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#5

AY 2006-07

Why Joseph Schumpeter's Creative Destruction?

Everything has changed, so it is the same: Towards "Mode 3"

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The American economy, clearly more than most, is in the grip of what the eminent Harvard professor, Joseph Schumpeter, many years ago called “creative destruction,” the continuous process by which emerging technologies push out the old. Standards of living rise when incomes created by the productive facilities employing older, increasingly obsolescent, technologies are marshaled to finance the newly produced capital assets that embody cutting-edge technologies.

(Greenspan, 1999)

Of what value is examining creative destruction and diffusion theories that Schumpeter introduced to the world? A variety of factors causes economic changes, but he argued that entrepreneurial innovation was central. Today, even those who create new products and processes hardly know who Schumpeter was, or what he did. It is difficult to believe that his contributions are not more popularly recognized today. Schumpeter’s theories are as valuable and important within the contemporary environment as they were when he wrote about them over four score or seventy years ago.

Schumpeter and Creative Destruction

Joseph Schumpeter worked on major projects that contributed greatly to the explanation of economic theory and especially those topics relating to economic development. One of Schumpeter’s greatest works was entitled *Capitalism, Socialism, and Democracy*. In this PAPER, Schumpeter “raises the question of whether capitalism from a purely economic point of view is likely to go under” (Swedberg 1991, p. 156). The quick answer is that it will not collapse. Schumpeter’s writes that it is not possible to explain economic change by simply studying

previous economic conditions in isolation. His essential argument is that capitalism is an evolutionary process and by its nature is a form or method of economic change that can never be stationary (Schumpeter, 1942, p. 82). The process works continuously. There is either a revolution or assimilation of the revolution in the economy. He explained that the results of these changes form what are known as the business cycles. Even though economic activity may recede, one of Schumpeter's arguments supporting the enduring strength of capitalism relates to the notion of creative destruction (Schumpeter, 1934). He states that the competitive market is the key to the success of capitalism. In the real world of economic theory, the economy is always changing. New firms start up, old ones die out, new technologies are introduced, and old ones fade away. This entrepreneurial function will never become obsolete because as ever-higher standards of living are achieved, wants automatically expand. Schumpeter was ahead of the curve by identifying leisure goods as emerging economic wants (Schumpeter, 1942).

According to Schumpeter (1934), the innovational process revolutionizes the economic structure from within, relentlessly destroying the old one, while continually creating a new one. He states that the process of creative destruction is the essential attribute of capitalism (Schumpeter, 1942, p. 83). He states that "a perennial gale of creative destruction" is going through capitalism (Swedberg 1991, p. 157). It is significant that Schumpeter's hero is not the competitive market, but the creative daring entrepreneur (Schumpeter, 1934). His idea of creative destruction triggers entrepreneurship. Thus, entrepreneurs produce benefits that permeate the free-enterprise system. Schumpeter describes this economic growth as the consequence of entrepreneurs bringing knowledge that is qualitatively new to the existing economic system (Langlois, 1991, p. 5). Entrepreneurs are therefore the dominant force for change whose primary weapon is their energy

in action (Bauer, 1997). They induce change by putting together existing elements into new combinations. The strategic stimulus to economic development, in Schumpeter's analysis, is innovation. According to Schumpeter (1934), this may be in a commercial or industrial application of something new, such as a new product, process, or method of production. Innovation may also manifest itself as new markets or sources of supply, as well as in a new form of commercial business or financial organization. Entrepreneurs are change agents who challenge the status quo and create the new by destroying the old (Foster & Kaplan, 2001).

Schumpeter also extended and reoriented economic principles from the prevailing assumptions established during the 1920s and 1930s. His ideas concerning structural economic change evolved from classical economic theories, but he extended the fixed structure theory of economic development. Taking on the classical "static" mainstream economic doctrines, he developed the "dynamic" perspective, thus establishing the distinction between static and dynamic analysis. Schumpeter also built upon the works of Smith, Ricardo, and Marx, but he introduced a dynamic theory that focused on understanding why economic systems change. However, Schumpeter rejected Marx's violent revolutionary predictions about capitalism by examining factors outside normal quantitative analysis. Instead, he saw different theoretical perspectives from other disciples as complementary rather than competitive. They may coexist and enrich understanding of social phenomena (Schumpeter, 1934). Thus, he took real-world examples and incorporated them into his economic theory. Schumpeter believed there were both internal and external factors that make the cycle of change occur in the economy. This recognition directed him towards developing his theory of entrepreneurship, which is at the core of "creative destruction" (Dahms, 1995, p. 4).

His creative destruction philosophy is the rule, rather than the exception. For example, organizations survive by focusing on what will allow them to be one step ahead of the competition. Hence, Schumpeter observed how businesses conduct their operations and influence the quality of human lives. He wrote that innovation is the preeminent mechanism by which individuals can rise in competitive capitalism (Brouwer, 1991, p. 18). Therefore, without innovation, business survival and success are unattainable. The contemporary environment abounds in disruptive (as opposed to sustaining) technologies, as well as discontinuous (as opposed to continuous) innovation. The latter type of innovation is significant because of the many attempts to determine the extent to which discontinuous innovations can be “managed” and how organizations can try to predict and leverage the emergence of disruptive technologies. Schumpeter’s ideas are important because central to the highly competitive global business environment is individual and organizational capacity for higher order learning, as well as the ability to manage the stock and flow of specialized knowledge.

This PAPER discusses matters related to Schumpeterian ideas of innovation and entrepreneurship that created a challenge to the orthodoxy of his peers and they continue to this day a critical force for developing sustainable advantage among enterprises. The discussion and examples within the chapters of this PAPER illustrate ideas and provide arguments -- for both the academic and practitioner environments -- that although Schumpeter’s concepts were developed over seventy years ago, his “creative destruction” idea is essential for organizations to survive in the future. His theory and its diffusion continues to be the foundation supporting the contemporary knowledge and technologically driven global economy.

The “Mode 3” System

Global perspectives and diverse human, socio-economic, technological, and cultural contexts are inter-woven within the chapters to produce an emerging worldview on specialized knowledge.

This socio-technical context may serve as the unit of reference for stocks and flows of a hybrid, public/private, tacit/codified, tangible/virtual good that represents the building block of the knowledge economy, society, and polity. One approach is the “Mode 3” System consisting of Innovation Networks and Knowledge Clusters (Carayannis & Campbell, 2006). This is a multi-layered, multi-modal, multi-nodal, and multi-lateral system. It encompasses mutually complementary and reinforcing innovation networks, as well as knowledge clusters that consist of human and intellectual capital. It is shaped by social capital and underpinned by financial capital. “Mode 3” is an extension of the ideas by Michael Gibbons (1994) by incorporating a new category of knowledge production. “Mode 3” can be understood as an evolutionary product of the work of Schumpeter on “creative destruction” and technological change. He also noted that entrepreneurial initiative is one of the main -- if not the main -- ways to drive economic development. Technological change catalyzes and accelerates growth, hence it is imperative to study Schumpeter’s theories to foster further economic development within the contemporary dynamic business environment.

Economics and Joseph Schumpeter's Theory of Creative Destruction: Definition of Terms

But in capitalist reality, ... it is not price competition which counts but the competition from the new commodity, the new technology, the source of supply, the new type of organization, ... competition which ... strikes not at the margins of the existing firms, but at their foundations and their very lives.

Joseph Schumpeter in his 1942 book: *Capitalism, Socialism and Democracy*.

