



Electronic Commerce and Knowledge Economics, Trust and Co-opetition in a Global Business Environment

By Elias Carayannis and Jeffrey Alexander

Elias Carayannis, PhD
 Email: caraye@gwis2.circ.gwu.edu
 Management of Science, Technology and Innovation,
 School of Business and Public Management,
 The George Washington University,
 Washington, DC 20052,

Jeffrey Alexander, VP
 Washington CORE:
 International Technology and Policy Consultants
 Bethesda, MD 20814

Abstract

Numerous authors are moving away from traditional ideas about the basis of firms' competitive advantages, such as superior strategic formulation by top managers, and towards a view which emphasizes the internal "resources" of the firm (see, for example, Barney, 1990). Recent works focus in particular on knowledge creation (Nonaka and Takeuchi, 1995) as the source of a given firm's unique and inimitable advantage. To be more specific, the firm's advantage is a function of the specialized knowledge held by its employees, the ability of the firm's management and other organizational routines to access that knowledge, and the integration of that knowledge into action (Grant, 1996).

We focus on the significance of knowledge economics and co-opetitive dynamics in understanding the role and potential of electronic commerce in an increasingly globalized and electronically based economy.

1. Knowledge Economics in a Post-Capitalist Global Economy

"Knowledge remains an infuriatingly vague subject to write about - let alone sell. Telling a reasonably effective company that it should focus on "knowledge creation" is rather like telling an orchestra that it should concentrate on "music making"."
 The Economist, 1997

On the macroeconomic scale, knowledge is also the focus of analysis of the "new" dynamics of the global economy. In an era of globalized, highly-mobile financial capital, multinational corporations can essentially "arbitrage" across national borders to find the best firms to integrate into their mode of production. Reich (1991) writes that in the new "global web" of enterprise, "power and wealth flow to groups that have accumulated the most valuable skills in problem-solving, problem-identifying, and strategic brokering" (Reich, 1991: 111). Drucker (1991) claims that this globalization of enterprise and economic transactions is transforming the world economy from capitalism to a "post-capitalist society."

1.1. Capitalism and post-capitalism

"Our plan is to lead the public with new products rather than ask them what kind of products they want. The public

does not know what is possible, but we do. So instead of doing a lot of market research, we refine our thinking on a product and its use and try to create a market for it by educating and communicating with the public."

Akio Morita, Chairman, Sony Corporation

In a capitalist society, wealth flows to those who control the flow of financial capital. In the early days of manufacturing, the capital requirements of production facilities were modest, allowing the accumulation of physical capital to be financed internally by the increased production afforded by factory methods (Rosenberg and Birdzell, 1985: 166).

But as the technologies of production grew more sophisticated and their resource demands increased, economies of scale emerged. This placed greater emphasis on the ability of enterprises to access financial capital. Also, as noted by Chandler (1977), the rise of an entirely new class of industry, namely communications and transportation firms, required distributed facilities and closely-coordinated. Since financial capital is now widely available across the development of these enterprises. The development of public capital markets increased the range of tools and the breadth of skills which managers could use to acquire financing. This has led to the rise of financial markets of such tremendous sophistication that humans can navigate these environments only with the aid of computers. In turn, managers are concerned that their actions are now dictated by financial forces beyond their control; they are no longer able to channel financial capital, but instead are beholden to its demands.

In post-capitalist economics, wealth flows not to those who control financial capital, but to those who can acquire and direct intellectual capital. Since financial capital is now widely available across the world, effective money management is only one skill necessary to the success of firms. The increased velocity of commerce (especially electronic commerce) and competition demands multi-faceted expertise from a firm. In fact, the changes in the world economy are placing requirements of skills and resources that often exceed those of a single enterprise, necessitating the formation of multiple alliances to ensure that the members of each alliance can marshal the intellectual capabilities to deal with the complexities of their environment. Only through the judicious and experienced application of knowledge can firms hope to outperform their counterparts and achieve sustained competitive advantages.

The post-capitalist knowledge-based economy operates with dynamics which differ radically from those assumed by neo-classical economics. First, unlike other forms of capital, intellectual capital is not only unevenly distributed, but it tends to grow without physical limits. A firm which captures and exercises unique knowledge capabilities will tend to attract more expert employees, thus exhibiting "increasing returns to scale." According to Arthur (1996), this dynamic leads to a new form of economics, namely knowledge economics, that is very different from traditional, process-oriented economics. He notes that "they call for different management techniques, strategies, and codes of government regulation" (Arthur, 1996: 101).

