Chapter 16

SYNERGY FOR SUSTAINABILITY

Law, Science, and Computability

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Introduction

At the most general level of analysis, concerns pertaining to sustainability includes the viability of (1) ecological configuration, (2) economic activity, (3) political behavior and governance, and (4) institutional performance. This chapter addresses key issues pertaining to law and implications for sustainability (Choucri, 1999: 149), and, by definition, to each of these domains as well.

Earlier in this book, we presented the overall GSSD design, including the segment on coordinated international initiatives for global accord. This segment is represented in the outer circle of the system. Implicit in the overall design is the assumption that there has been considerable progress in the international community's understanding of, and responses to global environmental problems and the challenges of sustainability which still fall short of solutions for most of the serious problems confronting us. A related assumption throughout the entire book is that advances in computer-related technologies facilitate our understanding of, and responses to, dilemmas of sustainability at local as well as global levels.

Context

Law, along with ethics, often a component part of law, not only plays an important role in coordinated international activities (the outer circle of the system), but is also mixed into all the other rings, often in important ways; for example, in the rings "From Activities and Conditions," "Sustainability Problems," and "Social Circle and Technical Solutions," laws and regulations apply to most, if not all of the subjects mentioned in these circles. This increase in understanding is in large part due to the realization that problems

N. Choucri et al. (eds.), Mapping Sustainability: Knowledge e-Networking and the Value Chain, 337–365.

of sustainable development can only be solved through application of knowledge from many fields in science, technology, biology, medicine, the social sciences and the law, including its ethical element. This chapter examines how law itself could become more effective by absorbing knowledge from other disciplines.

Focus

In this chapter we take a step back by adopting a broader perspective on the issues of law and legal and ethical precepts governing social interactions, for the purposes of exploring potentials for synergy in assessments and understandings. One purpose of this effort is to remind ourselves of some generic underlying issues related to providing order in complex social contexts – and recognizing the dilemmas posed by our increasing appreciation of the imperatives of complexity. A second is to explore some potential basis for "value added" derived from dual sources of insights: law and legal practice, on the one hand and science and computability, on the other. Most, if not all of the problems reflected in the Global System for Sustainable Development require knowledge from multiple disciplines – the natural sciences and the social sciences – and reflect current understandings of the sustainability domains and dimensions, the "outer circle" is about coordinated international actions, namely what we can do as an international community to manage the challenges generated by imperatives of sustainability.

Many of the illustrations (and anecdotes) introduced in this chapter draw upon legal discourse within advanced industrial societies; but it is important to remember that the issues central to this book – challenges of sustainability – are ubiquitous as well as generic. They cut across types of societies and levels of institutional development. And, most important of all: we must stress that the lines of inquiry pursued here is exploratory in nature. It is shaped by the overall logic of the previous chapters and the architecture of GSSD as an interactive agent interface between "users" on the one hand, and the rapidly growing "virtual community" generated by Internet, on the other.

16.1 Progress in Law

In the field of law there have been no Newtons, Lavoisiers, Darwins, Einsteins, or others who developed the quantum theory which governs the behavior of transistors and integrated circuits and is the basis of modern chemistry and biology (Hawking, 1988: 56). Scientific discoveries more recently, especially those in quantum mechanics, have triggered remarkable scientific progress which embodies new theories and paradigms which do not replace classical

mechanics in physics but apply to the behavior of elementary particles. Notably, then, Bernard Cohen adds that some discoveries in science in the past are revolutions comparable to religious conversions or the acceptance by a new generation of concepts the disappearing older generation could not accept (Cohen, 1985: 468–472).[1]

A description of litigation 2000 years ago in Athens shows how little progress legal "science" has made in dispute resolution since that time.[2] Of course, in the evolutionary time scale 2000 years of the estimated 2 million years of man's existence is not much, so perhaps one should not be discouraged yet. But comparing progress in law with that in physics, chemistry, and the other natural sciences often makes one think that judges and lawyers have not done enough in 2000 years to improve the legal system.[3]

16.1.1 The Purposes and Nature of Law

Max Weber's view that "Law is an order, i.e. a set of ought ideas which are held in the minds of certain people" is instructive here (Rheinstein, 1969: lxvii).[4] Some of the purposes of law in Western countries are to:

- Limit arbitrary government and protect the individual from his government and through criminal laws from illegal activity of his fellow citizens to soften, if not eliminate, the law of the jungle where the strong eliminates the weak. Law is a supposedly civilizing force leading to

[1] Cohen cites Max Planck's Scientific Autobiography, New York Philosophical Library, (1949), 33–34.

[2] Reading Greek Text, Part Five, Athenian Views of Justice, Section Sixteen "Private Justice: Trouble Down at the Farm," Cambridge: Cambridge University Press, Joint Association of Classical Teacher's Greek Course (1986). However, progress has been made in the last forty years through the substitution of conciliation, mediation, arbitration and alternative dispute resolution. There are fewer long costly trials in court now than in the past.

[3] Some dispute that the invention of the atomic bomb is progress, but there has been remarkable material progress after the industrial revolution and the more recent advances in science and technology, communications, and transmission of information. These developments are certainly due in great part to important discoveries in physics, chemistry, medical sciences and others, and progress in engineering which after World War II have fueled the accelerating globalization, especially in communication and intellectual technology.

[4] Rheinstein states that law-making and law-finding are formally rational insofar as "the legally relevant facts are determined in a process of logical interpretation of meaning and as fixed legal concepts are thus created and applied in the form of strictly abstract rules." Weber's interest centered on whether formal rationality of legal thought contributed to the rise of Capitalism or whether Capitalism contributed to the rise of logical rationality in legal thought.

the moral improvement of the species – or at least knock off the rough edges.[5]

- Guarantee political and economic freedom and to enforce rules of competition to benefit customers in free-enterprise economies.
- Provide for predictability by having a minimum of law and order through criminal and legal decisions to encourage hard work, invention, and wealth accumulation.
- Maintain social norms and values (on course).

In addition, of course, there is a fundamental purpose, namely to provide employment for a lawyer population (which has more than tripled since 1950 in the United States).[6]

Decision-makers, jurists, legislators, politicians, and civil servants also generate more and more laws and administrative regulations in Western countries on the theory that these are necessary and will please their constituents, who hope new laws will improve and reform society.[7]

For example, the United States got a fresh start in developing law governing a newly discovered country several centuries ago. It drew up its new constitution in the 18th century, a document intended to set the ground rules for present and future generations. The Constitution has been described as a triumph of "bounded rationality" with restricted but fundamental objectives – the preservation of freedom and an orderly society (Simon, 1994: 163).

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[5] By protecting the weak, rather than eliminating them, social costs rise for the rich and strong. Man seems to be the champion killer and the primary agent of extinction for animals, including himself, which reflects the survival of the fittest or self-destruction of the fittest.

[6] This factor was not added totally as a touch of humor, since once special groups grow up in a society or in government administrations – even those groups or organizations which initially served the public interest – they tend to militate for their own selfish goals and influence public opinion and secure legislation for their own benefit. A recent study tends to confirm that US lawyers themselves are responsible for promoting and perpetuating a system of adversarial and legalistic dispute resolution in costly court actions along with American political culture and governmental structure. See Kagan (1994).

[7] Irving Younger's May 15, 1980, Charles Evans Hughes Memorial Lecture, "Socrates, Law, and the Congress of the United States," delivered at the New York County Lawyer's Association, in which he criticizes complex laws not understood by the congressman who votes for them nor by the average citizen who is supposed to obey them, which are passed to solve insoluble problems [unpublished paper]. This results in mounting distrust of the law and a diminution of faith in government and democracy. Also see Clark (1992), 275–302. The author notes the growth in the amount of law, regulations, and case law published in the Federal Register between 1960 and 1985 was 270%, additional pages to West Regional Reporter were increased by 146%, Federal Reporters grew by 336%, and the full-time staff of 55 Federal Regulatory Agencies grew by 176%, and budget increased by 237%. J. Miller, in a comment made to this section, noted that the executive branch, by writing regulations, replaces the judge in common law as the decider of cases in an adversary system.