A conceptual pillar -- and the source of motivation for this PAPER -- is Schumpeter's work on "creative destruction" and technological change. This is the pre-eminent driver of the process of sustainable economic growth "which incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one. The process of Creative Destruction is the essential fact about capitalism." (Schumpeter, 1942, p. 82).

Entrepreneurial initiative is one of the main -- if not the main -- ways to drive technological change, catalyze, and accelerate sustainable growth, hence our motivation to better learn from Schumpeter's theories. This chapter describes and discusses the foundations of Schumpeter's economic theories and the nature and dynamics of innovation and entrepreneurship.

DEFINITIONS

Adam Smith defined *Land, Labor and Capital* as the key input factors of the economy in the eighteenth century. Joseph Schumpeter added *Technology and Entrepreneurship* as two more key input factors in the early twentieth century. He thus recognized the role and dynamic nature

of technological change and innovation as well as path dependencies in shaping the health and future of the economy and moving away from the static approach of Neoclassical Economics. Indeed, to review the history of innovation, one must look toward the classic works of Schumpeter. He wrote "The Theory of Economic Development" in 1934 as an examination of profit, capital, credit, interest, as well as business cycles. His main contributions were the expansion of Adam Smith's economic principles of land-labor-capital into land-labor-capital-technology-entrepreneurship and the introduction of the concept of disequilibrium into economic discourse.

In the late twentieth and the beginning of the twenty-first century, numerous scholars and practitioners such as Peter Drucker, have identified *knowledge* as perhaps the sixth and most important key input and output factor of economic activity. We would like to also emphasize the role and significance of *technological and economic learning* as a driver of productivity gains and an accelerator of economic growth and prosperity (Carayannis, 2000).

Entrepreneurship

Schumpeter described entrepreneurs as bringing the radically new into the economic system. This has been the province of bold individuals because -- in a world of limited knowledge -- he described it as necessarily an unpredictable and extra-rational activity. Notice that this is in effect an argument in favor of a capitalist (or, more correctly, a liberal) social order. For Schumpeter, the relative efficiency of an economic system depends not on how it "administers existing structures" (Schumpeter 1942, p. 84) -- but on how well it generates innovation. Because of limited knowledge, "planning" is incompatible with innovation. Therefore, progress depends on

the ability of individuals to command resources and direct them in unconventional and surprising directions (Langlois, 1997, p. 13).

Complicating matters is that there are actually two “Schumpeters” -- an “early” (or Schumpeter I) theorist and a “later” (or Schumpeter II) scholar. His own writings over time seem to indicate an evolving and apparently contradicting set of views. Schumpeter I strongly endorses entrepreneurs. The second Schumpeter sees their downfall with the rise of a new type of constantly innovative corporate organization. This leads to the question if Schumpeter was a believer in or a denigrator of entrepreneurs and entrepreneurial endeavors. He changed his analysis because he was reflecting on the particular type of capitalism at that time. While in turn-of-the-century Vienna, he observed small proprietor operated enterprises. During the 1930s and 1940s, he observed the large American corporations. Consequently, as the prevailing business environment changed over time, so did his outlook. He moved from Schumpeter I endorsing bold innovators, to Schumpeter II as an prophet of the inevitability of deterministic centralized economic planning:

The more accurately, however, we learn to know the natural and social world, the more perfect our control of facts becomes; and the greater the extent, with time and progressive rationalization, within which *things can be simply calculated*, and indeed quickly and reliably calculated, the more the significance of this [entrepreneurial] function decreases. *Therefore* the importance of the entrepreneurial type must diminish just as the importance of the military commander has already diminished. (Schumpeter 1934, p. 85, emphasis added.)

Creative Destruction

Schumpeter's theory is grounded in the general equilibrium model. It states that everything in the economy achieves equilibrium within the construct of the "circular flow". While Schumpeter understood that a stationary equilibrium is possible, he believed that it was unrealistic.

Schumpeter argued that the entrepreneur or innovator is a critical factor in the dynamic capitalistic economy (Screpanti & Zamagni, 1993, p. 243). Schumpeter's perspective highlights the entrepreneur as introducing new combinations of products, ideas, or methods into an organization's business environment. These new combinations disrupt the equilibrium condition forcing the organization to readjust and adapt itself to the new set of dynamics (Brouwer, 1991, p. 45). The entrepreneur's income therefore arises from a departure from the traditional equilibrium. In other words, entrepreneurial profits originate from the consequences of the innovation. An example is the introduction of a new process that reduces unit costs. In this case, innovation helps a firm achieve a competitive edge. Similarly, innovation may consist of a new or improved product that better satisfies consumers' needs.

Innovation

The word "innovation" comes from Latin meaning to introduce something new to the existing realm and order of things. In this sense, innovation has discontinuity and possibly disruptiveness. It can also be a continuum of discontinuities. From a business perspective, an innovation is perceived as the happy ending of the commercialization journey of an invention, when that journey is indeed successful and leads to the creation of a sustainable and flourishing market niche or new market. Innovation occurs when old organizations and processes are replaced by new ideas, productivity methods, and capabilities (Brouwer, 1991, p. 3). Not all innovations are

discontinuous and not all discontinuous innovations prove to be disruptive. This is determined by the scope, timing, and impact of the innovation under consideration.

Schumpeter's theory is based on the process of innovation. He distinguished five types of innovation: (1) new production processes, (2) new products, (3) new materials or resources, (4) new markets, and (5) new forms of organizations (Schumpeter, 1934, p. 66). He also viewed creative destruction on a continuum. It ranges from major breakthroughs that make established competencies and many capital goods obsolete, to small incremental improvements, which focus on tasks that managers already perform, but in a different way (Swedberg, 1991, p. 41). Innovation may also be the restructuring of the organization with different methods and processes that allow for better strategy development. Schumpeter's understanding of the influence of technological change within economics and business has thus led the way for interpreting economic growth.

Contemporary literature on innovation -- particularly regarding technological innovation -- is populated by a number of taxonomies that attempt to categorize innovations by significance, similarity (as well as dissimilarity), technical domain, and other characteristics. As the vocabulary used to describe innovation has grown and evolved, scholars naturally generate multiple taxonomies, which are at times overlapping, redundant, or divergent. A recent review of the literature on new product development found that in just 21 empirical studies, researchers have developed fifteen different constructs for describing various aspects of innovation (Garcia & Calantone, 2002). Some of the distinctions produced by previous authors include *process* versus *product* innovation (Utterback & Abernathy, 1975), *incremental versus radical*

innovation (Henderson and Clark, 1990), and *evolutionary versus revolutionary* innovation (Utterback, 1996):

Technological innovation is defined here as a situationally new development through which people extend their control over the environment. Essentially, technology is a tool of some kind that allows an individual to do something new. A technological innovation is basically information organized in a new way. So technology transfer amounts to the communication of information, usually from one organization to another.

