THE INFORMATION ECONOMY: AN EVOLUTION OF APPROACHES

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INTRODUCTION

Three processes related to the information economy have been unfolding concurrently, each according to its own dynamics and speed. A series of alternative conceptualizations of the information economy has emerged. The subfield of the economics of information is coalescing out of the merging and expansion of several strands of work in the literatures of economics. And empirical developments — including the appearance of new types of organizational form, shifting market activities, and the sustained production and distribution of goods and services — continue in their own multiple ways, unaware of, and unconcerned about the efforts of scholars to contain them.

The three are, of course, not unrelated. Conceptualizations of the information economy inform the making of policy and interact with the definition, bounding, and attitude of the nascent economics of information. Developments in the economics of information — most profoundly explored by Don Lamberton (1974, 1984, 1992, 1994, 1997) — expand the kit of tools available to analysts and decision-makers in both the public and private sectors. The policies which result are among the structural forces shaping the environment in which economic activities unfold. Thus, these elements are mutually constitutive.

The global economy is undergoing a shift from dominance by market relations to dominance by relations within organizations and other forms of networks. This is happening just as innovation in the information infrastructure enables evolution of organizational form itself. The simultaneity of various processes means there is more than one thing going on at a time. This is particularly so when one looks across levels of the social structure or uses different geographical or cultural loci as lenses. Sheer turbulence further adds to the complexity of economic activity.

In coping with these changes and complexities pragmatically and analytically, enough difficulties have been experienced that a paradigm shift in economic thinking appears to be required. Thomas Kuhn (1962) argued that the shifts in the basic paradigms of human understandings about the nature of the world that are the history of science come about as the result of a process that begins with the accumulation of empirical evidence that does not fit into the existing paradigm. Efforts by scholars to fit conflicting evidence into the existing
paradigm result in ever more complex models; the extraordinarily elaborate astronomic models of several hundred years ago provide a vivid example. However, as the counter-evidence builds, it becomes ever more difficult to incorporate it into any model based on the existing paradigm, no matter how complex. Meanwhile, other thinkers, scholars, and scientists will have begun suggesting alternative paradigms. Ultimately, the complexity of models, in combination with the amount of evidence that will not fit within them, causes the existing paradigm to fall and an alternative paradigm to come to dominate thought and scientific research in what Kuhn referred to as a ‘scientific revolution’. The period during which alternative paradigms are being discussed can be quite turbulent.

The three ways of conceptualizing the information economy that have appeared represent different stages in the process of paradigm change, from denial and resistance, to acceptance and experimentation, to tentative first identification of the seeds of a new paradigm. These three approaches differ in the questions they ask about the economy; the assumptions upon which they are based and the theories used to work from those assumptions; the ways in which they respond to the problems encountered during efforts to use neoclassical tools in the analysis of information creation, processing, flows, and use; and their implications for decision-making. The approaches are not mutually exclusive; it is argued here that a variation on the third approach, an enriched network economics perspective, has the greatest validity and the greatest utility as a foundation for further research and for use in decision-making purposes.

The first approach focuses on changes in the nature of information products, and defines the information economy as that in which products in the information sector play a proportionately larger role than they have during other periods of history. The second focuses on changes in the domain of the economy, and defines the information economy as that in which the economy has expanded through commodification of forms of information and its flows never before commodified. The third focuses on changes in the way in which the economy functions, defining the information economy is that in which the market has been replaced by harmonized information flows as the key coordinating mechanism.

The clarification of the different types of conceptualizations of the information economy offered in this chapter may contribute to the emergence of the field of the economics of information. Within the rubric of an enriched network economics approach there is room for many, if not all, of the strands in the history of economic thought which have dealt with aspects of the economics of information – transaction costs, uncertainty, asymmetry, and so on. A mapping of the latter onto the former should identify lacunae as well as complementarities and contradictions, and thus present a research agenda. The chapter begins with a synthetic review of problems faced by neoclassical economic treatment of information creation, processing, flows, and use.
PROBLEMS IN THE ECONOMICS OF INFORMATION

The problems described here have all been confronted by economists, businesses, and other entities struggling to deal with information in its various forms, and are popularly discussed as particularly troublesome features of the current economic environment. They are not all exclusively problems raised by dealing with information; many also occur when trying to cope analytically with things that are tangible as well (see, for example, Brennan's (1990) useful comparison of constraints on real as opposed to intellectual property). Here, the focus is on problems which confound efforts to use neoclassical analytical tools in the analysis of information creation, processing, flows, and use.