To extend the example, the court system in the United States provides some measure of predictability and protection. The Supreme Court usually follows its previous rulings but overturns decisions when it is time for change. Legislatures do the same work in their law-making, working with the seemingly chaotic behavior of great numbers of individuals in the state of nature pursuing their own interests through freedom of speech, formation of public opinion, and use of the political process. The legislatures take this raw material (input) and formulate general or specific rules which secure the sanction of the enforcement powers of the state. It does so through a variety of conversion rules mutually agreed upon.

But the role and organization of law itself (i.e. the "industry of law" and its knowledge-base) cannot be overlooked as we consider the presumed goals of law. Law as practiced in large law firms has become a global service industry helping countries with little or no modern law or legal traditions by introducing modalities of modern contractual systems to facilitate their induction into the global economy. Even in the U.S. lawyers, especially new firms or specialized firms, create law by developing legal devices and techniques on behalf of actual or potential clients – a bottom-up approach to the creation of law rather than the conventional top-down system (Powell, 1993: 423–452).[8] This form of innovation is akin to a "social technology" where robustness will be contingent on utility and precedence. Judges for 700 years have developed the Common Law as a by-product of litigation (Dawson, 1968).[9]

Thus, in the United States, the Constitution, the court system, and the legislative with other institutions in society organize the chaos of social interaction through a complex system of arrangements – which is itself organized more than it is chaotic or disorganized, made up of a "large number of parts that interact in a non-simple way." The whole is more than the sum of its parts, with special properties that are "retrieved" or called upon to facilitate transactions or interactions in any particular situation.

16.1.2 Advance in Legal Systems

It is true that law has "advanced," but "advance" is often difficult to define and generally quite slow. Often too, "advance" is culture- and context-specific. Hence it can be quite contentious. Further, it sometimes regresses, as in the Middle Ages compared to developments in Rome. The anecdotal evidence abounds. For example, proof by ordeal with fire in France, was accomplished

[8] This article demonstrates the entrepreneurial law-making role of corporate lawyers, who develop new legal devices such as the poison pill as a defense to a corporate take-over.

[9] For the historical and comparative study of the role of judges in the development of legal systems in England, Germany, and France. See Dawson (1968).

by forcing the accused to hold a red-hot iron. His hand was bandaged and sealed. If gangrene set in, guilt was proven. In the ordeal by cold water, the accused was bound and thrown into the water. If he sank, he was innocent. The "advance" that occurred next was adoption of the proof, the judicial duel (*"bataille"*), which first appeared in Burgundy in the year 501 and in the next century was adopted by the Francs. It was the most usual proof in the 13th century and lasted up though the 15th century as a privilege of the nobility in special cases of critical matters. This proof could occur at the beginning of the case where one party challenged the other to a duel within the premises of the court house. A party could provoke a duel with an unfavorable witness or a judge rendering an unfavorable judgment presumably to control perjury and a dishonest judgment (Laingui and Le Bigre, 1979: 26–27, 37). Saint Louis in 1260, to stop private wars between his nobles, instituted "la Quarantaine du Roi," a cooling-off period between belligerents during which negotiations began. He also prohibited the barbarous custom of proof by ordeals (Bordonove, 1984: 246).

The "advance" that followed was the use of torture, which was widely reported beginning in 13th century France for the purpose of securing "proof," i.e. confessions (Laingui and Le Bigre, 1979). This practice is still common in many parts of the world – in both developing and industrial countries. Governments at war often use torture to secure intelligence and law enforcement institutions of "law" often prefer confessions (even if false) and do not generally want to spend the time and the effort necessary to secure legal and more objective, independent, more reliable and civilized methods of proof but prefer efficiency and speed.

In law – at all levels of social orders, from local to global – both the notions of advance – could be defined as applications of more effective, less costly, and more legitimate (i.e. better) forms of justice in the formulation of "rules" and in the implementation of forms of justice. Progress in *content* of law, of course, need be viewed separately from improvements in applications and *instrumentalities* of law.

16.1.3 Contrasts to Advances in Science

In contrast to the natural sciences, the law seems to develop in more of a steady and gradual process that precludes "jumps" or sharp "breaks" with tradition. Law is essentially "system-preserving," sometimes too conservative, or it incorporates wrong or stupid rules that impede innovation and improvement in society. It can also be system-altering and can lead to important reforms in society. Nevertheless, one Swiss author, citing Thomas Kuhn's definition of a scientific paradigm – namely that in law there has been a series of paradigms which do not necessarily replace completely the

preceding one, i.e. the dialectic paradigm corresponding to the process by which the Roman law developed and became the subject of research and systematic knowledge, i.e. developed an architecture; the physics – mathematical paradigm which inspired the development of natural law; the historical paradigm which focuses on the study of legal issues in various countries throughout history. The author also stated that there are many founding and renovating figures in legal science (Dufour, 1994: 142–167).[10] Therefore, probably the only revolutions in law have occurred when a country is conquered and the winner imposes its law – which still can take time to become effective.

The practice of law has provided robust foundations for legal and other institutions and their governing rules necessary for a modern state to function. In addition, one can recognize considerable progress by making a historical analysis of constitutions, governmental structures, financial institutions, commercial and industrial companies, stock markets, and the innumerable laws governing important institutions, some of which have outlived their usefulness.[11]

In a legal context, however, where contentions are involved (in contrast to legal services related to developments of frameworks for coordination, at national or international levels, for example), "satisfaction" may be difficult to obtain because in a lawsuit both parties think they should win, but one party generally loses, and quite often both parties can waste a lot of time, effort, and substantial sums of money for legal fees, in which case the only real winners are the lawyers. In an international context, issues increase in complexity.

In such cases, the position of the lawyer compared to his or her client provides added insight in social relations. Overall, it is usually better to be a lawyer than a client. The cash flow is generally in the right direction, and if the lawyer retains his independence, honesty, and professional ethics, he should be less dependent on the client than vice versa. In the past, taking into account that the legal profession has usually had a monopoly position, its members do not always deliver services to the client which added value in proportion to the fees paid – at least not equivalent to outcomes or results received by the clients in all situations. But when the "client" is humanity, and the litigant is a sovereign state or a multinational entity, the stakes expand commensurately.

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[10] The meaning of the word "science" in French is often used in a broader sense than in English, i.e. an organized body of knowledge. Law and Economics in France are referred to as Science. See Dufour (1994).

[11] The fact that there has always been substantial popular dissatisfaction with the law and lawyers indicates that evaluation and expectations may have been unrealistic, and perhaps even that expectation of "satisfaction" has not been met.

In cases where legal services are required to facilitate institutional developments, policy harmonization and the like, it is usually the client that defines broad goals and the range of desired outcomes, and the lawyer then seeks to identify the operational feasibility and implementation procedures. In such cases, the driving motivations are less contentious than they are designed as they are targeted towards "feasibility." One could say that the "precedent" may be an accumulation of past "feasibilities."

16.1.4 Dilemmas of Progress

In social contexts, we tend to think of "progress" rather than "advance," even though both concepts are closely related. The Information Revolution is having a profound effect on our daily lives. Digital libraries may soon be accessed by 20 million people at no cost. Gordon Moore said in 1965 the number of components on a micro chip doubled every year since 1959 and the trend would continue to 1975. Computers are better each year – faster, cheaper, and smaller. Software has increased in size and complexity even faster than Moore's prediction. Microsoft's Word originally had 27,000 lines of code. In 1995, it had about 2 million lines (Brand, 1995: 154).[12] Clearly, there is a dilemma in defining "what is meant by progress in human societies is not easy". Increasing success in meeting basic needs for food, shelter, and health is one kind of definition most people would agree upon (Simon, 1994: 183). But "progress" today in this sense certainly is not constant in developed countries for all levels of its population, and a number of developing countries are regressing rather than advancing. And this holds true for some of the developed states as well. Among the more empirically oriented methods of measuring "progress" is the Human Development Index (HDI) computed by the United Nations Development Program (UNDP, various years). This measure is a composite of three indicators of improvements in material well-being. Not surprisingly, the HDI reveals a wide variability in the conditions of countries, even though or perhaps because its individual components are so similar to each other.