Diffusion

Diffusion is the process of acceptance or absorption of an idea or innovation into a social or economic system over time. Without innovation, no diffusion can take place. Correspondingly, without diffusion, an innovation remains an isolated event. Diffusion is complementary in Schumpeter's theory. He suggested that innovation without diffusion would not lead to economic development (Brouwer, 1991, p. 58). Those who initiate, create, and adopt innovations generally gain profits. Depending on the resources available and the entrepreneur's capability, diffusion can be rapid or slow. Not all entrepreneurs profit as quickly as others do. Some innovations require very high fixed costs and may only be profitable to organizations of a certain minimum size (Brouwer, 1991, p. 56). For example, progress in expensive technology is only relevant insofar as it has translated into increased productivity. As the cost of the new technology diminishes, more organizations are able to adapt and incorporate them. Because adjustments must be made when innovation is introduced, a new circular flow is established. As changes are incorporated into operating functions, a new equilibrium is established. The new output level is

greater and has different composition. This illustrates the spread of superior methods and products throughout the economy and is a method for improving economic efficiency. Building on Schumpeter's theory, Rogers (2003) wrote about the diffusion of innovations in 1962. Rogers noted the willingness and ability to adopt an innovation depended on awareness, interest, evaluation, trial, and adoption. However, many other factors also influence innovation adoption rates. These include unpredicted adaptation of a technology, as well as disruptive or competing technologies that may radically change the diffusion patterns.

CREATIVE DESTRUCTION IN ACTION

The Locomotive Industry

Schumpeter's concept of creative destruction through entrepreneurial combinations of existing resources and ideas provides new directions for economic development. Creative destruction, and the diffusion of new ideas, has given rise to numerous industries. Organizations cannot sustain themselves unless they are able to innovate, react, or adapt to changing environments.

The classic example of creative destruction is within the locomotive industry. From the very start the steamer locomotive was firmly established. Despite that, diesel power was introduced in 1920 (Churella, 1998, p. 378). This was a radical departure from previous ways of pulling trains.

The diesel engine did not share any integral parts that were essential to the steamers. Moreover, a new infrastructure had to be developed to accommodate the new fuel system, operation, and routine. The diesel locomotive also altered work-force requirements and efficiency of operations.

The impact on companies was even greater. A corporate realignment from earlier years had created two great locomotive companies: Baldwin Locomotive Works and American

Locomotive. They each held about forty percent of the total steamer market, with Lima Locomotive Works the remaining twenty percent. This three-firm oligopoly attempted to address the needs of locomotive buyers. Before long, two new entrants into the industry offered a diesel-fuelled substitute. Neither was in the locomotive business, but both General Motors and General Electric quickly gained control over diesel locomotive technology. The established steamer firms tried to catch up by incremental innovations, but creative destruction overpowered them. The new entrants were able to time their technological advances to meet the dynamics of the innovation cycle. This contributed heavily to their success (Churella, 1998, p. 378).

Schumpeter explained that no existing combination of resources is ever final and optimal. As such, there is always a better or more efficient way of organizing processes. New combinations are the essence of economic development. Furthermore, traditional ways of doing business are ending faster than anticipated because of the challenges of today's global economy. The changes within the economy are unlike any thing we have seen since the cave dwellers began bartering (Mandel, 1999, p. 60). This circumstance has created questions: what is next and how to prepare for the future. The current flood of innovations in almost all areas of life has forced all organizations to reinvent themselves to become more competitive. Such pressure has ushered a heightened ability to generate change.

Economic Vision

Schumpeter envisioned organizations operating at high rates of efficiency and scale while engaging in creative destruction (Foster & Kaplan, 2001, p. 21). This decision-making process involved divergent thinking. Rather than limiting creativity by focusing on clear problems and

providing well-known solutions quickly, divergent thinking promotes the broadening of decision-making. Instead of getting the fastest answer, the divergent approach places emphasis on careful observation of the facts and skills of reflection. As opposed to convergent “knee-jerk” answers, innovation and progress are achieved through expanding the context of decision-making (Foster & Kaplan, 2001, p. 19). Schumpeter presented three assumptions about innovation and economic vision: (1) innovation is assumed to be non-incremental over time, (2) innovation is only introduced at points of economic equilibrium; (3) equilibrium will be reestablished only when the innovation has been fully absorbed or diffused into the economy (Brouwer, 1991, p. 48).

Creative destruction is an element that promotes prosperity, improved standard of living, and quality of life. Dealing with the innovation process raises questions of how to harness this power to benefit society. Competition for small profits provokes entrepreneurs to innovate and it only takes a few leaders to take advantage of opportunities. Therefore, in a steady economy, an innovation by a single entrepreneur opens new profitable avenues. This causes a multiplier with other entrepreneurs as they begin to innovate, resulting in a cumulative effect of increasing overall revenues in the economy. Schumpeter believed that this process would continue by increasing the effects of innovation so entrepreneurs would create successive spurts of economic activity. This would lead to ever-higher levels of income. Unlike Ricardo, Schumpeter claimed that there were no diminishing returns to innovation (Riley, 1999).

Financial Flows

Schumpeter also applied the idea of Say's Law that supply creates its own demand in the area of finance. However, economists assert that financial services play only a minor role in stimulating economic growth (King & Levine, 1993, p. 1). Other economic theories are concerned with a finite supply of resources, such as factors of production. Nonetheless, Schumpeter wrote that financing business activity is limitless. Therefore, the availability of credit makes new commerce independent of previous activity. In other words, a bank creates credit by making loans from its excess reserves. For example, when a bond dealer surrenders a government bond to the Federal Reserve in exchange for a check, which is added to their account in a commercial bank, the bank can create new credit. This may be a direct transfer to an entrepreneur without the knowledge or consent of the deposit holder. Schumpeter suggested that this function constitutes the keystone of the modern credit structure (Schumpeter, 1961, p. 107).

Likewise, the private creation of credit, often financing entrepreneurial activities, spurs innovation (Schumpeter, 1961, p. 362). This is best illustrated by the role of venture capital. Innovations in financial organizations and instruments are themselves facilitators of further entrepreneurship and economic development. These phenomena are associated with the theory of creative destruction. Furthermore, while these innovations will generate incremental profits for the entrepreneur, they will eventually be diffused into the economy among competitors. The competitive differential that the entrepreneur had established will ultimately erode. Because of the diffusion, a new equilibrium will emerge and the process of creating competitive differences through innovations will again repeat itself. This will continue through the circular flow and is the dynamic process of the economy.

Static versus Dynamic Innovation

Schumpeter's point of view on innovation and creative destruction encompasses the notion that each firm tries to generate a profit not statically, but dynamically. It does so by choosing innovative long-run strategies. Companies do not increase profits from accepting existing constraints, but rather by breaking them. This competitive process, or the theory of creative destruction, is the foundation of economic growth (Screpanti & Zamagni, 1993, p. 244).

While equilibrium may appear to be the ideal state, disequilibrium must temporarily exist if the economy is to grow and incorporate innovations. This can be observed in that much of the growth in the major industrialized countries has come not from the expansion of well-established firms, but from the creation and growth of smaller enterprises. Disequilibrium will only occur and profits will only accrue from the entrepreneurs and early adopters because of diffusion.

The innovative process is defined by the correlation of its elements of study (Nelson & Winter, 1977). Inventions may be measured and the R&D process may be studied and defined. Science and invention may be linked, sources of innovation elaborated upon, organization factors investigated, the evolution of technology studied, diffusion of innovation measured, and the learning phenomena exposed. Invention is viewed as (a) complimentary, (b) cumulative, and (c) leapfrog (Rosenberg, 1976). Complimentary invention is the invention of a new process/product related to an existing technology; the invention of the mouse to support computer-human interaction is an example. Cumulative inventions are those that build upon, or "tweak" an existing invention, such as a product improvement like the pouring spout on juice containers.

Leapfrog invention infers a radical change away from existing technologies and echoes discontinuity in markets.

