1 # Knowledge and Technology

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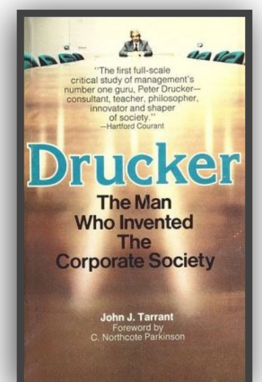
14 **The following ideas are by Peter Drucker in *Post-Capitalist Society*, *The Daily Drucker* and *Management, Revised Edition***



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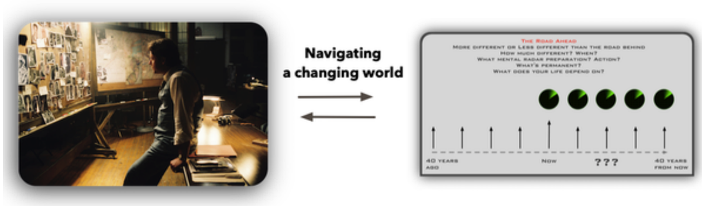
17 How is it possible

18 to works toward horizons ↑ ↓

19 that aren't on your mental radar –

20 at the right point in time? ↓

21 

22 Larger ↑

23 Thinking Broad and Thinking Detailed ↑ ↓

24 Intelligence, Information, Thinking

25 ▪ "Most of the mistakes in thinking are **mistakes in perception**.

26 ❖ Seeing only part of the situation – broad

27 ❖ Jumping to conclusions

28 ❖ Misinterpretation caused by feelings" – Edward de Bono

29 ▪ Awareness without action is useless

30 The MEMO they – the enemies of the future – don't want you to SEE

31 «§§§»

32 About technology

33 Knowledge as the central energy of a modern society **exists** altogether in application and when it is put to work

34 *Toward a New Philosophy*

35 *Landmarks of Tomorrow* 1957-1959

36 These new concepts have, within the last twenty or thirty years, become the reality of our work and world, if not the small talk of the popular newspaper.

37 They are obvious to us.

38 Anyone rash enough to suggest that they are anything but obvious, and are indeed almost incomprehensible – methodologically, philosophically and metaphysically – would at best be stared at as an egghead and more likely be curtly dismissed as a hairsplitter.

39 There are beginnings toward the new synthesis we need – in biology and physics, in operations research and modern mathematics, in general systems theory, in semantics, linguistics and mathematical information theory.

40 We are beginning to move from the old mechanical concept of discipline as determined by static properties of the subject matter, to new disciplines dealing with such universal configurations and processes as "growth," "information" or "ecology."

41 Anticipation of the new vision can be found in many great thinkers – Aristotle, Leonardo, Goethe, Bergson, Whitehead.

42 The first to comprehend it, however, was probably that astounding South African, Jan Christiaan Smuts — the closest to the "whole man" this century has produced — with his philosophy of Holism twenty-five or thirty years ago.

43 Physicists increasingly grope for it, as do Lancelot Law Whyte in his The Next Development of Man and Erwin Schroedinger, the Nobel Prize winner, in his What Is Life?

44 The latest and most persuasive expression of the new view is The Image, by the distinguished economist Kenneth Boulding.

45 The contemporary philosopher whose books sell best in paper-back editions in the United States is the late Ernst Cassirer, though his works are anything but popularly written — indeed a veritable thicket of Teutonic abstractions.

46 His writings deal with patterns, configurations and symbols of order as the essential human experiences.

47 Yet though we take the new world-view increasingly for granted, we do not yet understand it.

48 Though we talk glibly of "configuration," "purpose" and "process," we do not yet know what these terms express.

49 We have abandoned the Cartesian world-view; indeed it is rapidly becoming almost incomprehensible to us.

50 But we have not, so far, developed a new synthesis, a new toolbox of methods, or new axioms of meaning, order and inquiry.

51 We have certainly not yet produced a new Descartes.

52 As a result we are in intellectual and aesthetic crisis in every area.

53 The people working in a given discipline see the new process and configuration concepts; indeed, they often see little else.

54 But for rigorous work they have only methods based upon the old worldview and the old concepts, methods which are quite inappropriate to the new vision.

55 In the social sciences this lag shows itself in the glaring discrepancy between the talk of "culture," "personality" or "behavior" and the inability to produce much more than vast collections of empirical data about particular — and by definition meaningless — manifestations.

56 In a discipline that is much closer to my own daily interest, the study of management, the situation is equally frustrating.

57 The discipline only exists because we have configuration concepts such as "business enterprise" and "the process of managing."

58 All of us stress that the really important things are process-characteristics, such as the climate of an organization, the development of people in it, or the planning of the nature and purposes of a business enterprise.

59 But whenever we try to be scientific we are thrown back either on purely mechanistic and static methods, such as work measurement of individual operations, or at best on organization rules and definitions.

60 Or take the physicists: the more they discover about the various subatomic particles of matter, the more confused, complicated and inconsistent become their general theories of the nature of matter, energy and time.

61 Another result is that the very disciplines that are advancing the fastest, in which therefore there is the most to learn, are rapidly becoming unteachable.

62 There is no doubt that medicine has made giant strides during this last generation.

63 But every experienced teacher of medicine I know wonders whether the young medical school graduate of today — the same one who gets "the best medical education the world has to offer" — is as well taught and as well prepared as his more ignorant predecessor thirty years ago.

64 The reason is simple.

65 Medical schools are still organized around the idea of disciplines as static bundles of knowledge.

66 A hundred years ago, when the modern medical school came into existence in Paris, Vienna and Berlin, there were at most six or seven such "bundles."

