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Industry Clockspeed and Competency Chain Design: An Introductory Essay

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Abstract

This paper introduces the notion of industry clockspeed to classify industries by an aspect of their dynamic characteristics. The clockspeed framework suggests a dynamic theory of the firm where the "inner core" competency of an organization is the ability to continually design and assemble of chains of competencies to deliver value to the marketplace.

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1 Introduction and Motivation

Coping with the dizzying rate of change in the world today consumes much attention of industry and corporate leaders. Markets, technologies, and competitors all move more quickly than a decade ago and at light speed relative to a century ago. The half-lives of the leading business organizations seem to be shrinking as well, with each technological or organizational innovation unleashing another flood-tide of creative destruction. General Motors, IBM, and Sears each had their day in the sun, Microsoft is having theirs, but history provides one absolute in business as well as politics: All competitive advantage is temporary.

Although many observers have noted the need for organizational robustness in the face of economic turbulence, we have few organizing concepts to guide *dynamic* business strategy. This paper will introduce *industry clockspeed* as one such concept. Although the world may be moving faster, not all industries move at the same pace; different industries move at different clockspeeds. Furthermore, inside the firm, the different assets or capabilities may change, grow, or obsolesce at different rates. Therefore a clockspeed analysis of the firm's internal organization may yield useful insights as well.

Using the clockspeed concept as a tool, we will argue that the design and assembly of capabilities in the supply chain is the meta- or inner-core competency on which firms most need to focus. Although the business strategy literature has historically concentrated on the individual corporation as the appropriate unit of analysis, attention has now (appropriately) expanded to the extended organization, *i.e.*, the *supply chain*--a term we use to mean the corporation plus its supply network, its distribution network, and its alliance network. Much of the supply chain literature addresses supply chain *management*--the stewardship and utilization of the relevant network of organizations and assets to provide value to some final consumer. However, most of that literature takes the supply chain as given. Just as the manufacturing management community discovered in the past decade the enormous power of the product *design* activity for leverage in improving product *manufacturing* performance, the viewpoint here is that thorough consideration of supply chain design can reap enormous advantages for the activities undertaken in supply chain management.

Finally, we will argue that supply chain design ought to be thought of as assembling chains of capabilities for a series of temporary competitive advantages and that these design activities constitute the core of what defines a firm in a dynamic economy. Further, what distinguishes the top-performing firms from the ordinary is the ability to anticipate better where lucrative opportunities are likely to arise and to invest in the capabilities and relationships relevant to exploiting those opportunities. Risk and uncertainty are inherent in investing in hoped-for windows of opportunity, but superior market and technological forecasting ability and superior competency portfolio management are critical since, especially over the long run, fortune favors the prepared firm (Cohen and Levinthal).

2 Clockspeed: From Fruitflies and Infotainment to Dinosaurs and Airplanes

If an industry has a clockspeed, how might one measure it? Let me suggest several sub-metrics: process technology clockspeed measured by capital equipment obsolescence rates; product technology clockspeed measured by rates of new product introduction or intervals between new product generations; organizational clockspeed measured by rates of change in organizational structures; and "other asset" clockspeeds.

In process technology clockspeed, consider the semiconductor industry as compared to automobiles. A firm such as Intel sinks approximately a billion dollars into a wafer fabrication plant and expects that plant to be essentially obsolete in four years. If they don't get their money out in that time, they will not have the capital to build the next generation of plants. In comparison, a billion dollar engine or auto assembly plant for Ford will be expected to earn significant cash flow twenty years from now. Furthermore, Ford operates very productive twenty-year-old plants with twenty-year-old equipment. Intel has no such relics in its portfolio. Neither Intel nor Ford is necessarily sub-optimizing in this comparison, they merely operate in industries with different process technology clockspeeds.

In the domain of product technology clockspeed, consider the commercial aircraft industry compared with MICE (Multi-Media Information, Communications and Electronics--sometimes referred to as infotainment). Boeing's rate of (major) new product launches is slightly under two per decade (777 and new 737 in the 1990's, 757 and 767 in the 1980s, 747 in the 1970's). Compare this with Disney studios. In big-release children's animated movies, Disney seems to aim for one new product per year (*Beauty and the Beast*, *Lion King*, *Pocohantas*, etc.). On a corporate basis, a major movie studio may turn out dozens of new products per year, many of which will have their artistic and economic fate sealed in the first weekend after public release. Although these products do have a long tail to their shelf life (*Snow White* is far older that the 747), Disney's product development teams presumably work on a cycle time geared to the time between new product introductions, a metric that suggests that MICE has a faster clockspeed than commercial aircraft. (More striking, perhaps, is a look at Disney's whole MICE supply chain (no pun intended): the distribution channels and technologies exhibit a very high clockspeed, where business alliances seem to form and dissipate weekly in the contest to see who can win the race for a technology-content package for two-way video, movies on demand, and infotainment.)