Invention is the core derivation of innovation. Florida considers invention as a breakthrough and innovation as an actualization (Florida & Kenney, 1990). Hindle further clarifies invention by labeling it as the creative origin of new process and the enabler of innovation (Hindle & Lubar, 1986), which has impacts on social, economic, and financial processes. Thus, the emerging definition of invention may simply be the creative process of progress. On the other hand, innovation is defined by the impact on societies and markets (actualization). For example, Wallace (1995) suggested that innovation generally lowers the cost of responding to a change in the commercial environment.

Thus, innovation has the connotation of market influence. In this context, the validity of Schumpeter's principle of creative destruction is further corroborated. This principle underscores the importance as both a challenge and an opportunity of the continual replacement, renewal and reinvention of socio-economic, technological and political institutions, practices, and infrastructures. Hence, the role of private and financial sector development as an enabler, catalyst and accelerator of bottom-up, entrepreneurial initiatives coupled with top-down creative and realistic innovation policies in developed, developing, and transitioning economies becomes increasingly central. At the core of our domain of intellectual discourse, higher order economic and technological learning processes are critical -- especially using a systems approach. (Dyker & Radosevich, 2000; Matthew, 1996; Carayannis, 2000)

Economic Learning

The term economic learning describes the concept that particular economic structures appear to accommodate changes (e.g. products, technologies, markets) better than others do. They do so partly through the flexibility of their firms themselves, but also through their capacities to promote inter-organizational linkages and collaboration and, above all, through the capacity of public institutions to imbibe and develop innovations, and then disseminate those innovations in various forms to firms, thus accelerating the process of adaptation. Matthew (1996) makes a useful distinction between first-, second-, and third-order economic learning. First-order learning takes place within firms (organizations). Second-order learning takes place between firms through arrangements like sub-contracting, licensing, consortia, equity partnerships or joint ventures. Third-order economic learning takes place both outside and within firms but in such a way that their operating conditions are changed. It is “meta-learning” (or learning how to learn) and it takes place at the level of the economic system as a whole.

THE DRIVING FORCES

Types of Innovation

Schumpeter’s five types of innovation mentioned previously may be collapsed into two major categories: product and process innovation. The differences entail separate processes of adaptation and creative destruction (Brouwer, 1991, p. 62-63). These differences are noted in two areas.

- a) Process innovation is measured by decreases in average costs. Most often, these technical advances involve existing products. For example, Computer Aided Design (CAD) has

revolutionized the way things are designed. CAD can devise a product more precisely, quickly, and at lower cost, than using the previous drafting room arrangements.

b) Pure product innovation is measured by increased revenues or market share. Product innovations introduce the capability to be competitive with market demands and involve the development of new or improved products that satisfy new or existing consumer needs. For example, the Internet and software technology allow on-line sales. Even sophisticated financial products are a just click away. Everyone gains by having timely information and even non-innovative institutions may expand their markets.

The relationship between science, technology, innovative investment, and markets is now much more intimate and continuous (Freeman, 1982, p. 214). Schumpeter's view suggested that as demand for a product grew, a variety of new firms would enter the market with different versions of the same product. For example, this has occurred with automobiles and computers. As these products gained in early popularity, variants were quickly diffused among a large number of companies (Utterback, 1994, p. 29). This process exists today. As soon as an idea is introduced, it is copied and numerous versions are diffused. This occurs in all industries whether they are relatively new, such as the Internet, or very traditional, such as steel. The steel manufactured today is very different from the same size of steel made fifty years ago. Although both have the same function, the new one is far superior in performance because of the increased amount of design, research, and knowledge. Thanks to the additional R&D invested in the new steel, its value has become greater (Kelly, 1998, p. 74).

Perhaps most publicized areas of innovation are those in the digital field. As noted above, the Internet is reshaping the rules of business. It is now a source of information for almost any

business decision. The Internet is part of communication and helps to increase the flow of information worldwide. According to the Secretary-General of the Organization for Economic Co-operation and Development (OECD), “we are probably just at the beginning of a new wave of technological change whose effects will be felt everywhere” (Johnston, 1998). Major areas of change include the life sciences that are supported by government-led basic research. This work is revealing new treatments and better pharmaceuticals. Other areas of rapid improvements include environmental management. Significant technologies derived from living organisms and biocatalysts are more examples of the new driving forces in the economy.

Knowledge as a Driver

Schumpeter’s emphasis was on entrepreneurship bringing radical changes into the economic system. He was concerned with being able to generate opportunities for innovation to grow, rather than on the administration of existing structures. Schumpeter established the open-ended, dynamic, and evolutionary approach to economic development and knowledge. This was in contrast to the rational neoclassical economic modeling concepts where knowledge is “static” or constant. He believed that economic growth occurs when knowledge is introduced to the situation. Knowledge has characteristics that make it unique compared to other resources, such as financial capital or land. Knowledge is like currency. It is transferable between organizations or individuals. Unlike money and land for example, both donor and recipient hold the knowledge even after a transfer. The act of sharing knowledge allows both parties to utilize that knowledge independent of the other (Carayannis, 2002).

In highly developed nations, knowledge has become one of the key input and output factors of economic activity. In addition, new technologies facilitate the process of globalization of economies and societies. In such a context, technological learning and knowledge have become crucial factors of economic, social, and -- especially -- entrepreneurial development. This empowers people and entrepreneurs across the world to take advantage of opportunities and chances. This relevant role of knowledge within social and economic development is associated with the term "knowledge economy". Knowledge plays a central role today, but it is simply another evolution of development phases following the historical path from the agriculture based through the industrial based economies.

Innovation, knowledge, and entrepreneurship are, therefore, critical success factors. They help wages grow and offer greater opportunity for people. The United Nations has put this process into perspective: "Had it not been for the possibility of starting up a small company to exploit a new idea, it is likely that many ideas of potential benefit to humanity would have never been generated" (United Nations, 1999, p. 207).

Another example is the case of inflation. This phenomenon demonstrates the impact of how change can produce opportunities. Historically inflation has been a nemesis to society. It causes consumers to lose purchasing power and results in a lower quality of life. However, the use of new technology driven productivity has increased organizational efficiency, ultimately decreasing unit costs that influence prices and cause inflation. In the United States, the steady abatement of the rate inflation during the latter 1990s had increased consumer confidence. Increasing confidence directly altered consumption, as well as business investment in those

factors necessary for economic growth. The environment during this period was characterized by fewer economic fluctuations along with very dynamic levels of business activity, knowledge, and innovation. It also brought other benefits, such as more certainty in decision-making. This helped bring about an extended period of unprecedented economic growth in the United States.

Creative destruction has been the dynamic force in the new knowledge driven economy. Innovations create opportunities and choices. However, there may be limits to the amount of innovation that can be absorbed. For example, one reason for the recession within the Information Technology sector during the early 2000s was the inability of Information Technologies (IT) customers to apply those new technologies (Economist, 2004, p. 7). With organizations facing never-ending intense competition, it is critically important that knowledge and innovation be top priorities in strategic planning.

Efficient allocation of resources and innovation

Economics is about scarcity and efficiency. Innovation fits into this context and is central for achieving a resolution to both of these problems. The innovation effect is based on a new combination or ordering of existing elements, rather than the creation of new elements themselves. Innovation has the effect of creating a new resource or markedly increasing the value of an old resource. Lowering of costs and making resources available can significantly reduce scarcity and improve efficiency. By introducing innovations, an outward shift in the production possibility curve will occur. Moreover, it is not just the use of resources; but because of competitive pressures, the pace of incorporating innovation is critical. This demonstrates the power of innovation in making resources more efficient, productive, and, consequently,

economically rewarding (Gwartney, 1987, p. 38-39). This was the case in the United States during the late 1990s.