A quite different view of "progress" is an average increase in "human happiness." With regard to the latter, because of rising aspiration levels, Herbert Simon doubts if much progress (most broadly defined) has been made on this score. He adds, "there is no reason to suppose that a modern industrial society is more conducive to human happiness than the simpler, if more austere, societies that preceded it."

Simon's contribution to this issue is insightful: he cites a third way of measuring progress – in terms of intentions rather than outcomes – moral

[12] An interview with Nathan Myhrvold, a physicist turned programmer, Director of Microsoft's Advance Technology Group.

progress – but judgment on this issue is not easy. It may be too slow to be noticeable, or mankind could be regressing. Humans have probably killed other human beings recently in wars and murders at a faster rate now than ever before. But the record noted earlier clearly shows a commensurate growth in environmental protection, in terms of increasing environmental legislation, within states.

One view commonly expressed traces the optimistic belief in the inevitability of progress. This idea of progress was well expressed by Condorcet in the Enlightenment and driven by the Industrial Revolution and Adam Smith economics, so people thought the world would become more perfect and increasingly rich and happier. Although many Europeans lost this optimism about progress due to Marxism, Keynesian economics, world wars, and less happy circumstances, the Americans have retained up to now a much more optimistic view in large part due to opportunities that existed in the United States with a large unexploited country with room for expansion.

This optimistic (or perhaps instrumental) faith in progress seems to be receding among segments of the U.S. population in recent times as a result of the Vietnam War, stagnation of the income of the poor and middle classes after the 1960s, reduction in employment in companies implying that developed countries do not need all the labor force to produce plenty of goods, more social stress resulting from more aggressive action by women and minorities to improve their position, racial tensions, no common national objectives like one often sees in wartime when the population is mobilized. There also appears to be a lack of inspired leadership (Lewis, 1995).

A related but different proposition is illustrated by one high Japanese government official, who believes that what he calls progressivism – the goal of a rapid increase and a fair distribution of material welfare – ended with the end of the Cold War, which some have described as the victory of capitalism in its ideological war with socialism. He agrees with Huntington's analysis that "civilization identity will be increasingly important in the future, and the world will be shaped in a large measure by the interaction among seven or eight civilizations. This reemergence of civilization consciousness is directly related to deep disillusionment with the ideology of progressivism (Sakakibara, 1995: 8–14).

Sustainable development has raised a whole new perspective on the issue of "progress" by embedding human survival in the viability of the natural as well as the social systems.

Measuring "advance" in law as well as advances in law for sustainable development – recognizing that it is an institution central to the fabric of society – is not an easy task either, unless volume is the only criterion. If this criterion were to be applied, then we would conclude that there has been enormous progress in developed and many developing countries. However, it is difficult to argue that a volume criterion alone is sufficient, as this could

just as well reflect a regression in practice rather than progress. Indeed, the enormous proliferation of volume may well be a sign of "distress" in the advanced industrial countries. Perhaps we can think of "direction," i.e. moving in the right direction, given our definition of "progress" or "advance" along the issues noted earlier.

If the information revolution transforms how we live, it will surely transform how legal systems operate and how lawyers practice and could lead to profound changes in the very essence of law itself. For example, new tools rather than new doctrines have led to advances in physics (Dyson, 1995). The same could (or perhaps should) be true of law.[13] In Chapter 1 we noted the development of a wide range of coordinated international actions supporting sustainability – the outer circle of GSSD – that jointly reflect efforts to bring natural systems within the purview of legal systems or, alternatively, to expand the scope and reach of legal systems (for regulating interaction with social systems) to cover issues traditionally considered as part of "nature," rather than "society."

16.1.5 Law and the Internet

The Internet is a big part of the information revolution cited as progress in the previous section of this chapter. The purpose of this section is to rapidly review some examples of regulation of the Internet. It also will consider what new legal mechanisms the Internet has generated (Goldstein and Wu, 2006; Lessig, 1999).[14]

The major contentions relating the regulation of the Internet are: who should be responsible for regulating the operations of the Internet? Also, where, how much, and what should be regulated?

In the 1990s, some thought the Internet could not and should not be regulated. For them, cyberspace was a separate space in another world. As the years passed and governments and courts played their normal roles in the real world, it became obvious that the Internet was subject to regulation which, in some cases, resulted in removing information, like in China where information relating to democracy and Taiwan were withdrawn for political reasons.

Control and regulation of the Internet come from many sources. The U.S. government, through contracts with ICANN, has a predominant influence in fixing Internet policy. Other organizations actively engaged in proposing rules and/or regulating the Internet are: international organizations, the European Union, international conventions, technical arrangements with companies

[13] Clearly there are extensive caveats and qualifications associated with this statement.

[14] The author has learned a great deal from this excellent book in preparing this part of this chapter.

relating to equipment and software, laws enacted by nation states and court decisions in each country.

One global regulation mechanism is ICANN, the Internet Corporation for Assigned Names and Numbers, an international public organization in the form of a corporation formed under the laws of the State of California. ICANN is a private not-for-profit company which administers the Internet formerly managed by the U.S. government. It has an international board of directors which the European Commission has claimed is subject to too much U.S. political interference since changes cannot be made in the domain name system without approval of the U.S. Department of Commerce. Countries like Iran and Brazil have argued that the domain name system should be managed by the United Nations or another global body.

ICANN has been defined as an internationally organized, non-profit corporation that has responsibility for Internet Protocol (IP) address space allocation, protocol identifier assignment, generic (gTLD) and country code (ccTLD) Top-Level Domain name system management, and root server system management functions. These services were originally performed under U.S. Government contract by the Internet Assigned Numbers Authority (IANA) and other entities. ICANN now performs the IANA function.

As a private–public partnership, ICANN is dedicated "to preserving the operational stability of the Internet; to promoting competition; to achieving broad representation of global Internet communities; and to developing policy appropriate to its mission through bottom-up, consensus-based processes" (ICANN, 2006).

ICANN is the place where different interests, often hostile, discuss and decide Internet policy. Disputes have included trademark and domain name conflicts and numerous disputes over domain names. It is an organization built on consent which has worked by reaching decisions by consensus but difficult political and ethical issues arise which underline its relative fragility. Although some claim it is not always a transparent organization it is thought to be the only organization able to avoid total commercialization of the Internet.[15]

Whether or not the United States will be able to maintain its control of ICANN functions or will want to in the future remains to be seen. The United States government itself was in no position to administer the Internet since the technology is complex and it preferred to delegate this work to the private sector for industry self regulation and bottom-up governance, since it had doubts that a bureaucratic international public sector entity could do the work efficiently and carry out policies it favored. It has made an effort to set up representation on the board of directors from the high-tech industry from

[15] See http://www.gouvernance-internet.com.fr/information/faq-icann.html

many countries and has an advisory board of governments with the intention of reaching decisions by discussion and consensus among experts.

Thus, ICANN has the outward appearance of being an international organization, yet remains in the private sector (non-profit), subject to the ultimate control of the U.S. Department of Commerce. However, this has angered the European Union and the U.S. agreed to delegate a primary role to the World Intellectual Property Organization (WIPO), a European-based international organization, in order to settle trademark and domain name disputes (Mueller, 2002).

In 2005, a U.S. Department of Commerce official announced it will "maintain its historic role in authorizing changes or modifications to the authoritative root zone file" (Wright, 2005). As a compromise the United States agreed to a new Internet Governance Forum in which governments will debate and make recommendations on Internet policy without having decision-making power. All of this illustrates the management challenges created by the Internet.

Although one cannot say the legal structure for ICANN, a public–private California corporation, is a new invention, the purpose and the activities of the entity are entirely new since the Internet is a unique new development never seen before.

The United Nations General Assembly recently adopted a "Draft Convention on Electronic Communications in International Contracts" (A/Res/60/21) which will remain open for signature for two years. This convention was prepared by the United Nations Commission on International Trade Law (UNCITRAL) who also prepared the Model Law on Electronic Commerce and Model Laws on Electronic Signatures. Nations adopt laws, sometimes based on UNCITRAL model laws, which attempt to regulate activities on the Internet. An example of such a law is the U.S. Can-Span Act of 2003 (Controlling the Assault of Non-Solicited Pornography and Marketing Act) which establishes requirements for those who send commercial e-mail and provides penalties to companies whose products are advertised in violation of the law.