The problem of creation

From the perspective of neoclassical economics, things are created only in response to demands of the market. The producer and the consumer are distinct from each other, the producer is identifiable, and there are clear distinctions among intermediate product, final products, and capital. Yet, there are several types of information creation out of motivations radically different from those of the market, including those which build and sustain interpersonal and communal relations, symbolic communication, ritual communications, artistic creations, and physiologically stimulated expressions. Acknowledgment of non-market driven information may suggest a positive mandate to ensure that all members of the community have opportunities for all kinds of expression as part of the body of communicative rights. While historically the consumer has not been considered by economists to be part of the production process, there are multiple roles for consumers in the production of information products and services, from that of shaping products interactively (as with a database, or via collaborative work projects) to their role as products in themselves (as pointed out in Smythe's (1981) famous insight that viewers are the most important product in the television industry), to their role in crafting the meaning, and therefore value, of a product.

Joint production is increasingly a problem as new work arrangements evolve in the manufacture of material goods, but it is almost always a problem in the production of information services and goods, and is related to the problem of provenance discussed below. Since the relative import of any individual's contribution is impossible to measure quantitatively, the distribution of the profits and other benefits of the production of services and goods is always a political matter. Some information never enters the market as a commodity because it is retained for use by the information producer. This is a particularly fascinating problem in a period of increasing awareness on the part of organizations that determination as to which is to be retained as a form of capital and which information is to be sold as a commodity is one that can be a deliberate choice in this environment.
The problem of time

Economists working in the neoclassical tradition are concerned about information only when it enters into and as it affects the market, which requires a gap of time between production and consumption that is identifiable and fixed. A number of problems arise because of the fluidity of the relationships between information and time. Huber (1987) would elevate problems of time to the stature granted those of space, noting that historically we have been conceptually biased towards questions of space (tele-communications) rather than those of time (chrono-communications). The production and consumption of many informational goods and services occur simultaneously, so that there is no time during which market relations might appear.

Electronic networking enables constant production processes as electronic communities together create information, work collaboratively on texts or other projects, or participate in ongoing conversations. In such an environment, it is difficult to mark the single point at which a product is a commodity, for commodities are by definition stable in form across time and space (this is a particularly interesting problem when dealing with electronic art from the perspectives of collection and dealing). Similarly, there is no final consumption, only accumulation, dissipation, or transformation. In the domain of information, it is next to impossible to mark the time bounds of a transaction. We respond to ideas raised thousands of years ago, conversing with thinkers across time.

From acknowledgment of the social construction of reality by the social psychologists of the 1920s and 1930s, through the refinement and multiplication of the argument by those in cultural studies more recently, to Posner’s (1986) articulation of what this means for locating and implementing intellectual property rights, the inability to track precisely and accurately the provenance of information has had consequences for efforts to assign property rights and determine the value of various kinds of processing activities. Information is often said to be perishable, an economic issue as it affects the persistence of value over time; stock market information, for example, rapidly diminishes in value to investors over very short periods of time. The locus of perceived value can move, however, from one category of user (the investor or broker) to another (the analyst, and then the historian). Related issues emerge from the inability to store or stockpile many types of information, or the occasional inutility of doing so when it is possible.

Economists dealing with other utilities, such as electricity, are able to analyze statistics about habits of usage and to incorporate the results in projections for planning purposes. With information creation and flows, however, it has to date been impossible to determine regular peak periods of usage. Information received at different points in time differs in value because it is affected by information previously received. The value of information is cumulative over time and the reception of each piece of information affects the value of information that follows. In an extreme example of this problem, Boulding (1966) notes that information about the economic system itself changes the system. Thus, information not only flows within an existing economic structure, but also plays a constitutive role in producing,
reproducing, or changing that structure. Boulding describes this problem by calling information a generalized Heisenberg uncertainty principle.