Scherer states: "supply-push or technology-push concept occurs when changes in scientific and engineering knowledge makes new products or processes feasible or reduces their costs." This is illustrated when the autonomous advances in scientific and technical knowledge permit the substitution of modeling or computation for the more costly trial and error process.

Advancements in mathematical modeling or breakthroughs in new computer simulation can then be used to determine a one best way without the traditional laboratory. Traditionally, entrepreneurs and innovators generally work by trial and error and tend to prefer feasibility tests to feasibility studies. The net effect of these advances is to shift the supply curve for technological change and innovation to the right" (Scherer, 1984, p. 18).

ORGANIZATIONAL INNOVATIONS

Creativity and Entrepreneurship

Schumpeter's ideas were associated with the roles of innovation within organizations. Innovation can alter the development and configuration of organizational structures. He believed that enterprises might become so large that bureaucratic managers would be less apt to innovate and may eliminate their entrepreneurial functions. Although equilibrium models would say the opposite, Schumpeter points out those large firms with more control over prices do not necessarily become less efficient as they get larger. It is important to understand how innovation and organizations interact to promote this process.

Schumpeter wrote on how organizational innovation may create the atmosphere for idea development and more emphasis on creative destruction. This places a large responsibility on human resources, as they are the most important assets an organization possesses. Lacking productive workers, no business can prosper. While few managers would argue with these statements, not many businesses have incorporated innovative ways to keep their employees productive. This is particularly important within environments of continual changes and fierce competition (iThink, 1992, p. 189).

While creativity, innovation, and entrepreneurship are essential operating objectives for progressive companies, there are many organizations that should be innovative, but actually fail to do so. As dramatic technological, economic, political, and social changes continue to characterize the world, the responsibility of the managers in these organizations to stimulate, support, and achieve innovation is becoming inescapable (Schermerhorn, 1993, p. 660).

Managers, Creativity, and Innovation

Drucker wrote, "There is only one valued definition of business purpose. This is to create a customer. The customer determines what the business is and what the business will do for society. Because it is the purpose to create a customer, business enterprises have two, and only two, basic functions: marketing and innovation" (Drucker, 1985, p. 37). Since marketing and the other business functions are interrelated, there has been increased research on innovation's impact on corporate goal-attainment. Scholars have connected innovativeness to organizational

accomplishments. This suggests that a firm needs to be innovative in its design to gain a competitive edge and, hence, to survive and grow (Gronhaug & Kaufman, 1988, p. 3).

Entrepreneurs, or founders of a company, have more latitude and flexibility within their organization than other types of managers. Because of their individualistic orientation and more secure position, owners are uniquely willing and able to try new or more challenging options. Often they do not require as much supportive information as traditional managers. They may be more willing to accept a higher degree of risk. An integral part of the entrepreneurial culture is promoting innovation. The leaders cannot survive unless they are one product, service, or idea ahead of the competition. Yet, established organizations have a greater status quo to protect. Traditional managers must often document and plan much more carefully. They have less freedom to innovate. This behavior accents the need for a responsive and innovation oriented corporate culture among established companies.

Innovative organizations are mobilized to support creativity and entrepreneurship. Their managers take active roles in leading the innovative process. Four characteristics shared by highly innovative organizations are: (1) a strategy and culture that supports innovation, (2) an organizational structure that supports innovation, (3) a staffing component that supports innovation, and (4) a top management that supports innovation (Schermerhorn, 1993, p. 661). To encourage innovation, managers need to eliminate risk-averse climates and replace them with organizational cultures willing to pursue different approaches. However, Schumpeter was concerned that further development of capitalism will make the entrepreneur obsolete. He saw

modern corporations organize large planning and research and development departments where “innovation itself is being reduced to routine” (Schumpeter, 1942, p. 132).

Organizations may genuinely innovate because of a clear, predetermined strategy, or by accident. Some organizations have policies on product review and development responding to either technical change or market needs. Others simply react to the competition. For example, startup companies that are often established to market a single specialty product, fall into the latter category. However, when there is no clear strategy for innovation, it is unlikely that the necessary planning and control mechanisms will appear to carry through a successful project. This is why so many ventures involving new ideas fail, although what was involved may have been well designed and meet perceived needs. Successful companies innovate because of strategic planning that includes the formation of an infrastructure necessary to support the innovation. Yet, this does not mean that the existence of a strategy guarantees success. All innovations are subject to risk. The aim of the strategy and the subsequent planning is to create an environment and procedures that minimize this risk and increase the chances of success.

Managers who are actively willing to embrace the increasing uncertainty facing their organization and attempt to anticipate future developments are performing strategic planning. To be successful, they must have the fortitude not only to change the way their firm operates, but also modify elements in their environment to help create a future more favorable to their corporation. However, if a company is already in trouble, then management may first have to resolve the problems or issues that destabilized their organization. Unfortunately, research indicates that many managers are often not able to escape this day-to-day mode of decision-

making. They do not focus on the larger picture of organizational change. Additionally, the traditional bureaucratic corporation is most often not able to respond and innovate. It will not succeed. Therefore, Schumpeter's belief was that capitalism, in the form of the traditional corporation, would lead to its own destruction as a victim of the success of that economic system. He holds that innovation is the key to capitalism, and that innovation can break down even a monopoly by providing a substitute for the monopolized product. Innovation is the cause of both creation and destruction.

INTERNATIONAL ASPECTS OF INNOVATION

Innovation and the Global Dimension

Technology changes the way society functions. The dramatic advances in technology over recent decades have collaterally precipitated wide-sweeping and profound change to the functioning of almost every form of human exchange, the world over. What emerged in developed economies during the latter years of the twentieth century is knowledge-based economics -- an evolutionary framework of social transaction that now dominates the behavior of mankind in the twenty-first century:

The characteristic conduct of businessmen in depression consists of measures, corrections of measures, and further measures to solve this problem; all the phenomena, apart from panics unfounded in fact and the consequences of errors -- which characterize the abnormal course of events in a crisis -- may be included in this conception of the situation created by the boom and of businessmen's conduct

enforced by it, of the disturbance in equilibrium and the reaction to it, of the change in data and the successful or abortive adaptation to it (Schumpeter, 1934).

Companies engaging in international business have historically used economies of scale or low wages in specific labor markets as major advantages to augment their business portfolios and increase profits. Today, innovation and market opportunities are often cited for moving into the global market. Markets worldwide are becoming more open and intensely competitive. For example, information and communications technologies facilitate the globalization of markets. Moreover, innovation affects every sector in every country. The result is a networked world economy, "blurring the old dividing lines between the industrialized world and the transitional and emerging economies" (Johnston, 1998). To meet the demands and constraints of these markets, companies have been forced to introduce both product and process innovation (Bartlett & Ghoshal, 1998, p. 131).

Within this context, innovative ideas have filtered down to exist in two major dimensions: (1) the global corporate structure and (2) the locally linked environments. Both dimensions are connected and -- if taken together -- may provide the strength needed to compete in global markets. This arrangement is called trans-national innovation. For example, efficient transportation and development of telecommunications infrastructures has made dispersed markets close. Electronic commerce is further helping to eliminate political borders in many business sectors. Trans-national innovation is revolutionizing tradition bound services such as retailing and banking. Information technology is driving innovation even in very mature manufacturing industries (Johnston, 1998). This allows large multinational companies to

structure themselves and serve local market needs in innovative ways (Bartlett & Ghoshal, 1998, p. 132). On the other hand, small organizations are also able to benefit from trans-national innovation. For example, firms in low-cost areas are preparing to deal with the profit motive in the future by not emphasizing low-end production. Rather, some are focusing on better quality and service to become integral participants in the global supply chain.

