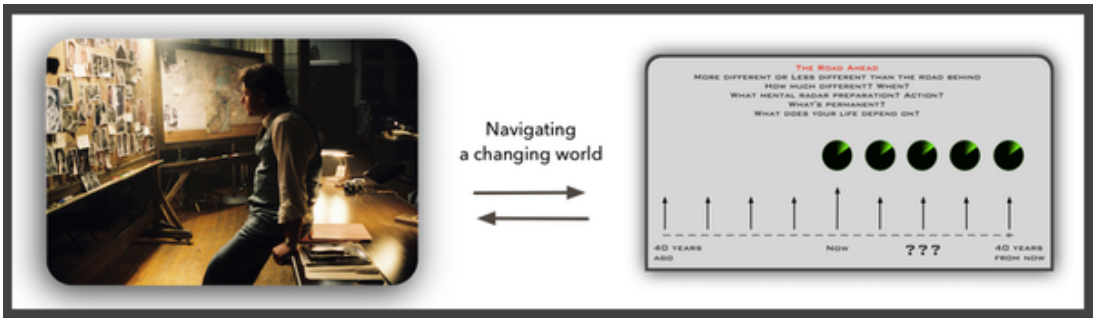
CHAPTER TWO

From Progress to innovation

From Peter Drucker's *Landmarks of Tomorrow*

See conditions for survival and then search that page for the word stem "innovat" to observe the many different contexts within which the innovation concept can be seen.



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1 The New Perception Of Order

Where is "inevitable progress" now?

Only a generation ago, despite the shock of the First World War, the belief in history's built-in progression was still ingrained.

The Frenchmen of the generation of Briand and Herriot believed in it, as did the well-meaning Social Democrats of the Weimar Republic, the English middle class that flocked to the "Left-Wing Book Club" in the thirties and the Liberals who then dominated the American university faculties. ¶¶¶

Today the very expression sounds odd-half macabre mockery, half plain foolishness.

Occasionally a faint rumble of the old belief echoes in the set phrases of political rhetoric; but these are the phrases the city editor cuts out first when he prepares the speech for newspaper publication.

Only the truly convinced Communist doctrinaires still profess belief in the historic inevitability of progress.

But what they mean is the inevitability of universal cataclysm.

And that, one suspects, is truly hoped for only by the old men now on top, men whose beliefs were formed thirty or more years ago.

Even in their mouths it has a hollow, archaic ring—somewhat of a piece with their stubborn clinging to Edwardian ornament or "*Jugendstil*" in architecture, late-'Wagnerian self-intoxication in music, and pre-Impressionist monumental painting. ¶¶¶

As for the rest of us, including, all evidence indicates, most of the younger leaders in the Communist countries, we no longer accept the blithe optimism of "inevitable progress," nor its blind denial of the tragic in human life and the evil in human nature.

We no longer believe that anything happens automatically except perhaps trouble.

We are no longer sure of the direction we are going, let alone of the destination we are bound for. ¶¶¶

But do we believe in anything? ¶¶¶

No answer can be found in what we say and write.

There everything is confusion, doubt, contradiction.

But a clear, though unexpected answer is found in our deeds.

We do not, indeed, believe any more in the inevitability, let alone the automaticity, of progress.

But we practice innovation—purposeful, directed, organized change. ¶¶¶

Innovation, as we now use the term, is based on the systematic, organized "leap into the unknown."

Its aim is to give us new power for action through a new capacity to see, a new vision.

Its tools are scientific; but its process is of the imagination, its method the organization of ignorance rather than that of known facts. ¶¶¶

The impact of this new power on our lives is already great.

It changes our technology and gives us new opportunities to make technological advance to order.

It is giving us an altogether new ability for nontechnological innovation in society and economy. ¶¶¶

Old basic institutions of human society—the government, the armed forces, the school—have been converted from organs of preservation into organs of innovation.

And new institutions expressly designed for innovation, such as business enterprise and research organization, have become of central importance. ¶¶¶

But innovation is more than a new method.

It is a new view of the universe, as one of risk rather than of chance or of certainty.

It is a new view of man's role in the universe; he creates order by taking risks.

And this means that innovation, rather than being an assertion of human power, is an acceptance of human responsibility.

The Research Explosion

The visible expression of this new belief in innovation is the activity aimed at producing new knowledge that we call "research."

With the belief in progress in collapse, research, one should have expected, would slow down, perhaps even disappear.

Instead there has been a research explosion. ¶¶¶

Within the last thirty years expenditures on technological research in American industry have risen about seventy-fold, from less than $100 million a year in 1928 to $7 billion or more today.

This represents only nonmilitary research on new technologies, new products and new processes for the civilian economy.

From being a marginal factor, industrial research has become a powerhouse of economic energy.

From being confined to a few large companies in a few highly technological industries such as electrical engineering or chemicals, it has become general-pursued alike by small and large business, by old or new industries.

46 Proportionately industrial research expenditures have grown faster than any other item in the nation's budget, excepting only military research.

47 Industrial research took 0.1 per cent of national income thirty years ago; today it takes almost 2 per cent of an income four times as large.

48 There is little doubt that the trend is toward continued further growth, both absolutely and in terms of national income. ¶¶¶

49 This is by no means a uniquely American development.

50 It is closely paralleled in Great Britain—the only other country for which figures are published.

51 In Switzerland and West Germany the trend has been the same.

52 One large Dutch business concern, Philips, has increased its research efforts fiftyfold during this period despite depression, war and enemy occupation.