A considerable number of cases have been brought in courts in various countries. Courts in France have punished violations of French legislation relating to collecting e-mail addresses and fraudulent publicity. In the United States and France, spammers have been punished for interfering with the treatment of data (Jahan, 2006: 19–21).

One of the most important cases was one brought in France when a French court re-issued a preliminary injunction ordering Yahoo!, an American company, to take all possible measures to dissuade and prevent the access in France of web pages in Yahoo!'s U.S.-based server which auctioned Nazi objects. Some in the United States saw this as a threat to free commerce and expression on the Internet. Yahoo! brought suit in the United States claiming

the French court had no jurisdiction and its right to free speech guaranteed by the U.S. Constitution was threatened. Others claim the Internet "is a separate jurisdiction" and reject the right of nations to interfere with the free flow of information on the Internet which, they claim, is a "value imbedded in the present architecture of the Internet through geographic indeterminacy of Internet transmission." One commentator notes this "decision forces the technical elites to respect democratically chosen values and the rule of law" and "does not vitiate the responsibility and power of States to police activities within their territories" (Reidenberg, 2002: 261–280). French law prohibited "the public display of any uniform, insignia or emblem of Nazi organization or person responsible for crimes against humanity" (Reidenberg, 2002: 261–280).

The result in this case confirms that "no longer will technologists be able to ignore national policies based upon the purported architectural values of the Internet. The technical instrument of geographic determinacy will allow multiple policies and values to co-exist. At the same time, the constraints of international law and the technical capability to boycott rogue nations will protect against the implementation of repressive policies in a nation's Internet rules. States will regain their voice in the global network as participants in a pluralistic international democracy" (Reidenberg, 2002: 261–280).

A leading French scholar has also analyzed this case (Watt, 2003: 673–696). She points out that conflicts arising in case of electronic commerce require little more than technical adjustment of the rules or methods applicable in analogous real world situations. However, a "growing number of conflicts involve clashing fundamental values in the international arena [...] the violence of reactions which the Yahoo! decision generated on both sides of the Atlantic – it may be these conflicts implicate an additional dimension unparalleled outside the Internet."

The author concludes that enforcement of rules in each country is probably facilitated because the Internet runs on man-made software and subject to change. This should make enforcement of national rules easier. The regulating State can prevent given data from entering within its borders through the use of gateway software. But this, in turn, raises the question: who should bear the burden? One would think the regulatory State would be the logical choice. However, "real world inequalities" will probably mean that the French court was right to put the burden on Yahoo! because it had local assets in France and it was earning money in France from its advertising revenues. However, Yahoo! did not want to filter out the obnoxious material so the receiving State had more incentive to bear the burden of excluding the unwelcome data which should militate against overregulation. However, some receiving States may not have the resources to bear this burden.

To conclude this brief inquiry into the impact of law on the Internet and the effect the Internet has had on the law, one notes that there is a new type

of global regulation through ICANN subject to U.S. control. The Yahoo! case teaches us that Internet technology need not dictate whether there is regulation or not. Each State's courts will likely follow its States rules. We have seen in the Yahoo! case that France's legislation prevailed in France and the violation of these rules was sanctioned by a French court that had jurisdiction over Yahoo! assets to insure enforcement of French rules.

Nations and individuals can effectively invoke the law and its sanctions to put cyber criminals in jail and to filter out undesired information in part, if not completely, to an important extent. While the Internet has and will lead to remarkable changes in the world application of the law, legal systems are more often than not effective. The techniques of applying the law are often different. Aside from regulation through the architecture and the software of systems, pressure or litigation is often effective if directed to Internet service providers and credit card businesses involved in Internet gambling and other illegal activities. Private enterprises need law enforcement help where their businesses can be invaded by fraudulent operators as was the case with E-Bay. Cisco, Yahoo! and Google have catered to the desires of China to restrict the flow of information believed to be contrary to its public interest, even though contrary to the unique but not universal values protected in the United States. Europe has, by its privacy requirements, forced Microsoft to respect European standards for its Dot-NET Passport, not just for Europe but for every client worldwide. Because Europe was such an important market (one-third of its business) and it was not practical to separate Europe from other markets, the European more restrictive rule was generalized by Microsoft throughout the world, causing all customers to bear the additional cost. European rules made global law.

Illegal activities, such as selling votes or selling drug paraphernalia, carried out on the Internet have been also sanctioned by removing rights to domain names which takes these activities off the Internet (Goldstein and Wu, 2006).

In conclusion, there is a vast number of ways to enforce various national laws relating to Internet activities. The law has adapted to regulating conduct on the Internet and to applying sanctions in imaginative, practical and effective ways.

The Internet, like the law, is an artificial complex adaptive system, a remarkable network of networks which promises to facilitate the spread of knowledge despite numerous barriers such as language and cultural differences. Law, in its many forms mentioned in this section, is a major force in shaping the nature of the Internet reflecting the values to be respected in each nation state.

16.1.6 Order Under Complexity

Complex systems are characterized by a hierarchy in a vertical structure or a more horizontal one "with sub-systems that in turn can have their own sub-systems." Such a system goes through an evolutionary process evolving faster than a non-hierarchical system would. It also has dynamic properties and can be organized into sub-systems in order to analyze their behavior. For example, one can distinguish "between the interaction among sub-systems ... and the interaction within sub-systems" (Simon, 1994: 195–229).[16] Complexity theory now provides a way of thinking using metaphors and concepts which have almost become generic since they are used in natural sciences as well as the social sciences. The fundamental concepts are anchored in positive and negative feedback loops, emergence, self-organization, among the most dominant, that serve as foundations for computability. In other words, the representation for such concepts requires computerization. Per Bak, a Danish scientist, wrote that "[a] general theory of complex systems must necessarily be abstract," i.e. unprecedented generality. There is convergence of chemistry, physics, biology, and engineering. If E.O. Wilson is correct, there is unity of knowledge (Wilson, 1998: 53–54, 85) of which this convergence is an illustration.

Two examples of complexity are illustrative of dominant properties. First is the case of sand in a sand pile. Add grains of sand to a sand pile on a table until its sides get steep and there is catastrophic collapse and much of the pile cascades to the floor. Nothing about the place where each grain of sand is added can tell you whether the pile will start to collapse. The necessary information is distributed throughout the pile. The added grain of sand (reductionism) will not describe what will happen to the whole pile (holism). The key point here is that of reaching the "tipping point."

Second is the case of symbols-in-a-pot. In a pot, there are numerous "symbol strings" floating. A simple symbol string is an ordered group of zeros and ones, like 011, 101011, 111000. Imagine these strings such as if part of one colliding string is 011 and if part of another is 100. Then the latter sequence is changed to 11010. The first string can be thought of as an "enzyme" that catalyzes the transformation of the second string. Assuming the pot has enough zeros and ones, a catalytic reaction can occur. This situation can be simulated on a computer with a given set of grammar rules which can result in an auto "catalytic set" which continually produces the same strings. Some think such a situation gives a crucial insight into life's

[16] In his chapter "The Architecture of Complexity," Simon has outlined the elements he believes make up a complex system, which the author has summarized or incorporated into this paragraph within quotation marks.

development from a primordial "soup pot" containing molecular strings of atoms (Talbot, 2001: 15–19).[17] The key point here is that of emergence.

An article in the French magazine *Revue internationale de théorie du droit et de sociologie* (L.G.D.J.), No. J4J6 (2000) concludes with a study stating that complexity is a paradigm for a legal system (Serge Diebolt). Other chapters in this study note that complexities should be plural because complex situations are often very different and analysis as a complex situation constitutes a heuristic quality to the analysis. It is also stated that it has taken a long time not to consider complexity as a difficulty or hurdle but as a useful way to see the world.

