THE AMERICAN CORPORATION IN THE TWENTY-FIRST CENTURY: FUTURE FORMS OF STRUCTURE AND GOVERNANCE

*Azizah Y. al-Hibri**

> *The fact is that America, having left the industrial phase, is today entering a distinct historical era: and one different from that of Western Europe and Japan . . . . What makes America unique in our time is that it is the first society to experience the future . . . . For better or for worse, the rest of the world learns what is in store for it by observing what happens in the U.S.A. . . . Today, America is the creative society; the others, consciously or unconsciously, are emulative.*[1]
>
> Zbigniew Brzezinski, 1968

The last few decades have ushered in many changes and challenges to the American corporation. Foremost among these

---

* Associate Professor, University of Richmond School of Law. The author warmly thanks her Allen Chair colleagues—Professor Marleen O'Connor, Professor George Triantis, Professor Mark Roe, Professor Ronald Gilson, and Professor Jeffrey Gordon—for presenting challenging views on the subject of the 1997 Allen Chair seminar and, above all, for their commitment to the students. The author also warmly thanks the family and friends of George E. Allen, a pioneering lawyer whose commitment to education and public interest made this seminar, as well as many before it, possible.

Research support for this article was provided from the Hunton & Williams Summer Research Fund at the University of Richmond Law School. An excerpt of this article was presented at the International Conference on Socio-Economics (SASSI), Montreal, Canada, July 7, 1997. The author thanks SASSI co-panelists Professors Marleen O'Connor, Stetson University College of Law, and Claire Moore Dickerson, St. John's University School of Law, for their valuable comments on earlier drafts of this article. The author also thanks Professors William Thorn, Department of History, University of Richmond, and Daphna Eylon, E. Claiborne Robins School of Business, University of Richmond, for their comments on sections of earlier drafts of this article relating to their field. Last but not least, the author thanks her research assistants Cheryl Conner, Deborah Chandler and Leslie Salter for their professional efforts in finalizing the footnotes and checking the text, a thankless task which involved not only bluebooking, but also research.

1. Zbigniew Brzezinski, *America in the Technetronic Age: New Questions of Our Time*, *in* TECHNOLOGY AND HUMAN AFFAIRS 274, 278 (Larry Hickman & Azizah al-Hibri eds., 1981).

is the Technetronic or Information Revolution, which paradoxically not only shrank the world (the macrocosm) into a "global village,"[2] but at the same time expanded the individual human experience (the microcosm) exponentially. This dual action has created the new Global Economic Order, as well as the sphere of customized industrial production.

Despite early attempts by many scholars to prepare the country, the Information Revolution has had a drastic impact on the American corporation. Many corporate governance structures have been modified as a result of this revolution; most notably, those in Silicon Valley.[3] Investments were made and skilled labor prepared in the best universities on earth, here in the United States. Nevertheless, the claim made by Dr. Brzezinski in 1968 has clearly lost some of its vigor today. In the last two decades, the United States has seen its undisputed competitive technological advantage over Europe and Japan shrink.[4] Eventually, the United States resorted to international joint ventures in part to import some of the technologies developed abroad.[5]

This disconcerting state of affairs has raised many questions, such as: why did our undisputed technological advantage shrink in the last two decades? Also, what will it take for the United States to regain its prior position? Is it possible for a technologically less advanced country to leapfrog ahead of the United States in informatics technology? As I will show in the third

---

2. This term was first introduced into the literature by Marshall McLuhan in THE MEDIUM IS THE MESSAGE 63 (1967). It was also discussed in a later book coauthored by McLuhan and Bruce R. Powers entitled THE GLOBAL VILLAGE (1989).

3. One of the best works on Silicon Valley which discusses this aspect is ANNALEE SAXENIAN, REGIONAL ADVANTAGE (1994). *See also* EVERETT M. ROGERS & JUDITH K. LARSEN, SILICON VALLEY FEVER: GROWTH OF HIGH-TECHNOLOGY CULTURE (1984).

4. *See, e.g.*, PETER F. DRUCKER, MANAGING FOR THE FUTURE 50 (1992); Mike Hobday, *Innovation in Semiconductor Technology: The Limits of the Silicon Valley Network Model, in* THE HANDBOOK OF INDUSTRIAL INNOVATION 157 (Mark Dodgson et al. eds., 1994) [hereinafter HANDBOOK]; DAVID C. MOWERY & NATHAN ROSENBERG, THE U.S. NATIONAL INNOVATION SYSTEM 3 (Consortium on Competitiveness and Cooperation Working Paper No. 90-3) (arguing that "[t]he U.S. innovation system has not succeeded . . . in maintaining pre-1973 rates of growth in real earnings; nor has it enabled U.S. productivity growth to match that of other industrial economies; nor has it prevented a significant deterioration in the U.S. current account").

5. *See generally* MOWERY & ROSENBERG, *supra* note 4, at 3-4.

part of this article, there are historical precedents for technological leapfrogging. There are also good explanations for such occurrences. The consequences of falling behind, however, can be disastrous.

This article focuses on corporate governance issues as they relate to the new technological developments and the issue of leapfrogging. I examine various theories about the new technologies and the changes in corporate governance that they may necessitate. I then assess and critique these theories in light of historical and other data. I suggest that our very concept of the corporation will be transformed by the Information Age. I also offer my own view as to the optimal forms of corporate governance that can equip American corporations with sufficient tools to win the accelerating competition anticipated for the next century. In presenting this solution, I also recognize the important role of human capital in the Information Age, and argue that this role will ultimately change the conceptual framework underlying our present system of corporate governance.

Section I provides a description of the Silicon Valley experience and its distinctive organizational features. Two of these, open communication and an aversion to hierarchies, are central. Section II introduces some widely-recognized theories about the distinctive features of the Information Age. These features are then compared with the Silicon Valley features described in Section I. Section III investigates the preparatory and early stages of the First Industrial Revolution (henceforth, the "Industrial Revolution") for features similar to those found in Silicon Valley. The results lead to the conclusion that these distinctive features are in fact indicative of an innovative community as opposed to a specifically technetronic one. Section IV bolsters this conclusion by reviewing some well-known literature on innovation and management. Section V examines more closely the notion of hierarchy and distinguishes different types of hierarchies. The ones that create a less hospitable climate for innovation turn out to be those that exhibit a high level of control. Section VI discusses forms of corporate governance that would reduce "surplus repression" and create a cooperative communicative milieu in a firm. It also discusses the effect of the increased importance of human capital contributions to

firms of the Information Age. It argues that the abundance of financial capital together with the shortage in skilled human capital, will ultimately result in a conceptual shift that would readjust the preferred Industrial Age status of financial capital in the corporate governance of the firm and extend a similar status to human capital. The Conclusion summarizes the results of this article.

I. THE SILICON VALLEY EXPERIENCE

The Silicon Valley experience is an important one for the purposes of this article. It involves advanced information technology and introduces a novel set of features which has impacted the corporate governance structures of firms in the Valley. Furthermore, the Silicon Valley experience has been successful. Some authors have argued that it is precisely these distinctive corporate features which have earned the Valley its enormous success as a leader of the Information Revolution.[6] If the claim is correct, then the experience is a valuable harbinger of corporate changes that will sweep the world as the Information Revolution spreads.

Situated in Northern California, Silicon Valley is a relatively recent comer to information technology. It has, nevertheless, been able to outstrip more established regions in the country that manufacture similar products. Its historical nucleus is a garage in Palo Alto in which two Stanford engineering students, William Hewlett and David Packard, started an electronic instrumentation business in the late Thirties.[7] The Hewlett-

6. *See* DAVID PACKARD, THE HP WAY 153-54 (1995) (quoting Drucker who is referred to as the "godfather of modern management," who points out that "in the traditional organization . . . the skeleton, or internal structure, was a combination of rank and power. In the emerging organization, it has to be mutual understanding and responsibility"); ROGERS & LARSEN, supra note 3, at 146 (referring to the Valley's "distinctive style of management"); ALVIN TOFFLER & HEIDI TOFFLER, CREATING A NEW CIVILIZATION 20 (1994); T. George Harris, *The Post-Capitalist Executive: An Interview with Peter F. Drucker*, HARV. BUS. REV., May-June 1993, at 122; *see also* MICHAEL S. MALONE, THE BIG SCORE 35 (1985) (describing the Hewlett-Packard management style as "a new type of corporate culture, an institutional morality never seen before in a big firm"); Ira Sager, *Cloning the Best of the Valley*, BUS. WK., Aug. 18-25, 1997, at 138-144 (stating that the secret to Silicon Valley's success lies not in silicon but in "the way of doing business"; also, quoting a venture capitalist who characterized the Valley "as a network, as opposed to a hierarchy").

7. *See* PACKARD, *supra* note 6, at 35-46; *see also* ROGERS & LARSEN, *supra* note

Packard Company (HP), resulting from efforts encouraged by Stanford Professor Frederick Terman, presaged professional relationships in the Valley.[8]

Researchers have identified these relationships, advocated by Professor Terman and articulated further by HP, as the critical ingredients in the early success of Silicon Valley.[9] These relationships and associated corporate structures will be described and then examined to determine their potential role in the success of informatics companies in the United States.

Together, Hewlett and Packard introduced the "HP way" to their company.[10] The HP way rejects authoritarian hierarchies and operates on the basis of trusting and motivating employees.[11] The cornerstone of this way is helpfulness and cooperation.[12] It starts by recruiting the most capable individuals available for a task and motivating them to do the best job they can. As a sign of trust, HP provides its employees with flexible hours and leaves storerooms unlocked and part bins open. This way, a product designer can come to the office after hours and take home a part needed for an experiment he[13] is

---

3, at 30-32 (recognizing the pioneering roles of Hewlett and Packard, but arguing that the birth of electronics in the Valley took place in 1912, in Palo Alto, when Lee de Forest conducted a vacuum tube experiment); SAXENIAN, *supra* note 3, at 20.

8. *See* SAXENIAN, *supra* note 3, at 20; *see also* ROGERS & LARSEN, *supra* note 3, at 31-34. It is worth noting that the contributions of Professor Terman were not limited to his positive influence on his two graduate students. Actually, he was the person who single-handedly promoted the industrial park concept at Stanford University in the Forties. The industrial park, which involved leasing university land to select companies, worked extremely well, benefitting both Stanford and these companies. *See* SAXENIAN, *supra* note 3, at 23.

9. *See, e.g.*, PACKARD, *supra* note 6, at 126-28 (describing the importance of trust in people, participatory management, teamwork and a strong spirit of cooperation); ROGERS & LARSEN, *supra* note 3, at 80 (illustrating how close networking proved to be advantageous for the region, and citing a Federal Trade Commission report which states that "the unique strength of the semi-conductor industry derives from its firms' rapid copying of each other's innovative chips"); SAXENIAN, *supra* note 3, at 31-32, 46 (describing the semiconductor community in Palo Alto as a tightly knit group with quasi-familial loyalty and an unusual spirit of cooperation and stating that "competition required continuous innovation, which in turn required cooperation among firms").

10. *See* PACKARD, *supra* note 6, at 128.

11. *See id.* at 152-55; *see also* SAXENIAN, *supra* note 3, at 51.

12. *See* PACKARD, *supra* note 6, at 128.

13. Throughout this paper, in describing past or existing conditions in Silicon Valley and elsewhere, the masculine gender has been used to emphasize gender inequalities in the field. For more on this point, see ROGERS & LARSEN, *supra* note 3,

conducting there.[14] HP also concerns itself with the welfare of its employees and adopts policies to promote that welfare.[15]

HP provides its employees with flexibility in working towards common goals[16] and encourages closer relations among them in order to facilitate a form of participatory management.[17] By consulting its employees, HP makes each one of them feel that he is a member of a team. Furthermore, in order to retain its emphasis on individual responsibility and achievement, HP has decentralized its corporate structure as it has grown larger.[18] It has broken it into divisions that have retained the kind of intimacy and ease of communication that characterized the company when it was smaller. At the same time, these divisions have achieved another primary goal, namely that of providing employees with considerable autonomy, thus "creating an environment [which] foster[s] individual motivation, initiative and creativity."[19]

When HP's growth, nevertheless, forced it to develop a bureaucracy, Hewlett and Packard recognized the emerging threat to intra-firm communication and decisional agility. They immediately restructured the company so as to eliminate unnecessary layers of management.[20] In their efforts to "flatten" the organizational structure of authority, however, they did not reject all hierarchies. Instead, a policy of management by objective (MBO) was introduced, which Packard defined as the antithesis of management by control (MBC).

He said:

> [MBC] refers to a tightly controlled system of management of the military type, where people are assigned—and expect-

---

at 141-45. *See also* Steve Hamm, *Why Women Are So Invisible,* BUS. WK., Aug. 18-25, 1997, at 136. In discussing future developments, gender-neutral terms were used in the belief that these inequities will be remedied.

14. *See* PACKARD, *supra* note 6, at 136-37. Packard observes, however, that while this policy continues and lab stock (a relatively small supply of HP's best parts and equipment) remains generally open, production stock is restricted. *See id.* at 137.

15. *See id.* at 130.

16. *See id.* at 141, 152-53.

17. *See id.* at 127-28.

18. *See id.* at 139-41; *see also* SAXENIAN, *supra* note 3, at 50-51.

19. PACKARD, *supra* note 6, at 141.

20. *See id.* at 150.

> ed to do—specific jobs, precisely as they are told and without the need to know much about the overall objectives of the organization. [MBO], on the other hand, refers to a system in which overall objectives are clearly stated and agreed upon, and which gives people the flexibility to work towards these goals in ways they determine best for their own areas of responsibility.[21]

These are the basic contours of the HP way. Whereas not all of its features have been duplicated *en masse* in other Silicon Valley organizations, the Valley as a whole reflects some of the basic assumptions underlying these features: trust, cooperation, egalitarianism and close professional ties. It also reflects a distinctive, non-autarkic, consultative management style based on these features.[22]

Although there are some leading firms in the Valley which are highly structured, such as Intel, most firms exhibit a distinctly egalitarian, decentralized managerial structure.[23] One purpose of this structure is to retain the firm's entrepreneurial spirit by delegating a great deal of responsibility to managers.[24] Another purpose is to nurture the spirit of cooperation existing in the Valley. This spirit of cooperation has so infected the Valley that it has reached across company lines and largely replaced competitive behavior with a strong sense of community.[25] It is not unusual for engineers to call their friends at competitive firms to discuss a problem that the others may have encountered and solved earlier. In fact, they tend to frequent the same bars and restaurants after hours where they discuss technical matters.[26] This openness in information exchange, unprecedented in the United States, is rooted in shared

---

21. *Id.* at 152.

22. *See id.* at 126-28 (dedicating a chapter to a description of how these concepts helped build HP); SAXENIAN, *supra* note 3, at 51-52.

