Chapter 7

CONCLUSION:

THE *RHYME* OF HISTORY

It is often stated, more as conventional wisdom than verifiable truth, that history repeats itself. From this vantage point, outcomes occurring in one epoch, along with the actors behind such events, inevitably resurface at another point in time in a process fundamentally unchanging and immutable. Such a view of history, however, is at best uninformed and naïvely uncritical. History never repeats itself because every historical moment is unique. Nevertheless, the process of history does admit to a poetic quality that more accurately depicts its true character. History *rhymes* -- not repeats -- in revealing parallels between the events, actors, and outcomes from different periods. Implicit in this approach is the idea that the subject of history is not only continuity, but also that history is about development and change. This rhyme of history has guided the comparison of Swift and Dell in this study.

At the core of this comparison lies an issue of fundamental centrality in the field of regional economic development: how do economies grow and change, and what provides the catalytic agent in this process of transformation. What the cases of Swift and Dell reveal most profoundly is how *innovation,* conceived broadly as new products, processes, organizations, and reconfigured territories for profit-making, reshapes economies. Schumpeter, following insights from Karl Marx, argued that innovation, leading to business cycles, constituted the essence of the capitalist process. His approach to innovation and economic development was fundamentally historical.[1] Innovation occurred in waves as an evolutionary phenomenon that demarcated different historical periods. These periods were unique but possessed common and comparable characteristics. In focusing on Swift and Dell, this study has aimed to uncover shared patterns of innovation and transformation in economies across time. Swift and Dell engineered parallel worlds of innovation. Although separated by a century, these parallel worlds of innovation provide insights into the contours of economic development and change throughout different historical periods.

The Pattern of Innovation and Economic Change

The pattern of innovation at both Swift and Dell derives from a similar historical origin -- a revolution in communications. This shared phenomenon, one occurring during the late nineteenth century, the other occurring a century later, provided the historical and structural foundations for the innovations in production networks created by the two firms. The railroad and telegraph, and the overland system of interregional commerce created by this infrastructure, established the preconditions for Swift to recast the system of beef production and distribution. Similarly, the Internet, and the system of commerce evolving from this infrastructure, enabled Dell to reorganize the production, distribution and sales of personal computers.

From this common platform of communications breakthroughs emerged similar sequences of innovation in strategy, operational routines, and organizational structure at the two firms. These similar sequences of innovation in strategy, routines, and structure, in turn, resulted in the creation of new networks of production and distribution at Swift and Dell. The production and distribution networks of Swift and Dell, however, were more than innovations in economic space. The networks of both firms created new geographical spaces for economic activity. These innovations became geographically embedded in the way they routed flows of materials and information across space, and in the way both firms organized certain spatial relationships of proximity between key nodes in their networks in order to facilitate the high volume flows of materials in compressed real time frames. These reconfigured territories represent geographies of innovation. A similar route from the communications revolution, to the process of innovation in production networks, to the reconfiguration of territory for profit-making links the experiences of these two firms across time.

While communications revolutions provided the structural foundations for innovation at both Swift and Dell, what these new technologies actually created for both firms were *opportunities* to compete and seek profit in different ways. By reshaping the territorial boundaries of markets, and by recalibrating the time necessary for accomplishing the myriad information processing tasks in economic activity, communications revolutions open possibilities for firms to produce, buy, and sell differently and

[1] On this point see especially the work of Lazonick, 1991: 126; 1991b; 1994.

more efficiently. In this sense, it is the redefined set of opportunities, resulting from communications revolutions, that function as the *source* for innovation at the two firms (Dosi, 1997: 1532).[2] Nevertheless, opportunity is insufficient as a causal explanation for innovation. The link between opportunity and innovation occurs through a process of *learning* within the firm. Both Swift and Dell had to learn, through experimentation, how to take advantage of the opportunities for profit-making created by technologies of the communications revolution, and deploy these technologies in business models for competing. This learning process is the most fundamental activity occurring inside the "black box" of the firm where innovation takes place (Rosenberg, 1982; Dosi, 1997: 1532).