67 But there are fifty or more today.

68 Each has become in its own right a full-blown science, which it takes a lifetime to master; even to acquire a smattering of ignorance in any of them takes more than the five years of medical training.

69 This crisis, it should be firmly said, is not the natural result of advancing knowledge as some academicians assert.

70 The natural result of advancing knowledge should be, as it has always been, greater simplicity — and greater ease of understanding, learning and teaching.

71 This is the first, if not the foremost, aim in advancing knowledge.

72 That our knowledge becomes constantly more specialized, more complicated, rather than more general, proves that something essential is lacking — namely a philosophical synthesis appropriate to the world we inhabit and see.

73 What may well be the most serious affliction of this time of philosophical transition is the maddening confusion of tongues among the various disciplines, and the resulting cheapening and erosion of language and style.

74 Each discipline has its own language, its own terms, its own increasingly esoteric symbols.

75 The unity of the universe is gone for twentieth-century man — for the first time, perhaps, since Thomas Aquinas, seven hundred years ago, wove together into one pattern the religious and the secular heritage of Western Christianity.

76 Whenever we try to reestablish such a unity all we can do is to go back to Cartesian, that is to ultrapositivist or mechanistic concepts of the world, which deny the very insights and knowledge that make the unification desirable and indeed necessary.

77 No wonder that the layman is confused, bewildered and sullen.

78 We hear a great deal today about the anti-intellectual public.

79 But what else can the public be if it cannot understand?

80 Yet to understand, it would need the unifying general concepts which the experts themselves do not have.

81 Fortunately we already can foresee — as only a decade or two ago we could not — what form the new integration will take.

82 We can see first what it will not be.

83 It will go beyond and encompass the Cartesian world-view rather than repudiate it.

84 The great shift to the Cartesian world-view became necessary because its predecessor, scholasticism, had become sterile and had ultimately failed.

85 The new worldview, however, has become necessary largely because of the great success of its predecessor, the mechanistic, positivist Cartesian "Science."

86 We are abandoning the whole-parts concept of the Cartesian world-view, its mechanical causality, its inertia axiom.

87 But while modern physics leads us, for instance, to rediscover Aristotle on an entirely new level of understanding, it does not make us any more appreciative of astrology.

88 Modern biology and modern Operations Research make us conscious of the need to accept and to measure quality, value and judgment.

89 They have not made us repudiate strict methods of demonstration and proof or abandon the quest for impersonal measurement.

90 Another negative conclusion: the Cartesian dualism between the universe of matter and the universe of the mind will not be maintained in the new integration.

91 It was never fully accepted in this country.

92 But it was certainly the most potent, as it was the most central, part of Descartes' own system.

93 For three hundred years it has paralyzed philosophy — if not thinking altogether — by creating meaningless but increasingly bitter splits between idealist and positivist, with each building ever-higher spite fences around his own little plot of reality.

94 If there ever was a useful distinction here, it ceased to be meaningful the day the first experimenter discovered that by the very act of observing phenomena he affected them.

95 Today our task is to understand patterns of physical, biological, psychological and social order in which mind and matter become meaningful precisely because they are reflections of a greater unity.

96 We can also say affirmatively what the new integration needs to be.

97 It must give us a concept of the "whole" as a universal and yet specific reality — whether it be "system," "organism" or "situation."

98 We need a discipline rather than a vision, a strict discipline of qualitative and irrevocable changes such as development, growth or decay.

99 We need rigorous methods for anticipation of such changes.

100 We need a discipline that explains events and phenomena in terms of their direction and future state rather than in terms of cause — a calculus of potential, you might say, rather than one of probability.

101 We need a philosophy of purpose, a logic of quality and ways to measure qualitative change.

102 We need a methodology of potential and opportunity, of turning points and critical factors, of risk and uncertainty, constant and timing, "jump" and continuity.

103 We need a dialectic of polarity in which unity and diversity are defined as simultaneous and necessary poles of the same essence.

104 This may sound like a big order — and one we are as yet far from being able to fill.

105 Yet we may well have the new synthesis more nearly within our grasp than we think.

106 On it are based powers we already exercise: the power to innovate, and the power to harmonize individual and society in a new dynamic order.

107 If there is one thing we have learned, it is the truth of the old injunction of the seventh-grade mathematics teacher: Don't worry about getting the right answer; what matters is setting up the right problem.

108 In philosophy, science and methodology — and even more perhaps in art — a problem begins to be solved the moment it can be defined, the moment the right questions are being asked, the moment the specifications are known which the answers must satisfy.

109 For then we know what we are looking for, what fits and what is relevant.

110 And that, in one after another of the areas of human endeavor, we already know.

111 *Knowledge industries, knowledge work and knowledge worker*

112 "The terms knowledge industries, knowledge work and knowledge worker are nearly fifty years old.

113 They were coined around 1960, simultaneously but independently – the first by a Princeton economist, Fritz Machlup, the second and third by this writer.

114 Now everyone uses them, but as yet hardly anyone understands their implications for human values and human behavior, for managing people and making them productive, for economics, and for politics.

115 What is already clear, however, is that the emerging knowledge society and knowledge economy will be radically different from the society and economy of the late twentieth century." Chapter 4, *Management, Revised Edition*

116 *[Transformations in Western History]*

117 EVERY FEW HUNDRED YEARS in Western history there occurs a sharp transformation.

118 We cross what in an earlier book (*The New Realities* (1989)).

119 I called a "divide."

120 Within a few short decades, society rearranges itself – its worldview; its basic values; its social and political structure; its arts; its key institutions.