23. *See* ROGERS & LARSEN, *supra* note 3 at 99, 145-46; *see also* SAXENIAN, *supra* note 3, at 53 (describing how Intel's organizational structure, though less familial, was also designed "to facilitate the exchange of ideas and information," encouraging "[o]penness and confrontation").

24. *See* PACKARD, *supra* note 6, at 80; ROGERS & LARSEN, *supra* note 3 at 145-46.

25. *See* SAXENIAN, *supra* note 3, at 31-37; *see also* MALONE, *supra* note 6, at 8; ROGERS & LARSEN, *supra* note 3, at 226-27 (noting that Silicon Valley is most acutely collaborative when faced with an external threat, like that posed by Japan in the 1980s).

26. *See* ROGERS & LARSEN, *supra* note 3, at 84; SAXENIAN, *supra* note 3, at 32-33.

past professional experiences and a scholarly/scientific attitude which dedicates individual technological achievements to the cause of advancing technology as a whole.[27] As a result, the industrial system of the Valley is effectively organized around professional and technical networks rather than individual firms.[28] So fundamental is the attitude of openness to the fabric of relations in the Valley that companies which attempted to restrict the exchange of information through legal action earned a poor reputation among potential employees in the Valley and suffered internal morale problems.[29] As a result, information exchange continues, even among employees from highly competitive companies, although some information is usually held back, if highly sensitive.[30] This state of affairs has added a new term to the American dictionary—"co-opetition."[31]

Because of the commitment of engineers to the technology itself, many tend to view themselves as employees not of one company or another but of the Valley as a whole.[32] This, along with other factors such as the inelasticity of the supply of skilled labor, has contributed to the high mobility rate that has become the norm among Valley employees.[33] As one engineer put it, "[o]ut here it was not that big a catastrophe to quit your job on Friday and have another job on Monday and this was just as true of company executives. You didn't necessarily have to tell your wife. You just drove off in another direction on Monday morning."[34] This mobility has helped to speed up the

---

27. *See* SAXENIAN, *supra* note 3, at 36. Other factors, however, may be at play. Note, for example, the story recounted by Rogers and Larsen, *supra* note 3, at 80, where one engineer smuggled out from Intel a couple of prototypes of a new chip needed by another company to develop a new product. According to the authors, Intel was "very happy" because there were, as a result, some immediate buyers.

28. *See* SAXENIAN, *supra* note 3, at 30.

29. *See* Alan Hyde, How Silicon Valley Has Eliminated Trade Secrets (and Why This Is Efficient) 19 (Feb. 7, 1997) (unpublished manuscript, on file with the *University of Richmond Law Review*).

30. *See* ROGERS & LARSEN, *supra* note 3, at 81; *see also supra* note 27 and accompanying text.

31. A whole book has now been published about this term. *See* ADAM M. BRANDENBURGER & BARRY J. NALEBUFF, CO-OPETITION (1996).

32. *See* SAXENIAN, *supra* note 3, at 37 (quoting Wilf Corrigan, founder of LSI Logic, in John Markoff, *Silicon Valley Faces a Midlife Crisis,* N.Y. TIMES, Sept. 28, 1992, at D1).

33. *See* SAXENIAN, *supra* note 3, at 35.

34. *Id.* at 34; *see* ROGERS & LARSEN, *supra* note 3, at 87-88. *See generally*

cross-fertilization of ideas among regional firms and has resulted in a state of continuous innovation.[35]

It is worth noting, however, that despite its novel set of features which has helped accelerate its growth, the Valley has a darker side which threatens its continued success. This side includes outdated attitudes towards race and gender and the emergence of pressing environmental and other problems.[36] There is reason to believe that, with the success of some immigrants and women in the Valley, attitudes will change in time. If they do not change fast enough, other regions willing to embrace talent, regardless of its color and gender, may take the lead.

Some authors have argued that it is the very nature of the information industry which makes the extensive form of information exchange practiced in Silicon Valley desirable.[37] This thesis is bolstered by the comparative information gathered about another technological region, Route 128 in Massachusetts. That region was the front runner in technological innovation and production just a few decades ago.[38] It has a long history of technological innovation with unparalleled concentration in skilled labor, capital and technology.[39] Nevertheless, as the

---

MALONE, supra note 6, at 262.

35. *See* ROGERS & LARSEN, *supra* note 3, at 273-74. It is important to note, however, that this openness has not totally destroyed such traditional behavior as industrial espionage, nor has it eliminated all need for security measures in many firms. Rather, it has brought about a major perceptual and behavioral shift that minimizes the central role usually accorded to enhancing secrecy and protecting trade secrets through security measures and strict hierarchical chains of command. *See id.* at 94-95; *see also* MALONE, *supra* note 6, at 233 (stating that Fairchild did not sue any of the spin-off firms in the 1960s, even though the employees leaving the company "raided [it] with absolute abandon").

36. For more on this, see *supra* note 13. *See also* ROGERS & LARSEN, *supra* note 3, at 197-99. But attitudes may be changing slowly, for example, see Hamm, *supra* note 13, at 123 (noting that new immigrants are succeeding in the Valley).

37. *See* Hyde, *supra* note 29, at 7 (noting that Silicon Valley would not have enjoyed the growth it did if the California courts enforced a strict interpretation of the Uniform Trade Secrets Act, CAL. CIV. CODE § 3426 (West 1998)); *see also* ROGERS & LARSEN, *supra* note 3, at 81; SAXENIAN, *supra* note 3, at 5.

38. *See* SAXENIAN, *supra* note 3, at 59; *see also* ROGERS & LARSEN, *supra* note 3, at 237 (describing the shift to high growth industries in 1955 and its success based on government contracts). According to Saxenian, Route 128, which had its genesis in an MIT project established in 1918, lost its competitive edge in the eighties and never recovered. *See generally* SAXENIAN, *supra* note 3.

39. *See* SAXENIAN, *supra* note 3, at 59; *see also* ROGERS & LARSEN, *supra* note 3,

competition in information technology heated up, Silicon Valley became the undisputed leader by the end of the Sixties.[40]

What is remarkable about Route 128 is its starkly traditional style of organization and management. This style emphasizes hierarchies combined with an authoritarian ethic.[41] Generally, local companies built self-contained and vertically integrated structures.[42] They created organizations characterized by bureaucracies, formal decision making, loyal long-term employees, and conservative workplace procedures.[43] These organizations were isolated from each other, sometimes even physically.[44] Furthermore, MIT and Harvard did not develop close relationships with the region. It appears that the prevalent culture in the East was one of self-reliance.[45] It was influenced by an earlier industrial era, that of the Industrial Revolution.[46]

The question arises as to whether these "cultural" differences between the Valley and Route 128 underlie their disparate performance. In the next section, I introduce discussions by futurists who have described the special features of the new Information Age and have argued for sometime now that it will

---

at 236.

40. *See* SAXENIAN, *supra* note 3, at 78.

41. *See id.* at 60. The management style was influenced by American Research and Development Corporation, the first modern venture capital firm. From its creation in 1946 until 1972, the firm was led by Georges F. Doriot, a French-born brigadier general and a professor at the Harvard Business School. *See* SUSAN ROSEGRANT & DAVID R. LAMPE, ROUTE 128: LESSONS FROM BOSTON'S HIGH-TECH COMMUNITY 111 (1992). Acting as a mentor to Ken Olsen, founder of Digital Equipment Corporation (DEC), Doriot influenced certain business practices. These included the practice of keeping equity out of the hands of the employees, which Olsen followed "assiduously." *See* Richard Rapaport, *Culture War: Route 128*, FORBES ASAP, Sept. 13, 1993, at 54.

42. *See* SAXENIAN, *supra* note 3, at 69. Saxenian describes DEC as an example of the Route 128 style. DEC, a multinational corporation, is headquartered in the second smallest town in Massachusetts. The only access routes to it are three two lane country roads and a company helicopter. The company was a "world unto itself." *See id.* at 71.

43. *See id.* at 73-74.

44. *See id.* at 71.

45. According to Saxenian, the founder of DEC also attributes the social conservatism of the Route 128 region and the reluctance of its employees to exchange information or rely on outsiders to the influence of its Puritanical tradition of self-reliance. *See id.* at 62.

46. *See id.* at 69-70 (arguing that the managerial notions of companies in the Route 128 region were shaped by managers from traditional industrial companies such as General Electric, Sylvania and RCA).

engender a new form of organization in society quite different from that imposed by the Industrial Revolution and very similar to that exhibited by Silicon Valley firms. These claims are then evaluated in the following section in light of historical evidence from the Industrial Revolution. The evidence points to the conclusion, discussed in the rest of the article, that the features identified with Silicon Valley have a long history that shows their great significance to firm organization.

II. CIVILIZATION AND THE INFORMATION AGE

Alvin and Heidi Toffler, famous American futurists, announced in their widely-read book. *Creating a New Civilization*, that "[a] new civilization is emerging in our lives, and blind men everywhere are trying to suppress it."[47] According to them, this new civilization, which they labeled "The Third Wave," brings with it, among other things, "changed ways of working, loving and living, a new economy . . . and . . . an altered consciousness as well."[48] It renders assembly lines obsolete and radically changes corporations.[49]

The Third Wave is that of the new information society. It is knowledge-based, requires globalization in various aspects of life, including business and finance, and its economies operate at accelerated speeds.[50] It goes beyond standardization, centralization, and concentration of resources, which are typical of the industrial or Second Wave societies.[51] It demassifies production, media and other aspects of society, introducing instead industrial customization, just-in-time inventories and proliferat-

47. TOFFLER & TOFFLER, *supra* note 6, at 19.
48. *Id.*
49. *See id.* at 19-20.
50. *See id.* at 31-33.
51. *See id.* at 20.

ing channels of cable television.[52] It eventually leads to a rise in individual heterogeneity.[53]

The Second Wave is characterized by mass production, mass education, and specialized corporations and universities.[54] The Tofflers point out that Second Wavers are still trying to cling to power on the American scene.[55] For this reason, they predict that the next major conflict will not be between the West and other nations, as Samuel Huntington predicted, but between Third Wavers pursuing change and Second Wavers who will defend their vested interests in obsolete industrial structures.[56]

According to the Tofflers, the vertical integration of the Second Wave is replaced by deliberate attempts to "hollow out" the corporation of the Third Wave.[57] A Third Wave company tries to contract out as many of its tasks as possible, reduce its staff and size to a minimum and disperse its activities to various geographical locations, thus becoming a "nexus of contracts."[58] Under this view of the Third Wave, we can conclude that HP is civilizationally a transitory structure which reflects some Third Wave features but retains many Second Wave features as well. Many Silicon Valley organizational structures, however, fit the Toffler description perfectly and appear to have completed the transition to the Third Wave successfully. Whether this is indeed the case is the topic of the next few sections.

The Toffler voices are not a lonely presence in the wilderness. Long before they spoke, other well-known scholars alerted industrialized societies to the coming world upheaval. Marshall McLuhan was an influential voice among those scholars.

---

52. *See id.* at 31-34. Just-in-time production would not have been possible without the present advanced modes of computation, transportation and communication. Before the computerization of inventory information and the emergence of overnight delivery services, firms tied up a significant part of their capital in stocking large inventories. The extra cost of these unnecessarily large inventories, the cost of warehousing them and the associated risks, such as those of loss, obsolescence and market fluctuation, were all eliminated with the just-in-time method of production.

53. *See id.* at 31, 37-38; *see also* ERICH FROMM, ESCAPE FROM FREEDOM 185-86, 237-38 (Holt, Rinehart & Winston eds., 1969).

54. *See* TOFFLER & TOFFLER, *supra* note 6, at 28.

55. *See id.* at 25.

56. *See id.* at 11, 27.

57. *Id.* at 85.

58. *See id.*

McLuhan warned the industrialized societies, and the world, of the approaching changes associated with the Age of Informatics.[59] As early as the Sixties, he argued that the new age will not be simply one in which sophisticated gadgets replace less technologically advanced ones.[60] Rather, he said, the new age will bring with it a new human being and a new society characterized by greater connectivity and networking.[61]

In *Understanding Media*, McLuhan argued that the printed word is being quickly replaced by the electronic medium.[62] The medium through which knowledge is transferred, he noted, is as critical as the message itself.[63] For this reason, McLuhan argued that the new electronic medium will impact both the individual and society in distinctive ways.[64] To emphasize this thesis, McLuhan coined the slogan "The Medium is the Message."[65]

McLuhan meant that the electronic medium brings with it a new mode of experience which is drastically different from that imposed upon us by the medium of print.[66] Print, he observed, is a visual medium which is mechanical, sequential and lineal.[67] Electronic media, on the other hand, are organic and simultaneous.[68] Thus, an individual who is a product of print technology (Second Waver) is likely to experience the world in a radically different way than a person who is the product of electronic technology. The first would experience the world in a sequential, lineal manner; the second would experience it as non-lineal, simultaneous and interconnected. The former mode of experience promotes uniformity and fragmentation and leads to centralization (putting the fragmented parts in a series), vertical organization (arranging them in a hierarchy) and con-

---

59. *See* MARSHALL MCLUHAN, UNDERSTANDING MEDIA 170-78 (1996) (reprinting McLuhan's editorial which originally appeared in the Times Literary Supplement of London, July 19, 1963).

60. *See id.*

61. *See id.*

62. *See id.* at 81-82.

63. *See id.* at 7-14, 81-88.

64. *See id.* at 185, 333-35.

65. *See id.* at 7-9.

66. *See id.* at 333-35.

67. For a quick list of the characteristics of the print media versus those of the electronic media, see *id.* at xii-xiii, 85.

68. *See id.* at xii-xiii.

trol.[69] The second compels integration with commitment, participation and pervasive decentralization.[70] These features create a new emerging world economy, characterized by a complex duality: "a spatially dispersed yet globally integrated organization of economic activity."[71]

The Tofflers and McLuhan appear to have predicted accurately developments in Silicon Valley and the differences between it and Route 128. Silicon Valley's forms of organization go beyond the old standardized, centralized and concentrated ones. Instead, they customize, decentralize, "hollow out," and throw open the doors to networking and other forms of simultaneous and participatory communication. Route 128, on the other hand, continues to reflect old patterns.[72]

Furthermore, translating the differences between the managers and employees of the two regions to the language of the Tofflers, McLuhan and the Sixties, these differences appear to be ones between culture and counter culture.[73] The children of the culture belong to the old world of mechanical industry, authority and hierarchy. The children of the counter culture are finally revealed to be not "flower children," as they used to be referred to in the Sixties, but as "electronic children," i.e., children of the Information Age.[74] Their struggle with powerful national institutions, such as the government, the military and corporations can now be understood as an early attempt to reject the organizational legacy of the Industrial Age which is based on hierarchy and authority. They were demanding increased information, participation and self-determination. Ultimately, some of them instituted their views in a corporate context. They formed daring organizational structures which reject-

69. For McLuhan's point of view on this, see *id.* at 11-12, 85.

70. *See id.* at 4, 9.