With both Swift and Dell, this learning process was of a specific type. It was not knowledge acquisition in search of discovering the optimal design characteristics of products. Swift and Dell engaged in a process of "learning by doing" known as learning by *using* (Rosenberg, 1982b). Similar to the pathbreaking idea of learning by doing developed by Kenneth Arrow (1962), the process of learning by using results from direct involvement in the productive process. When firms learn by using, they engineer incremental improvements, through experimentation and trial and error, not in products, but in *processes* for making and marketing products (Rosenberg, 1982b: 121-122). The innovations of Swift and Dell evolved from capabilities developed within the firm, to learn by using, and resulted in the creation of more efficient processes for producing and distributing their products.

These process innovations engineered by Swift and Dell also united the two firms as technology *users*. Both firms were users of technologies produced by communications revolutions. What they learned by using was how to deploy these technologies in business models in creating new networks of production and trade. In this role as technology users -- in learning to deploy the technology of rails and telegraphy and the Internet in their production and distribution networks -- Swift and Dell became drivers of innovation itself.

Although Swift and Dell emerged from this process of innovation as the largest, and arguably

[2] In analyzing what occurs inside Rosenberg's concept of the black box, Dosi distinguishes four primary elements: 1) *opportunities* which he insists are the "sources" of technological change and innovation; 2) *incentives* to exploit opportunities which presumably exist in the marketplace; 3) *capabilities* to learn and achieve innovation objectives; and 4) *organizational arrangements* through which to search for, and implement innovative advances (Dosi, 1997: 1532).

most successful firms in their respective industries, it was the impact they exerted on the competitive behavior of other companies that enabled the two innovators to influence patterns of development in the economy. Once the competitive superiority of the business models created by Swift and Dell became known by their competitors, and once the two firms had ascended into the top ranks of the beef and PC industries based upon these business models, the production and distribution networks they built became sources for the adaptive responses of firms in trying to compete with Swift and Dell. This process of *diffusion,* whereby innovations of entrepreneurial firms spread to others and become more generalized, is one of the primary mechanisms promoting growth and change in the economy. It is what completes the process described by Schumpeter as creative destruction in which firms imitate the creations of the successful innovator.

Both Swift and Dell influenced patterns of economic growth and change owing to the diffusion of their innovations to other meat packing and personal computer firm. The integrated and long distance beef network of Swift was soon the basis of the business models adopted by Armour and other firms in the meat packing industry. Swift's competitors built branch house networks from rail and telegraph technology that were virtually identical to the network developed by Swift. Similarly, the virtually integrated network of Dell, with its Internet-based system of demand and supply balancing and inventory compression, has emerged as the competitive standard that other firms in the PC industry -- with varying levels of success -- have aimed to duplicate. Dell's competitors, most notably Compaq, have used Dell's model in an effort to make the process of channel assembly resemble more closely Dell's Internet direct virtually integrated procurement, production, and distribution system. In fact, the contemporary impacts of Swift and Dell as innovators were so compelling that these companies influenced firms in other industries beyond meat packing and computing. A whole range of perishable goods industries imitated Swift while Dell's influence extends even into industries as traditional as autos (Chandler, 1977; Andrews, 1/26/2000; McWilliams and While, 12/1/99).

The innovations in production networks developed by Swift and Dell in effect, redefined standards for competition within and beyond their respective industries. In spreading beyond the two firms, the innovations of Swift and Dell induced a shared pattern of transformation in the economies of

the late nineteenth and late twentieth centuries. As their business systems diffused and spread, the two companies succeeded in creating economic worlds in their own image.

The Contours of Parallel Worlds

From this common platform of communications revolutions and innovation, Swift and Dell created comparable business systems and production networks. Comparisons between the two firms focus on three aspects of their production and distribution networks. These aspects include operations, organization, and territorial transformation.

