initiatives, their evolution through the 1980's, and the respondents' projections of such into the 1990's.

The authors report a shift in manufacturing response patterns from restructuring (i.e., downsizing, plant closure, plant relocation, workforce reductions, product standardization) and process improvement and product improvement in the 1980's, to the response pattern characterized by the authors as "integrative". This integrative pattern includes initiatives such as :

- 1) constructing measures that are congruent with business strategy,
- 2) using interfunctional teams to span functional barriers,
- 3) sharing goals through the entire hierarchy,
- 4) training supervisors and workers, and
- 5) enhancing organizational learning through knowledge transfer.

I contend that this paradigm shift is partly due to the ubiquitous integration of information technology (IT) into all facets of the business environment. The Tower of Babel is an apt metaphor for the modern IT-enabled business paradigm shift, in that communication capability enabled cooperation in the Tower's construction. The Tower's destruction was due to lack of communication. Likewise, business effectiveness and efficiency are enabled through cooperation, which depends on communication capability.

Economic Theory

Gurbaxni and Whang (1991) say, "Modern IT...has the potential to reduce market transaction costs related to contracting, since it facilitates tighter interfirm links through

information sharing and mutual monitoring." Clemons and Row (1992) suggest that IT has the effect of reducing not only the coordination cost component of transaction costs, but also the transaction risk component, i.e., the risk associated with the opportunism of a firm's trading partners, e.g., shirking, loss of resource control, ex post contract re-negotiation. This is because IT provides the mechanism for improved monitoring of contract performance, and serves as the firm's organizational memory.

Prisoner's Dilemma

I contend this decreased transaction risk has the effect of shifting a finite prisoner's dilemma game to an infinite game. This device gets its name from the story: two conspirators were arrested and interrogated separately by the police. Each was offered a plea bargain: if he would implicate his co-conspirator (i.e., "fink"), and his co-conspirator did not implicate him (i.e., "cooperate"), he would go free. If he refused to implicate his co-conspirator ("cooperate"), and his co-conspirator implicated him ("fink"), he would spend ten years in prison. If both conspirators refused to implicate the other ("cooperate"), they would each serve one year in prison, and if each implicated the other ("fink"), each would spend five years in prison. Therefore, the best strategy for each to follow--the Nash equilibrium (neither has an incentive to unilaterally change his strategy)--in a finite, i.e., one-shot game, is to "fink" on his partner (each will serve five years in prison).

	Fink	Cooperate
Fink	5, 5	0, 10
Cooperate	10, 0	1, 1

The infinite game version is one in which each business partner plans to continue doing business with the other, and if this relationship should end, it will be a surprise to both, and both will be worse off. Each, therefore is confident the other won't fink. Hence, in the Nash equilibrium, both "cooperate" (each will spend one year in prison--as opposed to five, in the finite game).

IT encourages an infinite horizon, in that it enables 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. Therefore, shirking (i.e., "finking") can more likely be punished, possibly using a "tit for tat" strategy in which a trading partner "cooperates" until he catches his trading partner "finking", after which he "finks" until the partner begins to "cooperate". A more draconian, although realistic, strategy is called "grim", in which a partner "cooperates" until his partner "finks", at which point his strategy becomes "fink forever". This would be analogical to doing business with a firm until it is found to be cheating, at which time its trading partner ceases all business with it--forever.

Cooperation

Malone, Yates and Benjamin (1987) discuss the intermediate formation of electronic hierarchies, in which a smaller set of vendors is more closely tied to producers by information technology. The fact that they depend upon one another more, and intend to continue doing business with one another in the future, makes it reasonable for them to invest in relation-specific assets and non-contractable services like quality, reduced cycle time and innovation. This trend, combined with a trend toward increased outsourcing, has been identified by Clemons and Row (1993) as the "Move to the Middle" hypothesis.

Bakos and Brynjolfsson (1993) attribute this establishment of closer relationships with a smaller set of suppliers to the improved profitability accruing from suppliers' investments in "noncontractibles". Suppliers would normally be unwilling to invest in "noncontractibles"--due to transaction risk that their customers will appropriate advantage, without paying them for their additional investment. To signal their intention not to fink, producers limit the set of suppliers, thus improving the suppliers' bargaining positions with respect to profit allocation, and guaranteeing adequate return on suppliers' investment. Fewer suppliers can thus bargain for a larger piece of a larger pie.

Applications

Clemons and Row (1993) use a different approach, when writing of limits to interfirm cooperation. They portray the game as a finite prisoners' dilemma played by two suppliers, each of whom will fink every time, which is to the retailer's advantage.

My point is that the supplier should be forming a strategic alliance with his customer, in which they both win. In this infinite game, neither player has an incentive to unilaterally fink, because he would be worse off. Rather than using Clemons and Row's (1993) example of a retailer playing two soap manufacturers against one another, I would use the example of a small soft drink bottler entering an alliance with a retailer, as described in *The Wall Street Journal* (March 3, 1994). The manufacturer bottles the soft drink under the retailer's brand, and passes along a larger margin to the retailer (in this case 20%, as compared to Coke and Pepsi's maximum of 5%), who in turn provides preferential shelf space, advertising, competitive information, and promotion assistance.

Each participant is better off in this arrangement than in any other. Participants would have a continuing relationship, trust, partnership. They would be able to negotiate "non-contractibles" that arise. Pepsi and Coke, according to this article, were finding it difficult to compete. This is similar to McKesson's Economost system in which McKesson allied itself strategically with its independent pharmacy customers to improve its customers' competitive positions--and thereby assure its own continued survival and growth. (Johnston & Lawrence, 1988)

Several other examples are cropping up--Merck's acquisition of Medco, and Lilly's acquisition of PCS will allow these companies to get closer to their customers. The infant formula industry is beginning to advertise directly to new parents. Drug manufacturers are also beginning to advertise directly to patients, telling customers, "Ask your doctor if [our drug] can help you." These companies are increasingly integrating their value

chains, forming partnerships with their customers, in addition to relying on others in the distribution channels.

Intra-firm Integration

This discussion has an intra-firm parallel, also, to which all five of Miller, et.al.'s integrative initiatives are relevant. Rockart & Short say that "...IT's most important role is allowing firms to manage organizational interdependence...to achieve concurrence of effort along multiple dimensions of the organization."(1989:7)

This concept of organizational interdependence is included in Henderson's discussion of strategic partnership, which he defines as, "...a working relationship that reflects a long-term commitment, a sense of mutual cooperation, shared risk and benefits, and other qualities consistent with concepts and theories of participatory decision making."(1990:8) This is relevant to the goal sharing and strategy-congruent measure construction initiatives, in that an incentive system aligned with the partnership goal structure causes the participants to view the partnership as an infinite game. This is because each of their "payoffs" are maximized in the partnership, causing each to believe 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, 1990:17)

Henderson concludes with the point that partnerships are not always the most appropriate relationships--that transaction-type relationships are sometimes preferable. Transaction relationships could be construed as finite games, as opposed to the infinite game partnerships. The important thing is to know the difference, as the strategies (and payoffs!) are very different." All agreed that an inherently bad and surprisingly common situation is to believe a partnership exists when, in fact, the relationship is a transaction." (Henderson 1990:17) The prisoner's dilemma analogy is "cooperating" when one's opponent is "finking".

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