The problem of space

In the 1980s, space as an analytical category began to be important across the social sciences in response to the experience of globalization. It appears in discussions about the economics of information because today’s information infrastructure permits distributed production, makes space disappear into irrelevance in many instances, and has caused the customer, at times, to disappear altogether. With the growth of trade in services and foreign direct investment (FDI), the problem of locating just where informational transactions take place has become increasingly pressing. With data processing, for example, a transnational corporation headquartered in one country may have computers in another which process data from a third country in response to requests from a fourth. In such a situation, it is not clear whether the transaction takes place in the country of consumption, of processing, of the data source, of the transnational corporate home, or in the telecommunications network itself – an issue which has a number of economic ramifications and is at the crux of the decreasing ability of nation-states to control the flow of money across their borders.

In a sense space can be said to disappear as an economic factor in the net environment, since services can be distributed globally, across political and geographic borders. Some services are altogether non-transportable because they are dependent on some dimension or dimensions of a specific locale. The degree to which this is true in a particular case depends on the service under discussion and the specific part of the world, socio-economic class, and culture of concern. Furthermore, many services can be delivered without the customer being present in the sense of exercising transaction-specific discretion.

The problem of tangibility

The single most salient feature of information distinguishing it for purposes of economic analysis, is its intangibility. The most popular definition of ‘services’ in economic and trade discussions has turned out to be that offered by the *Economist* (12 October, 1985): “Anything that can be bought and sold but which cannot be dropped on your foot”. The issues unleashed by intangibles have long been acknowledged in the history of economic thought for they infect efforts to deal with the tangible as well; the classic diamond-water paradox expresses this. In the information economy, however, problems in dealing with intangibles come to the fore because it is the domain currently being colonized for economic purposes. As such, it is the theoretical, computational, institutional, and legal Wild West, where rules are yet to be made. In this world, the relationships between information and the material are several.

One of the most widely recognized problems in the economics of information is the difficulty of distinguishing between the value of information and the value of the materials
with which it is associated or in which it is embedded. As Babe (1994; 1995) notes, most economic analysis of information deals with its tangible packaging, not with the information itself. Viewed from the perspective of a single transaction, a text of such inestimable value as the Bible can be bought quite cheaply, while a CD of an ephemeral heavy metal music group may cost quite a bit more. There are those book collectors who never open their books. Unbundling the value of information from its material manifestation or container is one of the most difficult problems economists face. This is true at the aggregate level as well as in the valuation of specific pieces of information, for statistics generally fail to distinguish the non-informational activities of those firms deemed to be in the information sector.

Labeling is a third potential source of value, in addition to the packaging and the information itself. Because labels offer another tier of self-reflexivity, they make yet more complex the relationship between the material and the immaterial, and can, in themselves, trigger the sense of hyper-reality. While the physical environment is perceived in terms of the symbolic, the symbolic in turn acts upon and shapes the physical. Thus, information is not only often embedded in the physical, but also shapes the materials which embody it. This self-reflexivity, too, confounds efforts to develop adequate tools for the economic analysis of information creation, processing, flows, and use.

Problems raised by features that flow from the intangibility of information are, of course, the most difficult of all. Because relationships between information and the material world are flexible and loosely coupled, information is epiphenomenal. It derives from the organization of the material world. As Babe (1994) notes, the same material phenomenon may produce different types of information, and different material phenomena may produce the same information. Many types of information never reach a material form, being embedded instead in relations. Efforts to quantify this type of information include the development of accounting systems to deal with intellectual, social, and cultural capital.

Among the most important of these relationships are those which store the information held by a community and pass it on over time. Via an extremely circuitous route, the economic value of traditional communal knowledge is finally coming to be recognized. As transnational corporations fight over the remaining genetic information held in the tropical centers of biodiversity (currently being rapidly destroyed), they realize that it is not enough to capture the plant and animal germplasm. They also need the knowledge of those in the traditional cultures of these places to access and use the genetic information. If one accepts the premise that value is added each time information is processed, story cycles of great antiquity should be recognized as the wealth that they are. The more information available about a particular material good, the more valuable that material good is. Similarly, the more service available for a particular material good, the more valuable it is. Thus the value of tangible goods can be managed by adjusting their intangible features.
The problem of heterogeneity

Heterogeneity is a problem throughout the field of economics, characterizing capital and money themselves. Heterogeneity of form, value, and function of information are also problematic. No one definition can cover all types of information or all of the industries in the information sector. At the same time, single information commodities may have multiple manifestations, unacceptable in an economics that requires specifiability, locatability, and stability of form of commodities across space and time. The constant development of information products and processes further contributes to their heterogeneity. In the information industries, in particular, there does not appear to be a moment of product maturation of much duration.