Operations

In using communications revolutions as the basis for process innovations, both Swift and Dell assumed similar identities as logistics firms. Although they developed new products, Swift and Dell established their core capabilities in the sphere of circulation. They both captured value by organizing the movement of supplies, semi-finished, and finished goods through the processes of procurement, assembly and disassembly, and final sale. The key to this movement for both firms was the processing of information through new technologies of communication. Both firms, in effect, relied on new technologies for information processing in order to coordinate the circulation of goods.

The process innovations built by both companies consisted of *direct pull* systems of production and distribution. These direct pull systems of Swift and Dell operate on the basis of a similar principle. Customer orders, processed essentially in real time from breakthroughs in communications technology, are the source for setting the system of procurement, production and distribution in motion. In contrast to "push" systems where component supplies are stored as inventory and finished goods are pushed into the marketplace to be sold to customers on the basis of demand planning, the direct pull systems of Swift and Dell relied on orders from customers already received to ignite the process of materials procurement and production.

In both cases, perishability of the product was a primary factor motivating the development of these direct pull systems. In the case of Swift, cattle supplies and dressed beef had obvious perishable

qualities in which the product, both in its raw material form, and its disassembled form, would spoil and lose value if not processed in a timely manner. Pulling the material through the procurement and production process in real time is the most obvious way to mitigate the adverse economic impacts of product spoilage and value loss. Less obvious but by no means less relevant is the perishable quality of PC components and finished personal computers. Because of the rapid pace of technological change in PC components, especially in the microprocessor and disk drive, the PC loses roughly one percent of its value per week. Over time, such value loss is indeed significant. In reference to this perishable quality, Michael Dell himself referred to the PC as having "the shelf life of lettuce." Much like Swift, pulling components through the procurement and production process, is designed to offset the perishable quality of PC component supplies and finished goods over time. Although one product is created from a living thing while the other is not, perishability in the form of value loss through time, creates a common thread in the direct pull innovations created by both firms.

The fact that both Swift and Dell operated pull systems of production made possible by technologies of communications revolutions, helps dispel the commonly held belief of mass production as a system based solely on producing in high volumes. The case of Swift reveals the mass production system indeed to be one of high volume, but also one in which producers used enormous amounts of information generated by new communications technology to modulate and control output in accordance with shifting demand, and to pull supplies as they were needed to meet shifting demand schedules. Communications and control were as important to Swift in its direct pull system as it is to Dell in organizing its direct production and distribution network.

In the case of Swift, sales agents at branch distribution houses collected orders from retail butchers in the vicinity of the branch. From branch houses, sales agents transmitted these orders to Swift's headquarters on a daily basis where they were broken down into purchasing requirements for cattle at stockyards, and requirements for the cuts and grades needed to fill the orders of retail butchers. In essence, the order pulled the material through the cycle. The telegraph provided the essential communications links in this direct pull system. In the case of Dell, orders from customers, both businesses and individuals, also pull the components and finished PCs through the cycle of procurement,

production, and final marketing. Customer orders are routed to Dell's headquarters and to various assembly sites. Orders are next transformed into material requirements and sent to supply logistics centers or local supplier factories. Components are then pulled from these facilities and delivered to Dell's assembly site where the components are assembled into finished machines. In the case of Dell, the Internet provides the essential communications links in its direct pull system.

While the two systems share a number of essential features, Dell's direct pull system differs in two ways from the direct pull system of Swift.

Firstly, in Dell's system, final customers are linked directly into the pull mechanism through Internet communication. In the case of Swift, the telegraph was used internally within the firm. Although documentation is limited, the evidence suggests that retail butchers were not linked directly to Swift through telegraphic communication. Orders came to branch houses through face-to-face sales calls with retail butchers in the city of the branch and the towns and villages in the vicinity (Federal Trade Commission, 1919: Pt. 3 p. 127; Unfer, 1951: 86). Consequently, the direct pull system of Dell represented an advance over Swift in that Dell's customers, through Internet communication, could be linked directly to procurement and assembly. Nevertheless, the direct pull system in both cases operated on the basis of new communications technologies that enabled the two companies to use real time information in the form of orders from customers as a substitute for the risk of forecasting market demand. In this sense, the business models of both firms were based on the principle of *build-to-order*.