Second, in traditional economics, free markets are the purest form of economic organization, and competition between diverse enterprises provides the "invisible hand" which Adam Smith (1776) claimed would guide market participants to mutual gains through trade. However, free market efficiency is predicated on numerous stylized assumptions, including perfect information symmetry provided by price signals. We now know that prices do not perfectly capture all information relevant to a transaction, leading in some cases to the use of bureaucratic organizations to conduct transactions (Williamson, 1985). Since information is often not distributed symmetrically, knowledge (which is based upon information) is also concentrated unevenly. Therefore, in knowledge-based markets, pure competition may not result in the most efficient solution. A direct corollary is that while a lack of competition is assumed to be a market failure in traditional economics, it may be an optimal solution in certain situations in knowledge-based economics.

Third, the forms of organization in knowledge-based economies differ from those in traditional markets. Chandler (1977) shows how mass production and mass distribution required a level of coordination best handled by bureaucratic mechanisms within the firm. Transaction cost economics, as described in Williamson (1985), suggests that the "visible hand of management," in Chandler's terminology, will supersede the invisible hand of the market when the dimensions of the transactions, such as asset specificity, transaction duration or recurrence, complexity, and measurement problems, create a situation where internal coordination and control can govern those transactions more efficiently than market mechanisms (Milgrom and Roberts, 1992: 30).

A key assumption of transaction cost economics is that individual opportunism will require coercive control and monitoring to ensure economic efficiency in such transactions (Ghoshal and Moran, 1996). If opportunism is not assumed in all cases, or if opportunism is exercised along a continuum instead of assumed as an absolute, it is possible for other forms of organization to emerge, including internal markets (Halal, 1996) and hybrid organizations.

1. Electronic Commerce Key Issues, Policies, and Realities:

>center> *"What's my ROI on e-commerce? Are you crazy? This is Columbus in the New World. What was his ROI?"*
 Andy Grove, Chairman, Intel Corporation

In its 1993 Agenda for Action and its 1995 Agenda for Cooperation, the Clinton Administration laid out its vision of the issues involved in promoting the spread and use of the National Information Infrastructure (NII) and the Global Information Infrastructure (GII). In July 1997, the Administration plans to release another landmark report titled "A Framework for Global Electronic Commerce", that will outline the key domestic and international policies that will allow the Internet to develop and extend throughout the world at the core of NII and GI.

The five key principles of the upcoming report are:

- a. The private sector should lead in the development of NII and GI.
- b. Governments should avoid undue restrictions on electronic commerce.
- c. Where a governmental involvement is needed, its aim should be to support and enforce a predictable, minimalist, consistent and simple legal environment for commerce.
- d. Governments should recognize the unique qualities of the Internet.
- e. Electronic commerce over the Internet should be facilitated on an international basis.

Furthermore, the report focuses on nine areas where international agreements and/or guidelines could facilitate the growth of electronic commerce by creating a predictable, market-oriented commercial framework:

- a. financial issues
 - i. customs and taxation
 - ii. electronic payment systems
- b. legal issues
 - iii. uniform commercial code for electronic commerce
 - iv. intellectual property protection
 - v. privacy
 - vi. security
- c. market access issues
 - vii. telecommunications infrastructure and interoperability
 - viii. content
 - ix. technical standards

Beyond the policy-making level, three key issues that will determine the long term viability of electronic commerce are:

- a. technological feasibility: the extent to which technology -- bandwidth availability and information reliability, tractability, and security -- will be able to sustain exponentially increasing demands worldwide.
- b. socio-cultural acceptability: the extent to which different cultures and ways of doing business worldwide will accommodate this new mode of transacting in terms of its nature (not face-to-face), speed, asynchronicity, and unidimensionality of transactions.
- c. business profitability: the extent to which this new way of doing business will allow for profit margins to exist at all: no intermediaries, instant access to sellers, global reach of buyers. It is of course too early to pass

judgment on any of these points: the technology is truly very young and also expanding so quickly that technology maturation is proceeding very slowly (Carayannis, 1996).

Moreover, the significance of privacy, security, and intellectual property rights protection as predicates for the successful diffusion, adoption, and commercial success of internet-related technologies both for the US and worldwide, especially in places with less democratic political institutions and free-market economies, is continually increasing.