71. SASKIA S. SASSEN, THE GLOBAL CITY 3 (1991).

72. But note recent changes that may affect the Route 128 management style. In 1992, Ken Olsen was forced out of the DEC and replaced with Robert B. Palmer, a man whose managerial style is similar to that found in Silicon Valley. Olsen founded DEC, the flagship of the Boston technology community, and his replacement "signal[s] the end of an era." Rapaport, *supra* note 41, at 59.

73. The term "counter culture" was popularized by Theodore Roszak in his widely read book, THE MAKING OF A COUNTER CULTURE (1969).

74. For a more detailed discussion of this point, see TECHNOLOGY AND HUMAN AFFAIRS, *supra* note 1, at 8.

ed these hierarchies and outperformed them. As the following sections will show, the success of these non-hierarchical structures was no accident. Furthermore, they helped the United States leap forward technologically.

I will now investigate further the thesis (the "Thesis") that the Silicon Valley experience embodies features peculiar to corporations and individuals of the Information Age. To do that, I shall turn to a rich source of information, namely, history.

III. INDUSTRIAL HISTORY AND THE SILICON VALLEY FEATURES

As Mark Roe has shown in another context, history is a great teacher of reality and destroyer of myths.[75] In this section, I study empirical data that predate the Information Age as a tool for determining the truth of the Thesis. To do that, I examine a historical period very similar to the present one. It is also a transitional period, one during which Europe was transformed from an agricultural society into an industrial one. Significantly, Britain, the country that led the Industrial Revolution, had lagged technologically behind other European countries for quite a while and then leapfrogged to the front.[76] In fact, Europe as a whole had lagged technologically behind other civilizations, such as the Chinese, which appeared at one time to be on the verge of their own Industrial Revolution but were hampered by political instability.[77]

In selecting our transitional period, it is important to recognize the fact that transitions have accelerated with new technologies. Thus, the Agricultural Revolution took thousands of years to become established. The Industrial Revolution, on the other hand, took a few hundred years. The Information Revolu-

---

75. *See generally* MARK J. ROE, STRONG MANAGERS, WEAK OWNERS: THE POLITICAL ROOTS OF AMERICAN CORPORATE FINANCE (1994).

76. *See* CARLO M. CIPOLLA, BEFORE THE INDUSTRIAL REVOLUTION 256-273 (1976); W.O. HENDERSON, THE INDUSTRIALIZATION OF EUROPE 14-15 (1969); 5 THE CAMBRIDGE ECONOMIC HISTORY OF EUROPE, THE ECONOMIC ORGANIZATION OF EARLY MODERN EUROPE 12 (E.E. Rich & C.H. Wilson eds., 1977) [hereinafter ECONOMIC ORGANIZATION].

77. *See* CIPOLLA, *supra* note 76, at 160-62, 214, 275-76; 3 M. HODGSON, THE VENTURE OF ISLAM: CONSCIENCE AND HISTORY IN WORLD CIVILIZATION 183, 197, 199 (1974); W. MCNEIL, THE RISE OF THE WEST: A HISTORY OF THE HUMAN COMMUNITY 710-22 (1963).

tion has established itself in a matter of decades.[78] Therefore, the comparative transitional period we will focus upon below will span the few centuries that led to the establishment of the Industrial Revolution.

Several developments in Europe were significant to the advent of the Industrial Revolution. Most important among the earlier ones, for our purposes, were the rise of the towns (later cities) in Europe in the tenth and twelfth centuries and the subsequent formation of guilds for craftsmen living in those cities.[79] In a poor, primitive and autarkic Europe, the rise of these cities introduced a new element to the life of its inhabitants that changed the course of history, namely, freedom from traditional institutions.[80] The cities were to become later centers of the Industrial Revolution. Like their more modern counterparts, regional industrial clusters such as Silicon Valley, they were viewed as "frontiers" of a new and dynamic world free from the yoke of serfdom and full of new opportunities and rewards for initiative, daring and industriousness.[81] Carlo Cipolla notes, in his chronicle of Europe before its industrialization, that

> what counted was not only the legal fact that the serf, having escaped from the countryside, found himself free in the towns, but that the whole social atmosphere in the towns was open to ambition and talent, whether the town-dweller was a member of the lesser feudal nobility, or a merchant, or a craftsman.[82]

---

78. *See* TOFFLER & TOFFLER, *supra* note 6, at 19.

79. *See* CIPOLLA, *supra* note 76, at 139; *see also* ECONOMIC ORGANIZATION, *supra* note 76, at 462-69.

80. *See* CIPOLLA, *supra* note 76, at 140-42. According to Cipolla, "[t]he urban revolution of the eleventh and twelfth centuries was the prelude to, and created the prerequisites for, the Industrial Revolution of the nineteenth century." *Id.* at 145; *see also* Aldo De Maddalena, *Rural Europe 1500-1750*, *in* 2 THE SIXTEENTH AND SEVENTEENTH CENTURIES 273-347 (C. Cipolla ed., 1977); GEORGE RUDE, EUROPE IN THE EIGHTEENTH CENTURY: ARISTOCRACY AND THE BOURGEOIS CHALLENGE 58-65 (1972).

81. *See* CIPOLLA, *supra* note 76, at 142 (stating that "[t]he town was to the people of Europe from the eleventh to the thirteenth centuries what America was to Europeans in the nineteenth century," and that it was said in German towns that "the air of the city makes one free"); *see also* ECONOMIC ORGANIZATION, *supra* note 76, at 428-29; *cf.* P. Bairoch, *The City and Technological Innovation*, *in* FAVORITES OF FORTUNE 159 (Patrice Higonnet et al. eds., 1991).

82. CIPOLLA, *supra* note 76, at 142.

The towns of medieval Europe were thus different from other towns in other civilizations. They came to symbolize freedom from the hierarchy of feudalism and its control and became an autonomous center which evolved its own culture, horizontal arrangements and values.[83] Because the town was surrounded by an outside world hostile to its culture, the community of town-dwellers became more cohesive and cooperative.[84] At the beginning of this transitional period, the guild emerged in the town as a network of support among equals.[85] The preparations for the Industrial Revolution, however, were barely beginning. It would take a few more centuries and a continent-wide upheaval before its final debut in Britain in the late eighteenth century.

By the sixteenth century, the very guilds which provided urban support networks for craftsmen deteriorated into highly regulated, hierarchical and authoritarian structures.[86] They controlled the terms of the competition and the number of businessmen who could compete in a specific market.[87] They were furthermore co-opted by a class of wealthy manufacturers and merchants who wanted to maintain their economic dominance.[88] As a result, guilds became instruments of control against the very journeymen and craftsmen they were supposed to support. Ultimately, guilds because obstacles to economic development and adaptation.[89] Many industries and craftsmen moved to the countryside where the guilds had very little presence, and some technological know-how was also diffused into the countryside in the process.[90]

---

83. *See id.* at 143; *see also* RUDE, *supra* note 80, at 62-63.

84. *See* JEROME BLUM, THE END OF THE OLD ORDER IN RURAL EUROPE 113-14, 414-17 (1978); CIPOLLA, *supra* note 76, at 144.

85. *See* CIPOLLA, *supra* note 76, at 144; *see also* ECONOMIC ORGANIZATION, *supra* note 76, at 466; RUDE, *supra* note 80, at 66.

86. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 437; *see also* RICHARD GRASSBY, THE BUSINESS COMMUNITY OF SEVENTEENTH CENTURY ENGLAND, 60-65, 75 (1995).

87. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 437; *see also* Herman Kellenbenz, *Technology in the Age of the Scientific Revolution 1500-1700, in* 2 THE SIXTEENTH AND SEVENTEENTH CENTURIES, *supra* note 80, at 243-44.

88. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 437; Kellenbenz, *supra* note 87, at 237.

89. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 437; Kellenbenz, *supra* note 87, at 243-44.

90. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 437; Kellenbenz, *supra* note

Between the twelfth and fifteenth century, Italy was in the forefront of technological progress.[91] That distinction passed to Britain and Holland in the next two centuries, a surprising event given the fact that Britain had lagged technologically behind the rest of Europe.[92] Many historians have studied the reasons that helped catapult Britain into the forefront of the World's Industrial Revolution. Clearly, Britain satisfied some basic prerequisites, such as the availability of coal and iron ore, an adequate labor force and a group of innovators and entrepreneurs.[93] Other European countries, however, shared many of these characteristics. So, what other features accelerated the industrialization of Britain?

According to the famous historian William McNeil, "pervasive looseness" in the texture of the British society helped give Britain its commanding lead.[94] This looseness was partly the result of political developments, such as the impact of war with the French on the British government, and the parliamentary action to limit the trend towards absolutism by the early Stuarts.[95] It was also partly the result of economic changes, such as those in trading patterns, the money supply, and governmental orders.[96] After examining this and other evidence, McNeil concluded that "[q]uite possibly, in a better regulated society, a more energetic official control of individual initiative and war profiteering would have prevented the rapid transformation of Britain's industrial plant which in fact occurred in the late eighteenth and early nineteenth centuries."[97] Furthermore, by the eighteenth century, serfdom was no longer in

---

87, at 244-45; *see also* HENDERSON, *supra* note 76, at 23, 25.

91. *See* CIPOLLA, *supra* note 76, at 174; BRIAN S. PULLAN, *Introduction* to A HISTORY OF EARLY RENAISSANCE ITALY 12 (1973).

92. *See* CIPOLLA, *supra* note 76, at 174. *See generally* ECONOMIC ORGANIZATION, *supra* note 76, at 23-28, 32-35.

93. *See* C.M. Cipolla, *Introduction* to THE FONTANA ECONOMIC HISTORY OF EUROPE: THE INDUSTRIAL REVOLUTION 11 (C.M. Cipolla ed., 1973); MCNEIL, *supra* note 77, at 733. It is worth noting that McNeil discusses the importance of the institutional and intellectual framework within which Britain's modern industrialism arose. Among these, he lists the "Protestant ethic." *Id.*; *see also* ECONOMIC ORGANIZATION, *supra* note 76, at 427.

94. *See* MCNEIL, *supra* note 77, at 733.

95. *See id.*

96. *See id.*

97. *Id.* at 734.

existence in Britain.[98] Commerce was energetic, forceful and open to risk-taking and innovation.[99] Entrepreneurs did not fear governmental interference, especially if their factories were outside municipal boundaries.[100] In addition, workmen were able to move freely throughout the country.[101] Even social classes were becoming less rigid, allowing some mobility.[102] Commerce and mobility among workers and social classes significantly increased the free flow of information.

Additionally, it is significant that only Britain experienced the disintegration of the guild system as a result of various factors, including legislation.[103] Consequently, guild restrictions were less severe than they were in the rest of Europe.[104] Furthermore, non-guild craftsmen were increasing in number causing further erosion of guild power.[105] This sharp reduction of guild power and its restrictive traditional approach helped fuel the Industrial Revolution in Britain.[106]

One factor that accelerated the demise of the guild system was the system of "putting out" which was used not only in Britain but also in the rest of Europe.[107] The system involved craftsmen (the technologists) in rural areas where guild presence was traditionally weak or absent who cooperated with merchants (the entrepreneurs).[108] The latter provided to the

---

98. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 113; HENDERSON, *supra* note 76, at 23.

99. *See* RUDE, *supra* note 80, at 53.

100. *See* HENDERSON, *supra* note 76, at 23.

101. *See id.*; ERIC PAWSON, THE EARLY INDUSTRIAL REVOLUTION: BRITAIN IN THE EIGHTEENTH CENTURY 154 (1979).

102. *See* HENDERSON, *supra* note 76, at 25; RUDE, *supra* note 80, at 80, 82.

103. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 465; *see also* RUDE, *supra* note 80, at 44.

104. *See* RUDE, *supra* note 80, at 44; *see also* ECONOMIC ORGANIZATION, *supra* note 76, at 465.

105. *See* RUDE, *supra* note 80, at 44, 53; *see also* ECONOMIC ORGANIZATION, *supra* note 76, at 465.

106. *See* J.F. Bergier, *The Industrial Bourgeoisie and the Rise of the Working Class 1700-1914*, *in* THE FONTANA ECONOMIC HISTORY OF EUROPE, *supra* note 93, at 438-39; ECONOMIC ORGANIZATION, *supra* note 76, at 465; *see also* RUDE, *supra* note 80, at 198-99.

107. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 469-70; William Lazonick, *What Happened to the Theory of Economic Development*, *in* FAVORITES OF FORTUNE, *supra* note 81, at 277-78.

108. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 470.

former raw material and sold the finished industrial product. The former provided the finished product.[109] This system diffused technology throughout the countryside and provided an important counterweight to the guild system by opening the door to free, i.e., non-guild labor.[110]

Despite the attempt to use rural craftsmen for some types of industrial work, such as spinning, the city remained the center of industry and innovation. Most innovations in eighteenth century England took place in cities.[111] Similar data are available for some other European cities that raise a question about the ways in which the city provided an impetus for innovation.[112] An obvious answer is that, as a general rule, the city facilitated the diffusion of technological innovation much more than did the countryside. There are many reasons for this. For one, the city offered proximity and frequency of contacts among potential innovators.[113] Its mobile population was constantly bringing new ideas into the city.[114] Its centers of learning helped further that process of intellectual curiosity and innovation.[115] Through training and experience, urban industrial centers provided a steady flow of information, richer than any other available in the countryside.[116] This density of information acted as an impetus for further industrial innovation.[117] This is why the "openness" in the British society as a whole, and in the cities in particular, was a crucial ingredient in its ability to leapfrog the other more technologically advanced European countries.

---

109. *See id.*; Lazonick, *supra* note 107, at 277-78.

110. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 470, 548; Lazonick, *supra* note 107, at 278.

111. *See* Bairoch, *supra* note 81, at 167.

112. *See id.* at 165-68.

113. *See id.* at 168-69, 172; *see also* HENDERSON, *supra* note 76, at 64; Walter Minchinton, *Patterns of Demand*, *in* THE FONTANA ECONOMIC HISTORY OF EUROPE, *supra* note 93, at 88-89.

114. *See* Bairoch, *supra* note 81, at 166-67; *see also* CIPOLLA, *supra* note 76, at 176-77.

115. *See* HENDERSON, *supra* note 76, at 62-64; *see also* Samuel Lilley, *Technological Progress and the Industrial Revolution 1700-1914*, *in* THE FONTANA ECONOMIC HISTORY OF EUROPE, *supra* note 93, at 231.

116. *See* LEWIS MUMFORD, TECHNICS AND CIVILIZATION 137-38 (1972).

117. *See* HENDERSON, *supra* note 76, at 62-64.