Secondly, the build-to-order systems of Swift and Dell differed with respect to the issue of *customization*. Dell's build-to-order system was essentially a system of *mass customization* in which the firm used the Internet to build individually configured products in high volume. Nevertheless, customization was not entirely absent from the pull system organized by Swift and it would be wrong to characterize the Swift system as simply a distribution system for an undifferentiated commodity. Myriad different grades of beef from different varieties of cattle, along with variations in cuts, created a range of product choices for retail butchers. Swift organized its procurement and disassembly activities on the basis of these orders, and in fulfilling them, created a type of customized system of production and distribution. One of the enduring contributions of the dressed beef industry pioneered by Swift, was

precisely the development of variety and choice in beef available at retail butchers. As a result of telegraphic messaging Swift and others in the dressed beef industry were able to deliver these products to branch houses, sometimes ready for delivery to retail butchers, other times requiring some additional butchering at the branch house site as per order. At the same time, however, while there were elements of customization in Swift's system owing to the telegraph, it would also be wrong to characterize Swift's production and distribution network as a custom system in the way that Dell's system operated. Customization in the form of individual choice lies at the core of the Dell system. The PC maker is able to fulfill this objective of mass customization, however, as a result of the modular and standardized nature of PC components. These standardized and modular components enable Dell to sell PCs to order "by assembling them like Legos" (Langlois, 2001: 26). Swift's production and distribution network was not organized around individually customized production in this way. Nevertheless, Swift's build-to-order system does admit to elements of a primitive type of customization made possible by telegraph technology. As orders collected from retail butchers at branch houses were telegraphed to Swift's headquarters and then broken down into cattle purchasing requirements, and as the various sides came off the disassembly line at disassembly facilities destined for certain branch house locations as per order, Swift to some extent was customizing its production in real time. Like Dell, the firm took advantage of the standardized nature of dressed cattle sides, and shipped these dressed sides to branch houses where they were custom butchered into cuts ordered by retail butchers. In effect, Dell has perfected a system of just-in-time mass customization, a system with antecedents in the procurement, production, and distribution network of Swift.

As they developed these just-in-time, direct-pull networks, both companies essentially solved a similar problem in an effort to capture greater increments of value from beef and computer production and distribution. Swift and Dell learned how to eliminate traditional wholesalers in the value chains of production and distribution for beef and personal computers. Their networks of production and distribution essentially disintermediated certain actors from the beef and personal computer value chains. This process of disintermediation was forged in both cases on the foundations of the rail and telegraph, and the Internet revolutions.

Swift and Dell also confronted a similar operational objective in organizing these pull systems: how to balance supply and demand flows between the different nodes in their networks in real time. Both companies used new communications technology to accomplish this aim. Swift relied on constant telegraphic messaging between branch houses, central headquarters in Chicago, stockyard purchasing offices, and disassembly sites to balance order demand from retail butchers processed at branch houses, with purchases of cattle supplies and schedules for slaughtering, butchering, and shipping. Dell utilizes a similar system in linking nodes in its network through communications technology. Dell's system of demand and supply balancing, however, relies on Internet messaging between company headquarters, assembly sites, supply logistics centers and supplier factories. At the same time, Dell's system, incorporates an additional node in this chain of Internet communications that differentiates it from Swift. In Dell's network, the *customer* is actually connected through new communications technology to the system of material balancing in the process of procurement, assembly, and distribution. With Dell, it is the Internet that provides this connection.

Organization

In creating their innovative networks, both Swift and Dell essentially built *organizations* for producing and distributing goods. In certain ways, the organizational forms of business enterprise pioneered by Swift and Dell provide the source of the most obvious differences the two firms. Yet, even in the case of organization, the communications revolutions that differentiate the two firms also create compelling parallels.