121 Fifty years later, there is a new world.

122 And the people born then cannot even imagine the world in which their grandparents lived and into which their own parents were born.

123 We are currently living through just such a transformation.

124 It is creating the post-capitalist society, which is the subject of this book.

125 skipping forward

126 WITHIN ONE HUNDRED FIFTY YEARS, from 1750 to 1900, capitalism and technology conquered the globe and created a world civilization.

127 Neither capitalism nor technical innovations were new; both had been common, recurrent phenomena throughout the ages, in West and East alike.

128 What was brand new was their speed of diffusion and their global reach across cultures, classes, and geography.

129 And it was this speed and scope that converted capitalism into "Capitalism" and into a "system," and technical advances into the "Industrial Revolution."

130 This transformation was driven by a radical change in the meaning of knowledge.

131 In both West and East, knowledge had always been seen as applying to being.

132 Then, almost overnight, it came to be applied to doing.

133 It became a resource and a utility.

134 Knowledge had always been a private good.

135 Almost overnight it became a public good.

136 For a hundred years–during the first phase–knowledge was applied to tools, processes, products.

137 This created the Industrial Revolution.

138 But it also created what Karl Marx (1818-1883) called "alienation," new classes and class war, and with them Communism.

139 In its second phase, beginning around 1880 and culminating around the end of World War II, knowledge in its new meaning came to be applied to work.

140 This ushered in the Productivity Revolution, which in seventy-five years converted the proletarian into a middle-class bourgeois with near-upper-class income.

141 The Productivity Revolution thus defeated class war and Communism. …

142 The last phase began after World War II.

143 Today, knowledge is being applied to knowledge itself.

144 This is the **Management Revolution**.

145 Knowledge is now fast becoming the sole factor of production, sidelining both capital and labor.

146 It may be premature (and certainly would be presumptuous) to call ours a "knowledge society"; so far, we have only a knowledge economy.

147 But our society is surely "post-capitalist." …

148 Capitalism, in one form or another, has occurred and reoccurred many times throughout the ages, in the East as well as in the West .

149 And there have been numerous earlier periods of rapid technical invention and innovation—again in the East as well as the West—many of them producing technical changes fully as radical as any in the late eighteenth or early nineteenth centuries. *[1]

150 What is unprecedented and unique about the developments of the last two hundred fifty years is their speed and scope.

151 Instead of being one element in society, as all earlier capitalism had been, Capitalism – with a capital C – became society.

152 Instead of being confined, as always before, to a narrow locality, Capitalism – again with a capital C – took over all of Western and Northern Europe in a mere one hundred years, from 1750 to 1850.

153 Then, within another fifty years, it took over the entire inhabited world.

154 All earlier capitalism had been confined to small, narrow groups in society.

155 Nobles, landowners, the military, peasants, professionals, craftsmen, even laborers, were almost untouched by it.

156 Capitalism with a capital C soon permeated and transformed all groups in society wherever it spread.

157 From earliest times in the Old World, new tools, new processes, new materials, new crops, new techniques–what we now call "technology"–diffused swiftly.

158 Few modern inventions, for instance, spread as fast as a thirteenth-century one: eyeglasses.

159 Derived from the optical experiments of an English Franciscan friar, Roger Bacon (d.1292 or 1294), around 1270, reading glasses for the elderly were in use at the papal court of Avignon by 1290, at the Sultan's court in Cairo by 1300, and at the court of the Mongol emperor of China no later than 1310.

160 Only the sewing machine and the telephone, fastest–spreading of all nineteenth-century inventions, moved as swiftly.

161 But earlier technological change almost without exception remained confined to one craft or one application.

162 It took another two hundred years — until the early 1500s —before Bacon's invention had its second application: eyeglasses to correct nearsightedness.

163 The potter's wheel was in full use in the Mediterranean by 1500 B.C.; pots for cooking, and for storing water and food, were available in every household.

164 Yet the principle underlying the potter's wheel was not applied until A.D. 1000 to women's work: spinning.

165 Similarly, the redesign of the windmill around the year 800, which converted it from the toy it had been in antiquity into a true machine (and a fully "automated" one at that), was not applied to ships for more than three hundred years, after 1100.

166 Until then, ships used oars; if wind was used at all to propel them, it was as an auxiliary power, and then only if it blew in the right direction.

167 The sail that drives a ship works exactly the same way as the sail that drives the windmill, and the need for a sail that would enable a ship to sail cross-wind and against the wind had been known for a long time.

168 The windmill was redesigned in Northern France or in the Low Countries, both regions thoroughly familiar with ships and navigation.

169 Yet it did not occur to anyone for several hundred years to apply something invented to pump water and to grind corn–for use on land–to use offshore.

170 The inventions of the Industrial Revolution, however, were immediately applied across the board, and across all conceivable crafts and industries.

171 They were immediately seen as *technology*.

172 James Watt's (1736-1819) redesign of the steam engine between 1765 and 1776 made it into a cost-effective provider of power.

173 Watt himself throughout his own productive life focused on one use only: to pump water out of a mine–the use for which the steam engine had first been designed by Thomas Newcomen in the early years of the eighteenth century.

174 But one of England's leading iron-masters immediately saw that the redesigned steam engine could also be used to blow air into a blast furnace and bid for the second engine Watt had built.

175 And Watt's partner, Matthew Boulton (1728-1809), right away promoted the steam engine as a provider of power for all kinds of industrial processes, especially the largest of all manufacturing industries, textiles.