Regarding measures of organizational clockspeed, a few suggestive papers are Leonard-Barton (1992) who describes organizational obsolescence as "core rigidities" and Henderson and Clark (1990) who describe how firms might be unable to respond to architectural innovations in their industries due to an organizational bureaucratization around the needs of a previous technological architecture embedded in their principal products. Refining organizational clockspeed metrics will require a more thorough examination of the organizational literature.

Finally, one should consider clockspeed measurement for assets that are not explicitly process technology, product technology, or internal organizational capabilities. Two examples are distribution channels and brand names. Distribution channels such as the Sears catalog, the Walmart department store, and the internet storefront may vary significantly in the rates at which the assets can be constructed and at which they may decay. Similarly, the value of brand names such as Coca Cola soft drinks or Tide detergent may have developed over decades and may be

quite durable, whereas Saturn, Lexus, and Yugo automobiles each established a strong brand image in a fairly short period of time.

Two further complexities of measuring clockspeed must also be addressed. First, aside from measuring an industry's mean clockspeed, one must consider its variance. Sturgeon (1996?) has observed that both the semiconductor and the circuit board industries are reasonably fast clockspeed, but that microprocessor development has followed a low variance path as predicted by Moore's law, whereas circuit boards were slow-moving until the advent of surface mount technology, which represented a burst of improvement in the technology. Second, industry clockspeed may not be stationary in all (or any) industries. In particular, life cycle effects may exist. One could imagine an industry pattern whereby early bursts of technological discovery generate a fast pace which slows down as the industry matures. Alternately, a slow-moving industry could be hit with an innovation or an increased level of competition which drives the clockspeed up.

Clockspeed may not be stationary within an industry or even well-defined at the industry level since many industries are composites of others (e.g., airplanes are composites of the airframe, engine, and avionics industries, each of which has a different clockspeed). However, the observation that some industries move faster than others has three potential uses. First, clockspeed provides an alternative perspective from which to classify industries. Although a number of industry classification constructs exist, e.g., by capital intensiveness or by concentration ratio, the clockspeed concept suggests a classification that explicitly recognizes the dynamic nature of industry and technology, providing the potential to refine industry-level and inter-industry understanding of Schumpeterian dynamics. Second, the clockspeed concept suggests a cross-industry benchmarking analysis that may prove helpful for firms in designing their extended organizations. Biologists study the "fast-clockspeed" fruitfly species to observe many generations in a short time period and build models of genetic dynamics that are then applied to moderate-clockspeed mammals or glacial-speed reptiles (or perhaps even geologic-speed mountain ranges, although that's probably a stretch). Similarly, industry analysts can observe fast-clockspeed industries (e.g., electronics) to build models of industry dynamics that can then be

applied to slower-moving industries such as autos or aircraft. Third, the clockspeed concept may be useful for articulating more concisely the effects of technological or organizational non-stationarities on, for example, a transactions costs analysis of vertical integration (Williamson, 1985).

3 A Firm is the Ability to Continually Design Competency Chains for Temporary Competitive Advantage

Fine and Whitney (1996) have argued that the make/buy decision process and the related processes of product development and systems engineering might be thought of as core competencies. That is, the ability to choose intelligently which capabilities should be developed and/or maintained internally may be at least as important as any individual technical capability, for example. This paper extends that argument to suggest that the capability of ongoing concurrent design of products, processes, and the intra- and inter-organizational network of competencies required to deliver value to the marketplace is perhaps THE meta-core (or inner-core) competency above all others. Especially in a fast-clockspeed environment, this ability to develop continually a series of temporary competitive advantages, may be the essence of the firm in a dynamic world. A more dynamic theory of the firm would therefore view a firm as the capability to design and assemble assets, organizations, skill sets, and competencies for a series of temporary competitive advantages, rather than a set of activities held together by low transactions costs, for example. Such a characterization of firms is consistent, I believe, with the competitive environment of what Goldman, Nagel, and Preiss (1995) have termed "agile competitors and virtual organizations."

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