53 Even in Soviet Russia industrial nonmilitary research has been expanding fast in the last few years—though the Russian economy, except for military purposes, is still largely imitative. ¶¶¶

54 Nor has the explosive expansion of research effort and expenditures been confined to economy and business.

55 Medical research expenditures have probably increased even faster.

56 We all know the story of research in military technology; it has changed warfare more in the last fifteen years than it had been changed in the century before.

57 Nontechnological research and inquiry, aimed at social innovation, which were almost unknown thirty years ago, are also growing to major proportions: organized research into accounting concepts or educational methods, into hospital administration, theories of organization or marketing practices. ¶¶¶

58 Only a few years ago *Punch*, the English comic weekly, commented on the new "fad" by listing the numerous advantages and the one single disadvantage of industrial research.

59 Among its main advantages were these: ¶¶¶

60 It does no harm. ¶¶¶

61 It reduces unemployment. ¶¶¶

62 Visitors and shareholders alike are impressed by the sight of so much science and the smell of hydrogen sulfide. ¶¶¶

63 One of these days someone may find something that will make all the difference in your business.

64 At least according to statistics this is not altogether impossible. ¶¶¶

65 Scientists are nice quiet lads without vice. ¶¶¶

66 The only real disadvantage is *cash*. ¶¶¶

67 *Punch* went on to say that it could not visualize any businessman comparing these advantages with the one slight impediment and remaining long in doubt what to do.

68 After all, money is not everything. ¶¶¶

69 When this comment appeared there were already many readers who did not think it funny—who, on the contrary, thought that the attitude behind it was the real reason why Great Britain had lost her economic leadership.

70 Today there would be few who did not feel that the joke, if any, was on *Punch*.

Man and Change

In the shift from yesterday's "progress" to today's "innovation" the new post-Cartesian, postmodern world-view finds its clearest expression.

And in the new capacity to aim at and to bring about innovation—however crude and primitive it still may be—the new concepts of pattern and purposeful process have first become effective and operational. ¶¶¶

Innovation views change as controlled, directed and purposeful human activity. ¶¶¶

This is a new view, different alike from the traditional as well as from the "progress" view of change.

However sharply opposed in other respects, both considered change as uncontrollable; if purposeful at all, its direction and purpose were outside and beyond man. ¶¶¶

Man has of course always lived in change.

Consciousness of impermanence, of becoming and passing, and the faculty to adapt to both, are among his most distinct traits.

Yet throughout most of history change was considered catastrophe, and immutability the goal of organized human efforts.

All social institutions of man for thousands of years had as their first purpose to prevent, or at least to slow down, the onrush of change.

Family and church, army and state, were built to be ramparts of security against the threat of change.

All through history, "from time immemorial" has been the seal of approval and the hallmark of perfection, the "return to the good old days" the flag in which the very demand for the new had to wrap itself to be respectable. ¶¶¶

Thus the Renaissance, for all its creative energy, for all the great changes it produced, saw itself as a return to the changeless perfection of classical antiquity.

The contemporary Reformation saw itself as a return to the perfection of early Christianity.

Any departure from the ways of the primitive Church was automatically a corruption.

Much later still, the American Revolution justified itself as a restoration of the traditional "rights of Englishmen."

And even after World War I, Europe instinctively aimed at the return to the "golden age" of 1913 rather than toward something new and in the future—which was surely one of the reasons for the resultant catastrophe. ¶¶¶

The belief in inevitable progress reversed this attitude toward change; but it left unaltered the character of change as something outside man—in history, in social forces or in evolution.

All it did, so to speak, was to change the minus sign into a plus sign without changing the equation.

As has often been said, it secularized the Christian view of history as the progression of God's plan; but while the fullness of time was now to be measured by historical periods rather than by the clock of eternity, the process itself was still self-initiated and self-controlled rather than humanly initiated and humanly controlled. ¶¶¶

By contrast we today no longer even understand the question whether change is by itself bad or good.

We start out with the axiom that it is the norm.

We do not see change as altering the order—for better or for worse.

We see change as being order in itself—indeed the only order we can comprehend today is a dynamic, a moving, a changing one.

And because change itself defines any order we can see, change can be anticipated, can be foretold to a considerable extent, and can therefore even be controlled. ¶¶¶

Innovation itself is not new; it has gone on as long as man has existed.

All of man's institutions except the family, all his thoughts, all his art, all his tools, once were innovations, developed consciously and introduced purposefully.

What is new is the view of man as the order-maker, working consistently through the anticipation, control and direction of change. ¶¶¶

Even the idea of organizing innovation is not so very new.

In respect to social innovation it goes back almost two hundred years.

The Northwest Ordnance of 1787, which innovated the pattern of settlement and government for the empty North American Continent, was an early example.

The American Constitution was an essay in purposeful innovation with its concepts—at once so conservative and so radical—of a republic built on all three principles of legitimate rule: of law and courts as the true sovereign; of the simultaneous allegiance of the citizen to Union and to individual state; and of the self-regulation of the system through a prearranged process of constitutional amendment and revision. ¶¶¶

Technological innovation based on science goes back as much as a century.

It was in 1857 that a young Englishman, William Perkin, discovering by accident the first synthetic dyestuff, first set about consciously to apply scientific knowledge to industrial production and thereby became the father not only of science-based industry but of modern technology and of industrial research. ¶¶¶

Among economists Karl Marx was the first perhaps to see the role of the businessman as innovator; to this insight he owes in large measure his power as an economic historian.

But to admit this as meaningful would have destroyed the myth of progress.

Hence Marx explained away his own insight by making the "objective logic of the class situation" the determining factor and dismissing the innovating act as mere self-delusion or conscious deception. ¶¶¶

Today this seems to us incomprehensible.