16.1.7 Ubiquity of Networks

Complex systems usually consist of networks with nodes that sometimes become hubs which are linked together. Networks are ubiquitous; they exist in governments, universities, neurons in brains, cities, Internet, multinational and business corporations which can have significant impact in many countries on economic development and civil society. Other networks include public private partnerships which privatize activities heretofore performed by governments such as managing prisons, financing and performing educational and other government's functions. Indeed, all social interactions involve networks (as well as networks of networks) ordered by legal instruments managed within the underlying legal order.

In the international context, there are no instruments that perform the exactly same functions as do constitutions in the national context. That is, after all, the difference between national sovereignty and international conditions. Internationally, norms, customs, and treaties provide analogous functions, however these are not accompanied by commensurate institutions and sanctions to enforce compliance. Practices and institutions for coordinated international action are noteworthy in both scale and scope. Some scholars believe that national governments can reform their own internal laws to extend them to effect some measure of global governance in absence of a world government (Aman, 2004). Others argue that some world governance is growing through contacts between persons operating within horizontal networks of government officials from different countries who sometimes form associations. In some case there is especially close cooperation in matters of intelligence. These networks also occur in other fields such as regulators with specialized expertise who meet in international conferences. There are also G-7, G-20 and other similar meetings. This is also true for judges, legislators, foreign ministers, and military leaders from a number of countries and those within international organizations, intergovernmental

[17] The examples are summarized from Talbot (2001).

executive agreements, the Basel Committee as well as other information and enforcement networks, not to mention international organizations like the OMC which are more akin to a vertical network (Slaughter, 2004).

And, as evidenced in various chapters throughout this book, our efforts to provide coherence in our understanding of evolving global complexities are daunting indeed. Interactions of vertical structures with more horizontal ones and the embedded and nested relationships within and across structures (and sub-systems) are inherently difficult to grasp (let alone model). At best, we have tried to provide some internally consistent intellectual order in current understanding of complex global dynamics in both social and natural environments.

16.1.8 Complexity and Computability

As defined by Herbert A. Simon, law can be regarded as an "artificial system," namely one that is "inextricably interwoven" with complexity. He examines economics, social planning, and designing, which he characterizes as "artificial" because "they are as they are only because of a system being molded, by goals and purposes to the environment in which it lives." If natural phenomena have an air of "necessity" about them in their subservience to natural law, artificial phenomena have an air of "contingency..." and depending upon what nature and qualities they are given by man (Simon, 1994: i–xi). In this context, law can be viewed as an "artificial system."

The "artificial world," as defined by Simon, has been greatly expanded recently by the forging of cyberspace, which has generated what is now known as "virtual reality" shaped by "a globally networked, computer sustained, computer accessed, and computer generated multidimensional, artificial, or "virtual" reality. In this reality, to which every computer is a window, seen or heard objects are neither physical nor necessarily representations of physical objects but are rather, in form, character, and action, made up of data, of pure information" (Benedikt, 1994: 119). In this connection, it is important to distinguish among computer *science*, computer *technology*, and domains and types of *applications*.[18] Parenthetically, we should note here that we are concerned with all three dimensions of "computability," particularly since the *Global System for Sustainable Development* provides an example of all three facets. In addition, we are concerned with identifying and reducing barriers to each of these three facets as they bear on transitions toward sustainable development.

[18] We are grateful to Professor Robert Silsbee for reminding us of the relevance of these distinctions.

16.2 Sustainability of Legal Systems

On efficiency grounds, law should effectively rule the minimum requirements to be enforced by society with sanctions. These minimum requirements become legally enforceable duties. Higher up the scale "duty leaves off and the challenge of excellence begins." There is much conflict as to where along the scale the invisible pointer should be set that marks the dividing line between duty and aspiration. Morality and ethics rule the higher-level ethical behavior, and there is in this upper portion of the scale more divergence of opinion (Fuller, 1964: 9–10). Nevertheless, unethical actions, even if they do not violate any laws, are often subject to the pressure of public opinion and the press.

On equity grounds is the realization that transcending all of the above is the underlying function of law: to reflect, protect, and represent the consensus in a society, its norms, aspirations, and regards for individuals and for the society as a whole (the "parts" and "whole" argument or consensus analogy in the context of complex adaptive systems). And, we know from empirical experience, social order can be maintained even in the absence of modern and formal instruments of law (Carbonnier, 1992: 37).

16.2.1 The Overload Issue

Does excessive legal infrastructure create too many laws and precedents? Is there an excessively complex society in the most developed countries which ultimately tends to collapse from its own weight from time to time as it becomes less and less efficient? How much is too much? Ancient Greece was well known for the litigiousness of its citizens before it declined.

In the 16th century, Montaigne, who was a distinguished judge before he became a writer, quoted a Roman in his 13th Essay: "For we have in France more laws than all the rest of the world together, and more than would be needed to rule all the world of Epicurus: As formerly we suffered from crimes, so now we suffer from laws (Tacitus)" (Montaigne, translated by Frame, 1958: 815).

Even within a highly developed legal system when traditional systems of securing justice are long, expensive, and inefficient, short-cuts grow up to replace them (Baker and Fontbressin, 1992–1993).[19] These short-cuts tend to serve an adaptive function and reduce prospects of "ossification." Conversely,

[19] The Alternative Dispute Resolution movement, which has seen impressive growth in the last 20 years in the United States, militates for more private arbitration, mediation, conciliation, etc. through institutions and procedures outside the overcrowded court system. The need for resolving disputes often spurs new, more efficient and flexible systems for settling disputes, such as the system of equity in English legal history.

it has been argued that too many laws reflect a pathological condition in which increasing laws lead to an increase in lawyers and more claims, frivolous litigation, new regulations, bureaucracy, and resistance to simplifying and lightening the burden of the law and more tension in society (Carbonnier, 1992: 7).

16.2.2 Corporate Perspective

In the corporate community, the growth of law has been viewed as follows:

> In the 70's we learned how to do things right, then, in the 90s, we are going to learn what to stop doing! My thesis is that legal work, as it has been classified in times past, has grown exponentially. That there is 10 times as much legal work to be done in 1990 than there was to be done in 1980. We need also to be better able to explain it to our skeptical CEO's and financial officers in defense of our ever-growing legal budgets (Weise, 1992: 5–1, 5–2, 5–3).

The question that follows is this: why is there 10 times as much legal work in this expansionist era? And Weise answers as follows:

> In the last decade, we have seen criminalization of government procurement, the securities industry, the banking industry, environmental matters and occupational safety … Our corporate clients get indicted, they need their own lawyers and the legal standards for caring for their well-being increase. More lawyers have to do more things with a higher standard of care.

As the law schools pump out more lawyers, they have found work in previously unmined causes like unjust termination, discrimination, invasions of privacy, denial of sales commissions, occupational safety, and negligent hiring – at the expense of corporate America. The simple fact is that the cost of legal services to U.S. corporations is fast becoming unaffordable.[20]

In the United States at least, there is a view that it is not changing client demands that have caused the growth of large law firms but the race among young lawyers to win the promotion to partnership tournament to be the root cause of the exponential growth of the large law firms. In other words, big law firms have had a built in "growth engine" (Galanter, 1991).

While promoting order, it is clear that in many societies – industrial as well as developing – the legal system has aspects that do not serve the poor,

[20] *The Wall Street Journal* European Edition, October 6, 1994, p. 1 reported that Motorola, beginning in 1992, ran up a $15.2 million legal bill defending itself against a pollution case arising from dumping commercial solvents on the ground for over three decades near Phoenix, Arizona, which had as many as 700,000 potential plaintiffs.

the general welfare, and sometimes only favor narrow private interests (Trubek, 1984: 575–622; Unger, 1983).[21]

16.2.3 Public Policy Perspective

Richard Epstein, in his April 2004 article "The Optimal Complexity of Legal Rules" (Epstein, 2004), believes the government should have strong coercive powers only within well-defined spheres to achieve its primary objectives – the maintenance of order and infrastructure that make voluntary transactions possible. He notes that a legal system must deal with the lack of knowledge (cognitive limitations) of ordinary people but also curb excesses of individual self-interest. However, he warns that the motives and cognitive powers of individuals working for the government are not themselves above question. He believes that the simpler rules of thumb that characterized natural law often do a better job in overcoming the cognitive and motivational weaknesses than the more complicated administrative expertise which much modern law provides. For him, the optimal strategy involves the fragmentation of government power and the limitation of public discretion. "Three types of rules that help achieve this result are rules of absolute priority, rules that judge conduct by outcomes, not inputs, and rules that use simple ratio formulas to allocate benefits and burdens."