A continual cycle forms as a company introduces a new idea. It is rapidly diffused and spread to others within the global environment. Similarly, as one innovation enters a work environment, at least two new ones are generated. The endless ebb and flow of creative destruction and diffusion continue to drive global markets and the circular flow of products, processes, as well as profits (Bartlett & Ghoshal, 1998, p. 153). There are constant breakthroughs in science and technology. Enterprises anywhere can benefit from these opportunities because of expanding information networks. Production of improved goods and services generates new markets starting an expanding cycle, and higher standards of living, therefore encouraging new ideas to flourish in a world in search of sustainable growth (Johnston, 1998).

The Schumpeterian theory of creative destruction circulates around the world. It has become the cornerstone of competitive edge for international business by helping organizations survive in the global markets. A greater awareness is required that innovation, globalization, and the work force revolution are as much tools for developing nations to escape poverty, as they are tools for them to be exploited (Friedman, 1999, p. 12).

SOCIAL IMPACT OF CREATIVE DESTRUCTION

One of the less known areas of Schumpeter's work is his framework to incorporate the socio-economic sciences. Schumpeter attempted to develop an integrated approach the social sciences. Schumpeter showed how static analysis could be correct at points in time; however, it could not be used in time series. Thus, evolutionary dynamics applied in the biological sciences, but while extending it to the field of economics, Schumpeter also focused attention to it to the other social sciences.

Social Dimensions of Innovation

People, culture, and technology serve as the institutional, market, and socio-economic "glue" that binds, catalyzes, and accelerates interactions and manifestations between creativity and innovation, along with public-private partnerships, international research & development (R&D) consortia, technical, business, and legal standards (such as intellectual property rights: "IPR") as well as human nature and the "creative demon". The relationship is highly non-linear, complex and dynamic, evolving over time and driven by both external and internal stimuli and factors such as firm strategy, structure, and performance as well as top-down policies and bottom-up initiatives that act as enablers, catalysts, and accelerators for creativity and innovation that leads to competitiveness.

National and international policies concerning IPR are examples of top-down enablers. The incentive to invest in R&D is the opportunity to earn monopoly rents from a significant innovation or discovery. Hence, protecting IPR is viewed under traditional economics as

fundamental to growth and development. However, this notion has been questioned when corporate objectives move from an open knowledge economy to the extraction of maximum profits from their innovations. This is most often to the detriment of the health or welfare of citizens living in various societies. For example, increasing pressure is being placed on pharmaceutical companies to share their discoveries in the less developed nations, as well as on media that include copy protection schemes within their products that tamper or impede their customer's playback equipment.

Another area of great concern for growth in an economy is human capital. This is because before there can be any investments in technology and innovation, there must be sufficient human capital. This was not the case during the industrial economy when machines replaced human labor to generate wealth. In the knowledge economy, human capital is the machine that creates wealth. Human capital is not only associated with advanced technology industries, rather it is required in all fields as knowledge workers provides new opportunities. Increasingly, workers today must use information skills to perform their duties, than carry out entirely unaided physical labor. This raises another social policy issue. Not only is formal education and training critical for facilitating economic growth, but also experience and life-long learning are increasingly important as intellectual capital. Human capital is thus a source of competitive advantage.

According to Routti (2003), the knowledge-based economy can be characterized as fractal -- *non-linear, unstable, and stochastic*. The knowledge-based economy creates profit avalanches. Entrance is easy for small, intelligent companies, but there is no space for organic growth; the market is instantly global and a newcomer can attain dominance in ten years. It also

differentiates itself by the convergence of technologies, which removes market sector boundaries: wireless, satellite, cable, and telecom no longer belong to discrete sectors. In a mobile information society, services as well are different, impacted by the presence of Internet, virtual organization, or network transactions.

Schumpeter's ideas are rooted in social-cultural changes. He wrote that the capitalist system might cause a breakdown of social relations. He anticipated that high profits might act as a brake on innovation. In this context, entrepreneurial activity would then be viewed as a negative force in society. The public may then have a skeptical opinion of the overly compensated and highly influential capitalist. The average working person could then adversely react to the aggressive activities of ambitious materialist driven individuals. Consequently, a cynical view of the greedy entrepreneur would then diminish the supply of entrepreneurs. The recent flood of stories about top management greed and wrongdoing has underscored this problem.

On the other hand, innovation is a variable that contributes and aids in social and economic development. Major benefits accrue to business and individual users of innovations. However, innovation also creates destruction and displacement of people, resources, and entire industries. For some members of society this is a major hardship. Nevertheless, change has been a vehicle toward prosperity and higher standards of living for many people. This is the case within the United States and many of the developed industrialized nations. Unfortunately, knowledge and entrepreneurship are not equally distributed. Many countries in the world, including those considered lesser developed, are far from participating in the opportunities available in the economically advanced nations.

Billions of people still exist by scraping together items from the earth simply to survive from one day to the next (Geewax, 1999, p. B1). There is a huge gap between the technologically advanced nations where innovations are produced continually and the conditions in some parts of the world that are still using methods invented centuries ago. While Schumpeter's ideas have been enormously successful in the industrialized nations, they have not been completely implemented in many other societies. As technological advances accelerate even more, the gap widens and more people may become members of the "have-not" groups.

Comprehensive answers to bridging this gap have yet to be developed. Simple aid solutions may not affect long-term needs. Incorporating the principles of innovation, creative destruction, and diffusion should play a central role in more programs. These principles are inevitable, therefore - if managed properly -- can become very effective vehicles to lift living standards. For example, working conditions in poor nations should improve if barriers to globalization and innovation are reduced. A trans-national innovation driven policy can produce many benefits for even the less fortunate. Promoting greater business expansion to low-cost labor nations ultimately means producers must tie in with retailers in advanced nations. The more this happens, the more conditions will improve in less developed areas, as consumers are demanding not only lower prices, but also higher quality. Therefore, to increase the quality of production, working standards in low-cost labor areas will not only improve, but will also have to meet the values expected by consumers in advanced nations. This phenomenon underscores Schumpeterian principles.

The United States may serve as an example of the effects of what Schumpeter predicted. Although this country is proud of its capitalistic economy, it has seen a steady increase in so-called "socialistic" programs over the past half century. Most recently, the emphasis has shifted from social programs to more corporate welfare. These include assistance to various industries (therefore indirectly providing benefits to their employees and investors). This is due to the shortcomings of the pure capitalist scheme. Schumpeter predicted that more social programs would become unavoidable. This stems from the economic gaps that exist among members of our society, as well as the deficiency in social responsibility among corporate entities. Nevertheless, intervention in the market place through social programs has actually improved the economic system instead of "destroying" it. Policy dilemmas currently facing not only the United States, serve as a reminder of Schumpeter's prophecies:

Increasingly, the US is at a crossroads no less dramatic than that facing European welfare states. Employers will contribute toward, but no longer guarantee, the benefits that previous generations took for granted. Instead, there is a policy vacuum as politicians from both right and left worry that employees are unable or unwilling to save enough on their own but cannot agree on a solution. If welfare capitalism is dying away, what will replace it - a more self-reliant individualism or creeping state intervention? The irony of the second scenario is not lost on those who study the history of US corporate benefits. Since American Express launched the first employer-provided retirement plan in 1875, through the Great Depression and the postwar boom, part of the reason the business community has been willing to provide such benefits was to guard against the dread accretion of big government (Roberts, 2006).