For we now take innovation for granted, and see change as the norm, instead of the occasional, the extraordinary and often the fearful.

We hardly understand any more the "logic of history" or any other of the conceptual trappings of the age of progress. ¶¶¶

But do we really understand innovation?

Innovation and Knowledge

There is obviously a close link between science and innovation.

Indeed the most common current definition of innovation would be that it is purposeful change by means of the systematic inquiry we call scientific method and of the new knowledge gained thereby.

115 Innovation is clearly a result of the scientific breakthrough, that is of the emergence of scientific method as fundamental method, and of scientific knowledge as a main tool of human and social action. ¶¶¶

116 But things are not quite so simple.

117 One sign of this is the new relationship between pure and applied research in innovation. ¶¶¶

118 Innovation aims at application; its goal is not knowledge in itself but effective change.

119 This would argue for applied research which extends and makes usable pure knowledge as the appropriate tool of innovation.

120 But increasingly we find—in the military, in industry, in society—that pure research has the greatest innovating impact.

121 Today, especially in the United States, we talk a good deal of the mistake of slighting pure research.

122 But contrary to public belief, we are not spending proportionately less effort or less money on pure research than has been spent traditionally.

123 Proportionately we spend a good deal more, since historically pure research was always limited to a mere handful of people in a few universities.

124 Still it is true that we have been slighting pure research as measured against today's innovation needs and opportunities; pure research has simply become the most effective form of applied research. ¶¶¶

125 At the same time applied research too has changed its meaning and character.

126 Just as pure research is increasingly concerned with application, applied research is increasingly concerned with fundamental knowledge, is indeed increasingly productive of new fundamental knowledge.

127 Work on the dosage of antibiotics, for instance, would be considered applied research by any definition.

128 Yet this work raised such fundamental questions as the genetic character of microorganisms, that it produced new fundamental insights into the nature of infection and the body's defenses against it. ¶¶¶

129 The conventional picture of pure and applied research is somewhat analogous to the relationship between radio transmitter and receiving set.

130 The transmitter sends out its signals whether any set is tuned in or not.

131 It is a one-way relationship in which knowledge radiates out to be converted and applied, but where nothing feeds back from application to knowledge. ¶¶¶

132 By contrast innovation assumes a circular process.

133 Application, in trying to make existing fundamental knowledge effective in action, uncovers both needs for new knowledge of a fundamental kind and the necessary insights.

134 «§§§»

135 One example: the application of well-known theoretical statistics to the marketing problems of business uncovered the need both for a fundamental and nonstatistical theory of consumer behavior and motivation and for new fundamental insights needed to go to work on it.

136 The pure research thus stimulated produces not only the necessary fundamental knowledge but new opportunities for new applications and the tools for them—which in

turn uncovers new needs for fundamental knowledge, and so on.[1] ¶¶¶

137 This shift in the relationship—or in our understanding thereof—will change the organization of systematic research and inquiry.

138 We will have to provide for systematic feed-back from applied to pure knowledge.

139 It will have profound impact on the relationship between disciplines and on the education of the people engaged in research and inquiry. ¶¶¶

140 Yet this is only a symptom of something much bigger, though far less tangible: a change in the meaning of "knowledge."

141 In the traditional concept the aim of the systematic search for knowledge was new facts (whatever this slippery metaphysical term might mean).

142 The knowledge derived from innovation and the goal of its systematic, organized, purposeful search is, however, a new vision, a new pattern, a new attitude. ¶¶¶

143 I shall—intentionally—take my examples from the economic rather than from the technological field. ¶¶¶

144 Among the most potent and most visible changes in an industrial economy are the new tools and practices developed for the very old job of selling a product or a service: consumer credit, packaging, advertising, market research, brand promotion, chain stores, supermarkets and discount houses.

145 Within thirty years they have changed the behavior of business, the behavior of consumers, the very face of our towns and cities—and in significant measure the structure of the economy, its strength and vulnerability, and the division of national income. ¶¶¶

146 Yet these are not the real innovations, they are consequences and results of two big changes in basic view.

147 We shifted first from a traditional view of selling as the specialized effort that persuades an individual customer to buy whatever it is the business produces, to one of marketing, which is a business-wide function aiming both at creating customer and market for the company's product and at adapting the product to customer and market.

148 And now we are shifting again from this product-focused to a customer-focused concept which sees marketing as the "demand half" of the economy, that is as the sum of all efforts and activities necessary for the fullest and yet most economical satisfaction of customer wants.

149 «§§§»

150 Obviously each of these views sees the same elements—the market, the product, the customer, the producer, the distributive chain between the two, and so on.

151 But each sees these elements in a different pattern.

152 And it is this view of the pattern that is knowledge and the foundation of innovation, this view of the pattern that creates both the need for new knowledge and new approaches, and the opportunities to develop new tools, new methods and new distributive systems. ¶¶¶

153 Another big change in our economic system during this last generation is the new view of the business enterprise as a human and social organization, the shift that underlies the emergence of human relations, of the new concepts of management and organization, and the rise of such new disciplines as industrial psychology and industrial sociology.

154 Again there were no new facts; indeed all the elements had been known and understood for many years.

155 What was new was a view of the relationship between men at work—the vision of the new

human organization we shall discuss later on in this book. ¶¶¶

Few innovations, whether technological or social, are as sweeping as these.

But even the more modest innovation—the new "major medical expense" insurance policy, for instance, or a new plastic—results from such a new view: of the function of insurance or of the nature of illness as an economic problem for the family; of the structure of large molecules or of textile demand.