Any single information product or process is simultaneously valued differently by different people. This feature is shared with the valuing of material goods, but seems particularly critical in the measurement of the value of information. For information more than for other goods, the value in use may be utterly unrelated to the exchange value. For the same person, the same information may hold different value under different conditions: private and public; depending on the speaker; and as constrained by the time, place, and manner restrictions that are accepted, even under First Amendment law in the United States.

The same informational product or process can simultaneously serve multiple functions in the economy. An accounting system, for example, is not only a commodity in its own right; it is also a structural device used in the production of other commodities, providing coordination within and between organizations. It serves related functions, a perspective implicit in efforts by transnational corporations in favor of including trade in accounting services under the rules of international trade.

The problem of inextricability

Perceiving information solely as a commodity in neoclassical terms makes invisible many of the most important consequences of information exchange, such as creation of a public space and the exercise of power. Information is completely dependent upon the social, cultural, political, and ecological elements of its context, treated only as externalities in neoclassical economics. There are two ways to respond to this problem. First, one can turn to non-economic modes of analysis, as Tribe (1985) argues when he rejects the use of cost-benefit analysis at the level of constitutional analysis. Tribe points out that cost-benefit analyses - the very stuff of economic analysis of communication policy problems - by definition deal with fixed categories and relations within and between categories, while the mission of constitutional adjudication is to reconsider the categories used and activities permitted within and between them. All communication policy issues, Tribe claims, are constitutional issues.

A second response to this problem is to try to develop alternative decision-making procedures which can handle types of values not previously incorporated in economic
analysis. Three types of alternative procedures might be developed: (1) those which identify moments in which quantitative procedures should be abandoned in favor of the use of qualitative procedures appropriate to the particular problem or issue encountered; (2) those which find ways of quantifying variables previously treated as non-quantifiable, so that they can be included in decision-making calculi; and (3) those which offer qualitative decision-making procedures that can be used by working policy-makers in a timely, affordable, and accessible manner.

The problem of inappropriability

Problems in the appropriability of information are critical, for without appropriation there are no commodities. The fury of concern over intellectual property rights, the vehicle through which property rights are asserted for many (though not all) types of intangibles, reveals how serious a problem this is.

There are two difficulties that arise from the duality of the nature of information as both a private and a public good. There is a fundamental contradiction in treating information economically since the material package in which information is embedded is a private good, while the information itself is a public good (see Brennan (1990) for a particularly clear exploration of this). The two meanings of the term ‘public good’ also sometimes come into conflict. The common sense meaning looks at public goods as things that should rightfully be accessible to every member of the public, such as water. A public good in economists’ terms refers to something whose use does not deprive others of its use. To economists, information has a public good aspect, for knowledge by one person of something does not deny others of that knowledge. Efforts to expand the ways in which information can be turned into private property mark the hottest battles of the decade.

While the sale of material goods entails the transfer of an object from seller to buyer, in the case of information the seller retains the information, and its use, even after the sale. This is a radical shift in what is understood to be appropriation. Questions about the line between that which is withheld from the market altogether and that which is offered as a commodity, as noted above, are increasingly questions about organizational form and the development of network relationships. When transferring information it is very difficult to restrict use of the information to the buyer alone. Information is, in this sense, said to be ‘leaky’, for it is very easy for non-purchasers also to use or enjoy the information. As reproduction and transmission costs go down, this problem increases.

The problem of indivisibility

Agreements about the measurements used to divide objects and groups of objects in the material world have been achieved only recently in human history, contributing to a great spurt in economic activity. Nothing like such agreement has been achieved for ‘things’ in the
intangible world; endless arguments over whether something is or is not ‘novel’ for intellectual property purposes is one example of arguments over just such measurement issues.

It is difficult to identify discrete pieces of information. In the case of a journal article, is it the entire article, a paragraph, a sentence, an idea, or the stream of literature in which it is embedded? It is not even clear who has the responsibility for unitizing. In the case of a novel, for example, is the writer, the reader (or the filmmaker) responsible for unitizing? In many cases, multiple types of units may be concurrently applicable; which should be deemed most pertinent for economic purposes? Umberto Eco (1995), in a series of essays on fiction, talks about the problem of time in novels, distinguishing between story time (the fictional time span over which the story takes place), discourse time (the time period to which the novel speaks), and reading time (the time it takes to read the book).