After citing Hobbes, Locke, Hume, Adam Smith, Madison, and Hayek for their vision of the world, he asks the question "What is the optimal complexity of law within this framework? The answer depends upon the greatest obstacles toward the achievement of a stable political order. "Here the modern preoccupation with behavioral economics and cooperative limitations tends to find the weak link in human behavior in the ability to integrate information and to calculate the odds of future events. Expected utility calculations are a mirage for all concerned" (Kahneman and Tversky, 1982). Epstein goes on to cite Madison's concern "Who guards the guardians?" and comment that we need institutions that can stand abuse in bad times just as they promote effective government in good times. This makes the grand objective not to minimize the level of complexity but in the United States has led to the fragmentation of power "that consciously reduces short-term efficiency in order to counteract the corrupt motivations of political actors." This fragmentation occurred by the separation of powers between the

[21] The legal system that has evolved in the United States has in the last decades of the 20th Century been subjected to severe criticism by a group of scholars referred to as Critical Legal Studies Movement who claim that the legal system, which is more resistant to change than rapidly innovative, is skewed in favor of the rich against the poor, that although legal principles may seem objective, in fact, the poor do not secure the benefits from the legal system that they should.

legislative, executive, and judicial to insure that no individual or small group controlled all functions of government. Epstein adds other limits to power, such as the system of checks and balances, elaborate electoral rules designed to slow down election of public officials, the electoral college and finally the system of federalism which divides power between the Nation and the States.

16.2.4 The Value Added Dimension

In many ways trans-disciplinary contributions to law tend to be underestimated. There is hidden "value-added" whose potential is yet to be fully realized. As a result, trans-disciplinary studies have been incorporated in curricula at leading law schools. Economists and specialists in other disciplines have become members of law faculties and done important work. (Coase, 1992). Does Brian Arthur's emphasis on "law of increasing returns" in new economic theory have an effect on law in society? This theory has been used to explain Microsoft's success by setting a standard with its software which does not follow the law of diminishing returns (Cassidy, 1998).

History, including the history of the law, has long been a field of study which illuminates and explains the existence of many legal institutions and rules. Justice Holmes, probably the most influential legal scholar in the United States and a Justice on the Supreme Court, stated that "The life of the law has not been logic: it has been experience" (Holmes, 1920: 238–239). The equivalent of "experiments" in the natural sciences is found in law and the social sciences in trying out legal rules and institutions in real life to ascertain if they function well. It is legal history and the study of comparative law that records the results of these "experiments" (Atias, 1994: 129–144).[22]

A legal distinguished scholar has "thought that certain developments in science (physics) can help us discover a deeper and richer insight into the pervasive and profound role law plays in shaping our society ..." (Tribe, 1989: 574). Simon also argues that cybernetics constitutes "if not a theory, at least a point of view that has been proving fruitful over a wide range of applications in seeking out common properties among diverse kinds of complex systems."

Significant studies in linguistics have been accomplished by computer which could also be relevant to the legal profession.[23] And, clearly, sometimes

[22] Atias denies there are revolutions in law – only continuity – and notes that "experiments" in law sometimes are confirmed by public opinion polls and the study of comparative law. Could it be said that discovery practice in the United States has some elements of an "experiment" before going to trial?

[23] See publications by David G. Hayes described in an article in August 1995 *New York Times* by Wolfgang Saxon.

interdisciplinary knowledge helps natural scientists. According to his own account, Einstein developed his critical powers by reading philosophy and had discussions with his friends of Hume's and Ernst Mach's writings (Whitrow, 1970: 36). Other scholars are working to increase understanding about the relationship between biology, human behavior, and law and to develop new ways to facilitate the integration of biological theories in law, economics, and public policy.

More recently, economics has incorporated knowledge of psychology to create a new area of research behavioral economics, which explains why we "procrastinate, buy, borrow, and grab chocolate on the spur of the moment" (Lamtest, 2006). The addition of skills and knowledge of physics helped lead to the revolutionary discovery of the double helix. The recent discovery of important laws of scaling in biology was accomplished by Geoffrey West of the Santa Fe Institute, a physicist working with a leading biologist. So combining deep knowledge in separate fields has yielded remarkable results. Crick, a physicist working with Watson, a biochemist, led to the most important Nobel Prize winning discovery of the double helix.

One of the most important additions to law school curricula is courses on negotiation (Fisher and Ury, 1981) and the study of alternative dispute resolution. Although lawyers have long negotiated settlements in disputes, it was not generally thought to be a subject that was teachable or constituted a body of knowledge worthy of special attention. Alternative dispute resolution has grown up because of the increase in litigation and its rising cost. It includes arbitration, mini-trials (a quick, informal non-binding procedure designed to facilitate a settlement), mediation, and conciliation. These techniques have themselves drawn on knowledge from other fields such as psychology. Although the development of these different dispute resolution options has not proven to have helped reduce the case load in courts it has certainly provided additional paths for resolving the growing number of conflicts.[24]

16.3 Potentials for Synergy via Computability

What is to be gained for sustainability by exploring potentials for synergy between legal thinking and practice, on the one hand, and artificial intelligence (AI) and "computability" on the other? What are the sources and what are the potential benefits?[25]

[24] This statement is drawn from a conversation with Frank A.E. Sander.

[25] The costs of such efforts are more readily identifiable: They would be conventionally seen as a diversion from the benefits of continued specialization, and as a source of "fragmentation" of knowledge, insight, and wisdom.

At issue here is the argument that synergy between innovative computational applications and the legal systems add value to each. This argument expresses a new and increasingly important view among legal specialists (Rissland, 1990). In this connection Rissland distinguishes "expert systems," which are special purpose computer programs in narrow problem areas used to model certain rule-based aspects of law. Constitutional law, she believes, has concepts too vague for an expert system. Drawing on Marvin Minsky's definition of Artificial Intelligence, "the science of making machines do things that would require intelligence if done by man," and describing its realm as playing chess, solving calculus problems, making mathematical discoveries, understanding short stories, learning new concepts, interpreting visual scenes, diagnosing diseases, and reasoning by analogy with the limiting factor that "common sense" reasoning or perception such as language understanding are by far the most difficult for formal representation of artificial intelligence (Minksy, 1966: 1958–1959).

In an article written about 25 years ago, Minsky described a program employing reasoning by analogy – a system of reasoning commonly used by lawyers (Minsky, 1966). The process of modeling laws, Rissland adds, has helped programmers uncover problems in the laws "such as undefined legal predicates and loopholes" (Minsky, 1966: 1967) and in this connection distinguishes among a number of modes of reasoning:

(1) Reasoning with Rules (Rand Corporation's Center for Civil Justice and the Legal Decision Making System [LDS], which computes the settlement value of a case).
(2) Precedent-Based Reasoning with Cases and Hypotheticals (Kevin Ashley's HYPO model, where certain aspects of case-based reasoning are used). This system evaluates trade secret problems by comparing them and contrasting them with cases from its knowledge-base. It generates legal arguments citing past cases as justification for legal conclusions about who should win. HYPO's arguments present competing adversarial views of the problem and it poses hypotheticals to alter the balance of the evaluation.
(3) Reasoning with both Rules and Cases.