If there is no such new view there is no innovation; there is only adaptation. ¶¶¶

But there is also no innovation if the new view is accidental, is entirely hunch or guess rather than the result of a deliberate, systematic organized effort to reach it. ¶¶¶

We believe today that such vision can, in all areas of human knowledge, be aimed at purposefully and brought about systematically.

This is why we believe in innovation.

But are we capable of planning, organizing and working for informed and systematic intuition?

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[1] * This circular relationship would of course always have been a more correct picture than the conventional one-way street—even in that purest of disciplines, theoretical mathematics. What matters here is, however, less which picture is correct, but which is seen, held and understood.

The Power of Organized Ignorance

Sixty years ago the great French physicist Henri Poincaré first pointed out the role of intuitive insight in scientific discovery.

But to Poincaré this was essentially a "flash of genius," unpredictable and indeed subconscious.

All one could do, Poincaré thought, was to train oneself to watch out for it. ¶¶¶

Today we increasingly believe that there is a conscious discipline—already learnable though perhaps not yet teachable—for the imaginative leap into the unknown.

We are developing rigorous method for creative perception.

Unlike the science of yesterday, it is not based on organizing our knowledge.

It is based on organizing our ignorance. ¶¶¶

The best example is an old one which antedates today's innovation by many decades: Mendeleev's formulation, between 1869 and 1872, of the Periodic Table of Chemical Elements—the great creative act of order on which rest both modern physics and modem chemistry.

Mendeleev did not discover a single new element, nor a single new property of any of the then known sixty-three elements.

He did not propound a new theory of elements, their structure or their relations.

He did not, in other words, organize the then existing knowledge and build on it.

All earlier efforts to bring order out of the chaos of nineteenth-century chemistry had tried to do just that; and though great men, such as Lothar Meyer, had spent years on it, they only added confusion.

Mendeleev asked instead: What unknown and as yet undiscovered elements must we assume to make order out of those we know?

179 Science textbooks quite rightly stress that Mendeleev's theory was proven through its power to predict the "blank spaces," the twenty-nine then undiscovered and unknown elements, their weights and their properties.

180 But they rarely stress that it was the blank spaces that ordered the known sixty-three elements rather than the known sixty-three that provided the blanks.

181 It was this organization of ignorance on which the whole tremendous accomplishment rested. ¶¶¶

182 Few achievements can compare with Mendeleev's.

183 Yet on a smaller scale we do today systematically what ninety years ago was an isolated and uncomprehended feat of individual genius.

184 One example is the development of the atomic bomb in the Manhattan Project during World War II.

185 Most nuclear scientists apparently understood right away that Hahn and Meitner by accomplishing nuclear fission had made possible an atomic bomb.

186 But the development of the bomb itself required the systematic organization of our ignorance, the determination of the things that would have to become known, the inference of what they would be and would mean, and the organization of work on each piece of ignorance.

187 Similarly the development of a vaccine against infantile paralysis was conscious and directed innovation based on the organization of ignorance over a twenty-year period.

188 Again the question was: What, that is today unknown, do we have to assume to make order out of the chaos of our fragments of knowledge?

189 What, in other words, are the specifications for future knowledge? ¶¶¶

190 To discuss the various approaches and tools we are developing would go far beyond my purpose here.

191 There is Operations Research for instance.

192 It can be defined as the application of systematic method, especially of logic and mathematics, to risk-taking decisions.

193 It is no accident that its original development in wartime Great Britain started with the idea of putting to work on strategic or weapons problems people who, while possessing rigorously trained minds, had no knowledge of the subject matter.

194 Biologists, psychologists and mathematicians were for instance set to work on the allocation of aircraft or on antisubmarine defense. ¶¶¶

195 There are methods such as "critical-factor analysis" which enable us to say both what new knowledge we need, and what new developments in other, apparently unrelated fields would have meaning for our problem. ¶¶¶

196 We cannot yet build efficient solar-energy plants.

197 But Dr. Kenneth Kingdon of the General Electric Company's Research Laboratory has shown, first, that there is enough solar energy to provide power for every house in the United States; second, how much such energy could cost and yet be competitive; third, that the only feasible system would need devices that do the jobs of photovoltaic cells and storage batteries; and finally, that the cost of these devices would have to be one per cent of present cells and 16 per cent of present batteries.

198 This does not of course give us solar energy.

199 But starting out with what we do not know, we arrive at a specification of what we need to

know.

As a result we can decide whether the project is feasible, what it requires in terms of knowledge, effort, and manpower, and how to allocate our time and money.

It is even possible to predict how long it will take to get the new knowledge, what specific breakthroughs we need and where they might come from. ¶¶¶

But the essential things are not the new tools but the new concept.

It assumes that there is order—order in the universe, order to our imagination and order in the development of knowledge.

It further assumes that this order is one of pattern, so that it can be perceived before it is known.

It assumes that this perception of order is the basis of innovation.

It finally assumes that we can "leap-frog" to this perception through the systematic organization of our ignorance from which we then can develop the necessary new specific knowledge and tools.

2 . The Power of Innovation

Innovation adds; it does not replace.

It cannot and will not take the place of the creative act, of the "Eureka" of sudden insight by the genius.

Neither does it render superfluous organized work on the refinement and the adaptation of knowledge. ¶¶¶

On the contrary: Innovation is used properly to multiply the power both of the flash of genius and of the steady slugging away on improvement, adaptation and application.

It catches, so to speak, the flash of lightning of individual insight that streaks across the horizon, and converts it into permanent light.

At the same time it can give direction to the work of improvement and can sense when the small, unimaginative steps in expanding existing knowledge reach the threshold of new imagination.