Partial information is often useless or even damaging, yet it can be difficult to know whether one has complete information. The persuasive industries, from propaganda to public relations, have found ways to capitalize on this. There are many goods for which sales can be made over and over, such as food and clothing. With information, however, one is often satiated with the first unit of certain types of information, so that repeat sales are not available. Multiple copies are useless unless they can be sold; hoarding behaviors are generally meaningless unless storage of information is the niche in the information economy specifically being filled.

The problem of self-reflexivity

Both Stiglitz (1985) and Arrow (1962) have pointed to the problem that arises when purchasers attempt to determine the value of an informational product in order to make a buying decision. Stiglitz described this as a problem of infinite regress, for it is impossible to determine whether it is worthwhile to obtain information about whether it is worthwhile to obtain information, and so on. Arrow, working within a tradition of research into the costs of acquiring information, a tradition in which Coase (1937) seminally described the firm as an effort to reduce the costs of acquiring information, points out that the value of information for the purchaser isn’t known until she has the information – but then she has, in effect, acquired the knowledge itself without cost.

Because informational products and processes are constitutive of individuals, communities, and societies, they are constantly interacting with the social, cultural, political, economic, and ecological environments in which they are occurring, which they shape, and to which they refer. Informational products and processes themselves generate additional information. Thus, information commodities serve as materials or even as agents in production processes, something not true either of most material goods or of the other factors of production.
ALTERNATIVE CONCEPTUALIZATIONS OF THE INFORMATION ECONOMY

The three conceptualizations differ in their responses to these problems and, as a result, in how they define the information society. They differ in the aspect of the economy upon which they focus: the first on products, the second on the domain, and the third on functions. They differ in their assumptions and theoretical bases. Inevitably, then, each approach suggests quite different principles, policies, and implementation practices for decision-makers in the public and private sectors. These approaches developed, loosely, chronologically, but are all extant today. They are not mutually exclusive. The earliest continues to dominate policy-making. It is suggested here that enrichment of the third approach (functions) with insights from the first two and other theoretical and empirical material provides the most valid and useful path forward.

The information economy: products

The first conceptualization of the information economy focuses on the economic role of information and the technologies that handle it as final and intermediate goods and services – on what the economy produces. It defines the information society as that in which those industries which produce information goods and services are proportionately more important to the economy as a whole than they have been in the past. It assumes that the economy works as it always has, and that the neoclassical economic theoretical base remains adequate. The problems experienced by those using neoclassical analytical tools are denied.

This approach arose in the 1960s as part of the self-awareness of qualitative shifts in the nature of society that marked awareness of the emerging information society. This occurred almost simultaneously in Japan, where Umesao coined the term ‘informatization’ in 1962 and the government subsequently popularized it (Ito, 1991), and in the US, where Daniel Bell’s 1960s notion of the post-industrial society (1976) diffused quickly. Both Bell and Umesao took an evolutionary approach to the emergence of the information economy, claiming it was an inevitable stage in the development of societies, following upon the agricultural and industrial stages. There are variations on the theme – some group all activities related to the creation, processing, flow, and use of information into one economic sector, while others distinguish between information and service sectors, and so forth.

This approach became the basis of policy-making once operationalized by identification of the information industries first (at a gross level) by Machlup (1962) and then (in a more fine-grained way) by Porat (1977). Porat’s technique, which evolved into the system used by the US Department of Commerce and subsequently in the international arena, used Standard Industrial Classification (SIC) codes to identify those businesses and workers within the information sector. Despite the problems of this approach, which necessarily includes some arbitrary decisions (physicians are in, but people who can repair radios are out) and has no way of grappling with many of the significant economic forms informational goods and services can take, it has continued to be the methodology used to derive the percentages of the economy and the labor force in the information sector.
The inadequacies of this approach are increasingly clear. Thus, the Department of Commerce is working to revamp the SIC code system to reflect economic realities, but remains stumped by the same issues that have confounded economists working in this area for over a century. Meanwhile, corporate leaders involved in the “intellectual capital movement” (Stewart, 1994) are struggling on their own to develop accounting systems which will permit them to evaluate intangibles as well as the kinds of assets for which accounting tools have been developed (Hopwood & Miller, 1994; Temin, 1991).