176 Thirty-five years later an American, Robert Fulton (1765-1815), floated the first steamship on New York's Hudson River.

177 Another twenty years later the steam engine was put on wheels and the locomotive was born.

178 And by 1840–or at the very latest 1850–the steam engine had transformed every single manufacturing process from glassmaking to printing.

179 It had transformed long-distance transportation on land and sea, and it was beginning to transform farming.

180 By then, it had penetrated almost the entire world–Tibet, Nepal, and the interior of tropical Africa being the sole exceptions.

181 The nineteenth century believed–and most people still believe–that the Industrial Revolution was the first time a change in the "mode of production" (to use Karl Marx's term) changed social structure and created new classes, the capitalist and the proletarian.

182 But this belief, too, is invalid.

183 Between 700 and 1100 A.D. , two brand-new classes were created in Europe by technological change: those of the feudal knight and the urban craftsman.

184 The knight was created by the invention of the stirrup–an invention that arose in Central Asia around the year 700; the craftsman by the redesign of water wheel and windmill into true machines which, for the first time, used inanimate forces (water and wind) as motive power rather than human muscle.

185 The stirrup made it possible to fight on horseback; without it, a rider wielding lance, sword, or heavy bow would immediately have been thrown off his horse by the force of Newton's Second Law: "To every action there is an equal and opposite reaction."

186 For several hundred years, the knight remained an invincible "fighting machine."

187 But this machine had to be supported by a "military-agricultural complex"–something quite new in history.

188 Germans until this century called it a *Rittergut*, a knight's estate, endowed with legal status and economic and political privileges, and containing at least fifty peasant families or some two hundred people to produce the food needed to support the fighting machine: the knight, his squire, his three horses, and his twelve to fifteen grooms.

189 The stirrup, in other words, created feudalism.

190 The craftsman of antiquity had been a slave.

191 The craftsman of the first "machine age," the craftsman of Europe's Middle Ages, became the urban ruling class, the "burgher," who then created Europe's unique city, and both the Gothic and the Renaissance styles that followed.

192 The technical innovations — stirrup, water wheel, and windmill — traveled throughout the entire Old World, and fast.

193 But the classes of the earlier industrial revolution remained European phenomena on the whole.

194 Only in Japan, around 1100 A.D. , did proud and independent craftsmen evolve, who enjoyed high esteem and, until 1600, considerable power.

195 But while the Japanese adopted the stirrup for riding, they continued to fight on foot.

196 The rulers in rural Japan were the commanders of foot soldiers — the *daimyo*.

197 They levied taxes on the peasantry but had no feudal estates.

198 In China, in India, in the world of Islam, the new technologies had no social impact whatever.

199 Craftsmen in China remained serfs without social status.

200 The military did not become landowners but remained, as in Europe's antiquity, professional mercenaries.

201 Even in Europe, the social changes generated by this early industrial revolution took almost four hundred years to take full effect.

202 By contrast, the social transformation of society brought about by Capitalism and Industrial Revolution took less than a hundred years to become fully effective in Western Europe.

203 In 1750, capitalists and proletarians were still marginal groups; in fact, proletarians in the nineteenth-century meaning of the term, that is, factory workers, hardly existed at all.

204 By 1850, capitalists and proletarians were the dynamic classes of Western Europe, and were on the offensive.

205 They rapidly became the dominant classes wherever capitalism and modern technology penetrated.

206 In Japan, the transformation took less than thirty years, from the Meiji Restoration in 1867 to the war with China in 1894.

207 It took not much longer in Shanghai and Hong Kong, Calcutta and Bombay, or in the tsars' Russia. ¶¶¶

208 Capitalism and the Industrial Revolution — because of their speed and their scope — created a world civilization. *[2]

209

210 [1] The best discussion of capitalism as a recurrent and fairly frequent phenomenon can be found in two works by the great French economic historian Fernand Braudel:

211 *The Mediterranean* (2 vols., first published in France in 1949 English translation, New York: Harper & Row, 1972);

212 and *Civilization and Capitalism* (3 vols., first published in France in 1979; English translation, New York: Harper & Row, 1981).

213 The best discussions of earlier "industrial revolutions" are *Medieval Technology and Social Change*, by Lynn White, Jr. (Oxford University Press, 1962);

214 *The Medieval Machine: The Industrial Revolution of the Middle Ages*, by Jean Gimpel (first published in France in 1975; English translation, New York: Holt, Rinehart & Winston, 1976); and

215 the monumental *Science and Civilization in China* by the British biochemist, orientalist, and historian Joseph Needham (Cambridge University Press), publication of which began in 1954 with half of the planned twenty-five parts yet to appear.

216 What Needham has published so far has already completely changed our knowledge of early technology.

217 For earlier "industrial revolutions " see also my *Technology, Management and Society* (1973), especially Chapters 3, 7, and 11.

218 [2] The best history of this development is *Prometheus Unbound*, by the Harvard historian David S. Landes (Cambridge University Press, 1969).

219 *The New Meaning Of Knowledge*

220 Unlike those "terrible simplifiers," the nineteenth-century ideologues such as Hegel and Marx, we now know that major historical events rarely have just one cause and just one explanation.

221 They typically result from the convergence of a good many separate and independent developments. …

222 jumping forward

223 *The Management Revolution*

224 When I decided in 1926 not to go to college but to go to work after finishing secondary school, my father was quite distressed; ours had long been a family of lawyers and doctors.