Indeed it can organize for this leap. ¶¶¶

The story of antibiotics is one illustration of the power to convert the flash of genius into systematic innovation.

The flash of genius was Fleming's discovery of the bacteria—killing properties of the penicillium mold.

The innovation was Waksman's insight, gained by the process of organizing ignorance, that here was a whole new view of biological action in the organism, and a whole new approach, the "antibiotic" one, to the treatment of disease.

This took ten years.

But once gained, it made possible, almost overnight, the organized search for new antibiotic microorganisms, the development of specifications for them, the theoretical understanding of their action and of their risks. ¶¶¶

An illustration of the impact of innovation on adaptations of present knowledge is the development of a theory of the change from an underdeveloped preindustrial and static economy to a growing, advancing, industrializing one.

221 Ten years ago there was no such theory.

222 Today we have a theory, admittedly crude and primitive, but adequate enough to win general acceptance among economists, regardless of their other views, regardless even of the side of the Iron Curtain they work on.

223 Yet, unlike all other major economic theories, there is no one great economist to whom the theory of Economic Development can be credited.

224 Rather it represents the achievement of a method: defining the aim, specifying what we have to know, and analyzing a great many small improvement-efforts to spot the threshold where adaptation turns into doing something new. ¶¶¶

225 Innovation does not change the permanent limitations of human existence.

226 But within them it adds a new dimension: that of setting an objective beyond our power and knowledge today, defining what needs to be done to make it attainable, and organizing work to get it done.

227 Again—this cannot be said too often—there has always been innovation.

228 What is new is only that we are becoming capable of doing systematically what before has usually been a streak of lightning, and that we can organize ordinary mortals to do what before could usually be done only by the rare genius. ¶¶¶

229 There are two major areas of innovation: the created universe of nature and man's own society.

230 There is technological innovation, the finding of new understanding of nature and its channeling into new human capacity to control, to prevent and to produce.

231 And there is social innovation, the diagnosis of social needs and opportunities and the development of concepts and institutions to satisfy them.

232 In both areas innovation gives us new capacities.

233 It makes technology open-ended.

234 And it makes it possible to go beyond reform and revolution in society.

235 The Open-Ended Technology

236 Innovation makes technology open-ended and capable of being designed.

237 We now can organize for technological innovation, both to obtain new basic resources of material civilization and to develop new material end products to our specifications.

238 This in turn gives us, to an increasing degree, freedom to arrange the elements of the physical environment to fit predetermined human, economic and social ends rather than letting the available elements determine what is possible. ¶¶¶

239 If we look at the history of modern technology, that is at the last two hundred years or so, we can see readily that the important breakthroughs were changes in the foundations.

240 Some of these actually opened up fresh physical resources, such as the development of new sources of mechanical energy beginning with the steam engine, or the use of electromagnetic and electronic phenomena for communication and control.

241 Some created new attitudes, that is new mental resources.

242 Such were the application of system and knowledge to agriculture that began in England in the early eighteenth century, the application of thought to work—from Eli 'Whitney's interchangeable parts around 1810 to today's automation—and the application of science to create new products for the market, which began with Perkin in 1857. ¶¶¶

243 Our industrial civilization rests on ten or fifteen such basic technological breakthroughs of the last two hundred years.

244 The chronometer which made possible controlled navigation, the machine tools developed in the late eighteenth century, and the industrial production of steel invented around 1860 were the only ones among them that were improvements within the then existing technology; these three made it possible to do better, faster and more cheaply something that was already being done.

245 All the others were innovations; they made it possible for us to do what we had never done before.

246 They contributed a new power rather than better performance. ¶¶¶

247 The same is true of medicine.

248 There have been a dozen or so medical breakthroughs since Harvey discovered the circulation of the blood, and Jenner the smallpox vaccination.

249 Every one of them was a true jump, every one created a new vision and a new power—quite apart from flying in the face of all that passed for medical knowledge and practice in its time. ¶¶¶

250 Yet despite its fundamental importance, work on new foundations was peripheral rather than central to our effort to understand and to control nature.

251 The bulk of our manpower, time and money has always been spent on improvement of existing knowledge.

252 The breakthroughs, with rare exceptions, came from outside the going technological effort, came from the flash of genius.

253 The popular picture of the lonely inventor starving in his garret is a caricature.

254 Most of the men who contributed the breakthroughs did very nicely; and quite a few—Watt, Liebig, Perkins, Siemens, Bell and Edison, for instance—built flourishing industrial empires.

255 Even in medicine, where up till 1880 or so, resistance to change was much more pronounced, few of the great innovators were denied their due recognition.

256 But the popular impression senses rightly that the great technological breakthroughs were not themselves the product of organized technological effort but came from the outsider. ¶¶¶

257 Innovation makes it possible to organize for such breakthroughs to new foundations within the organization of economy and technology. ¶¶¶

258 We know that the food supply of the world can be greatly increased within the existing technology:

259 by applying, world-wide, already available and tested methods of the technology and of the social organization of farming

260 by applying the research concepts and tools developed for the temperate zone to the largely unimproved crops and animals of the tropics which support half of mankind

261 and by cutting waste, loss and spoilage which now destroy half of everything produced in most of the world, through the application of well-known and tested methods and tools of farm finance, crop handling, farm marketing and transportation.

262 Indeed we know that world supply can at least be doubled, and probably tripled this way. ¶¶¶

263 We also know that all such applications may within fifty years have become inadequate to

feed a rapidly growing world population on an increasing nutrition level. ¶¶¶

264 We can, however, define clearly—and this is innovation—what other, new major source of food is already available to us.