The problem is to achieve a balance between lifting the quality of life in conjunction with increasing technology, as well as determining the proper mix of social welfare and the so-called entrepreneurial spirit of capitalism. "Unlike other economic systems, the capitalist system is geared to incessant change. This process of creative destruction is the essential fact about capitalism" (Schumpeter, 1942). It keeps the system healthy by weeding out weak businesses, nourishing the strong ones, and thereby raising living standards by promoting efficiency and innovation. This may not be a comfortable or easy environment, but it is a means for lifting the masses of the people out of poverty (Hanke, 1997, p. 1).

SCHUMPETER AS A SOCIALIST?

The Collapse of the Capitalist System?

It is interesting to note that Schumpeter believed that the capitalist system would eventually collapse from within and it would be replaced by a socialist system. On this point, he agreed with Marx, but his version of socialism was in many respects very different. Marx felt very strongly that the economic model employed would determine the construct of society. The cornerstone of his theoretical structure was the "Theory of Value" (*Das Kapital*) where the value of a commodity, given perfect equilibrium and perfect competition, is proportional to the input of labor. Schumpeter disagreed with Marx on this issue offering the conclusion that both perfect equilibrium and perfect competition were problematic at best. Additional disagreements centered on the inclusion of the value of land in the equation. Another point on which Schumpeter

disagreed, is Marx's contention that the capitalist system would implode (*Zusammenbruchstheorie*) because of its intrinsic inequities. In Schumpeter's view, the natural evolution of capitalism would destroy the foundations of capitalism from within. In fact, he believed that the economic depression of the 1930's was an indication of a paradigm shift, reinforcing his beliefs. Schumpeter viewed capitalism in much the same way as he viewed the process of innovation. Both were generally considered stable processes (under perfect conditions) from a theoretical model perspective. However, Schumpeter introduced the conceptual theory of disequilibrium as the key influential factor and this could be further expanded into the concept of a continuum of punctuated disequilibriums (Carayannis, 1994) to capture and articulate the concept of successive Fisher-Pry curves (S-curves) with discontinuous and/or disruptive innovations causing a change of curve and/or change of "the rules of the game":

Michael Tushman and Charles O'Reilly suggest that discontinuous innovation involves breaking with the past to create new technologies, processes, and organizational "S-curves" that result in significant leaps in the value delivered to customers. Similarly, Clay Christensen, Gary Hamel and C.K. Prahalad, and James Utterback describe discontinuous innovation as involving "disruptive technologies," "discontinuities," or "radical innovations" that permit entire industries and markets to emerge, transform, or disappear (Kaplan, 1999).

While early capitalism is often referred to as "laissez-faire" because of its freedom to change, post-World War II capitalism is much more bounded by social, political, and legal norms. This more bounded form of capitalism of today is a logical extension of Schumpeter's theory.

The concept of innovation as a “socio-technical” system is now well established. For example, Rogers (2003) defined innovation in terms of the perceptions of the individuals or groups that adopt an innovation. The significance and relevance of technology is twofold. In one case, it widens the gap, leaving developing countries lagging. In the other, technology can optimize and maximize development efforts. There exist significant variation in the acceptance of innovation among societies. The influences of socio-technical forces to foster economic growth are well documented. Deeper cooperation among international donors and recipient countries is needed to allow the optimization role of technology. An example would be the numerous attempts overcome the widening disparity among the highly industrialized and the developing nations.

Technological transformations, as well as economic and social discontinuities among regions, necessitate new thinking and possibly re-inventing ways and means to support economic development. An example could be the pronounced shift from product-focused and tangible-based economies to business environments that are focused on services and their basis is intangibility that at the heart of the knowledge economy.

Innovation through the creation, diffusion and use of knowledge has become a key driver of economic growth and provides part of the response to many new social challenges. However, the determinants of innovation performance have changed in a globalizing knowledge-based economy ... partly as a result of information and communication technologies. ... Innovation results from increasingly complex interactions at the local, national and world levels among

individuals, firms, and other knowledge institutions. Governments exert a strong influence on the innovation process through the financing and steering of public organizations that are directly involved in knowledge generation and diffusion (universities, public labs), and through the provision of financial and regulatory incentive (OECD, 2001).

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The "Old and the "New" Economy

Foundations of post-World War II technology paradigms have been influenced by market size, standards, high motivation, and the supply of capital. From the perspective of the United States, there has been a paradigm shift, affecting competitiveness, productivity, and innovation. The key elements affecting this shift are discontinuity, innovation (*generally reducing overall cost*), market demand (*technology pull and market push*) (Carayannis & Roy, 1999), and imports (*competitiveness factor*) (Diwan & Chakrabarty, 1991).

Contemporary economic models have an underlying theme of reinvigorating how innovation and entrepreneurship is viewed. For example, in the recent past there were references to the "old" and "new" economy to describe the evolution of economic models. The old economy -- industry based -- traditionally has been characterized by economies of scale. On the other hand, the new economy -- knowledge based -- is considered the economy of networks and collaborative (Shapiro & Varian, 1999). In Moore (1996), the traditional old economy is defined as a firm

going up against its competition, in a win-loose scenario. The new economy paradigm is defined as market creation or co-evolution in a win-win type of scenario.

This new paradigm in economic and social development brings is now called the Knowledge Economy. It is based directly on the production, distribution, and use of knowledge and information. Economic growth is driven by the accumulation of knowledge and new technological developments create technical platforms for further innovations. These technical platforms, in turn, are drivers of economic growth. Even with unlimited labor, natural resources, and ample capital, traditional economics predicts that there are diminishing returns on investment. Technology raises the return on investment (Carayannis & Wetter, 2004). This is why developed countries can sustain growth and why developing economies cannot attain growth without it.

Schumpeter predicted that “creative destruction” and technological change would drive the process of economic growth. The contemporary Knowledge Economy is a perfect example of his theories at work.

REFERENCES

- Bartlett, C.A. and Ghoshal, S. (1998). *Managing Across Borders: The Transnational Solutions*. Boston: Harvard Business School Press.
- Bauer, J. M. (1997). Market Power, Innovation and efficiency in Telecommunications: Schumpeter Reconsidered. *Journal of Economic Issues*, 31(2), p. 557-565.
- Brouwer, M. (1991). *Schumpeterian Puzzles - Technological Competition and Economic Evolution*, Ann Arbor, MI: The University of Michigan Press.
- Carayannis, E. and Roy, S. (1999). Davids vs. Goliaths in the Small Satellite Industry: The Role of Technological Innovation Dynamics in Firm Competitiveness, *International Journal of Technovation*, May 20(6) p. 287-97.
- Carayannis, E. and Wetter, J. (2004). "The Nature and Dynamics of Discontinuous vs. Disruptive Innovations and the S-Curve: vs. Market Pull & Push Forces and Learning Curve Effects". International Association for Management of Technology (IAMOT) Washington, DC, April 3-7. Accessed on 25 November 2005:
<http://www.iamot.org/conference/index.php?cf=4>
- Carayannis, E. (1994). The Strategic Management of Technological Learning: Transnational Decision Making Frameworks and their Empirical Effectiveness. *Published PhD dissertation, School of Management, Rensselaer Polytechnic Institute, Troy, NY.*
- Carayannis, E. (2000). The Strategic Management of Technological Learning: Case Studies from Power Generation, Transportation, Pharmaceuticals, and Software US and European Firms, CRC Press.