225 But he did not call me a "dropout."

226 He did not try to change my mind.

227 And he did not prophesy that I would never amount to anything.

228 I was a responsible adult wanting to work as an adult.

229 Some thirty years later, when my son reached age eighteen, I practically forced him to go to college.

230 Like his father, he wanted to be an adult among adults.

231 Like his father, he felt that in twelve years of sitting on a school bench he had learned little, and that his chances of learning more by spending another four years on a school bench were not particularly great.

232 Like his father at that age, he was action-focused, not learning-focused.

233 And yet by 1958, thirty-two years after I had moved from high school graduate to trainee in an export firm, a college degree had become a necessity.

234 It had become the passport to careers.

235 Not to go to college in 1958 was “dropping out” for an American boy who had grown up in a well-to-do family and done well in school.

236 My father did not have the slightest difficulty in finding a trainee job for me in a reputable merchant house.

237 Thirty years later, such firms would not have accepted a high school graduate as a trainee; they would all have said, “Go to college for four years—and then you probably should go on to graduate school.”

238 In my father's generation (he was born in 1876), going to college was for the sons of the wealthy and a very small number of poor but exceptionally brilliant youngsters (such as he had been).

239 Of all the American business successes of the nineteenth century, only one went to college: J. P. Morgan went to Göttingen to study mathematics, but dropped out after one year.

240 Few of the others even attended high school, let alone graduated from it.*[1]

241 By my time, going to college was already desirable; it gave one social status.

242 But it was by no means necessary nor much help in one's life and career.

243 When I did the first study of a major business corporation, General Motors †[2], the public relations department at the company tried very hard to conceal the fact that a good many of their top executives had gone to college.

244 The proper thing then was to start as a machinist and work one's way up.†[3]

245 As late as 1950 or 1960, the quickest route to a middle-class income—in the United States, in Great Britain, in Germany (though no longer in Japan)—was not to go to college; it was to go to work at age sixteen in one of the unionized mass production industries.

246 There one could earn a middle-class income after a few months—the result of the productivity explosion.

247 Today these opportunities are practically gone.

248 Now there is practically no access to a middle-class income without a formal degree which certifies to the acquisition of knowledge that can only be obtained systematically and in a school.

249 The change in the meaning of knowledge that began two hundred fifty years ago has transformed society and economy.

250 Formal knowledge is seen as both the key personal and the key economic resource.

251 In fact, knowledge is the only meaningful resource today.

252 The traditional "factors of production"—land (i. e., natural resources), labor, and capital—have not disappeared, but they have become secondary.

253 They can be obtained and obtained easily, provided there is knowledge.

254 And knowledge in this new sense means knowledge as a utility, knowledge as the means to obtain social and economic results.

255 These developments, whether desirable or not, are responses to an irreversible change: knowledge is now being applied to knowledge.

256 This is the third and perhaps the ultimate step in the transformation of knowledge.

257 Supplying knowledge to find out how existing knowledge can best be applied to produce results is, in effect, what we mean by management.

258 But knowledge is now also being applied systematically and purposefully to define what new knowledge is needed, whether it is feasible, and what has to be done to make knowledge effective.

259 It is being applied, in other words, to systematic innovation. *[4]

260 This third change in the dynamics of knowledge can be called the "Management Revolution."

261 Like its two predecessors— knowledge applied to tools, processes, and products, and knowledge applied to human work—the Management Revolution has swept the earth.

262 It took a hundred years, from the middle of the eighteenth century to the middle of the nineteenth century, for the Industrial Revolution to become dominant and worldwide.

263 It took some seventy years, from 1880 to the end of World War II, for the Productivity Revolution to become dominant and world-wide.

264 It has taken less than fifty years—from 1945 to 1990—for the Management Revolution to become dominant and worldwide.

265 Most people when they hear the word "management" still hear "business management."

266 Management did indeed first emerge in its present form in large-scale business organizations.

267 When I began to work on management some fifty years ago, I too concentrated on business management. †[5]

268 But we soon learned that management is needed in all modern organizations.

269 In fact, we soon learned that it is needed even more in organizations that are not businesses, whether not-for-profit but non-governmental organizations (what in this book I propose we call the "social sector") or government agencies.

270 These organizations need management the most precisely because they lack the discipline of the “bottom line” under which business operates.

271 That management is not confined to business was recognized first in the United States.

272 But it is now becoming accepted in every developed country.

273 We now know that management is a generic function of all organizations, whatever their specific mission.

274 It is the generic organ of the knowledge society.

275 Management has been around for a very long time.

276 I am often asked whom I consider the best or the greatest executive.

277 My answer is always: “The man who conceived, designed, and built the first Egyptian Pyramid more than four thousand years ago—and it still stands.”

278 But management as a specific kind of work was not seen until after World War I—and then by just a handful of people.

279 Management as a discipline only emerged after World War II.

280 As late as 1950, when the World Bank began to lend money for economic development, the word “management” was not even in its vocabulary.

281 In fact, while management was invented thousands of years ago, it was not discovered until after World War II.

282 One reason for its discovery was the experience of World War II itself, and especially the performance of American industry.

283 But perhaps equally important to the general acceptance of management has been the performance of Japan since 1950.

284 Japan was not an "underdeveloped" country after World War II but its industry and economy were almost totally destroyed, and it had practically no domestic technology.

285 The nation's main resource was its willingness to adopt and adapt the management which the Americans had developed during World War II (and especially training).

286 Within twenty years—from the 1950s, when the American occupation of Japan ended, to the 1970s—Japan became the world's second economic power, and a leader in technology.

287 When the Korean War ended in the early 1950s, South Korea was left even more devastated than Japan had been seven years earlier.