265 We know (though we do not fully understand) the basic process by which the mechanical energy of light is converted into the biological energy of food; we know above all that it is light rather than soil that produces biological energy.

266 Hence we can determine that there is a major, largely unused source of food—the oceans—and that we can develop aquaculture, the systematic farming of the surface of the sea, to complement agriculture, the systematic farming of the surface of the land.

267 Indeed we can say that aquaculture is capable of producing more biological energy than agriculture.

268 Since light is the source of biological energy, the sea must be as productive, acre for acre, as is the land; it may well be more productive.

269 There is of course more than twice as much sea surface as there is land surface; and, excepting only the arctic wastes, the entire sea surface is productive, whereas most of the land surface is not. ¶¶¶

270 All this is theoretical argument: a new view of old and well-known facts.

271 And it is not based on any sizable knowledge of marine biology.

272 But now we can specify what knowledge we need and where to search for it.

273 In agriculture we have two major sources of food: plants and vertebrate animals.

274 In aquaculture we have three: plants such as algae, vertebrate animals (though they are mainly fish rather than birds or mammals) and, specific to the sea, invertebrate animals such as the small shellfish known as "krill," which exists in abundance in most oceans and furnishes the staple food of the large whales.

275 Incidentally, these marine invertebrates have, of all known animals, the highest efficiency in converting fodder into meat, carbohydrates into protein. ¶¶¶

276 We therefore can specify that we must explore all three potentially feasible areas of aquaculture; we know what specifications as to cost, production methods and yield each must satisfy to become practical; we can predict what knowledge we need, and so on.

277 We can, in other words, organize for systematic work.

278 We can even estimate how much time, effort and money it might take to produce large-scale practical results. ¶¶¶

279 This is but one example.

280 We can—and do—similarly organize innovation with respect to new sources of mechanical energy.

281 Increasingly we should become capable of organizing innovations in other material foundations of human life: soil and water supply, weather and space.

282 In respect to human life itself we are becoming capable of organizing innovation to maintain health in addition to curing or preventing disease.

283 We are at work on developing means for cheap and effective self-control of human fertility. ¶¶¶

284 In every one of these areas the process of organizing innovation, if spelled out step by step, might sound as simple as that of organizing for aquaculture (though, needless to say, the actual work is complex and difficult, will take many decades and may indeed

never succeed).

285 Yet though it sounds simple, it is a rigorous process which we did not possess fifty or even thirty years ago. ¶¶¶

286 At the same time innovation opens up technology at the other end: that of materials and products.

287 It enables us to make new products to specifications, indeed to arrange nature according to manmade stipulations: ¶¶¶

288 Polymer chemistry, the branch of chemistry that deals with large organic molecules, has produced synthetic rubbers and plastic fibers, and underlies our fastest-growing industry.

289 Here we increasingly start out with specifications: We need a material that has certain properties not found in any existing material or in nature.

290 We can define what structure of the molecule this is likely to require.

291 Then we can organize to build it.

292 This, for instance is the process by which a German chemist, Ziegler, recently developed the new low-pressure polyethylene in which the atoms of an old substance, polyethylene, are rearranged to produce a new substance with new, planned properties. ¶¶¶

293 The same approach is taken increasingly in pharmaceutical research—for instance, in the attempts to build, according to specifications, chemical substances that will "fool" a diseased organ or a cancer, that will be sufficiently close to its normal food to be snatched up hungrily, but will be sufficiently different not to nourish disease or cancer but to starve it.

294 We are increasingly building to specifications materials and products in electronics and metallurgy, and in many other fields.

295 And much that is of great impact is not in fundamental and big areas but in ordinary, everyday products and materials which too are increasingly being designed and redesigned according to theoretical specifications—of performance, of the market, of style, of price and cost.

296 «§§§»

297 Open-endedness with respect to the foundations, combined with open-endedness with respect to end products enables us to plan and design a business, a technology or even a national economy rather than adapt to existing resources or existing products. ¶¶¶

298 It was axiomatic to traditional economists (including Marx), and is still taken for granted by most, that available resources determine what can be produced, and conversely that existing products require specific resources.

299 This is the characteristic economic expression of the Cartesian world-view.

300 If you have steel there are certain things you can produce; and to produce them you have to have steel.

301 The only choice is between the alternative uses of steel.

302 At any one time there is an optimum allocation of steel between these alternative uses, a fixed, determined, "best" utilization of equally fixed and determined resources. ¶¶¶

303 This determinist view is changing rapidly under the impact of innovation.

304 We can increasingly decide what end products we want and then find the raw materials for them.

305 We can increasingly decide what raw materials we have available and then develop the uses for them.

306 There are, obviously, real limitations.

307 But these are being rolled back steadily; the space between them is already so large that it is sounder today for a country, a technologist or a business to start out with the assumption that there are no limitations than to start out with the determinist strait jacket of tradition and existing knowledge. ¶¶¶

308 Thus paper, which as material for writing, printing and packaging is as basic to industrial civilization as is steel, has been a product of temperate-zone trees.

309 Countries without such trees had to import paper or do without.

310 Today we ask: What is it that the substance called "paper" does, and how can locally available materials be made to produce this?

311 As a result we are today making paper from sugar-cane wastes.

312 We can make paper from any source of cellulose, even from noncellulose raw materials if we have to.

313 We can produce plastics that do the job of metals, or use glass to make textile fibers, and so on.

314 These are not only technical possibilities but economic possibilities; indeed we can define what the costs should be, what conditions of raw-material supply, market and process would be needed, and how probable is their attainment. ¶¶¶

315 We already feel the impact of this new reality in which the traditional mutual determination of resource and end product is being replaced by the ability of planned, purposeful substitution of both resources and end products.