More recently, Aikenhead notes the shortcomings of a rule-based system (a positivist jurisprudential model) because the open texture of rules makes possible different interpretations, especially when facts change. He also thinks the case-based system, founded on thinking by legal realists that the law is based on experience embodied in case law, fails to capture all that is law. He then concludes that of key importance to law is the justification of legal decisions and the discursive theory of law (law as a process of argument between parties) provide a better way to the community's acceptance of a decision reached through a process of argumentation. Rules and cases

are of course elements used in the construction of arguments but are not stand-alone arguments. Models have been developed based on the nature of legal argument but in addition to other complications the discursive model requires reference to policies, principles, and values in support of arguments, i.e. reference to meta-standards which need to be incorporated in the model. But this in turn has problems: what is an acceptable meta-level argument, how do you determine which meta-argument supports a particular argument and what happens when meta-arguments conflict? (Aikenhead, 2006).

In this context, we can begin to see what some potential gains from synergy might be. The types of reasoning noted above are clearly the kind of intellectual activity accomplished by legal services operating within legal codes. The next step will be to determine to what extent they, even though imperfect, can be useful to the practicing lawyer, the legislator, or the client.

By the same token, it may well be that there is a special role for law as an "open discipline" capable of borrowing knowledge from closely related and relevant other fields. Therefore, this process of expanding and deepening inter- and cross-disciplinary work is a most fertile avenue for producing progress in the law, even though it may complicate the attempt to model legal decision-making.

In addition, the study of laws of other countries and comparing solutions and institutions has provided interesting insight which can be of practical application. This process is particularly important for progress in the law for countries without a strong legal system.

It is possible that the most important recent progress in the legal system has been made in perfecting negotiating techniques and alternative dispute resolution procedures to short-cut or otherwise avoid court cases. Consideration of the modes of legal reasoning and legal modeling mentioned above could facilitate negotiation and settlement techniques before a court decision becomes necessary. The importance of this development should be measured against the seemingly constant increase of litigation in many developed countries. The extent legal experts presently use these above tools is only a beginning which will hopefully increase in the future to improve the efficiency of the law's service to society.

As noted, law is produced and applied through (society constructed) complex adaptive systems of social interactions which in participatory societies are supposed to evolve and change without violent destructive disruption or revolution. But as in the past, if *any* system becomes too complicated, overloaded with outdated laws, does not recognize and provide answers to new problems and if new generations fail to take the actions necessary to make the system work better than their ancestors did, it may decay, collapse, and disappear. Wars can also help destroy a civilization with a legal system. History provides a good record of civilizations that did not survive (Tainter, 1988).

Keeping in mind that metaphor and analogy may be helpful –but can also be misleading – legal analysts may obtain some sense of potential "value-added" for enhancing their own pursuits by exploring the implications of analytical innovations in the study of complex systems. It might very well be that some useful insights might emerge. However, some basic skills in "computability" are needed, or to put it differently, at least an elementary form of literacy.

Certainly, we do not suggest to partially or wholly replace the system of justice by efficient adaptive computer programs filled with problem-solving capabilities and legal precedents. That would be both unrealistic and highly irresponsible. But "computability" may facilitate the efficiency of information processing, at the very minimum.

For example, litigants could "submit" their complaints and have an objective decision in ten minutes if the program were perfectly prepared. Just think how much money, time, and effort could be saved in an economy without lawyers and judges, especially if there was an interactive interface to simulate human intervention.[26] Even if litigants found it unacceptable to submit their dispute to a software program for decision, such a system might be helpful instead of a mini-trial or if a potential plaintiff wished to secure an advisory opinion prior to filing of a lawsuit.

If one can draw any conclusions about the success or failure of legal systems in transforming chaos, violence, and unpredictability into more ordinary, even benign, rules governing society, one could say that it has been a crucial element in the economic growth of Western societies, providing basic rules and enough stability to facilitate the production of significant wealth. In industrial countries some ask if it is not reaching the breaking point as court systems become overloaded with cases (reflecting more and more of a demand for justice). This could indicate the system is functioning by providing a substitute for physical violence, the more ancient and more efficient mode of dispute resolution.[27]

The increasing "demand" for justice also reflects more willingness by citizens to enforce their rights in court which have heretofore been ignored – presumably a positive factor in measuring improvement in a society. The question here is how that justice is in fact "supplied." In many ways, the issues raised in Chapter 14 on e-governance touch upon the suppositions above.

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[26] You would not have to "kill all the lawyers," as Shakespeare suggested – they would just become obsolete.

[27] Perhaps not more efficient if reciprocal killings lead to family wars, regional wars, and world wars which cannot really be characterized as an efficient method of dispute resolution, since it is costly in lives and property. Even if a lawsuit is inefficient, slow, and costly, there may be a benefit in that the adversaries secure time to cool off and settle the dispute after time passes and circumstances change.

16.4 Synergy for a "World That Could Be"[28]

This chapter briefly considered ways in which one might view the legal and ethical system as a reflection of the complexities of society as well as of efforts to manage the complexities. The legal system as well as the underlying social orders can be seen as constituting complex systems to which mathematical, scientific, or computational tools of analysis could be utilized in the hope of introducing analytical rigor in order to clarify contradictions, tensions, and "irreconcilable" factors and, potentially, to lead to efficiency. This view would be applicable to both the more and the less contentious legal contexts.

In this connection, we have argued that innovative analogies which might be relevant and possibly instrumental to improve insights in the legal system may be found in computation-dependent domains of knowledge. Computer science and modeling, for example, could provide better computational analysis and better strategic decisions as to where the law should be going in the future. In medicine, recent use of scanning devices and computer analysis have greatly enhanced diagnosis efficiency and reliability. If doctors were able to use computers that could help diagnose the 12,000 known diseases perhaps most of the preventable medical errors which are estimated to lead to the death of 44,000 to 98,000 people annually in the United States could be avoided (Economist, 2005). Common law lawyers have a somewhat similar problem in being sure they have found all the legal precedents relevant to the problem involved.

Clearly, the adoption of computational representation and new modes of analysis must never replace the human mind, human knowledge and experience. But advances in providing and organizing all the information needed and in analytical reasoning, computation capabilities, and electronic technologies cannot be ignored. Is there a potential basis for the proverbial "win-win" combinations? We think yes.

We have argued in this chapter that the quest for sustainability could be enhanced through the pursuit of a distinctive form of synergy, namely between the theory and practice of law, on the one hand, and the advances and applications of computational methods, on the other. In this connection, we argued that legal analysts, scholars, and practitioners could gain in creativity and in practice by understanding and then utilizing the logic and even the potential applicability of methods relevant to advances in the natural and social sciences, and the uses of models associated with advances in information technology, for example.

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[28] Initially coined by the late Professor Robert C. North, of Stanford University, the "World that Could Be" is a phrase that reflects both vision and possibility.

The search for synergy is predicated on the premise that those entrusted with preserving the rule and the role of law in modern societies need also explore the impacts of such "progress" for sustainable development. Central to sustainability is enhancing the resilience of legal systems and their adaptability to rapidly changing socio-economic and technological conditions worldwide. This may even mean reevaluating old truths and value systems embedded in the procedures that may have been instrumental and effective in the past but may not be optimal at present, and perhaps even more burdensome in the longer run. The concept of sustainable development has added new perspectives to law and ethics that must be taken into account, such as intergenerational ethical considerations which should leave a better world to our offspring than was delivered to us. Human activity has become a danger to survival through misdirected harmful scientific and technical advances, unwanted climate change, pollution which damages health and other environmental threats. This militates for careful analysis and action before a dangerous situation becomes irreversible.

Reaching a consensus among the nations on the importance and the nature of the environmental problems that require solutions has been impossible up to the present. Politicians, governments, and citizens have failed for many reasons which include powerful private interests. There is great difficulty in understanding highly complex problems. Most human beings remain unconcerned by potential long term problems confirmed by experts, probably because people are genetically programmed to react only to immediate threats and to ignore long term threats which they hope will disappear. Behavioral economists have found that people act irrationally by overly discounting the future.

Many believe the Kyoto Convention will not be able to deliver much relating to climate change. In 2005, an Alternative Climate Pact was announced between the United States, China, India, Australia, Japan, and South Korea, representing about one half the world's population and about 40% if the CO_2 emissions. By contrast, everyone agrees that more will need to be done to manage the challenges of climate change.