288 And it had never been anything but a backward country, especially as the Japanese systematically suppressed Korean enterprise and higher education during their thirty-five years of occupation.

289 But by using the colleges and universities of the United States to educate their able young people, and by importing and applying the concepts of management, Korea became a highly developed country within twenty-five years.

290 With this powerful expansion of management came a growing understanding of what management really means.

291 When I first began to study management, during and immediately after World War II, a manager was defined as "someone who is responsible for the work of subordinates."

292 A manager in other words was a “boss,” and management was rank and power.

293 This is probably still the definition a good many people have in mind when they speak of “managers” and “management.”

294 But by the early 1950s, the definition of a manager had already changed to one who “is responsible for the performance of people.”

295 Today, we know that that is also too narrow a definition.

296 The right definition of a manager is one who “is responsible for the application and performance of knowledge.”

297 This change means that we now see knowledge as the essential resource.

298 Land, labor, and capital are important chiefly as restraints.

299 Without them, even knowledge cannot produce; with out them, even management cannot perform.

300 But where there is effective management, that is, application of knowledge to knowledge, we can always obtain the other resources.

301 That knowledge has become the resource, rather than a resource, is what makes our society “post-capitalist.”

302 This fact changes—fundamentally—the structure of society.

303 It creates new social and economic dynamics.

304 It creates new politics.

305

306 [1] (In the novels of Edith Wharton, the chronicler of American society around 1910 and 1920, the sons of the old and rich New York families do go to Harvard and to Harvard Law School, but practically none of them then practices law. Higher education was considered a luxury, an ornament, and a pleasant way to spend one's early adulthood.)

307 [2] † Published in Concept of the Corporation (1946))

308 [3] †The story is told in the chapter "Alfred P. Sloan" in Adventures of a Bystander (1980, reissued 1991)

309 [4] For more on this, see my Innovation and Entrepreneurship (1986)

310 [5] † In The Practice of Management, which first established management as a discipline in 1954, most of the discussion is of business management, and so are most examples

311 *From Knowledge To Knowledges*

312 Underlying all three phases in the shift to knowledge—the Industrial Revolution, the Productivity Revolution, and the Management Revolution—is a fundamental change in the meaning of knowledge.

313 We have moved from knowledge in the singular to knowledges in the plural.

314 Traditional knowledge was general.

315 What we now consider knowledge is of necessity highly specialized.

316 We never before spoke of a “man (or woman) of knowledge”; we spoke of an “educated person.”

317 Educated people were generalists.

318 They knew enough to talk or write about a good many things, enough to understand a good many things.

319 But they did not know enough to do any one thing.

320 As an old saying has it: You would want an educated person as a guest at your dinner table, but you would not want him or her alone with you on a desert island, where you need somebody who knows how to do things.

321 But in today’s university the traditional “educated people” are not considered “educated” at all.

322 They are looked down on as dilettantes.

323 The Connecticut Yankee at King Arthur’s Court, the hero of the 1889 book by Mark Twain, was not an educated person.

324 He surely knew neither Latin nor Greek, had probably never read Shakespeare, and did not even know the Bible well.

325 But he knew how to do everything mechanical, up to and including generating electricity and building telephones.

326 The purpose of knowledge for Socrates, as said earlier, was self-knowledge and self-development; results were internal.

327 For his antagonist, Protagoras, the result was the ability to know what to say and to say it well.

328 It was “image,” to use a contemporary term.

329 For more than two thousand years, Protagoras's concept of knowledge dominated Western learning and defined knowledge.

330 The medieval trivium, the educational system that up to this day underlies what we call a "liberal education," consisted of grammar, logic, and rhetoric—the tools needed to decide what to say and how to say it.

331 They are not tools for deciding what to do and how to do it.

332 The Zen concept of knowledge and the Confucian concept of knowledge—the two concepts that dominated Eastern learning and Eastern culture for thousands of years—were similar.

333 The first focused on self-knowledge; the second—like the medieval trivium—on the Chinese equivalents of grammar, logic, and rhetoric.

334 The knowledge we now consider knowledge proves itself in action.

335 What we now mean by knowledge is information effective in action, information focused on results.

336 These results are seen outside the person—in society and economy, or in the advancement of knowledge itself.

337 To accomplish anything, this knowledge has to be highly specialized.

338 This was the reason why the tradition—beginning with the ancients but still persisting in what we call "liberal education"—relegated it to the status of a technē, or craft.

339 It could neither be learned nor taught; nor did it imply any general principle whatever.

340 It was specific and specialized-experience rather than learning, training rather than schooling.

341 But today we do not speak of these specialized knowledges as “crafts”; we speak of “disciplines.”

342 This is as great a change in intellectual history as any ever recorded. ¶¶¶

343 A discipline converts a “craft” into a methodology—such as engineering, the scientific method, the quantitative method, or the physician’s differential diagnosis.

344 Each of these methodologies converts ad hoc experience into system.

345 Each converts anecdote into information.

346 Each converts skill into something that can be taught and learned. «§§§»

347 The shift from knowledge to knowledges has given knowledge the power to create a new society.

348 But this society **has to be structured on the basis** of knowledge as something specialized, and of knowledge people as specialists.

349 **This is what gives them their power**.

350 But it also raises basic questions—of values, of vision, of beliefs, of all the things that hold society together and give meaning to our lives.

351 As the last chapter of this book will discuss, it also raises a big—and a new-question: what constitutes the educated person in the society of knowledges?