To better understand this historical example of technological leapfrogging, we must examine briefly the history of technological development and other related occurrences in Europe during that period.

Around the fifteenth century, a major event took place: Guttenberg's printing of the Bible. Until then, books were so expensive that only the wealthy could own them.[118] With the invention of movable parts printing, Europe changed forever. For the first time, it became possible to diffuse knowledge massively in the form of printed books. Historians often point to this development as a major factor for the diffusion of knowledge throughout Europe.[119] Scientific and engineering manuscripts were disseminated among and read by many innovators who were university graduates.[120] But a closer look at industrial progress in Europe reveals that many innovations were made by technicians using not the scientific manuscript but the method of trial and error.[121]

Almost all technological advances made during the early stages of the Industrial Revolution were the result of the efforts of craftsmen, not scientists.[122] Thus, in the case of the textile industry and the iron and steel industries, the impetus for innovation came from inside the industries themselves and resulted from practical training and experience.[123] Illustrations of these facts abound. For example, Thomas Newcomen, inventor of the steam pump, was a blacksmith; Samuel Crompton, inventor of the mule, was a spinner and a farmer; and James Hargreaves, inventor of the spinning jenny, was a weaver.[124]

---

118. *See* CIPOLLA, *supra* note 76, at 167. To give an idea of the cost of books prior to the invention of the printing press, the author mentions that in Spain, around the early ninth century, a book cost roughly as much as two cows. *See id.*

119. *See, e.g.*, ECONOMIC ORGANIZATION, *supra* note 76, at 472; *see also* Bairoch, *supra* note 81, at 160-61; Kellenbenz, *supra* note 87, at 182.

120. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 472; HENDERSON, *supra* note 76, at 64; Kellenbenz, *supra* note 87, at 182-86 (pointing out that "the practical value of these manuscripts varied considerably; it was greatest when the author knew his subject from practical experience").

121. *See* Bairoch, *supra* note 81, at 161; HENDERSON, *supra* note 76, at 63.

122. *See* Bairoch, *supra* note 81, at 161.

123. *See id.* at 162; *see also* HENDERSON, *supra* note 76, at 48; RUDE, *supra* note 80, at 51.

124. *See* CIPOLLA, *supra* note 76, at 193. A mule is a machine that combined the essential features of both the jenny and spinning-frame, significantly increasing the

Even the steam engine was a "rule-of-thumb development" by James Watt, a mechanic.[125]

Furthermore, intercontinental diffusion of knowledge was accomplished with the help of immigrant skilled labor, entrepreneurs, and indigenous technologists who plagiarized new inventions after learning about them through their travels.[126] Evidence abounds of the role of various waves of immigrants and other types of mobile labor in carrying technological knowledge with them to various countries. Among these examples are the French Huguenots, Flemish Protestants, the German mining engineers and the Dutch canal-builders, all of whom contributed their technological expertise to Britain in the sixteenth and seventeenth centuries.[127] It is such historical data that have led some historians to conclude that the inflow of good minds, combined with society's receptiveness to new ideas, was among the main reasons for the industrial success of countries such as England, Holland, Sweden and Switzerland in the sixteenth and seventeenth centuries.[128]

So significant was this mode of diffusion of knowledge that European governments issued decrees forbidding the emigration of skilled workers.[129] For example, the Venetian government flatly prohibited the migration of caulkers.[130] The penalty for a violator was six years in prison or a two hundred lire fine.[131] The Grand Duke of Florence went further in 1575, authorizing "any person to kill with impunity" any worker in the brocade trade who left Florence.[132] The Venetian and Florentine authorities were not overreacting to a bad situation. There is ample evidence that technological transfer in Medieval

---

output of spinners. *See* HENDERSON, *supra* note 76, at 39, 43, 47, 63.

125. *See* HENDERSON, *supra* note 76, at 38; RUDE, *supra* note 80, at 50-51.

126. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 478, 486.

127. *See* CIPOLLA, *supra* note 76, at 177; Francois Crouzet, *The Huguenots and the English Financial Revolution, in* FAVORITES OF FORTUNE, *supra* note 81, at 224; HENDERSON, *supra* note 76, at 14.

128. *See* CIPOLLA, *supra* note 76, at 181; ECONOMIC ORGANIZATION, *supra* note 76, at 40.

129. *See* CIPOLLA, *supra* note 76, at 178.

130. *See id.*

131. *See id.*

132. *See id.*

Europe was not accomplished primarily through the diffusion of the written word, but rather by contact among technologists.[133]

For example, in the early sixteenth century Vittorio Zonca published a manuscript entitled *Nuovo Teatro di Machine et Edificii*, containing engravings and descriptions of intricate machines, including one for "throwing silk by water power in a large factory."[134] That book was in a British library available to technologists as early as 1620.[135] It was, however, an additional hundred years before the British succeeded in building a silk throwing mill.[136] Their success followed a trip of industrial espionage to Italy by a technologist named John Lombe.[137] During his stay, he "found means to see this engine so often that he made himself master of the whole invention and of all the different parts and motions."[138]

In time, the technology of the Industrial Revolution has become more closely linked to science.[139] Today's information technology is very different from the older mechanical technology. It reflects a closer relationship between science and technology. For these reasons, diffusion of technology through publications may be more effective today than it was in the past. It is still true, however, that there is a significant degree of technique which cannot be imparted except through "hands-on" training or face-to-face discussion.[140] Consequently, even in today's Silicon Valley, companies do include non-compete provisions in contracts with their employees.[141] The enforcement

133. *See id.* at 176; *see also* Bairoch, *supra* note 81, at 168-72; *cf.* MUMFORD, *supra* note 116, at 135-36.

134. CIPOLLA, *supra* note 76, at 174.

135. *See id.*

136. *See id.* at 174; *see also* HENDERSON, *supra* note 76, at 48; Kellenbenz, *supra* note 87, at 215.

137. *See* CIPOLLA, *supra* note 76, at 174.

138. *Id.* at 174; *cf.* HENDERSON, *supra* note 76, at 14 (attributing this particular technology transfer to an Italian immigrant craftsman. This difference in account does not affect the main point of the passage, namely, the importance of practical knowledge in technology transfer.).

139. *See* Bairoch, *supra* note 81, at 171-74; Samuel Lilley, *Technological Progress and the Industrial Revolution 1700-1914*, *in* THE FONTANA ECONOMIC HISTORY OF EUROPE: THE INDUSTRIAL REVOLUTION, *supra* note 93, at 226-36.

140. *See* CIPOLLA, *supra* note 76, at 176.

141. *See* Hyde, *supra* note 29, at 10-11.

of such provisions, however, has been quite lax for a variety of reasons, not least among them (as discussed in section I) is the aversion of the skilled technicians, who are in short supply, to restrictive behavior.[142]

The diffusion of technology through publication, migration, plagiarism and putting-out systems, to mention a few avenues, reveals the following features about the transitory stage leading to the Industrial Revolution. First, a large and mobile supply of skilled labor existed in Europe, concentrated particularly in Britain. Second, there was significant diffusion of technological know-how despite all legal and other restrictions. Third, the technologist of the Industrial Revolution rejected traditional hierarchies and affiliations, opting instead to cooperate with other technologists and entrepreneurs to achieve progress.

In fact, the achievements of the Industrial Revolution were no more than a conglomeration of mostly incremental advances made possible by an increasingly inclusive and interdependent nexus of technologists.[143] These technologists came from different disciplines but discovered that they could build on each other's innovations to improve or increase the efficiency of their own machines.[144] By doing so, the ability to innovate increased and the quantity of innovations multiplied exponentially, thrusting Britain and then the rest of Europe to the developmental forefront.[145]

To list a few familiar examples, the flying shuttle, which doubled a weaver's output, led to a shortage in yarn.[146] This shortage led to improvements in the spinning wheel.[147] The cotton mills that accelerated the shift from cottage to factory forms of organization were powered by water wheels.[148] The Albion mills, which used steam for grinding wheat, were the

142. *See supra* notes 26-31 and accompanying text.

143. *See* HENDERSON, *supra* note 76, at 62; *see also* Lilley, *supra* note 139, at 187-254.

144. *See generally* HENDERSON, *supra* note 76, at 62.

145. *See generally* HODGSON, *supra* note 77, at 185; PAWSON, *supra* note 101, at 17.

146. *See* Lilley, *supra* note 139, at 192; RUDE, *supra* note 80, at 51.

147. *See* Lilley, *supra* note 139, at 187-254; RUDE, *supra* note 80, at 51.

148. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 477; Lilley *supra* note 139, at 190.

first important establishment in which all the parts of the plant and equipment were made of metal.[149] The expansion of the iron industry was based for a long time on increasing amounts of water power.[150] On the other hand, Watt would not have been able to improve his steam engine without advances in the metallurgical arts.[151] Use of electricity for lighting, transportation and industrial power would not have been possible without the invention of the dynamo which harnessed steam engines, water wheels and turbines.[152] Many of today's advanced modes of transportation, including the airplane, would not have been possible without the invention of the internal combustion engine.[153]

Furthermore, certain inventions were themselves the result of the efforts of a series of inventors attempting to solve the same problem. For example, Richard Arkwright's water-frame was anticipated by the work of Lewis Paul and John Wyatt, who constructed a roller-spinner machine.[154] James Watt's steam engine was preceded by the atmospheric engine of Thomas Newcomen.[155] N.A. Otto's gas engine was preceded by that of Etienne Lenoir.[156]

The preceding discussion establishes the critical role played by craftsmen/technicians in bringing about the Industrial Revolution. The discussion in this section also underlines the critical importance of openness, increased egalitarianism, motivation, and the free flow of information for both British craftsmen and entrepreneurs. Together, they were able to transform Britain from a technologically lagging country into the world leader of the Industrial Revolution.

The above data will now be used to evaluate the Thesis, namely that the Silicon Valley experience embodies features

---

149. *See* MUMFORD, *supra* note 116, at 161.

150. *See* Lilley, *supra* note 139, at 189; MUMFORD, *supra* note 116, at 161.

151. *See* MUMFORD, *supra* note 116, at 160.

152. *See* HENDERSON, *supra* note 76, at 56; Lilley, *supra* note 139, at 241; MUMFORD, *supra* note 116, at 161.

153. *See generally* HENDERSON, *supra* note 76, at 57.

154. *See id.* at 62; Lilley, *supra* note 139, at 192-93; RUDE, *supra* note 80, at 51.

155. *See* HENDERSON, *supra* note 76, at 62; MUMFORD, *supra* note 116, at 160-61; RUDE, *supra* note 80, at 50.

156. *See* HENDERSON, *supra* note 76, at 62.

peculiar to corporations and individuals of the Information Age. Comparing the features of the Industrial Revolution in Britain to those of the Information Revolution in Silicon Valley, we find them remarkably similar. Taking into account historical differences between the two, we discover that both technological revolutions required a significant breakdown of traditional modes of operation, the dismantling of authoritarian hierarchies, substantial free flow of information, cooperation and teamwork among technologists. In fact, to use Tofflerian language, the Second Wavers described above look very much at their moment of transition like Third Wavers. Restated in McLuhan's terminology, the urban craftsmen of eighteenth century Britain appear to be the "electronic/flower children" of that era. They rejected lineal, authoritarian structures and uniform, fragmented experiences. Instead, they pursued open structures, interconnectedness and creative experiences.

This is no doubt a surprising conclusion for those who think of the Industrial Revolution as giving birth to societies which are highly (linearly, hierarchically) structured, standardized and centralized. Some of this era's greatest achievements were the clock, the assembly line and the orchestra.[157] Each one of these achievements offered one more building block in the regimentation of society in the industrial world, thus leaving no room for individual creativity or initiative. But these features describe a mature industrial society, not a struggling one which is teetering on the edge of innovation and creativity.

In fact, it is interesting to observe how attempts to achieve a free and open society turned into their opposite during the Industrial Age. The guilds became authoritarian and restrictive.[158] Patents, initially introduced to encourage inventors to disclose their inventions, became obstacles to fast incremental improvements as well as to fundamentally new innovations.[159]

---

157. *See* MUMFORD, *supra* note 116, at 138-39.

158. *See* ECONOMIC ORGANIZATION, *supra* note 76, at 464-69; *see also* HODGSON, *supra* note 77, at 26.

159. *See* MUMFORD, *supra* note 116, at 194. *But see* ROGERS & LARSEN, *supra* note 3, at 93 (discussing the new attitude about patents in Silicon Valley which views them in today's information industry as mostly ineffective).

Today, in Silicon Valley where technological change is very rapid and engineers can "reverse engineer" an innovation, many innovations are not patented.[160]

Underlying this whole upheaval is a tacit rejection by the craftsman/technologist of the view that an innovation is a private property that belongs to the inventor as a personal/corporate asset. Instead, the technologist views innovation as belonging to the world at large, to humanity.[161] Consequently, the technologist (including the hacker) is in constant search of the free flow of information. Companies that recognized this fact early in the days of the Information Revolution did extremely well in business.[162]

The fact that our discussion could move so readily between Britain and the United States, the Industrial Revolution and the Information Revolution, shows significant commonality between the two experiences. As has been shown above, certain distinctive features of Silicon Valley were shared by industrial regions in medieval and eighteenth century Britain. This result invalidates the Thesis, namely that these Silicon Valley features are peculiar to the Information Age. Our discussion has shown that these features are more distinctive of an innovative environment in which the excitement and vigor of the innovators break down traditional barriers.

IV. INNOVATION, COMMUNICATION AND STRUCTURE

So far, the conclusion reached above has been based exclusively on data from medieval and eighteenth century Europe as well as today's Silicon Valley. It may therefore be enlightening to reexamine briefly this Thesis from the point of view of

---

160. *See* ROBERT X. CRINGELY, ACCIDENTAL EMPIRES 171 (1992); ROGERS & LARSEN, *supra* note 3, at 94.

161. *See* MUMFORD, *supra* note 116, at 407-09; SAXENIAN, *supra* note 3, at 27. *See generally* 1 KRANSBERG & PURCELL, TECHNOLOGY IN WESTERN CIVILIZATION 313 (1997); Lilley, *supra* note 139, at 213.

162. IBM built its success on "an 'open architecture' or non-proprietary specification freely available to other manufacturers." Chris Kraul, *CLONES: Growing Sales Threaten IBM PC Market Share*, THE SAN DIEGO UNION-TRIB., July 20, 1986, *available in* 1986 WL 2896629. At the time, there was speculation that the creation of clones would eventually put IBM out of business. *See* Geoff Lewis et al., *The PC Wars: IBM vs. The Clones*, BUS. WK., July 28, 1986, at 62.

today's traditional (non-informatics) industry. To do so, I will focus on two sets of interconnected features that appeared in the earlier discussion as critical to innovation. The first feature is that of open communication and collaboration, the second is that of non-authoritarian structures.