The differentiation between the internet as a global network of computer networks and the intranets, corporate-based computer networks that are protected by "firewalls" and involve well-defined communities as potentially more promising technology platforms for fostering internet-related commerce (Intranet commerce has surpassed Internet commerce in terms of revenue and already more than half of the Web sites worldwide are commercial in nature). Strategic alliances such as the alliance of Cybercash with Netscape to post Cybercash's electronic wallet on the internet for using its electronic money or "cheets" to facilitate electronic commerce. More than 100 banks are supporting this technology and its users can have moneys deducted from their accounts automatically while the security of the transactions is guaranteed.

Entry of new competitors such as the cyber market set up by Federal Express to allow commercial cyber-transactions: Fedex believes it is in the business of hauling information not just traditional mail packages. The industry has defined e-commerce too narrowly: many consumers reach a decision to buy on the Web and then buy using some other route (The Economist, 1997).

The online leaders are not the traditional commercial giants of the physical world, but outsiders who often had no prior experience about the markets they chose to enter (eg: Amazon.com).

Areas of business endeavor where electronic commerce matters (The Economist, 1997):

1. Financial services
2. Sex
3. Travel
4. Retailing
5. Music
6. Cars (Auto-by-tel)
7. Advertising & Marketing
8. Books (Amazon.com)
9. Business-to-Business commerce
10. Business-to-Government commerce

General Electric is doing \$1 billion annually with 1,400 of its suppliers through its Trading Process Network (TPN) Web site and has thus lowered the cost of business between 5 and 20% with 15% of the orders going abroad. With \$30 billion annual purchases, GE "can use its purchasing power to pull entire industries into electronic commerce" (The Economist, 1997).

1.1. Issues of Security and Trust Affecting Electronic Commerce: Internet Thief Apprehended

A computer cracker who broke into a San Diego Internet service provider's computer and stole 100,000 credit card numbers has been nabbed. The thief used a "packet sniffer" program to gather the information from a dozen companies selling products over the Internet, and was arrested as he tried to peddle them to an undercover FBI agent for \$260,000. "What is unique about this case is that this individual was able to hack into this third party, copy this information and encrypt it to be sold," says a Bureau spokesman. The cracker was using an account at the University of California at San Francisco, although authorities have not determined whether he is affiliated with the university.
(New York Times 23 May 97)

Concerns about security and privacy are significant factors affecting the spreading and growth of electronic commerce as all entities involved are treading technological virgin terrains. Recently, a small Danish start-up announced that all Netscape browsers had a "bug" that could allow a "hacker" to read the information on the hard drive of a computer

"surfing" the WWW even if it were behind a protective "firewall" (CNN, 6/21/97).

At the same time, James Barksdale of Netscape contends that "I don't know of a dime that has been lost over the internet" (The Economist, 1997), while Visa and Mastercard are working together to on developing Secure Electronic Transaction (SET) technology that could make credit cards safer on the Internet than in the physical world. The uncertainty and risk involved highlight the strategic preponderance of well established brands (such as Visa) in gaining widespread consumer acceptance and trust (ibid).

2. Game Theory, Co-Opetition, Strategic Inflexion Points and Strategic Capability Options

"You can not overtake the runner in front of you by following in his footsteps."

Mao tse-Tung

The essence of firm is the set of relationships among its stakeholders and between itself and and other firms.... The most important objectives of commercial relationships are cooperation (the joint activity toward a shared goal), coordination (the need for mutually consistent responses), and differentiation (the avoidance of mutually incompatible activities).

Game theory is a helpful way of describing these relationships. So although the discussion of cooperation begins from the familiar business problem of achieving success in a joint venture, we go on to explain how that issue can be described by the most famous of all games - the Prisoner's Dilemma.

The objectives of coordination and differentiation are represented by the Battle of the Sexes and the Game of Chicken, respectively. I also describe the paradox of commitment - how it is possible to gain by limiting one's own options." (Kay, 1995).

By taking a game theory approach to strategy, Brandenburger and Nalebuff (1996) derive one alternative to pure competition as the basis for interfirm relations. They begin by noting that the concept of rationality, which underpins both traditional economics and the "bounded rationality" of transaction cost economics, is never absolute. For example, "two people can both be rational and yet evaluate the same outcome quite differently" (p. 60). They discuss the concept of allocentrism: evaluating a multi-player game from the points of view of all the players. Brandenburger and Nalebuff (1996: 39) describe co-opetition as "a duality in every relationship -- the simultaneous elements of cooperation and competition. War and peace. Co-opetition."