352 *4 FEB – Knowledge and Technology*

353 The search for knowledge, as well as the teaching thereof, has traditionally been dissociated from application.

354 Both have been organized by subject, that is, according to what appeared to be the logic of knowledge itself.

355 The faculties and departments of the university, its degrees, its specializations, indeed the entire organization of higher learning, have been subject-focused.

356 They have been, to use the language of the experts on organization, based upon “product,” rather than on “market” or “end use.”

357 Now we are increasingly organizing knowledge and the search for it around areas of application rather than around the subject areas of disciplines.

358 Interdisciplinary work has grown everywhere.

359 This is a symptom of the shift in the meaning of knowledge from an end in itself to a resource, that is, a means to some result.

360 Knowledge as the central energy of a modern society exists altogether in application and when it is put to work.

361 **Work**, however, cannot be defined in terms of the disciplines.

362 End results are interdisciplinary of necessity.

363 *The Daily Drucker*

364 *Technologies and End-Users Are Fixed and Given*

365 Four major assumptions, as said at the beginning of this chapter, have been underlying the *practice* of management all along—in fact, for much longer than there has been a *discipline* of management.

366 The assumptions about technology and end-users underlie, to a very large extent, the rise of modern business and of the modern economy altogether.

367 They go back to the very early days of the Industrial Revolution.

368 When the textile industry first developed, out of what had been cottage industries, it was assumed—and with complete validity—that the textile industry had its own unique technology.

369 The same was true in respect to coal mining and any of the other industries that arose in the late eighteenth century and the first half of the nineteenth century.

370 The first one to understand this and to base a major enterprise on it was also one of the first men to develop what we would today call a modern business, the German Werner Siemens (1816-1892).

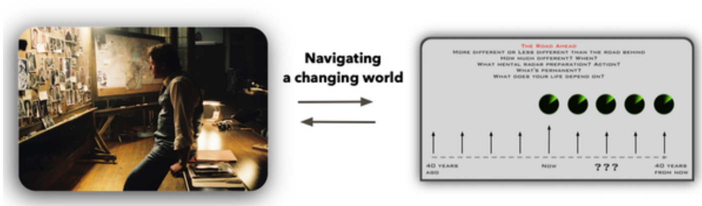
371 It led him, in 1869, to hire the first university trained scientist to start a modern research lab—devoted exclusively to what we would now call electronics, and based on a clear understanding that electronics (in those days called "low-voltage") was distinct and separate from all other industries and had its distinct and separate technology.

372 Out of the insight that technologies and their end-uses are distinct, grew not only Siemens's own company with its own research lab, but also the German chemical industry, which assumed worldwide leadership because it based itself the assumption that chemistry—and especially organic chemistry—had its own unique technology.

373 Out of it then grew the other major leading companies the world over—the American electrical and chemical companies, the automobile companies the telephone companies, and so on.

374 Out of this insight also grew more of what may well be the most successful invention of the nineteenth century, the research laboratory—the last one, almost a century after Siemens's, the 1950 lab of IBM.

375 **Research Management**

376 

377 Larger ↑

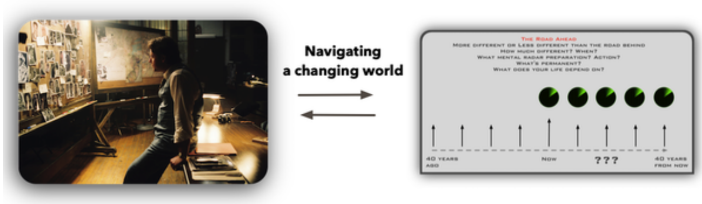
378 At around the same time the research labs of the major pharmaceutical companies emerged as a worldwide industry after World War II.

379 By now, though, the assumptions underlying these successes have become untenable.

380 The best example of this is in the pharmaceutical industry, which increasingly has come to depend on technologies that are fundamentally different from the technologies on which the pharmaceutical research lab is based generics, microbiology, molecular biology, medical electronics, and so on.

381 In the nineteenth century and throughout the first half of the twentieth century, it could be taken for granted that technologies outside one's own industry had no, or at least only minimal, impact on it.

382 *Now the assumption to start with is that the technologies that are likely to have the greatest impact on a company and an industry are technologies outside its own field*. ...

383 

384 The original assumption was, of course, that one's own research lab would and could produce everything the company—or the company's industry—needed.

385 And, in turn, the assumption was that everything that this research lab produced would be used in and by the industry that it served. ...

386 Today's technologies, unlike the nineteenth-century technologies, no longer run in parallel.

387 They constantly *crisscross*, as discussed briefly in chapter 6.

388 Technology that people in their given industries have barely heard of (just as the people in the pharmaceutical industry had never heard of genetics, let alone medical electronics) revolutionizes those industries.

389 Such outside technologies force industries to learn, to acquire, to adapt, to change their very mindset, not to mention their technical knowledge. ...

390 A second assumption that was equally important to the rise of nineteenth and twentieth-century industry and companies was:

391 *End-uses are fixed and given*.

392 For example, for the end-use of putting beer into containers, there is now extreme competition among various suppliers of containers.

393 But at one time all of them were glass companies, and there was only one way of putting beer into containers—put it in a glass bottle.

394 Fixed end-use was accepted as obvious, not only by business, industry, and the consumer, but by governments as well.

395 The American regulation of business rests on the assumptions that to every industry there pertains a unique technology and that to every end-use there pertains a specific and unique product or service.

396 These are the assumptions on which antitrust was based.

397 And to this day antitrust law concerns itself with the domination of the market in glass bottles and pays little attention to the fact that beer increasingly is put not into glass bottles but into cans or plastic bottles.