Open Communication and Collaboration. For some time now, both features have been topics of discussion in business management literature and that of related fields. Literature addressing issues of increased production and profitability has also addressed, at times, issues of entrepreneurial innovation. In fact, several distinguished authors in the field have observed that communication and collaboration are important for innovation.[163] One version of the product cycle theory emphasizes the critical importance of intense face-to-face interactions in the early stages of a firm's existence when the firm tends to be small.[164] The assumption underlying this position is that "an important part of the innovation process involves the rapid exploitation of unexpected (serendipitous) exchanges of ideas."[165] According to another theory, the industrial district theory, economic growth is being generated by spatially concentrated networks, usually small to medium in size, with extensive interfirm linkages.[166] The linkages result in a "paradoxical" state of affairs in which these firms at once compete and collaborate with each other.[167] Again, the underlying assumption is that these linkages engender trust which leads to collaboration and results in growth.[168]

---

163. *See, e.g.,* RICHARD CRAWFORD, IN THE ERA OF HUMAN CAPITAL 122-24 (1991); SAXENIAN, *supra* note 3, at 5; *see also* Philip Cooke & Kevin Morgan, *The Creative Milieu: A Regional Perspective on Innovation, in* HANDBOOK, *supra* note 4, at 29-31.

164. *See* Bennett Harrison, *Industrial Districts: Old Wine in New Bottles?, in* 26 REGIONAL STUDIES 469, 473 (1991) (noting the product cycle theory "posits that the innovation process passes through conceptually distinct, if not always fully operationally separable, stages, from early experimentation to diffusion and ultimately to maturity"); *see also* SAXENIAN, *supra* note 3, at 5.

165. Harrison, *supra* note 164, at 473.

166. *See id.* at 469; ROGERS & LARSEN, *supra* note 3, at 238 (discussing that Route 128 would later profit from imitating Silicon Valley's organizational and managerial style in the late 1970s, though the physical distance separating the Route 128 firms made it more difficult); SAXENIAN, *supra* note 3, at 30-36, 43-44.

167. *See* Harrison, *supra* note 164, at 478; SAXENIAN, *supra* note 3, at 32-33.

168. *See* Harrison, *supra* note 164, at 478. Incidentally, the firms used in this study were not all high-tech firms; some had traditional industrial or agricultural products.

Joint ventures and licensing agreements, which are common in various industries, show that communication and collaboration are not limited to small and medium-size firms. Furthermore, some interesting studies show that even in the absence of formal arrangements for communication and collaboration among firms, technical trading of proprietary know-how does take place routinely in some industries, sometimes with the knowledge of managers.[169] The reason for such behavior is that companies recognize that, by trading their information, they usually obtain other valuable information in return.[170] Since certain know-how cannot be acquired from books and can be developed either by the company engineers themselves or by talking to others who have already developed it, it becomes cheaper to share know-how with promising groups of companies.[171] Clearly, know-how which has high competitive value is usually not shared.[172]

There are various avenues for the informal exchange of know-how. One important avenue is that of professional conferences where engineers with common professional interests discuss their work.[173] Other avenues, especially useful when the know-how is visibly embodied in equipment, are through suppliers and customers (and at times even competitors) who interact with the company and visit its plant.[174] Consequently, diffusion of knowledge is hard to prevent, but in the absence of a formal open communications/collaboration policy, the benefits of such trading of know-how are significantly reduced.[175]

---

169. *See* ERIC VON HIPPEL, THE SOURCES OF INNOVATION 81 (1988); SAXENIAN, *supra* note 3, at 33; Hyde, *supra* note 29, at 14.

170. *See* VON HIPPEL, *supra* note 169, at 82.

171. *See id.* at 76-77.

172. *See id.* at 77.

173. *See id.* at 77; AnnaLee Saxenian, *Institutions and the Growth of Silicon Valley, in* ORGANIZATIONAL CAPABILITY AND COMPETITIVE ADVANTAGE: DEBATES, DYNAMICS AND POLICIES 544, 548 (William Lazonick & William Mass eds., 1995); *see also* SAXENIAN, *supra* note 3, at 32.

174. *See* SAXENIAN, *supra* note 3, at 3, 7; VON HIPPEL, *supra* note 169, at 81-82.

175. *See* Edwin Mansfield, *How Rapidly Does New Industrial Technology Leak Out?*, 34 J. INDUS. ECON. 217, 220-21 (1985). Because process development involves less communication and interaction with other firms than new product development, information about it tends to leak more slowly. *See id.* One study covering 100 American traditional firms found that it takes one year on average, and in some cases as much as fifteen months, for information about a new product or process to leak to competitors. *See id.* Channels for the spread of this information, according to the

One benefit of this diffusion of information is the development of imitative products. These products may themselves contain innovations, however slight, that render them superior to the original product. Another benefit is that the new products may be necessary or desirable components of an innovation being designed by another company. In this instance, while the companies may be rivals, the new invention may be complementary. In either case, slowing the diffusion of information slows the development of concomitant innovations.

Thus, even in non-informatics fields, a free exchange of ideas and open communication channels continue to be distinctive features of an innovative milieu. In the past, attempts to place limits on such a flow of information were made in an effort to preserve temporarily the industrialist's profits. This policy, however, had a detrimental long-term effect on the future of technological progress in the country as a whole. Consequently, a tension was embedded in the industrial society between technological progress and economic realities. This tension was resolved by a compromise which slowed the rate of innovation in order to allow industrialists the opportunity to reap the benefits of their investments, and hence, reinvest in the economy.

This compromise is now being renegotiated in the Information Age. The material base for the renegotiation is the fact that Industrial Revolution products tend to have a much longer life cycle than informatics products. The latter can become obsolete in a matter of months. Consequently, there is no need to slow the free flow of information to the degree experienced previously.[176] This fact points out one important result, namely, that while diffusion of knowledge is essential for innovation, there is much less tension for such diffusion in the informatics society. Given the accelerated rate of innovation and obsolescence in that society, a better, less restrictive compromise can

---

study, include movement of personnel among firms, informal communication of networks among engineers and scientists working at various firms, and professional meetings. *See id.* at 221. While the intelligence-gathering process varies among industries, there is little difference in the rate of diffusion of information among them. *See id.*

176. For more on patents in Silicon Valley, see ROGERS & LARSEN, *supra* note 3, at 93-94. *See also* SAXENIAN, *supra* note 3, at 149.

be made between technological progress and economic realities in the new society.

Nevertheless, the increased frequency of suits brought by Silicon Valley firms against other, usually smaller, firms for alleged violations of intellectual property rights may indicate that the region is maturing in ways not totally conducive to future innovation.[177] If that is the case, then we can reach the following conclusions. First, the behavior verifies the adage that old (industrial) habits die hard. Second, local firms that reject this behavior as obsolete may be able to achieve, under the right circumstances, competitive advantage. Third, if a significant number of firms persevere in this behavior, then the region (like Route 128 before it) may lose its technological lead to a more flexible and communicative milieu.[178]

Non-authoritarian Structures. I will now turn to the second feature distinctive of innovation, namely, that of non-authoritarian structures. At first glance, this second feature may appear quite independent from the first. In fact, the two are closely related. One good way for comprehending this relation was offered by Burns and Stalker several decades ago in their important work on innovative organizations.[179] They described two ideal forms of organization: mechanistic and organic.[180] The first was hierarchical, high control and *demanded* obedience. The second was low-control and encouraged flexibility, initiative and commitment to the goals of the organization.[181]

Burns and Stalker suggested that when a high degree of innovation is desired and the organization's environment is changing rapidly, the organic mode of organization is the most suitable.[182] The reason is that organic organizations permit a

177. *See* Harrison, *supra* note 164, at 478.

178. Incidentally, that milieu may be in a different country altogether.

179. *See* Gerard Fairtlough, *Innovation and Organization, in* HANDBOOK, *supra* note 4, at 326 (discussing the study of innovative organizations in TOM BURNS & G.M. STALKER, THE MANAGEMENT OF INNOVATION (1966)); WALTER R. NORD & SHARON TUCKER, IMPLEMENTING ROUTINE AND RADICAL INNOVATIONS 14-17 (1987); *see also* CRAWFORD, *supra* note 163, at 122-23.

180. *See* BURNS & STALKER, *supra* note 179, at 5-6; Fairtlough, *supra* note 179, at 326.

181. *See* BURNS & STALKER, *supra* note 179, at 11, 121-22; Fairtlough, *supra* note 179, at 326; NORD & TUCKER, *supra* note 179, at 14.

182. *See* BURNS & STALKER, *supra* note 179, at 121-22; Fairtlough, *supra* note 179,

higher degree of adaptability, uninhibited expressions of opinion and a freer flow of ideas.[183] Numerous studies following in the footsteps of Burns and Stalker have suggested that creativity is invigorated by loose structure.[184] They have also suggested that innovation, which partly relies on creativity, requires a free flow of information.[185] The two go hand in hand. A loose structure encourages the flow; a tight structure hinders it. So why would anyone want a tight or mechanistic structure?

One possible answer to this question is that the mature industrial organization itself required a hierarchical structure in which the few knowledgeable individuals (management) occupied the top of the pyramid, while unskilled labor populated the base. In other words, it takes a hierarchy to run the railroad on time, or even to construct it. This answer, however, commits us to the view that in any society where a significant discrepancy in knowledge exists, a hierarchical structure would offer a more efficient and rational system. This result presents two problems. First, even in an Industrial society, we need to differentiate among types of knowledge or information. Surely, certain information may not be readily available or known to workers by virtue of their position, such as market conditions, strategic information and competitive threats. But other types of information, such as ways in which the production process can be rendered more efficient or the product improved, may be enjoyed by all. So, it takes all kinds of knowledge to run an efficient company. An authoritarian hierarchy, however, filters out certain types of knowledge or information by de-legitimizing it as not emanating from the top. The result is stagnation, alienation and even miscalculation as opposed to innovation and progress. In an environment which is not highly competitive, such inefficiencies may not be fatal. But in today's market where the threat is not to an entrepreneur but rather to the technological leadership of the country as a whole, the problem is more acute.

---

at 326; NORD & TUCKER, *supra* note 179, at 15.

183. *See* BURNS & STALKER, *supra* note 179, at 9; Fairtlough, *supra* note 179, at 326.

184. *See* Fairtlough, *supra* note 179, at 327-28.

185. *See id.*

The problems discussed in the previous paragraph mainly relate to an industrial organizational structure. The amount of power appropriated by the top of the hierarchy at the expense of the base has resulted in "surplus repression."[186] Many authors have discussed surplus repression and the malaise it has brought with it into our societies.[187] Ironically, at the birth of the Industrial Revolution, the Luddites opposed mechanization because they were concerned that it would rob workers of their livelihoods.[188] The pro-technologists hailed the new age as one that would liberate the worker from the drudgery of work and make life better for everyone. Both groups were wrong. Despite the Luddites' fears, the new Industrial Age brought with it many more jobs than the ones it made obsolete. On the other hand, whereas the Industrial Revolution ultimately did usher in a higher standard of living for all strata of society, it did not liberate the worker from the drudgery of work. It introduced its own form of drudgery.

In sum, the Industrial Revolution, augmented by such theories as Taylorism, gave rise internally to an alienated workforce.[189] Alienation infected every aspect of the life of the worker, and led to an increased amount of overall social unhappiness. This unhappy state of affairs resulted in significant instabilities in Europe and even the United States, a serious matter, given the lessons of Chinese history. As pointed out in Section III, China had paid a high price for its own political instability during the Middle Ages. Despite the fact that it was on the verge of its own Industrial Revolution, China lost its

---

186. *See* HERBERT MARCUSE, EROS AND CIVILIZATION: A PHILOSOPHICAL INQUIRY INTO FREUD 35 (1966).

187. *See id.* at 35-37; Albert P. Cardarelli & Stephen C. Hicks, *Radicalism in Law and Criminology: A Retrospective View of Critical Legal Studies and Radical Criminology*, 84 J. CRIM. L. & CRIMINOLOGY 502, 546 (1993); *see also* Jonathan Simon, *Power without Parents: Juvenile Justice in a Postmodern Society*, 16 CARDOZO L. REV. 1363, 1409 (1995).

188. For more on the Luddites, see, e.g., HENDERSON, *supra* note 76, at 23-26, and J.F. Bergier, *The Industrial Bourgeoisie and the Rise of the Working class 1700-1914*, *in* THE FONTANA ECONOMIC HISTORY OF EUROPE: THE INDUSTRIAL REVOLUTION, *supra* note 93, at 438-39.

189. *See* BURNS & STALKER, *supra* note 179, at 11; *see also* DRUCKER, *supra* note 4, at 97-107. "Taylorism" is a school of scientific management aimed at increasing workers' productivity and efficiency through the observation and modification of their practices. For more on Taylorism, see STEPHEN P. WARING, TAYLORISM TRANSFORMED: SCIENTIFIC MANAGEMENT SINCE 1945, at 133-36 (1991).

historical opportunity because of political instability. The instabilities in Europe and the United States, however, were remedied by certain political compromises that may not have been the most economically efficient.[190] The instabilities were also reduced by a continuous rise in production and export.[191] Neither approach, however, is a satisfactory long term solution.

In the Industrial Age, industrial countries pried markets open by resorting to such systems as colonialism and other forms of international hegemony.[192] In the Information Age, it is no longer necessary to access other countries' resources by resorting to force. For example, the new modes of communication have made it possible for an American company to employ low-wage engineers in other parts of the world to do the work of an American worker at a significantly lower cost.[193] This development will have internal ramifications in the United States. The internal ramifications may in turn affect the economic well-being, even stability, of the country and lead to new compromises, which again may not be the most economically efficient.[194]

Theoretically, the advances of the Informatics Revolution have made it possible for the first time ever for United States' firms to become truly global. In practice, we are already experiencing a significant proliferation of multinational companies (MNC). These MNCs tend to have a centralized, authoritarian, hierarchical structure in which headquarters play a major role. Indeed, today some large organizations in Southeast Asia are utilizing this kind of structure. This is particularly true of family-owned and operated businesses.[195] The structure appears to work efficiently and smoothly. There is no evidence of wide-

190. *See* ROE, *supra* note 75, at 205-09, 283-87 (arguing that "politics molded the modern corporation," and that "it is worthwhile for academics to begin to consider whether alternative financial and organizational forms would better resolve problems of organization").

191. For more on the importance of increasing production in order to achieve labor peace, see DRUCKER, *supra* note 4, at 110.

192. *See* HODGSON, *supra* note 77, at 176-77.

193. *See* Josh Clark, *Brave New Work*, MOTHER JONES, July-Aug. 1997, at 53; *Great Unknown Companies . . . And Why You Should Know Them*, INFO. WK., Sept. 16, 1996, *available in* 1996 WL 12494727.