In this connection, then, the pressing objective for the international community as a whole, indeed a "desirable-trajectory," may perhaps best be viewed as one of increased understanding enhancing social resilience, adaptability to necessary changes, and, above all, sustainability in conceptions and applicability of law, order, and institutions of justice. In other words, the challenge of synergy is one of facilitating "the world that could be" in order to prosper and survive. If the world is diligent, urgency will arise, leading to a mobilization of citizens' demands, and their articulation in public contexts, to drive politicians to forge solutions before irreversibility sets in and move the world toward a sustainable trajectory.

References

Aikenhead, M. (2006). A discourse on law and artificial intelligence. *Law Technology Journal*, 5(1). Retrieved August, 2005, from http://www.law.warwick.ac.uk/ltj/5-1c.html

Aman, A. (2004). *The democracy deficit taming globalization through law reform*. (New York: New York University Press)

Atias, C. (1994). Legal experiments: are there any crucial experiments? *Théorie du droit et de la science, L'Armatan*, PUF.

Baker, W. R. (1999). Law, chaos, and complexity: can progress in the law be accelerated? revised edition, *The International Lawyer*, Nomos Verlags Gesellschaft, Baden Baden.

Baker, W. R. and de Fontbressin, P. (1992–1993). The French référé procedure – a legal miracle? *The University of Miami Yearbook of International Law*: 2.

Benedikt, M. (1994). Cyberspace: some proposals. (In *Cyberspace*: First Steps. Cambridge, MA: MIT Press)

Bordonove, G. (1984). Les rois qui ont fait la France, les capétiens, Saint Louis. Collection Marabout University, Editions Pygmalion/Gerald Watelet, Paris.

Brand, S. S. (1995). For $100 you get software that costs $100 million to make. *Wired Magazine*.

Carbonnier, J. (1992). *Flexible droit, pour une sociologie du droit sans rigueur. seventh edition* (L.G.D.J. Paris)

Cassidy, J. (1998). The force of an idea. *The New Yorker:* January 12.

Choucri, N. (1999). The political logic of sustainability. (In E. Becker and T. Jahn (Eds.) *Sustainability and the social sciences, a cross-disciplinary approach to integrating environmental considerations into theoretical reorientation*. London: Zed Books)

Clark, R. C. (1992). Why so many lawyers? Are they good or bad? *Fordham Law Review*: 61.

Coase, R. H. (1992). The institutional structure of production, *Occasional papers from the law school.* University of Chicago, No. 28, Nobel Prize Lecture. (Buffalo, New York: Hein and Company)

Cohen, B. (1985). *Revolution in science*. (Cambridge, MA: The Belknap Press of Harvard University Press)

Dawson, J. P. (1968). *The Oracles of the law*. (Ann Arbor, MI: The University of Michigan Law School)

Diebolt, S. (2000). Ubiquity of networks. *Revue internationale de théorie du droit et de sociologie* (L.G.D.J.), No. J4J6.

Dufour, A. (1994). The scientific paradigm in modern legal thought. *Théorie du Droit et Science, Léviathan*, PUF.

Dyson, F. (1995). Introduction: the scientist as a rebel, nature's imagination. (In J. Cornwell II (Ed.) *A debate on the future of science*. Oxford: Oxford University Press)

Economist, The. (2005). Technology Quarterly. *The Economist*, December 10: 35.

Epstein, R. A. (2004). Optimal complexity of legal rules. *Chicago Working Paper Series Index*. Retrieved 2004, from http://www.law.uchicago.edu/lawecon/index.htm

Fisher, R. and Ury, W. (1981). *Getting to the yes.* (Boston: Houghton Mifflin Company)

Fuller, L. L. (1964). *Morality and the law. revised edition.* (New Haven: Yale University Press)

Galanter, M. and Palay, T. (1991). Tournament of lawyers. (In *The transformation of the big law firm*. Chicago: University of Chicago Press)

Goldstein, J. and Wu, T. (2006). Who controls the Internet? (In *Illusions of a borderless world*. Oxford: Oxford University Press)

Hawking, S. (1988). *A Brief History of Time*. (New York: Bantam Books)

Holmes, O. W. (1920). *Collected legal papers*. (New York: Harcourt, Brace & Company)

Jahan, G. (2006). Le rapport du congrès sur le Can-Spam Act: bilan de la loi américaine contre les spam (The report of congress on the Can-Spam Act: the effect of the American law against spamming). *Gazette du Palais*, Paris: 16–20 April.

Kagan, R. A. (1994). Do lawyers cause adversarial legalism? A preliminary inquiry. Law, and social inquiry, *Journal of the American Bar Foundation*: 19(1).

Kahneman, D. and Tversky, S. P. (1982). *Judgment under uncertainty: heurists and biases*. (Cambridge: Cambridge University Press)

Kuhn, T. S. (1970). *The structure of scientific revolutions, second edition*. (Chicago: University of Chicago Press)

Laingui, A. and Le Bigre, A. (1979). Histoire du droit penal II, la procédure criminelle. *Synthèse Cujas 4, 6, 8 rue de la Maison Blanche*, Paris.

Lamtest, C. (2006). The marketplace of perception. *Harvard Magazine*, March–April: 49–50.

Lessig, L. (1999). *Code and other laws of cyberspace*. (New York: Basic Books)

Lewis, A. (1995). *What ails America?* Talk given at Edgartown, Massachusetts.

Minsky, M. (1966). *Artificial intelligence in information*. A Scientific American Book.

Montaigne, M. (1958). The complete essays of Montaigne, 13th Essay, *Of experience*. Translated by Donald M. Frame. (Stanford, CA: Stanford University Press)

Mueller, M. (2002). Ruling the root. (Cambridge, MA: MIT Press)

Muir Watt, H. (2003). Yahoo! cyber-collision of cultures: who regulates? *Michigan Journal of International Law*, 24(3).

Powell, M. J. (1993). Professional innovation, corporate lawyers and private law making. *Law and Social Inquiry American Bar Association*, 18(3).

Reidenberg, J. R. (2002). Yahoo! and democracy on the Internet. *Jurimetrics*, 42.

Rheinstein, M. (1969). Introduction to Max Weber. *On law and economy in society*. The 20th Century Legal Philosophy Series. (Cambridge, MA: Harvard University Press)

Rissland, E. L. (1990). Artificial intelligence and the law: stepping stones to a model of legal reasoning. *The Yale Law Journal*, 99(8).

Sakakibara, E. (1995). The end of progressivism. *Foreign Affairs*, September/October.

Slaughter, A. M. (2004). *A new world order*. (Princeton, NJ: Princeton University Press)

Simon, H. A. (1994). *The sciences of the artificial*. (Cambridge, MA: MIT Press)

Tainter, J. A. (1988). The collapse of complex societies. (Cambridge: Cambridge University Press)

Talbot, S. (2001). The lure of complexity. Context #6, *The Nature Institute*. Retrieved September 27, 2006, from http://natureinstitute.org/pub/ic/ic6/complexity.htm

Tribe, L. (1989). Laws, geometry and the curvature of constitutional space. *The Record of the Association of the Bar of the City of New York*: Cardoyo Lecture.

Trubek, D. M. (1984). Where the action is. *Critical Legal Studies and Empiricism*, *Stanford Law Review*

Unger, R. M. (1983). *The critical legal studies movement*. (Cambridge, MA: Harvard University Press)

U.S. principals on Internet's domain names and addressing system. Retrieved August 19, 2005, from http://www.ntia.doc.gov/ntiahome/domainename/USDNSprincipals_06302005.htm

Weise, R. H. (1992). Representing the corporate client/designs for quality. (In *Full client utilization*. New Jersey: Prentice Hall and Business)

Whitrow, G. J. (Ed.). (1970). Einstein: the man and his achievement. (In *Einstein: early years*. Reprinted by R. Karplus in *Physics and man*. New York: W.A. Benjamin Inc.)

Wilson, E. O. (1998). *Consilience - the unity of knowledge*. (New York: Alfred Knopf)

Wright, T. (2005). E.U. and U.S. clash over control of the net. *International Herald Tribune*: September 20.

Younger, I. (1980). Society, law and the Congress of the United States. Charles Even Hughes memorial lectures (unpublished paper).