In the case of Swift, the firm built a highly integrated enterprise. In the process of integration, the Company assumed ownership and control over most of the adjacent steps in the beef value chain. Integration provided the firm with a response to risk. The rail and telegraph enabled Swift to operate its time sensitive network of supply and demand balancing in the way that the infrastructure bridged distance between the various nodes. Yet, this time sensitive network made the firm highly vulnerable if any of the steps connecting the various nodes were in any way disrupted. In effect, Swift was heavily exposed to risk if any of the adjacent steps in the network and the processes connecting them broke down.

Disruptions in cattle supplies, production, telegraphic messaging, rail transit, even supplies of ice for refrigeration compelled the firm to mitigate its risk by assuming ownership over a vast collection of different activities. The firm became as much a rail car builder and ice harvester as a cattle disassembler and dressed beef distributor. It integrated into its own organizational virtually all of the activities, primary and ancillary, of beef production and distribution short of grazing cattle. Swift built its capabilities and business model on the foundations of internal economies of scale. In organizing these activities, Swift utilized systems of administrative coordination that replaced activities formerly coordinated through markets between different small businesses. Alfred Chandler referred to these mechanisms of administrative coordination within the firm as *The Visible Hand* and contrasted them with the invisible hand of the market popularized in Adam Smith's classic work. In forging these methods of administrative control, Swift built an organization virtually from scratch without precedent.

Dell by contrast, created a much different type of organization. Dell built its network on the basis of far more limited set of core competencies, namely the assembly process and the logistics of procurement, production, and distribution. Perhaps most importantly, however, Dell unlike Swift, relies fundamentally on the external capabilities of other firms. Without the technological expertise of firms outside the boundaries of Dell, that supply the PC maker with virtually all of the components for PC production, Dell would not be in business. Unlike Swift, Dell did not pioneer this form of organization. The disintegrated firm in the personal computer industry was already a well-established phenomenon when Dell entered the industry. What Dell did that was fundamentally, new, however, was to use the Internet in building what it called a virtually-integrated enterprise. This form of organization provided Dell with certain benefits associated with vertical integration. It enabled Dell to align the production and distribution of its product around the needs of the customer, and provided the firm with the capacity to coordinate the operations necessary to fulfill those needs. The virtually-integrated enterprise of Dell, however, differed from Swift in a very fundamental way. Unlike Swift, Dell did not aim to take ownership of the assets required for carrying out the tasks at adjacent steps of the PC value chain. There was not need for Dell to seek such an objective. There was sufficient coordination capability between different asset-owing firms already developed within the PC value chain that made ownership of assets

unnecessary. What Dell did was deploy the Internet within this dis-integrated value chain in a new and creative way in making this value chain more efficient. As a consequence, where Swift became an asset-owning business enterprise, Dell has become an organization fundamentally asset averse.

Yet, in spite of these differences between the integrated structure of Swift and the dis-integrated structure of Dell, both firms employ a fundamentally similar principle in organizing the movement of supplies and finished products through their networks. The two companies rely on the organizing principle of administrative *control* rather than market coordination to ensure that materials and finished goods move within their networks from procurement through production to final marketing. Although Dell is a separate organizational entity from the other firms comprising its network, it does not interact with these companies on the basis of markets and the price system in securing supplies and logistics services. On the contrary, Dell *organizes* the relationships of collaboration between itself and its network partners, by essentially imposing upon these firms its own protocols -- both technical and administrative -- as a condition for entry into its network. Such use of force does not mean that only Dell profits from such relationships. Both Dell and its partners clearly benefit from this system of administrative control, but the idea that interfirm networks such as Dell's reveal the flexibility and ascendancy of market coordination in the current economy is inaccurate. The need for Dell to exercise such control stems from the fact that the PC maker, in coordinating its high-speed, build-to-order network, confronts the same types of risk from disruptions at adjacent steps along the value chain, as the risks faced by Swift. Just as Swift remedied such risks by taking control of virtually the entire value chain through ownership of assets, so too has Dell employed a mechanism for taking control of the value chain but without having to assume ownership of the assets at these adjacent steps. Power and control are as much a part of the story at Dell as they were at Swift. In the logistics-oriented organizations built by Swift and Dell, Chandler's *Visible Hand* has proven to be a more valuable asset than Smith's Hidden Hand.