Despite growing recognition of the limits of this approach, it is likely to continue to dominate policy-making for some time, because of its chronological priority, because it does not require conceptual shifts, because it permits continued use of existing decision-making tools by working policy-makers, and because it serves the interests of some of the most powerful economic entities in the world. Certainly within its terms its insights are valid and important. It does not, however, fully capture many significant qualitative features of the contemporary economy, and thus is inadequate for fully successful decision-making in this environment. Those who take this approach are clinging to an old paradigm in the face of mounting evidence of difficulties in the application of this paradigm. Motivations for continuing to choose this approach in the late 1990s, over 30 years into a discussion of the multiplying problems involved, are multiple.

The information economy: domain

The second type of conceptualization of the information economy to emerge focuses on the bounding of the domain of the economy itself rather than on relative quantities of different types of goods and services produced within it. Those who take this position define the information economy as that which has expanded through commodification of forms of information never before commodified, including that which is most personal (such as what is in someone’s thoughts, or urine) and that which is most public (such as databases created by the government).

This approach received its first full fleshing in the 1970s, again coming from multiple directions. Political economists in the developed world, such as Schiller, Mosco, and Hamelink, began to examine the consequences of the use of new information technologies. Meanwhile, some of those in the developing world who had been struggling for a New International Economic Order since the early 1960s came to realize that a prior condition for redistribution of global material and economic resources was a redistribution of information resources. This view was articulated in such venues as the United Nations Educational, Social, and Cultural Organization (UNESCO) as calls for a New World Information Order (NWIO) (Richstad and Anderson, 1981). Political economics as applied in this context developed largely through ideas about the nature of dependency and the research it stimulated.

Generally this approach is based on the assumption that the economy has never worked the way neoclassical economists have claimed it worked (to the significant detriment of large portions of the population). Those attempting to use neoclassical economic tools in the
analysis of information creation, processing, flows and use have always encountered problems. Economists are simply being forced to acknowledge their existence by the growth of the relative importance of these problems in the information economy.

The weakness of this approach from the perspective of working decision-makers is that its analysis generally remains couched in the broadest theoretical terms (such as, ensure universal access), ignoring the institutional and other mid-level issues that must be dealt with in order to form recommendations for specific policies and implementation practices (such as what access to allow, how access is to be handled institutionally as well as economically and politically, and how access is to be evaluated). Often, those who take this approach call for such radical change – sometimes transformation to a socialist, or gift (Hyde, 1983) economy – that discussion becomes polarized and no viable, consensually acceptable, steps appear.

However, the insight offered by those who take this approach is profound. The use of surveillance technologies appears to be increasing rapidly, while concurrently the population of even the United States has less and less access to the information upon which policymakers base their decisions, and to decision-making processes themselves. This is so for a number of reasons. Shifts in organizational form alter structures of information flows in critical but often obscure ways. Privatization of many formerly public types of information (such as government databases) is a form of disempowerment through commoditization of information. Innovations also extend the ability to treat information and its flows, processing, and use as commodities. The growth in the number of people who want access to the Internet, for example, has itself become a commodity as the addresses needed to identify each individual user (including those within organizations) become scarce and tradeable goods likely to rise in price. Such practices affect our individual and social lives qualitatively as well as economically. Awareness of this expansion of the breadth of the economic domain and penetration into our lives should be retained by those struggling to deal with the effects of the transformation to an information economy. Those who take this approach recognize the need for a paradigm change and are committed to one among the many alternatives available. It is not yet inevitable or clear around which alternative there will ultimately be coalescence.

The information economy: functions

The third approach focuses on how the economy functions, and defines this as an information economy because the market has been replaced by harmonized information flows as the key coordinating mechanism. Thus, today’s environment is described as a network economy. Those who take this approach acknowledge that the nature of the economy has qualitatively changed. They are building theory based on adapting and developing existing economic concepts as well as inductive and adductive analysis of large amounts of empirical data. A strength of the work of Antonelli (1992), in particular, is that it is based on decades of empirical work examining the many different types of transnational corporations emerging around the world.
Rather than trying to fit new types of phenomena and processes into economic (and legal) categories that no longer fit, those who take the network economics approach, such as Antonelli (1992), Guerin-Calvert and Wildman (1991), and Grabher (1993), are struggling to see in what ways information creation, processing, flows, and use in this environment can be treated like other types of economic entities, and in what ways they cannot. This is a part of a creativity which treats models and typologies as toolkits to be explored for techniques and concepts which can be identified, adapted, discarded, or replaced as needed for particular settings and issues.