194. *See* ROE, *supra* note 75, at 283-87; *see also* George G. Triantis, *Debt Financing and Motivation*, 31 U. RICH. L. REV. 1323 (1998).

195. *See generally* Jack W. Hou et al., *Pacific Rim Trade and Development: Historical Environment and Future Prospects*, CONTEMP. ECON. POL'Y, Oct. 1, 1995, at 1.

spread labor unrest in connection with these firms. So, how can we account for this state of affairs?

Perhaps part of the answer lies in the economic conditions and cultural/social values of other countries. For a variety of such reasons, a non-Western worker abroad may find himself more accepting of authoritarian hierarchical structures. Consequently, a major element of internal instability at the workplace is eliminated. In fact, it appears that even in the United States, different workers have different cultural values and hence, differing levels of tolerance for authoritarian structures. For example, workers in the Route 128 region appear to be more tolerant of an authoritarian hierarchical structure than their counterparts in Silicon Valley. For a while Route 128 did very well, and is still a viable region, though it has lost its leading edge. So, it is too simplistic to argue that hierarchical organizations are doomed to extinction in the Information Age. It is sufficient to examine briefly the Japanese model to refute this argument. The Japanese firms have so far preserved their overarching hierarchical structure even as they adjusted the internal substructures to allow for increased information gathering/consultative processes. These firms, many of which are in the informatics industry, are leaders in their respective fields.

The argument about the waning of authority in the Information Age carries a different force when evaluated in the context of Western cultures. The mere fact that the argument is context sensitive and that the context is cultural makes plain that the argument is not based on the technological necessities of the Information Age. Then what is it about the West that renders the argument more defensible in its context? The answer is Western political and economic path dependencies. As Mark Roe and others have argued in another context, such path dependencies cannot be ignored in discussing corporate governance structures in the United States and elsewhere.[196]

196. *See* S.J. Liebowitz & Stephen E. Margolis, *Path Dependence, Lock-In, and History*, 11 J. L. ECON. & ORG. 205, 217-22 (1995); Mark J. Roe, *Chaos And Evolution in Law And Economics*, 109 HARV. L. REV. 641, 643-58 (1996). *See generally* MANCUR OLSON, THE RISE AND DECLINE OF NATIONS: ECONOMIC GROWTH, STAGFLATION, AND SOCIAL RIGIDITIES (1982).

It is probative that the Industrial Revolution in Europe was taking place at about the same time a political uprising for greater freedom and self-determination was gaining strength there. These demands arose for a variety of complex social and political reasons better left to historians. The harbinger of these demands was the French Revolution's call for equality, liberty and fraternity. In time, these demands spread throughout Europe and the United States to give rise to new political institutions called "democracies." The Western questioning of authority was facilitated by the decay of the Western feudal order and other centers of political/religious power. The Industrial Revolution, which brought with it a shift in economic and political power towards the new emerging monied class, did not question authority as such, but only the authority of the older regime.[197] Consequently, it merely replaced one authority with another, adapting the new form of authority to the new circumstances, including those of industrial production. Hence, hierarchical firms proliferated, and were even rationalized in terms of more efficient production. Even Taylorism, which was about efficiency, became a tool in the arsenal of hierarchical authority to justify alienated, boring and fragmented labor.[198] Yet, one can readily imagine a system which recognizes fragmented "Taylorized" tasks but is, nevertheless, simultaneously both efficient and less alienating.

The claim being made in this section is that the issue of corporate structure/governance is as much an ideological construct as it is a response to material economic and technological conditions. Therefore, it cannot be discussed without reference to the consciousness of the society in which the structure is being developed. Therein lies a paradox. If the claim that structure is in part ideologically motivated is true, then why did firm structure in the Industrial Revolution not fail to exhibit the same degree of openness and democracy which the political system required? The answer has two parts.

---

197. *See* 11 NEW CAMBRIDGE MODERN HISTORY: MATERIAL PROGRESS AND WORLD-WIDE PROBLEMS 11-17 (F. H. Hinsley ed., Cambridge Univ. Press 1962). *See generally* ECONOMIC ORGANIZATION, *supra* note 76, at 573-88.

198. *See* WARING, *supra* note 189, at 133-36. *See generally* FROMM, *supra* note 53, at 118-123; HERBERT MARCUSE, ONE DIMENSIONAL MAN: STUDIES IN THE IDEOLOGY OF ADVANCED INDUSTRIAL SOCIETY 22-34 (1964).

First, the political system itself took a long time to implement the values it proclaimed. Even then, it did so imperfectly. The French Revolution, for example, spawned a hundred years of terror, followed by the installation of an emperor, Napoleon. Second, human consciousness, despite its heroic efforts, usually *evolves* into radically different changes rather than engage in a "radical conversion."[199] Thus, even as the French masses were calling for equality, it took time to understand the content and repercussions of such a demand. It then took a longer time before that information "sank into" the human psyche.

For this reason, we find even today in the United States business "leaders" who are still operating under a dated hierarchical/authoritarian ideology.[200] To the extent that the workers in such organizations (at the various levels, including managerial) do not find the structure oppressive or are willing to tolerate it, the organization will function very well in the short and perhaps intermediate term. To the extent they are bothered by the structure, it is an inefficient system to adopt. Here, we are only speaking about production efficiency in the narrowest sense. We are not taking into account the (non/slow) innovation costs of such an organization in a competitive milieu.

Alternatively, we find business "leaders" promoting organizations that have relatively flat structures. Despite the well-meaning approach, such structures may not be efficient in a milieu where the worker is still ideologically committed, consciously or unconsciously, to an authoritarian arrangement. This is why, for example, Silicon Valley's flat structures were easier to introduce in "new frontier" California than in the traditional society of Massachusetts.

In other words, a firm operating within a society needs to choose the most advanced techniques suitable to that particular

---

199. *See* JEAN-PAUL SARTRE, BEING AND NOTHINGNESS: AN ESSAY ON PHENOMENOLOGICAL ONTOLOGY 257 (Hazel E. Barnes trans., Phil. Libr. ed. 1956) (defining the notion of "radical conversion"); *see also* ROE, *supra* note 196, at 650 (stating that "once a society has invested in its institutions, it has many reasons not to change them radically, or at all, because the costs of change might outweigh any advantages from change"). A society's reluctance to change is also an expression of its path dependencies. *See id.*

200. *See* Bruce Orwall & Joann S. Lublin, *If a Company Prospers, Should Its Directors Behave by the Book?*, WALL ST. J., Feb. 24, 1997, at A1.

society. These techniques include production techniques and organizational ones. The two must go hand in hand in order to provide the best possible combination in that society. If they are unsuited to or incompatible with each other, the enterprise might simply wither away after suffering for a period of time.

Two European professors, F. Lissoni of Italy and J.S. Metcalf of Britain, have concluded that "compatibility [of innovation with existing technology], inter-relatedness and co-development are emerging as important themes in modern diffusion [of innovation] research."[201] They argued that what is being diffused is not a single innovation, but a sequence of innovations developing in response to competing and complementary configurations in an environment which consists of many other technologies.[202] In the context of this discussion, I would modify their insightful statement in two ways. First, I would point out that innovations are not simply serial but have a rather complex matrix of relations that develop in all unpredicted directions. Second, I would replace the reference to technology with one to "technique," a more inclusive term which recognizes that innovation goes beyond the classical definition to include organizational structures, language and other elements that constitute our human-made milieu.[203]

In other words, a society is not a *tabula rasa.* It has embedded in it a variety of techniques and technologies, such as authoritarianism, consultative traditions, and agricultural and industrial inventions all of which render some innovations more readily suited for adoption than others. This is the broader sense of path dependency that others have mentioned. Path dependency was very much at work in Britain, for example, a monarchy which at the beginning of the Industrial Revolution produced a large number of innovations related to the textile industry. Clearly, a major reason for the concentration of innovation and production in textiles and related areas was the widespread pre-industrial (agricultural) technologies and favorable conditions in Britain relating to textiles, such as weaving,

---

201. F. Lissoni & J.S. Metcalfe, *Diffusion of Innovation Ancient and Modern: A Review of the Main Themes, in* HANDBOOK, *supra* note 4, at 107.

202. *See id.*

203. For more on the use of the term "technique," see J. Ellul, *The Technological Order, in* TECHNOLOGY AND HUMAN AFFAIRS, *supra* note 1, at 205-14.

spinning, and the colonization of cotton-rich Egypt and India. Thus, the invention of the cotton jenny, steam mill and a whole other set of inventions not only represented a significant stride forward in a society with a mostly agrarian technological configuration, but it also represented valuable complementary technology.[204]

Yet for a system of monarchy, such as Britain's, with well-defined political and social hierarchies, even though they may be loosening, it would have been difficult to adopt a social/industrial technique based on equality and consultation with workers. It would require an ideological revolution or a schizophrenic national psyche to institute technological advances that could be instituted more cheaply in terms of social cost under existing ideological authoritarian arrangements. Hence, while technology offered a *chance* for liberating humanity from drudgery, that potential was not tapped in Britain. On the other hand, the United States, which rejected a system of monarchy and fought several wars in order to secure a more open and democratic society, was able to lead the way in instituting more egalitarian structures in the workplace. These structures produced a higher rate of innovation and helped the United States acquire the technological leadership of the world. The next country to achieve that distinction would be one which has, among other things, an ideological superstructure which enables it to institute even more open organizational structures in the search for a higher rate of innovation.

Before ending this part of the discussion, we should note that, while the role of ideology in influencing organizational structures is undeniably important, technologies do have propensities that themselves influence the final outcome. The mechanical technologies of the Industrial Revolution had the propensity to liberate and introduce into society greater equality. For this reason, the authoritarian hierarchy of the factory became more subtle and less restrictive than that of the feudal lord. Similarly, the technology of the Information Age has a

---

204. *See* P. Bairoch, *Agriculture & the Industrial Revolution, in* THE FONTANA ECONOMIC HISTORY OF EUROPE, *supra* note 93, at 486-87; HODGSON, *supra* note 77, at 207-19; *see also* HENDERSON, *supra* note 76, at 45-66; Lissoni & Metcalfe, *supra* note 201, at 106.

propensity to be even more liberating. It is helpful to outline now some of the ways in which it does that.

Propensities of the Information Age. Unlike the Industrial Age, the Information Age is based mainly on knowledge, not muscle. Its skilled workers are generally trained in areas of science and technology. So, they tend to derive their self-esteem from their profession, and they care about the quality of their lives.[205] They also tend not to be "organization men."[206] These facts contribute to their increased mobility. Additionally, their scientific training makes them open to data-gathering, free discussion and critique. A centralized, authoritarian milieu is not readily compatible with these traits. In attending to the "quality of life" issue, these and other workers are refusing to dedicate themselves to the organization and are opting instead for a more balanced personal life. The dissatisfaction afflicting skilled workers, among others, usually infects them with a malaise which is later reflected in reduced productivity and even a poorer quality of production. In a market in which the supply of skilled labor is inelastic and the cost of producing skilled labor is high, it makes a great deal of sense to reorganize firms in ways that are more efficient and productive. In this age, this means organizing firms in structures that are less oppressive and more inspiring to the worker. In short, the knowledge-based economy works more efficiently if organized along democratic structures. There is no one such structure, and the selected structure may differ from one community/society to another, but the main features of open communication and non-authoritarian arrangements are critical to it.

As the supply of skilled labor becomes more available overseas, especially in countries where authoritarian structures are prevalent, MNCs may decide to keep their centralized authoritarian structures in the name of Industrial Age efficiency and abandon the "affluent and spoiled" American workers for the cheaper, less demanding foreign worker. This approach, however, has serious limitations. First, the number of skilled workers

205. *See* CHARLES HANDY, THE AGE OF PARADOX 259-60 (1994).

206. *See* PETER F. DRUCKER, THE NEW SOCIETY 263-66 (Harper Torchbooks 1962); JOHN J. TARRANT, DRUCKER: THE MAN WHO INVENTED CORPORATE SOCIETY 41 (1976). *See generally* WILLIAM H. WHYTE, JR., THE ORGANIZATION MAN (1956).

available to MNCs abroad is relatively limited. Second, despite the ability to telecommunicate, distance can create its own problems; for example, it will slow down the rate of diffusion of (hands-on) knowledge/information within the company. Third, MNCs have to compete with local companies for overseas workers, and a worker's commitment to the technological development of her own country may play a role. Fourth, while initially cheaper, skilled workers will soon recognize the existing gap in salaries and try to narrow it by making demands on the MNC, by building bridges with American labor movements or immigrating to the United States (the "brain drain" phenomenon).[207]

Therefore, an American company interested in long term competitive productivity and stability must start re-examining its managerial techniques and updating them so that they may become better suited to the historical and technological era in which we live. This is a conclusion that many authors have reached through various analyses. In particular, the well-known author Peter Drucker has argued that the manager of the future must earn the trust of the workers.[208] Critical of the condescending behavior of Industrial Age managers and cognizant of the special characteristics of the Information Age, Drucker concluded that management must seek a relationship of partnership with its workers. Comparing this era to the prior one, he said: "[i]in making and moving things [in the Industrial Age], partnership with the responsible worker is . . . only the *best* way-after all, Taylor's telling them worked, too, and quite well. In knowledge and service work, partnership with the responsible worker is the *only* way; nothing else will work at all."[209]

Drucker points out that the Japanese attempts in the Fifties and Sixties to return to prewar autocracy in the plant resulted in bloody clashes and severe conflicts.[210] This led to a "loosen-

207. *See* Hamm, *supra* note 13, at 123; *see also* DRUCKER, *supra* note 4, at 38-41.
208. *See* DRUCKER, *supra* note 4, at 122.
209. *Id.* at 107 (emphasis in the original).
210. *See id.*

ing" of Japanese plant structure which accommodated input from workers and led to the flourishing of Japanese industry.

Now that I have established the importance of structure for productivity and the structural qualities best suited for the Information Age, I will briefly examine vertical, virtual and other structures in light of my conclusions.

V. CORPORATE STRUCTURE IN THE INFORMATION AGE

Vertical organizations are hierarchical organizations, with various layers of management between the top manager/entrepreneur and the bottom employee/worker. Virtual organizations are the paradigm of Toffler's "hollowing out" organizations. In a virtual organization, the structure is pared down to the bare essentials of the business.[211] All other functions are outsourced to other companies. This approach rejects the concept of vertical integration and the relationship of the firms is mainly contractual.[212] In one sense, a network of organizations is created through this outsourcing. The resulting network may be regarded as an advanced form of the Medieval "putting out" network, which was structurally much simpler and involved individuals rather than companies.[213] There are other types of networks of relations in Silicon Valley as well. Which of these structures is optimal for the new Information Age?