398 But since World War II end-uses are no longer uniquely tied to a certain product or service.

399 The plastics, of course, were the first major exception to the rule.

400 But by now it is clear that it is not just one material moving in on what was considered the “turf” of another one.

401 Increasingly, the same want is being satisfied by very different means.

402 It is the want that is unique, and not the means to satisfy it.

403 As late as the beginning of World War II, dissemination of news was basically the monopoly of the printed newspaper—an eighteenth-century invention that saw its biggest growth in the early years of the twentieth century.

404 Now there are many competing deliverers of news:

405 the radio, the television, still the printed newspaper, increasingly the same newspaper delivered online through the Internet, separate news organizations that operate only electronically—(as is increasingly the case with economic and business news), and quite a few additional ones.

406 And then there is the new "basic resource" *information*.

407 It differs radically from all other commodities in that it does not stand under the *scarcity* theorem.

408 On the contrary, it stands under an *abundance* theorem.

409 If I sell a thing—for example, a book—I no longer have the book.

410 If I impart information, I still have it.

411 And in fact, information becomes more valuable the more people have it.

412 What this means for economics is well beyond the scope of this chapter, though it is clear that it will force us to radically revise basic economic theory.

413 But it also means a good deal for management.

414 Increasingly, basic assumptions will have to be changed.

415 Information does not pertain exclusively to any industry or to any business.

416 Information also does not have any one end-use, nor does any end-use require or depend upon one particular kind of information.

417 Therefore, management now has to start out with the assumption that there is no one technology that pertains to an industry and that, on the contrary, all technologies are capable—and indeed likely—to be of major importance to any industry and to have impact on any industry.

418 Similarly, management has to start with the assumption that there is no one given end-use for any product or service and that, conversely, no end-use is going to be linked solely to any one product or service.

419 One implication of this is that increasingly the *noncustomers* of an enterprise whether a business, a university, a church, a hospital—are as important as the customers, if not more important.

420 Even the biggest enterprise (other than a government monopoly) has many more noncustomers than it has customers.

421 There are very few institutions that supply as large a percentage of a market as 30 percent.

422 There are, therefore, few institutions where the noncustomers do not amount to at least 70 percent of the potential market.

423 And yet very few institutions know anything about the noncustomers—very few of them even know that they exist, let alone know who they are.

424 And even fewer know why they are not customers.

425 Yet, it is with the noncustomers that changes always start.

426 *The starting point has to be what customers consider value*.

427 The starting point has to be the assumption—an assumption amply proven by all our experience—that the customer never buys what the supplier sells.

428 What is value to the customer is always something quite different from what is value or quality to the supplier.

429 This applies as much to a business as to a university or to a hospital.

430 *Management, in other words, will increasingly have to be based on the assumption that* neither *technology nor end-use is a foundation for management policy.*

431 *They are limitations.*

432 *The foundations have to be customer values and customer decisions on the distribution of their disposable income.*

433 *It is with those that management policy and management strategy increasingly will have to start*.

434 [*Management, Revised Edition*]

435 *9 AUG – Research Laboratory: Obsolete?*

436 about **research management** **!!!!!**

437 What accounts for the decline in the number of major corporate research labs?

438 The company-owned research laboratory was one of the nineteenth century's most successful inventions.

439 Now many research directors, as well as high-tech industrialists, tend to believe that such labs are becoming obsolete.

440 Why?

441 Technologies crisscross industries and travel incredibly fast, making few of them unique anymore.

442 And increasingly, the knowledge needed in a given industry comes out of some totally different technology with which, very often, the people in the industry are quite unfamiliar.

443 As a result the big research labs of the past are becoming obsolete.

444 The research laboratory of the big telephone companies, the famous Bell Laboratories of the U.S., was for many decades the source of all major innovations in the telephone industry.

445 But no one in that industry worked on fiberglass cables or had **ever heard of them**.

446 They were developed by a glass company, Corning.

447 Yet they have revolutionized communications worldwide.

448 *The Daily Drucker*

449 *20 JUL – New Knowledge*

450 New knowledge is not the most reliable or most predictable source of successful innovations.

451 Purposeful innovation

452 For all the visibility, glamour, and importance of science-based innovation, it is actually the least reliable and least predictable one.

453 Knowledge-based innovation has the longest lead-time of any innovation.

454 First, there is **a long time span** between the emergence of new knowledge, and it’s becoming applicable to technology.

455 And then there is **another long period** before the new technology turns into products, processes, or services in the marketplace.

456 The introduction of innovation creates excitement and **attracts a host of competitors**, meaning that innovators **have to be right the first time**.

457 They are **unlikely to get a second chance**.

458 Here, even successful innovators almost immediately have far more company than they want and must prepare themselves to weather the storm that lies ahead.

459 For example, Apple Computer invented the personal computer.

460 IBM was able to wrest market leadership from Apple through creative imitation.

461 Apple failed to maintain its leadership position and became a niche player because it failed to predict and respond to the competition it would face.

462 In the theory and practice of innovation and entrepreneurship, the bright-idea innovation belongs in the appendix.

463 But it should be appreciated and rewarded.

464 It represents qualities that society needs: initiative, ambition, and ingenuity.

465 *The Daily Drucker*

466 How do you make these ideas operational?

467 About humor, hindsight and insight, creativity and lateral thinking, lateral thinking as process, judgment and provocation, the word "Po", the stepping stone method, the escape method, the random stimulation method, general use of lateral thinking, the logic of lateral thinking → here