316 The traditional idea of the one "best" allocation of resources is being replaced, for every national economy, every industry and every business, by a choice between a number of optima which themselves are the result of human decision and action rather than of God-given resources.

317 We do not yet have any economic theory based on this new capacity to choose.

318 But a powerful new tool of economic analysis, input-output analysis, clearly assumes that we can choose between optima, can indeed create new ones.

319 This is also what businessmen assume when they talk of "long-range planning."

320 From Reform to Social Innovation

321 The invention of "lend-lease" rivaled all the new weapons as a contribution to Allied victory in World War II.

322 It made possible a unified war effort for maximum production under central direction; and yet it strengthened national pride and initiative, indeed built on it.

323 Similarly the Marshall Plan rather than the atom bomb restored the Free World.

324 These are social innovations, and they have had an impact on the life of our generation as great as any technological innovation. ¶¶¶

325 The emergence of Soviet Russia as a superpower rests neither on Marxist ideology nor on technology but on social innovations such as the farm-machine station which made possible the political suppression and economic exploitation of the farmer without complete collapse of food production; the Five-Year Plan; and the concept of mass education as a tool of both economic development and military prowess (none of these, needless to say, "Marxist" or even easily compatible with Marx).

326 Economic Development, which marches over the world today, is another new social

vision, a social innovation. ¶¶¶

327 The great changes in the economy of the developed countries during the last twenty-five or fifty years have resulted primarily from similar social innovations.

328 Cartels as well as antitrust laws are social innovation.

329 In the United States the development of mass production, mass distribution, mass research and mass ownership of industry through pension funds and investment trusts has brought the great changes.

330 All are social rather than technological innovations, as is the new concept of the role of government in the economy.

331 "Productivity" is a social innovation even though its tools are, in part at least, technological. ¶¶¶

332 All through the Free World—but in Soviet Russia as well—there is the new institution, the business enterprise, and the new process of making human resources fully effective, the process of management. ¶¶¶

333 On a lower plane: Most businesses that have been outstanding successes during the last generation or two, and have grown from corner-store to giant size, have been based on social innovation.

334 Marks and Spencer in England or Sears, Roebuck in the United States are based on a vision of the mass market; the Volkswagen on a vision of a European transportation revolution; IBM on a vision of the organization of information and office work; Philips of Holland on a new concept of the international economy and its new subsistence needs. ¶¶¶

335 Social innovation is the mark also of the spectacular individual success stories—the "great millionaires" who so captivate the common imagination.

336 From the English Press Lords or Henry Ford in the early years of our century to the Greek tanker kings today who built their fortunes on the realization that the world's energy economy had become an essay in transportation, they all started out with a new configuration of social elements, a new vision of social opportunities and social needs.

337 Then they created the needed technology, invented new financial instruments or new methods of selling and servicing, and so on. ¶¶¶

338 It could be said that social innovation is nothing new, that all along it has been at least as important as technological innovation, and has had at least as much impact.

339 We could not even dream of an industrial economy but for the social innovation of insurance sometime late in the seventeenth century.

340 For we could not take the economic risks of economic change if we also had to take, unprotected, the economic risks of natural catastrophe, of fire and flood, shipwreck and hailstorm.

341 But social innovation has in the past decades become much more frequent, much more rapid, much more "normal." ¶¶¶

342 We are today organizing for it—in every large business, in every large labor union, in every government.

343 Few businesses have yet recognized this clearly (I know only of one, the General Electric Company, that has set up its headquarters staffs deliberately as social innovators).

344 But every large company—and many a small one—works on social innovation in one or the other area: organization structure or marketing, managing technological research, distribution costs or financial policy, human relations or data processing, management

education or international economic development.

345 The same is true of governments and of universities, of hospitals and of military forces. ¶¶¶

346 All this would mean little but for the fact that we are gaining the ability to make social innovations systematically, purposefully and effectively.

347 We may not yet really understand what our new capacity is.

348 But we do know that it is method rather than flash of genius, disciplined imagination rather than artistic temperament, and organized effort rather than lucky break.

349 Above all it is a method that enables us to set objectives and to organize work for their attainment. ¶¶¶

350 One sign of this advance is the conscious and deliberate integration of social with technological innovation in the new independent research organizations that have grown so spectacularly in this country since the end of World War II.

351 Stanford Research Institute, Arthur D. Little and the Rand Corporation (a subsidiary of the U.S. Air Force) all combine technological and social innovation.

352 Their staff includes social scientists and political scientists, management and marketing experts, economists and historians, working together with physicists, geologists, chemists, biologists and mathematicians. ¶¶¶

353 Only twenty years ago this would have been unthinkable.

354 When the research activities of the U.S. Department of Agriculture — the oldest, largest and most versatile research organization in this country—were reorganized and expanded during the thirties, for instance, natural-science research and social research were sharply separated.

355 The very successful regional research institutes in the South or Southwest included in their program only physical research in raw materials, products or processes.

356 Yet the postwar institutes owe their phenomenal growth and success precisely to the inclusion of social innovation. ¶¶¶

357 The impact of social innovation is similar to that of technological innovation.

358 It makes social organization open-ended.

359 It makes possible the organized leap to new social ends, and the organized development of new social tools and institutions to specifications.

360 It gives us a choice between ways of accomplishing social ends and a choice of ends to be accomplished by given approaches or institutions. ¶¶¶

361 Twenty-five years ago we knew only one way to provide for the cost of modern medical and hospital care in industrial society: through a government-run compulsory national health service.