It is clear from the earlier discussion that small, flat organizational structures are very helpful for generating innovations, especially fundamentally new ones, and that large authoritarian hierarchical structures are not. Consequently, one may draw the conclusion that large hierarchical/vertical firms are bad for innovation and thus undesirable. This conclusion is unwarranted for many reasons that will be discussed in greater detail below. First, it overlooks the fact that large firms have made some contributions to innovation, especially incremental im-

---

211. *See* C. Dickerson, Virtual Versus Vertical: Vectors in Organizational Governance 1-2, 12 (July 7, 1997) (unpublished manuscript, presented at the International Conference on Socio-Economics, Montreal, Canada, on file with the *University of Richmond Law Review*). This paper contains an excellent discussion of the governance issues arising in various structures.

212. *See id.*

213. *See supra* notes 104-10 and accompanying text.

provements on innovations made by smaller firms. Second, it overlooks the economic power of these large firms which allows them to capitalize upon, and mainstream, radically new innovations. The spreading of these innovations through mainstreaming is particularly important because it facilitates the cross-fertilization of ideas, thus leading to further innovation.

This Section develops these observations further and argues that, despite its drawbacks, the large firm continues to have a role in today's corporate landscape. Furthermore, the section examines more closely the notion of hierarchy and argue that virtual corporations and networks are not necessarily less authoritarian in their internal and external relations than vertical organizations. Further it is argued that while certain organizational forms have their own propensities, the actual relationship within the firm depends on more than its adopted structural form. It depends on the extent, if any, to which the top exercises control on the bottom. In conclusion, while the Information Age has provided the small firm with unprecedented advantages, large vertical firms not organized as autarkic hierarchies will continue to play a role in the future economy and have not been rendered obsolete.

Firm size. The observations and arguments presented above about the relation of the size of the firm to the rate of innovation have been bolstered by various studies. One relatively recent study conducted in the United States concluded that the average innovation rate of small firms is considerably higher than that of large firms.[214] It also discovered that many (though not all) of the large firm innovations were incremental improvements upon the more "radical" or basic innovations of small firms.[215] These improvements, however, are quite impor-

214. *See* ZOLTAN ACS & DAVID AUDRETSCH, INNOVATION AND SMALL FIRMS 50 (1990).

215. *See id.* at 50-53; *see also* Patrick J. Rondeau & Bhal J. Bhatt, *A Framework For Assessing Product Innovation Strategies In A Competitive Context*, 2 ADVANCES IN COMPETITIVE RESEARCH 3 4-5 (1994) (classifying the development of new products and discussing different types of innovation, such as "incremental," "synthetic," and "discontinuous" innovations. The last refers to the development of previously non-existent products.).

tant for capitalizing on an innovation by opening more possibilities for its exploitation.[216]

The same study found that the large firm innovation rate exceeded the small firm innovation rate in certain industries.[217] These industries tended to be, among other things, capital-intensive, in concentrated markets, or in markets with significant structural barriers.[218] Thus, in today's economic climate, the innovational contribution of a firm appears to be, at least in part, industry dependent. This is especially true of more advanced generations of innovative informatics products, such as chips. Each generation essentially renders the one before it obsolete, yet each requires a very high capital investment for its development, testing and production. Significantly, the cycle of innovation in chips, for example, has been repeated every few years. As a result, a continuous ability to make such large capital outlays is required.[219] This state of affairs makes it difficult for a small firm to compete successfully over the long term.

Small firms have other long-term problems. Once the decision to manufacture a product is made, the product usually needs to be launched, mass-produced, marketed and advertised. In Silicon Valley, where small companies have direct contacts with one another, it is possible, initially, to locate buyers without such a campaign. But when the product reaches a more mature stage, then either the small company has to grow, or it will lose ground to an imitator, with perhaps a slightly improved product, who can grow.

The loss of the United States market share in semiconductors to Japan in the late Eighties is a case in point.[220] Silicon Valley was experiencing a boom then, yet Japanese firms were able to move ahead and capture the lead in market share from the United States in the semiconductor industry.[221] Some

---

216. *See* ACS & AUDRETSCH, *supra* note 214, at 54 (quoting Scherer's conclusion that, "No single firm size is uniquely conductive to technological progress. There is room for firms of all sizes.").

217. *See id.* at 53-55.

218. *See id.* at 54-56.

219. *See generally* Hobday, *supra* note 4, at 163.

220. *See id.* at 155.

221. *See id.*

blame that loss on the fact that the Silicon Valley network of firms involved at that time in semiconductor production lacked adequate "complementary assets," i.e., the ability to produce, market and distribute on a large scale, as well as commit the necessary financial resources.[222] Surely there were exceptions, but not enough to salvage the situation. It was only after large firms in Silicon Valley, such as Intel, revised their strategies to gain a larger share of the market, that the United States was able to recapture the lead from the Japanese in the Nineties.[223]

In concluding that large firms serve an important function in our economy, it is important to keep in mind that some of the arguments used in support of that conclusion are becoming rapidly obsolete. For example, the recent explosion of Internet communication has radically changed the rules of raising funds, marketing and advertising. Some small companies that would have ordinarily solicited the help of an expensive underwriter in order to tap the capital markets have now dispensed with that expense by marketing their own securities on the Internet.[224] This development will produce related securities laws for the protection of investors purchasing through this medium.[225] The rules, however, will not prohibit offers made through the Internet; they will only regulate them.[226] This means that small companies have been significantly empowered by the new technology. This new power translates into decreased costs and increased profits.

---

222. *See id.* at 154-55.

223. *See id.*

224. There are now Internet services available to match a venture with capital. *See, e.g., Capital Matchmaker* (visited Sept. 24, 1997) <http://www.matchmaker.org/-capital/>; *Wit Capital* (visited Sept. 30, 1997) <http://www.witcapital.com>.

225. The SEC is currently "reevaluating its approach to the regulation of exchanges and other markets in light of technological advances and the corresponding growth of alternative trading systems . . . ." Regulation of Exchanges, Exchange Act Release No. 34,38672, May 23, 1997, *available in* 1997 SEC LEXIS 1178. The Internet services themselves take no responsibility for ensuring that the on-line securities solicitations they publish are in conformity with existing securities laws. *See, e.g., Capital Matchmaker* (visited Sept. 24, 1997) <http://www.matchmaker.org/capital/-legal.htm>; *Wit Capital* (visited Sept. 30, 1997) <http://www.witcapital.com/rules/buying.html>; *see also* Michael Krantz, *Moguls by the Million*, TIME, Sept. 29, 1997, at 43.

226. *See, e.g.*, Real Goods Trading Corporation, SEC No-Action Letter, June 24, 1996, *available in* 1996 SEC LEXIS 566.

Similarly, a small innovative company with a new product can significantly reduce the cost of launching and marketing that product by resorting to Internet advertising.[227] This new freedom from traditional market players/authorities democratizes and decentralizes the market in ways that can only spur the innovative spirit. It also presents a challenge to the small firm as the firm's product matures. Given a small firm's limited resources, human and other, it may not be able to continue marketing and supplying the maturing product without adversely impacting its valuable innovative capabilities. At that point, the small firm may want to outsource a certain function (or license or sell that product) to another firm willing to dedicate itself to the maturing product. Usually, this other firm would be a large, established firm.

Another trend which adds to the viability of small companies is the existence of active and significant joint venture capital. Joint venturers have helped finance many technologists/entrepreneurs with innovative ideas. Despite some intermittent losses, the returns on successful joint ventures have been very lucrative. At the present, so long as small companies continue to innovate, joint venture capital is available to finance them. This availability diminishes the need, in the case of a capital intensive project/product, for vertically-integrated firms with large capital reserves.

Clearly, the new Information Age has made it easier for the small firm to survive longer without the need to evolve into a vertical structure, which may reduce its communicative and innovative capabilities. Nevertheless, as argued earlier, there remain residual reasons for a firm to opt to grow larger and adopt a hierarchical organizational structure. Therefore, in evaluating the optimal corporate structure for the United States, there appears to be no single optimal structure. It depends, among other things, on concomitant technological, industrial and economic conditions. Small, nimble corporate structures are important for continued, especially radically new, innovation. It is easier to maintain a high level of open communication within such small structures. They also are not sty-

227. *See, e.g., AT&T* (visited Sept. 24, 1997) <http://att.com/business/feature> (featuring different businesses that have been successful marketing directly on-line).

mied by slow bureaucracies. Larger firms are important for producing certain types of innovation, for the incremental development of innovations, as well as for capturing the market for innovations at the mature stage. They have the structure that makes it possible to engage, on a regular basis, in large scale actions. But isn't the large firm's ability to act on a large scale the result of its bureaucratic organization? In other words, could bureaucracy be good after all? The next Section considers these issues.

Firm structure. Regardless of size, the question remains as to what type of structure is optimal for an organization. The discussion has indicated that an authoritarian hierarchical structure, even in a small organization, is detrimental to the free flow of information and hence to the technical progress of the company. It also has detrimental effects on labor. But are there non-authoritarian hierarchies? If so, are those also detrimental?

There are a variety of hierarchical structures. Some authors have referred to "horizontal" as opposed to "vertical" hierarchies.[228] The term appears to be an oxymoron. It suggests both at once: a vertical structure and its absence. A horizontal hierarchy is a relatively flat vertical hierarchy, i.e., it is a single *tranche* hierarchy. Because horizontal hierarchies eliminate intermediaries between the entrepreneur and the managers, the direct link tends to mean more control by the entrepreneur.[229] Thus, this structure, which is well-suited for small companies, turns out to be potentially more authoritarian than a "less horizontal" one.

Elaborate hierarchies tend to dilute control from the top by allowing middle managers the opportunity to share in it. From the point of view of labor, however, the source of control is not as significant as its extent, depth, and even its very existence as a mode of management/labor relation. So, the laborer's view is not significantly different as between the two forms of hierarchy. Either arrangement, whether vertical or horizontal, could be highly oppressive.

---

228. *See* R. Rajan and L. Zingales, The Firm as a Dedicated Hierarchy 20 (1997) (unpublished manuscript, on file with author).

229. *See id.*

A climate of control breeds distrust between management and employees, thus creating an adversarial relationship rather than a productive one. This increases the manager's worry about security issues, including the appropriation of technological know-how and the formation of competing companies by departing labor. Such a scenario did take place at the early stages of development in Silicon Valley, which was not good for the Fairchild company.[230] Yet, the Company's departing skilled labor became a major source of new, small, innovative companies which had a favorable impact on the industry and the country.[231]

Later, other firms in the Silicon Valley learned from the Fairchild experience. They assisted, rather than warred with, defecting skilled labor. The reason these firms were able to relax their attempts to control departing skilled labor was only partially related to the nature of the Information Age. Other factors were as, if not more, important. For example, the region in which these firms were located is well-known for its aversion to traditional authoritarian structures.[232] This fact appears to have affected the firms themselves by giving them unique features that distinguished them from firms in more traditional regions, such as Route 128 in Massachusetts. This "cultural" difference is certainly aided by the fact that intellectual assets of the Information Age are harder to protect (at present) than physical assets, that the products of the new age become obsolete quickly, and that there is a small pool of skilled labor. In the presence of a "high-control" culture, however, it is easy to imagine how the technological factors could readily translate into a highly authoritarian structure determined to achieve success through increased policing and restriction of workers' mobility.

The key concept in this discussion is not "hierarchy" but "control." Whereas hierarchies provide many opportunities within the structure to establish control, they do not have to. It is possible to imagine a relatively innocuous (unabused) hierarchy based on cooperative modes of organization in which everyone

230. *See* SAXENIAN, *supra* note 3, at 25-26.
231. *See id.*
232. *See id.* at 50-51, 53.

is "connected" to the (functional) top and has full-fledged input in the project in which she is involved (communication as opposed to control). This modified structure, the "inverted tree" model, will require a modified consciousness that does not crave control. This consciousness, as argued earlier, is the product of a variety of social and political developments. The Information Age does not bring it about; it is simply better suited to it, given the entrepreneur's reliance on skilled labor. Today's climate in the United States as a whole is conducive to the development of a less controlling consciousness. Conditions suitable for a mentality less interested in autarkic controls are created by the environmental and feminist movements at their best, the resurgence of religious/spiritual consciousness (as opposed to political religious movements), demand for a less powerful central/federal government and even the United States Constitution, especially as recently interpreted by the Supreme Court.

The managerial structure of Hewlett Packard, labeled MBO (management by objective), illustrates this point. This structure, we are told, is the "antithesis of management by control."[233] It is a system in which "overall objectives are clearly stated and agreed upon."[234] Packard suggests that workers have an input in this process, the extent and vertical reach of which will determine the extent of internal corporate democracy.[235] Drucker's optimistic view of the coming managerial change is that managers will need to "learn to manage in situations where you don't have command authority, where you are neither controlled nor controlling."[236] The internal structure of the emerging organization, according to Drucker, is one of "mutual understanding and responsibility."[237]

It is important to note that when applied, the MBO method will nevertheless vary from one company to another, and from one historical era or region to another. This variation will surely test its democratic content from one extreme to another. It is conceivable that under autarkic political developments, the MBO structure (or some other "democratically biased" structure)

233. *See* PACKARD, *supra* note 6, at 152.
234. *Id.* at 152.
235. *See id.* at 153-59.
236. Harris, *supra* note 6, at 115.
237. *Id.* at 122.

could be substantially emptied from any real democratic content. The answer to labor's suffering therefore lies at least as much in societal/cultural values as it does in technology. I would therefore modify McLuhan's slogan to say "[a] medium is *an important part of the* message," with the medium here being the mode of organization.[238] A structure certainly has its propensities, but it does not predetermine the outcome.

Virtual corporations and networks suffer from similar vulnerabilities. Each of these two forms of organization allows firms to express, within their boundaries, the corporate governance culture they prefer. To that extent, they are no different from other firms. It may appear, however, that because of the contractual outsourcing relation between a virtual corporation (the "center") and other firms (the "spokes"), that the relation is, therefore, less controlled; but this need not be the case. In fact, some centers will try to exert as much control on the spokes as they can.[239] That level of control may exceed one in a vertically organized democratically-oriented firm. Thus, mere paring of functions and shifting of production to other companies does not in itself promote corporate democracy within the company or between the center and its spokes. It may, however, make it somewhat more difficult for networks. Nevertheless, similar arguments could be made about the relation of various firms within a network. The network firm, with the highest craving for control, may end up maneuvering to control the other firms in the network. So, neither form is optimal as a non-authoritarian structure, although both have external propensities favoring such structure.