Instead of viewing all players as competitors, this approach can reveal that some opponents are in fact 'complementors,' who may add value to others. By focusing on turning apparent zero-sum situations into positive-sum games, Brandenburger and Nalebuff argue that firms should pursue a strategy of 'co-opetition,' combining cooperation and competition depending on the exact situation to achieve the greatest gainsharing among all players. Co-opetition is exercised through the formation of "value nets," where the firm interacts with suppliers, customers, competitors and complementors to maximize its own added value, in turn raising the returns to the other players in the net.

Co-opeting occurs when you collaborate with your rivals and compete with your partners in pursuit of "win-win" market players / stakeholders configurations (Carayannis, 1997).

Cooperation vs. Coordination:

There is a need for cooperation - to encourage individual persons to pursue a common goal against the contrary pressures of their own interests. There is also the problem of coordination. It often is important to that everyone do the same thing, even though precisely what it is that everyone does is not important at all. But there is also a need for differentiation. Although all different aspects of an activity need to be covered by an organization, if all firms in a market adopt similar strategies, the outcome is unlikely to be profitable for any of them. (Kay, 1995). Strategic Inflexion Points:

In an industry, a strategic inflexion point is when the balance of forces shifts from the old structure, from the old ways

of doing business and the old ways of competing to the new.

Before the strategic inflection point, the industry simply was more like the old. After it, it is more like the new. It is a point where the curve has subtly but profoundly changed, never to change back again.

It is very difficult to tell when an strategic inflection point occurs even in retrospect. And it is even harder to tell while going through one. People who experience one develop a sense of it being an inflection point at different times. (Grove, 1995).

Strategic Technological Capability Options:

The concept of creating strategic technological capability options implies that by investing in given technologies, firms create opportunities or 'options' for themselves, to make still additional investments in the future.

The idea is more commonly understood in terms of "staying on the learning curve": machine tool companies that adopted numerically-controlled production technology in the early 1970's, found it easier to switch to integrated computer-based manufacturing a decade later ... these firms developed capability options, which could be "exercised" to reduce the cost of adopting subsequent, more advanced technology vintages.

In this context, the capabilities developed in the first technology transition facilitated a subsequent transition to the more advanced technology. This implies that part of the benefit the original investment was the capability to work with automated processing equipment, a capability that translated more easily into the adoption of CIM technology in the 1980's (Carayannis, Preston, & Awerbuch, 1996).

3. Trust and economic transactions

Another focus of the recent economic analysis is the concept of trust. The rise of modern managerial capitalism from the old regime of family enterprise is viewed as a watershed in the move from craft production to mass production. These new companies were able to replace family ties with purely economic loyalties. Many economic historians argue that "how these loyalties were created...we cannot know for sure" (Rosenberg and Birdzell, 1985: 124). One possibility is that these firms grew from military units who developed mutual loyalty in battle (Rosenberg and Birdzell, 1985: 125). But larger social forces seem to be at work to lead to the rise of entire economic systems based on economic loyalty. In particular, economists are now exploring the idea of "social capital," the ability of people to cooperate towards a common goal beyond purely financial motives. To form and lead the kinds of hybrid, cooperative organizational forms described above, companies must command substantial social capital. Clearly, just as knowledge is the lever of intellectual capital, trust is the lever of social capital. Fukuyama (1995) defines trust as "the expectation that arises within a shared norms, on the part of other members of that community" (p.26). He attributes the development of shared norms to social activities such as religion. Thus, the economic development of various societies is the result of social development which determines whether a given society is "high-trust" (such as the United States) or "low-trust" (such as China), with high-trust societies more likely to adopt advanced forms of economic organization.

4. Knowledge Exchange as the Basis of Cooperation

Fukuyama ignores the development of global webs of enterprises, where entities from different societies coordinate and cooperate in individual action toward common goals. Such international alliances have increased in the past two decades. These groups themselves must be based on some kind of trust, although their members do not share common social backgrounds. We argue that building trust in such networks requires the sharing of intellectual capital to build social capital. In other words, knowledge exchange forms the foundation for trust in corporate alliances, linking intellectual capital with social capital.