Territory

Forms of business organization are inherently territorial (Walker, 1988: 385). Business organizations assume territorial characteristics most fundamentally in two interrelated ways. Firstly, firms are territorial in the way they route flows of materials and information between nodes in their networks for producing and selling. Secondly, firms are territorial in the choices they make for locating these nodes. Together, nodes and flows between nodes create geographical space.

The networks built by Swift and Dell from these organizations reveal a similar geographical tendency. Both networks employ technology from communications revolutions to route flows of materials and information over long distances in establishing systems of long-distance control for accumulating profit. At the same time, both networks concentrate flows of material and information in specific places where Swift and Dell organize relationships of proximity between these flows and key network nodes. In effect, Swift and Dell share a similar role as agents in shaping geographies of spread and concentration, and configuring territory for competing and profit-making.

Swift used the railroad and the telegraph to build a production and distribution network extending over the territory of the U.S. that obliterated the localized character of beef slaughter and consumption while it eliminated the practice of shipping live cattle long distances. For the first time in history, cattle was being slaughtered in locations far removed from where it was being consumed as fresh beef. At the same time, Swift, and the firms that it influenced, consolidated slaughtering activity in Chicago and locales in the cornbelt states in the vicinity of Illinois. In the process, Swift and other large packing firms created industrial districts of slaughtering and meat packing in Chicago and other Midwestern stockyard towns. The geographical pattern of this new and innovative way of producing and selling beef -- the configuration of the production and distribution flows within the network of Swift -- was one of a vast expansion outward represented by distribution activity through branch houses, and a powerful centrifugal movement inward toward the center of the country for slaughtering.

Swift assumed the role as agent in creating this pattern. It was Swift that determined the location of branch houses and disassembly facilities. At the same time, Swift organized crucial relationships of geographical proximity between certain key network nodes. Swift established disassembly facilities at

stockyards in which it invested in order to exercise some control over cattle supplies. Branch houses, in turn, were located in virtually all urban centers such that the map of Swift's branch house network, and the map of urban America in 1900 was roughly the same. Both slaughtering facilities and branch houses in turn, were systematically connected to rail and telegraph lines. This geography, with its pattern of spread and concentration, centralization and decentralization, was an integral element of Swift's innovative business model. Perhaps most importantly, this geography of spread and concentration embedded in the production and distribution network of Swift, provided the foundations for a national market in the U.S.

Dell is using the communications revolution of the Internet to build a production and distribution network with this same basic attribute of geographical spread and concentration, but the scale of operation is vastly different in comparison to the scale of Swift. In contrast to the nationally-oriented focus of Swift's beef network, Dell's Internet-driven production and distribution network is establishing new standards for organizing logistics activity on a *global* scale. In creating this network, the firm is playing an integral role in defining the actual economic meaning of contemporary globalization.

What Dell has established through its Internet-driven innovations in global supply planning and demand fulfillment, is a set of fundamentally similar, build-to-order, production ensembles in different parts of the world. In creating these functionally similar complexes, however, Dell, in contrast to Swift, has not so much provided the source for creation of industrial districts in its locations of concentration. Instead, the PC maker has relied on already-existing concentrations of high technology activity. In these places, suppliers and skill bases were readily available to the PC maker.