Therefore, it would appear that a choice of a corporate structure made to maximize innovation and economic viability must be combined with a serious effort to reeducate management and labor about responsible egalitarian governance. The structure itself should be chosen in light of other criteria as well. For example, if the firm is mass-producing a mature product, then it may be advisable to adopt a vertical hierarchy. On the other hand, if it is located in a region rich with small entrepreneurs

238. For a discussion of McLuhan's original slogan, see *supra* notes 62-74 and accompanying text.

239. *See* Dickerson, *supra* note 211, at 20.

ready to supply it with components, then perhaps it should opt for a virtual structure or networking. A company may even decide to both participate in a mature industry and benefit from continued related innovations internally and externally. Given certain economic factors, such a company may have to opt for a vertical hierarchy. In that case, it needs to devise an internal governance structure which reduces internal control and thus spurs innovation within the firm. The company may also invest in small firms with flat non-authoritarian structures and promising research. The investment approach will preserve each firm's structural advantage while giving both firms a significant economic advantage. As the small firm matures, it may even decide to merge with the large firm, given a suitable corporate culture. Therefore, the optimal structure for a firm is a versatile structure which is sufficiently flexible so as to capitalize on all emerging possibilities of interest to the firm. A single structure offers no guarantees and may be constrictive under certain market or other conditions.

VI. CORPORATE GOVERNANCE FOR THE INFORMATION AGE

The above discussion shows that while the size of a firm and its structure have certain propensities towards encouraging innovation within that firm, the ultimate determinant remains its ideological/cultural human dynamic. As stated earlier, a culture of control breeds distrust between management and employees, leading to an adversarial relation fraught with tensions.[240] On the other hand, a co-operative democratic culture facilitates building trust between the two groups and produces a friendlier and more productive working place.

The Coming Cultural/Ideological Shift. There are many ways in which a cooperative non-hierarchical culture may be fostered in a firm. Open door policies and flexible hours are examples of minimal ways that do not require a radical departure from our Industrial Age consciousness. For this reason, their effect will also be minimal. Other ways may represent such a radical departure from tradition that they present us with a totally different conception of the firm, corporate law and human be-

240. *See supra* notes 230-31 and accompanying text.

ings. In the latter case, our consciousness will need time to contemplate these ways, and therefore it may take decades before the worldview they are based upon is accepted and internalized.

A case in point is the change in consciousness related to the Industrial Revolution. The passage from the Agricultural to the Industrial Age required a fundamental ideological/conceptual shift. Under the old feudal system, humans could be owned as property, and under the new industrial system, humans are viewed as free agents who could dispose of their own labor as they choose. Originally, the economic model represented by the free craftsmen in Europe was negligible compared to the feudal model.[241] In time, however, the feudal model became economically, technologically and politically obsolete, causing a great deal of chaos and unrest. The price paid for establishing this ideological/conceptual shift in the United States was a civil war.

The Information Age is bringing with it an ideological/conceptual shift of similar magnitude. There are phenomena that already point in that direction. For example, labor has found new strength after a series of losses. During the last decade alone, labor suffered through downsizing, plant closings, escalating executive salaries and the rise in the number of temporary workers. These developments led various writers to become concerned about matters ranging from possible labor unrest to the social implications of the existing system.[242] Several writers have concluded that the present corporate/economic system is in dire need of reexamination. They offered to remedy the situation by proposing, for example, profit sharing, employee stock ownership, codetermination by workers, fiduciary duties by directors towards stakeholders and shareholder activism by labor.[243]

---

241. *See generally* ECONOMIC ORGANIZATION, *supra* note 76, at 551-54.

242. *See generally* PROGRESSIVE CORPORATE LAW (L. Mitchell ed., 1995); Joann S. Lublin, *Executive Pay (A Special Report)*, WALL ST. J., April 11, 1996, at R1.

243. *See* PROGRESSIVE CORPORATE LAW, *supra* note 242; *see also* Richard Freeman, *Employee Councils, Worker Participation, and Other Squishy Stuff*, 43RD ANNUAL PROCEEDINGS (Indus. Rel. Res. Ass'n Series, Madison, Wis.), Dec. 1990, at 328. Jeffrey N. Gordon, Employee Stock Ownership in Economic Transitions: The Case of United Air Lines, (1996) (unpublished manuscript, Sloan Conference, Columbia University) (on file with the *University of Richmond Law Review*); Marleen A. O'Connor, *Organized Labor as Shareholder Activist: Building Coalitions to Promote Worker Capi-*

The problem, however, is more fundamental. The basic imbalance in today's corporate structure lies in the fact that as a result of various historical political developments, control has become concentrated in the hands of a few, its top managers. Combined with a hierarchical Industrial Age legal system of corporate governance, these managers' primary responsibility has become one of maximizing profits for the shareholders/owners. Other corporate constituencies suffer from this tunnel vision. To ameliorate this situation, the above suggestions were made. While all of them are designed to improve the economic lot of the employees, among others, none of them sufficiently address the fundamental issue of corporate democracy.

The term "corporate democracy" usually refers to shareholder rights, which reflects a view of the corporation as a *polis* where only the "owners of shares" count as citizens. In political terms, shareholders of a corporation are the only citizens of the corporate *polis*, and only citizens vote. Put in this way, we now recognize that our legal system does not view non-shareholders as "citizens." This is analogous to a familiar political situation in our past where only landowners had the right to vote in an election and the non-landed, non-owners had no voting rights. We have since recognized in the political arena that those who do not own land are nevertheless an integral part of the citizenship of our country. The same recognition seems to be overdue in corporate law and practice. Getting to it, however, will require a major ideological/conceptual shift not only in the concept of "corporate citizenship," but also in the concept of the "corporation" itself.[244]

The corporation is not just a production unit, a "cash cow," or a profit center; it has become a community for all those in it. People spend most of their waking hours at work in the corporation; they make friends there, have meals there, and derive

---

talism, 31 U. RICH. L. REV. 1345 (1997) [hereinafter O'Connor, *Organized Labor*]; Marleen A. O'Connor, *The Human Capital Era: Reconceptualizing Corporate Law To Facilitate Labor-Management Cooperation*, 78 CORNELL L. REV. 899, 936-40 (1993).

244. An interesting article which provides a different set of arguments for similar conclusions is that of David Ellerman, The Human-Capital-ist Firm: An Approach from Property Theory and Democratic Theory (1997) (presented at the Conference on Human Capital and the Theory of the Firm, The Brookings Institute) (unpublished manuscript, on file with the *University of Richmond Law Review*).

much of their self-esteem from work. A corporation is therefore an important *community* for those who work in it, and it significantly impacts on the society in which it is imbedded. Conversely, a corporation derives significant benefits from that society. Consequently, it may no longer define its goals in isolation from, or in disregard of, the encompassing society. The traditional goal of maximizing profits must now be tempered by other considerations including specific, as well as overarching, communal goals. These goals must be determined primarily by the corporation's community, but with an eye to the overarching goals of society. Several events in the last decade have pointed to this shift in our view of the corporation. The shift, however, has been slow and incremental. All of its consequences have not been fully recognized. We have also not yet reflected it adequately in our legal system.

For example, after an extended period of hesitation and debate, society rejected the self-centered approach of corporations that maximized profits at the expense of our shared environment and the health of American citizens. The rejection, however, took a very limited form such as passing environmental laws and cigarette regulations. The basic problem, namely the very concept of the corporation as an insular societal entity concerned only with shareholders profits, remains unchanged. Consequently, other manifestations of this problem, such as those that emerged in the mergers and acquisitions era of the Eighties, are also being approached with further piece-meal remedies. This slow process is costly in a globally competitive environment, yet our legal corporate system continues to lag behind the new facts.

In the meantime, employees of the firm can only be heard if they present themselves as owners, i.e., as something *other than employees*. This unfortunate fact has accelerated the development of a new phenomenon: the shareholder/employee activist.[245] By being both a "citizen" of the corporation and a "non-citizen/employee" as well, the shareholder/employee activist attempts to bridge the existing gap in democratic corporate governance. But, by resorting to this method of communica-

245. For further discussion, see O'Connor, *Organized Labor*, *supra* note 243, at 1345-54.

tion/representation, the shareholder/employee is underlining the obsolescence of the traditional dichotomy between owners and employees in the area of corporate governance. If the dichotomy increasingly makes no sense, then it becomes increasingly easier to discard it. The dichotomy has traditionally been justified for various reasons. Major among them is the reified view of the employee as not being "smart" enough to be an owner. The shareholder/employee activist does not only challenge this perception, but also illustrates on a periodical basis the inefficiencies involved in the circuitous mode of communication with managers and shareholders required by the present system. What is really needed, as indicated earlier, is a truly participatory workplace in which employees actively communicate their views about the workplace and the production process. They also share in the decision making, especially in the areas of their expertise and concern.

The benefits of involving workers in the decision-making process has been adequately illustrated in Japan and Germany.[246] But the level of participation being advocated for the United States in the Information Age requires a fundamental leveling of autarkic hierarchies, a democratic partnership between owners and employees with a common/communal goal and destiny. Codetermination and profit-sharing would take the firm part of the way towards that goal, but without full corporate democracy, the employees will continue to feel alienated, helpless and frustrated. These negative feelings reflect themselves in the behavior of the employees and tend to be expressed in lack of commitment, initiative and enthusiasm. Since many of these employees are technicians, the level of innovation and performance in the firm is likely to suffer as a result.

Reassessing the Role of Human Capital. The ideological/conceptual shift, which appears to be facilitated by the age of communication, participation, cooperation and full-fledged democracy, redefines capital contributions to the firm so as to include non-financial forms. In the Industrial Age, where capital was in great demand and short supply, a special privilege was accorded to those who were monied. They became "owners" of the firm in which they invested their money. The primary index of

246. *See generally* HANDY, *supra* note 205, at 100-01.

this ownership was control. By assigning legal control to owners, other constituencies of the corporation were denied it. Our legal structure reflects this choice.

Reality, however, reflects newer facts. Managers, a later Industrial Age phenomenon consisting of a newly-emerged class of skilled labor, were able to wrest effective control from the owners through a series of historical developments. Recently, we have heard about the attempt of institutional investors to reestablish corporate democracy.[247] That attempt is really a return to industrial democracy which reserves ownership rights only to financial capital. The corporate democracy necessitated by the Information Age has made the Industrial view obsolete. The clout of managers in today's corporations attests to this fact.

In the Information Age, financial capital is abundant and skilled human capital is in short supply. As a result, a new pattern has emerged in which those with exceptional technological, managerial, engineering and other needed skills were compensated in large part with an ownership interest in the corporation in exchange for their human capital contributions. Because of the questionable application of this new principle with respect to top managers in autarkic corporations, this development became so controversial that new disclosure rules for compensation were promulgated by the SEC.[248]

The principle, however, has been established. While in traditional firms it was applied only to top managers, in Silicon Valley it has been broadened to include not only computer engineers and software innovators, but also, for example, secretaries.[249] Once we recognize that human capital is another form of corporate contribution/investment, there is no rational argument for compensating an engineer's contribution with equity and then deny the same treatment to a secretarial contribution.

---

247. *See* Richard H. Koppes, *Corporate Governance*, NAT'L L.J., Apr. 14, 1997, at B5.

248. *See* Executive Compensation Disclosure; Securityholder Lists and Mailing Requests, Exchange Act Release No. 33-7032, Nov. 22, 1993, *available in* 1993 SEC LEXIS 3215.

249. Only a limited number of secretaries, however, have been so fortunate. *See* Hamm, *supra* note 13, at 135. Again, as stated in the text relating to note 36, the Valley has its darker side.

That is not to say that the value of the contributions are necessarily the same. But, if one is a form of capital, so is the other. After all, a shareholder who invests a single dollar in a corporation is as much of a shareholder and "owner" as one who has invested a million dollars.

The Industrial Age bias toward financial capital is no longer rational and needs to be reviewed. In the new Age, both contributions should reap the same kind of benefits. Under this scenario, profit-sharing is no longer regarded as a matter of firm policy, but as an employee right; just as compensating a worker in industrialized Europe was not regarded as an expression of the feudal lord's kindness, but as a right of the worker. This ideological/conceptual shift is not yet obvious, but its indicators are already with us.

Historically, political changes and economic/technological changes have gone together hand-in-hand, some preceding or following others by a few decades. There is no good reason to argue that this time around the situation will be different. The political situation has certainly been evolving towards increased and improved democratic structures. In such a case, the structure of corporate governance cannot lag much behind.

The Silicon Valley example cracks the door open to the ultimate change both psychologically and perceptually. There, some secretaries have become rich by receiving stock options as part of their compensation. They were given these stock options because these secretaries were willing to work for upstart companies that had a lot of promise but little money. The dedication of all those involved to the success of the new business redounded to the benefit of all. This sort of motivation, where each employee views her contribution as important to the success of the firm, creates an enthusiastic and active firm which has a higher chance of success. As a result, the pie becomes larger and everyone benefits. Furthermore, in lean times, economic losses are not compounded with chaos and unrest.

The Information Age allows us finally to reconcile our economic interests with our moral principles. On the legal plain, that means redrafting the statutes so as to reconceptualize the corporation as a community of economic interests that sets its own goals democratically, while cognizant of being part of and

imbedded in a society with values. It also means drafting provisions that protect and encourage managers of a corporation who recognize these facts and act upon them. "Citizens" of a corporation must be redefined to improve the process of consulting and decision-making and realign corporate democracy. Finally, managerial and other hierarchies must be flattened and laws drafted, including securities laws, that will open the door to full and free communication among all these "citizens" without burdening them with high costs. The presence of the Internet will assist in this goal.

VII. CONCLUSION

Technological innovations create new media that modify human experience in significant ways. These media do not, however, impose predetermined modes of relating on humanity. They only have a propensity to facilitate certain modes as opposed to others. Other factors, such as economy and ideology, play an important part as well. Innovative energy appears to rest with organizations that have two main features, open communication and "loose" controls or open structures. Contrary to common belief, such features could exist in a large as well as a small firm, although the larger structure has a propensity for increased bureaucratic control and hierarchy.

In the new age of Information, innovations become obsolete within a short period of time. This places an immense amount of pressure on firms for continued innovation to preserve their competitive advantage. Small firms have proven to be more nimble in this area than larger firms. Small firms, however, are often unable to preserve their advantage in mature markets or enter capital-intensive areas of innovation. Consequently, an alliance among companies of various sizes and structures may be optimal to preserve the whole economy's competitive edge in an increasingly competitive global market.

Finally, the Information Age, with its propensities toward communication, flattening of hierarchies, cooperation and democracy, will necessitate a new way of perceiving the firm and its constituencies. This perception will evolve as more data accumulates with respect to the obsolescence of a corporate governance system dedicated to the interest of the sharehold-

ers/shareowners alone, the critical role of human capital in the new age, the cost of continued disenfranchisement of employees from corporate governance and the inefficiencies related to solving these matters by using incremental circuitous methods instead of overhauling the Industrial Age legal system. The required ideological/conceptual shift may be delayed by path dependencies in United States corporate history. Such delays will give other countries a chance to leapfrog to the forefront of technological leadership.