Knowledge as a medium of exchange

Knowledge has certain characteristics which make it very distinct from other media of exchange, such as financial capital or physical capital (e.g. land). Knowledge can be transferred between firms or individuals, like other forms of currency. But unlike money and land, knowledge, once transferred, is held by both the donor and the recipient. Hence, knowledge is not transferred in a formal sense; it is shared. The act of sharing knowledge allows both parties to utilize that knowledge independent of the other.

Knowledge sharing, then, is by nature a positive-sum game; neither party is deprived of knowledge by engaging in sharing. However, knowledge sharing may lead to a zero-sum game if one party is better able to use that knowledge in a market situation than the other. For example, if a firm "reverse engineers" the products of a competitor, and then introduces an improved model onto the market, it can profit abnormally from the unintentional "sharing" of its competitor's knowledge. Intellectual property laws are intended to protect firms against the unintended appropriation of knowledge by outsiders. But since firms are notoriously "leaky" when it comes to knowledge, such legal protections are of limited value.

Knowledge exchange, cooperation and competition

Given that firms are unable to protect their knowledge absolutely, they may be able to pre-empt the misappropriation of their knowledge by sharing it with their competitors. This, in turn, can create the expectation that the competitor will in turn share its knowledge with the donor firm. Thus, knowledge becomes an object of barter between firms towards the development of a new form of economic relationship. The equal exchange of knowledge constitutes a "quid pro quo" which, in turn, reinforces a growing trust between the parties to that transaction. As long as the knowledge exchanged between the firms is perceived by the recipients to be of equal value, trust can be built. In contrast, many alliances and joint ventures fail because the participants are either unwilling to share knowledge, on the faulty assumption that they are "parting with" that expertise, or because the parties are unable to attain a mutually-agreeable arrangement for the sharing of knowledge ex ante and the division ex post of the intellectual assets resulting from cooperation. Knowledge exchange does not rule out downstream competition between two firms. Again, knowledge is simply the foundation of intellectual capital, not its equal. Possession of knowledge is one thing; its application and control is much more significant. Hence, firms may be willing to cooperate to share and develop jointly "generic knowledge," which they then apply in their unique ways in differentiated products on the market. The availability of that pool of generic knowledge adds value to the products of both firms, yet still allows them the freedom to compete with each other at the market level.

5. The Dynamics of Knowledge-Based Economics

The implications of knowledge sharing for the new knowledge-based economy are substantial. Knowledge-based competition is generally assumed to require that firms have different knowledge which they then use to create sustained competitive advantage. But knowledge sharing allows firms to access the same basic knowledge to cooperate and compete simultaneously for greater productivity. This, in turn, changes the way that firms must operate, and the mechanisms for governing transactions in the new economy.

5.1. Personal trust through shared knowledge

Within the firm, it is clear that individuals must share trust for the firm to survive and prosper. With the increasing mobility of human capital, it is no longer guaranteed that the employees of the firm have the same social and cultural background to provide a social basis for trust.

By encouraging knowledge sharing at the individual level, the firm gains in two ways. First, it can guarantee that knowledge will flow efficiently to those employees who are in the best position to utilize that knowledge at a given time. Second, however, it bonds individuals together in a collaborative mode to ensure that they work toward common goals, which in turn will drive firm innovation. As Foray (1991) observes, intra-firm cooperation is essential to innovation because the functions and resources of the firm are integrated together into a larger whole. He draws from the work of Aoki (1986) to show how Japanese firms are better organized through knowledge sharing to achieve higher-order innovation through the development of common, firm-specific knowledge using mechanisms of learning

by doing.

5. Conclusions

Electronic commerce is tightly linked with the exchange of information and knowledge as these are the key mediums of exchange that underlie this new form of commerce. As such, the issues that are salient to the area of knowledge economics are also key in understanding the "co-opetitive" dynamics of electronic commerce. Primary among these are the issues of trust and non-linear change underscored by the concepts of strategic inflexion points and strategic capability options. These concepts are becoming increasingly important as business transactions are becoming more digital and the barriers to entry into markets and industries fuzzier promoting more openness in pursuit of win-win business configurations:

"Two major forces - fundamental technological change and a new ethos of openness - are driving through our era, forces that could bring about the long boom, a 25-year global expansion with all its consequences. Five waves of technology - computers, telecommunications, biotechnology, nanotechnology, and alternative energy - may bring about big productivity increases that lead to high rates of economic growth, in balance with nature. Meanwhile, we're seeing unprecented global integration. ...These two meta-developments lead to increasing integration and prosperity worldwide." (Wired, July 1997).