In terms of policy, this work represents the merging of two decision-making sectors previously kept distinct: traditionally, corporate strategy was distinguished from public sector policy. Today, firms, networked firms, and government entities often make decisions together in what are called in the literature 'policy networks'. The impact of this merging of types of organizations on the definition of responsibilities of decision-makers to the various communities with which they are involved is neither empirically clear nor normatively resolved. Examples of this approach include identification of a new unit of analysis, the project, involving multiple interdependent organizations, as more useful than either the industry or the firm for analytical purposes. It is precisely because of the harmonization of information flows among these interdependent firms — called network firms (Antonelli, 1992) or embedded firms (Grabher, 1993) — that the role of the market has diminished. In the network economy, a combination of co-operation, co-ordination, and competition replaces sheer competition as the most successful economic strategy. The capacity to innovate, the most valuable capital of all, arises out of networked relations themselves.

Policy principles that flow from this approach are broad, such as the notion that co-operation and co-ordination are as important as competition, and that long-term relationships are more important than maximization of profit from single transactions. Specific policies and implementation practices are as likely to come from the field of organizational sociology as from public administration. McLuhan (1964) noted that the content of each medium is another medium, often the medium which just preceded it in dominance. From this perspective, network economics is about the global information infrastructure as medium and the economy as content. This emphasis on information flows does not deny the continued significance of capital as a motive force and as an operating framework — but capital itself is heterogeneous, and new forms are emerging.

In terms of a Kuhnian paradigm change, this approach to the conceptualization of the information economy offers the greatest validity and utility, and thus is most likely to provide the seed from which a new paradigm for understanding the economic world will grow. It is also interesting from the perspective of the sociology of knowledge because it highlights the importance of distinguishing among different manifestations of a paradigm and their relative importance. While Antonelli quacks like a mainstream economist quacks, and walks like a mainstream economist walks, the content of his insights is in many ways more genuinely radical than those of Marxism-driven proponents of the second approach.
AN ENRICHED NETWORK ECONOMICS APPROACH

Network economics might usefully gain from incorporation of insights offered by the other approaches to conceptualizing the information economy. The first perspective, focused on information products, is forced upon the network economics world through government policy based upon it and related accounting schemes. In turn, however, the network economics approach is likely to be of greater and greater influence during struggles like those currently going on over reformulation of the SIC code and related efforts in the accounting world.

It may be more difficult to incorporate into network economics the insights of the second approach into the nature and effects of expansion of the economic domain. Doing so requires finding ways of either adapting or developing new decision-making processes so that they can take qualitative types of information into account, or find ways of measuring things generally considered to be non-quantifiable. One example of the latter can be found in the efforts over the past half dozen years to develop ways of applying intellectual property rights to traditional bodies of knowledge held by indigenous tribal groups, and to knowledge held by communities; another is the development of tools to quantify ‘wildlife rights’ so that they can be incorporated into the economic system.

The network economics approach can also be usefully enriched by incorporation of the work of Scazzieri (1993), who offers an original conceptualization of the nature of production processes which provides a superb fit with current conditions. As Scazzieri notes, under current conditions, analyses must deal with those production factors, processes, products, and markets that may be virtual as well as those that are potential and actual. He also distinguishes among types of production processes in a way that is particularly useful in the digital, network environment. Elementary processes are elements out of which complex processes are comprised; and scale is the number of elementary processes involved in a particular production process. In the information economy, scale can be understood in terms of an information production chain which includes information creation, processing, storage, transportation, distribution, destruction, seeking, and use. Actors in the global information economy, then, are currently manipulating electronic, legal, political, cultural, and organizational infrastructures for digital activities as they seek to expand their scale.

Further elaboration of what an enriched network economic approach might look like must involve cross-checking what is incorporated into network economics with those various literatures that touch upon information creation, processing, flows, and use in the history of economic thought. The result would outline a research agenda for those working in this emergent area of economics, whether it is ultimately known as network economics or as the economics of information. By either name, this branch of economics will supply the foundation upon which policies will be made and strategies developed in the information economy. It is hoped that the conceptual clarifications offered here will, in turn, participate in the co-evolution of conceptualizations of the information economy and in the shaping and growth of the field.

REFERENCES