- Carayannis, E. (2002). "Is Higher Order Technological Learning a Firm Core Competence, How, Why, and When: A Longitudinal, Multi-Industry Study of Firm Technological Learning and Market Performance", *International Journal of Technovation*. (22) p. 625-643.
- Castelluccio, M. (2002). "Schumpeter's Dumpster", *Strategic Finance*, 84(4), p. 61-62.
- Churella, A. (1998). "Market Imperatives and Innovation Cycles: The Effect of Technological Discontinuities on the Twentieth Century Locomotive Industry." *Business and Economic History*, 27(2), Winter, p. 378-89.
- Dahms, H.F. (1995). "From Creative Action to the Social Rationalization of the Economy: Joseph A. Schumpeter's Social Theory", *Sociological Theory*, 13(1) p. 1-13.
- Diwan, R. and Chakraborty, C. (1991). *High technology and international competitiveness*. New York: Praeger
- Drucker, P.F. (1985). *Innovation and Entrepreneurship - Practices and Principles*, Harper and Row.
- Dyker, D. and Radosevic, S. (2000). *Building the Knowledge-based Economy in Countries in Transition: From Concepts to Policies*, Working Paper, World Bank & EU DGXII TSER programme.
- Florida, R.L. and Kenney, M. (1990). *The Breakthrough Illusion: corporate America's failure to move from innovation to mass production*. New York: Basic Books.
- Foster, R. and Kaplan, S. (2001). *Creative Destruction: Why Companies that Are Built to Last Underperform the Market - and How to Successfully Transform Them*. New York: Currency.
- Freeman, C. (1982). *The Economics of Industrial Innovation*, Cambridge, MA: The MIT Press.
- Friedman, T.L. (1999). "In Sri Lanka, 2005 is the Year to Fear." *New York Times*, November 23.

- Garcia, R. and Calantone, R. (2002). "A critical look at technological innovation typology and innovativeness terminology: a literature review", *Journal of Product Innovation Management*, 19, 110-132.
- Geewax, M. (1999). "Poverty Connection: High-Tech Divides Us Further." *Albany Times Union*, July 25.
- Gronhaug, K. and Kaufman, G. (eds) (1988). *Innovation: A Cross-Disciplinary Perspective*, Oslo: Norwegian University Press.
- Gwartney, J.D. (1987). *Economics - Private and Public Choice*, New York: Harcourt Brace Jovanovich.
- Hanke, S.H. (1997). "Stop the World, We Want to Get Off." *Forbes*, October 6.
- Henderson, R., and Clark, K. (1990). "Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms". *Administrative Science Quarterly*, 35, p. 9-30.
- High Performance Systems. (1992). *iThink™, The Visual Thinking Tool for the 90's*, Hanover, New Hampshire.
- Hindle, B. and Lubar, S.D. (1986). *Engines of change: the American industrial revolution, 1790-1860*. Washington, DC: Smithsonian Institution Press.
- Johnston, D.J. (1998). "Putting Innovation to Work." *The OECD Observer*, No. 213 August/September.
- Kaplan, S. (1999). "Discontinuous Innovation and the Growth Paradox", *Strategy and Leadership*, (27)2. March-April, p. 16-21.
- Kelly, K. (1998). *New Rules for a New Economy, 10 Radical Strategies for a Connected World*. New York: Viking (Penguin Group).

- King, R.G. and Levine, R. (1993). "Finance and Growth; Schumpeter Might be Right," Paper 1083, World Bank - Country Economics Department, Outreach #4.
- Langlois, R.N. (1991). "Schumpeter and the Obsolescence of the Entrepreneur." *Working Paper 91-1503* Department of Economics, University of Connecticut, November.
- Langlois, R.N. (1997). "Cognition and Capabilities: Opportunities Seized and Missed in the History of the Computer Industry," in Raghu Garud, Praveen Nayyar and Zur Shapira, eds., *Technological Learning, Oversights and Foresights*, New York: Cambridge University Press.
- Mandel, M. (1999). "The Road From Serfdom." *Forbes*, May 17.
- Matthew, J. (1996). "Organizational Foundations of the Knowledge-based Economy", in *Employment and Growth in The KBE*, Paris: OECD, p 161.
- Moore, J.F. (1996). *The Death of Competition*. New York: HarperCollins,
- Nelson, R.R. and Winter, S.G. (1977). "In search of useful theory of innovation". *New Holland Research Policy*. 6, p. 37-76.
- Riley, R. (1999). *Theories of Economic Growth*,
<http://ds.dial.pipex.com/town/parade/rcb48/growth.htm> (accessed on: 11/23/2005).
- Roberts, D. (2006) "America's Dilemma: As Business Retreats from its Welfare Role, who will take up the Burden?", *Financial Times*, January 13, p. 11.
- Rogers, E.M. (2003). *Diffusion of Innovations* (5th edition), New York: Free Press
- Rosenberg, N. (1976). "On Technological Expectations". *The Economic Journal*, (86)343, September, p. 523-535.
- Routti, J. (2003). *Research and Innovation in Finland; Transformation into a Knowledge Economy*. Keynote Speech at Knowledge Economy Forum II, Helsinki, March 26-8.

- Scherer, F.M. (1984). *Innovation and Growth: Schumpeterian Perspectives*, Cambridge, MA: The MIT Press.
- Schermerhorn Jr., J.R. (1993). *Management for Productivity*, Fourth Edition, John Wiley and Sons.
- Schumpeter, J.A. (1934, Fifth Printing, 1997). *The Theory of Economic Development*, Transaction Publishers (New Brunswick, USA and London, U.K.).
- Schumpeter, J.A. (1942). *Capitalism, Socialism, and Democracy*. New York: Harper & Brothers Publishers.
- Screpanti, E. and Zamagni, S. (1993). *An Outline of the History of Economic Thought*, trans. David Field, Oxford: Clarendon Press.
- Shapiro, C. and Varian, H. (1999). *Innovation Rules: a Strategic Guide to the Network Economy*. Boston: Harvard Business School Press.
- Stolper, W. (1994). *Joseph Alois Schumpeter: The Public Life of a Private Man*, Princeton, NJ: Princeton University Press.
- Swedberg, R. (1991). *Schumpeter, A Biography*, Princeton, NJ: Princeton University Press.
- Swedberg, R., Editor. (1991). *Joseph A. Schumpeter: The Economics and Sociology of Capitalism*, Princeton, NJ: Princeton University Press.
- The Economist* (2004). "Men and Machines" (reprint). Newspaper Group; New York. November 13.
- United Nations. (1999). *World Economic and Social Survey 1999*, (E1999/50/rev.1) New York: UN Development Policy and Analysis Division.
- Utterback, J.M. and Abernathy, W.J. (1975) "A Dynamic Model of Product and Process Innovation," *Omega*, 3(6) pp. 639-656.

Utterback, J.M. (1994, paperback in 1996). *Mastering the Dynamics of Innovation*. Boston: Harvard Business School Press.

Wallace, D. (1995). *Environmental Policy and Industrial Innovation: Strategies in Europe, the USA, and Japan*. London: Royal Institute of International Affairs; Washington, DC, Energy and Environmental Programme: Earthscan Publications.

Working Group on Innovation and Technology Policy. (2001). *Innovative Clusters: Drivers of National Innovation Systems*, Organization for Economic Cooperation and Development (OECD).