Perhaps more importantly, in setting up these Internet-based production complexes, Dell has arranged key nodes in its network in relationships of spatial proximity in order to fulfill the highly compressed time schedules in its build-to-order system. Suppliers are forced by Dell either to have a factory presence in each Dell's six global assembly locations, or they must warehouse components in supply logistics centers (SLCs) near Dell's assembly sites. Such proximity is essential so that the PC maker can "pull" parts from these factories or warehouses at two-hour intervals in accordance with its build schedules. Just as proximity was crucial to Swift in organizing the logistics of supply procurement

and cattle disassembly, so too is proximity critical to Dell in coordinating the logistics of procurement and PC assembly. Far from dispatching with barriers of distance and defying constraints of geography, the Internet in Dell's production and distribution network has actually heightened the need for Dell to shape relationships of geographical proximity between certain nodes in its network. By enabling Dell to create procurement and assembly schedules in real time, the Internet has actually enforced new conditions of space in the spaces of globalization.

Final Propositions

Fernand Braudel, the celebrated historian of the *Annales* school, writes of three kinds of history: a "history of the world as it is being made;" a history of "conjunctures" or sharp breaks; and a history of "structures" inquiring into long term changes termed by Braudel, the *longue duree* (Braudel, 1980: 74).[3] Braudel equates much of the first type to *social sciences*, while attributing the study of conjunctures and structures more to history proper. Rarely, claims Braudel, are the three types of history integrated together. In many ways, however, the comparison of Swift and Dell in this study has aimed to combine these three historical timeframes. In Dell, there is history still in the making, while in the comparison with Swift, there is both the notion of a demarcation and, with a full century separating the periods and the protagonists, there is the possibility of viewing the stories of these two firms from a long-term perspective. From the insights of these three levels of history, the comparable worlds of innovation created by Swift and Dell provide the foundations for an advance, albeit cautiously and tentatively, toward a set of propositions about the nature of the current period, the broad meaning of entire period in questions.

Firstly, the parallel worlds of innovation created by Swift and Dell are not accidental but instead derive fundamentally from a long-term historical trend that began in the nineteenth century with a sharp break from the past. This break is represented by the advent of the railroad and the telegraph,

[3] As one of the foremost figures of the *Annales*, Braudel was himself partial to the long-term movements of the past. He reserved some disdain for much of what passed for social sciences, which he insisted "seem little tempted by remembrance of things past." Nevertheless, Braudel spoke admiringly of historically-oriented social scientists such as Claude Levi-Strauss, along with historians of conjuncture such as Ernst Labrousse (Braudel, 1980: 35, 25-82).

technologies truly without precedent (Drucker, 1999: Carey, 1988). Until that moment, there had not been a significant advance in the speed with which goods and information could travel overland or on the high seas since ancient times. Ships, and humans on horses constituted the essential means of bridging distance in exchanging information, and transporting goods.

Rails and telegraphy completely transformed this paradigm. In the process, these technologies recast the relationships of distance and time for economic actors in exchanging goods and information. Furthermore, these technologies established foundations for human society to pose and resolve other transport and communications challenges. Following rapidly from the telegraph was voice telephony. After the telephone became widespread, it was not long before another major breakthrough occurred in the form of wireless radio broadcasting. Images came next through television and then hybrids of symbols, voice, images and wireless in form of computer networking and the Internet. On the transport side, the route from the railroad is equally compelling leading to the automobile, air travel and even the container ship.

What is striking is that from a long-term perspective -- from Braudel's *longue duree* -- these technologies are clustered within a relatively short historical time frame. Collectively, they demarcate a period in which, taken as a whole, there is both conjuncture, that is, a break from what preceded it, and a unified structure. Seen in this way, the entire period from the mid-nineteenth century to present day is arguably a single communications revolution. This revolution began with the railroad and the telegraph and is continuing to transform economy and society through the Internet. For business firms, the underlying theme of this communications revolution is one of *control*. The communications revolution is actually a "control revolution" in which business firms achieve new capabilities to control their operations (Beniger, 1986; Yates; 1989; Mulgan, 1991). Communications, capabilities, and control enable business firms to change how they conceive of profit-making, and how they act in pursuit of it. Within this historical space, the parallels of Swift and Dell are not accidental. They are the manifestations of an ongoing communications revolution in which business firms use new communications systems to master methods of control over long distances (Law, 1986). This revolution is not over. Swift and Dell represent different moments in this revolution which is likely to continue for many years to come.

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