362 The only question seemed to be whether there was a problem; and the evidence was clear that the rise of modem medicine—by making universal access to medical and hospital care desirable and possible—had indeed created a medical expense problem for all but the wealthy.

363 Every European country followed the logic of this argument into a government-run national health service. ¶¶¶

364 We in the United States would have done the same had we been “logical.”

365 Instead we defined the problem: to make the direct expenses of illness bearable for all.

366 We defined the requirements: medical care had to be prepaid, and the risk had to be

spread.

367 We established easily that both were feasible; sickness has a predictable probability distribution.

368 Indeed all national health plans then in existence were based on an insurance principle.

369 We defined our specifications: to maintain the free choice of doctors by patients, the professional relationship between the two, the doctor's freedom to set his fees within the limits of professional ethics, and the principle of local and private control.

370 Then we designed, one after another, new concepts and tools: voluntary hospital insurance, first for employee groups, later for whole communities; voluntary medical-care insurance for the "normal" illnesses; major medical expense insurance for the infrequent but financially catastrophic prolonged illness; and so on.

371 We created institutions: the voluntary community cooperatives such as "Blue Cross" and "Blue Shield" in free competition with medical-care plans and insurance companies.

372 Every one of these steps served a specific partial purpose; yet each was taken with the end objective of universal total coverage firmly in mind. ¶¶¶

373 By now we know the problem: The specifications cannot be satisfied completely; there are some marginal areas where government aid is needed to achieve the aim of financial protection for everyone: in reinsuring such marginal major-medical risks as the very aged, or in the care, treatment and expense of prolonged mental illness.

374 One group—the very poor who are only casually employed—cannot be covered by insurance but must be cared for free, as charity patients, or helped out by governmental relief funds.

375 We do not yet know how to insure the widow with small children unless she has a job.

376 There are weaknesses in our system, just as there are weaknesses in every governmental system. ¶¶¶

377 But we know that we are capable of solving the problem—have indeed solved most of it—at no more expense than the most efficient governmental system.

378 And we have done so in a way that strengthened social values: professional independence, local initiative, self-government and pluralist competition, which we rightly or wrongly consider valuable and important. ¶¶¶

379 The social problem to be solved was the same here and in Europe.

380 The aim was the same.

381 But the resources which we used to design the "product" were our own natural resources: the values and habits of American society. ¶¶¶

382 There are also examples where the same resources are being used to design very different social end products.

383 The Marshall Plan, for instance, used nothing new: loans, expert advice, intergovernmental committees.

384 But the "product" was new indeed—and was the result of conscious design to satisfy a truly innovating vision.

385 Another example is some of the international businesses being built today—by European as well as by American firms—who use very old means such as loans, patent licenses and investments, to build manufacturing businesses designed both to act as generators of economic development in underdeveloped countries and to prosper as "a stake in economic growth" rather than through a specific technology or product-line. ¶¶¶

386 There is the prospect of European unification—not through conquest, not through the dazzling diplomacy of a Bismarck or through revolutionary uprising, but through the planned design and development of common bonds; of common institutions for specific purposes such as the Iron and Steel Community, the Common Market, or Euratom; of common interests and common experiences.

387 The resources used for this creation of a Europe commonwealth are precisely the same national interests, national loyalties and national traditions that have always kept Europe apart. ¶¶¶

388 On a smaller scale, but perhaps as important, are the efforts today to create the habit of voluntary co-operation for mutual improvement in the poor peasant communities of the world.

389 These communities do have strong habits of co-operation, but only to maintain custom.

390 New things are traditionally begun only by government from above.

391 So many of the things that should be done are so easy: to dig a well, to grade an approach road, to use better seed.

392 The impact of these simple things is greatly out of proportion to the effort.

393 To do them, however, requires that the habit of community co-operation, which always operated to prevent change and to forbid initiative, now be directed toward promoting change and spurring initiative.

394 The innovation lies in making the old traditions of the peasant the very means by which he acquires the vision and the power to do new things. ¶¶¶

395 This last example brings out, I think, wherein social innovation differs from our old ways of producing social change: reform and revolution.

396 Unlike reform it does not aim at curing a defect; it aims at creating something new.

397 Unlike revolution it does not aim at subverting values, beliefs and institutions; it aims at using traditional values, beliefs and habits for new achievements, or to attain old goals in new, better ways that will change habits and beliefs.

398 But it also tries to do something neither reform nor revolution could do: to give us a method for defining both the new that is possible or needed and the things that can be done to achieve it. ¶¶¶

399 We need social innovation more than we need technological innovation.

400 The new frontiers of this post-modern world are all frontiers of innovation.

401 Neither reform nor revolution can solve these great problems; only genuine social innovation can do the job.

402 *3 Innovation—The New Conservatism?*

403 Innovation is risk.

404 Present resources are committed to future, highly uncertain results.

405 Present action and behavior are subordinated to the potential of an as yet unknown and uncomprehended future reality. ¶¶¶

406 Innovation can best be defined as man's attempt to create order, in his own mind and in the universe around him, by taking risk and creating risk.

407 It can be defined as the organized, indeed deliberate, seeking of risk to replace both the blind chance of premodern times (as symbolized in the Renaissance belief in *Fortuna* as

the presiding genius of human destiny) and the certainty of the more recent but still outdated belief in inevitable progress, both chanceless and riskless. ¶¶¶

This is bold, very bold.

It entails not just one heavy risk, but three: the risk of being overtaken by innovation, which one might call the risk of exposure; the risk of failure of the innovating attempt; and, heaviest of all, the risk of innovation's success.

The Risks of Innovation

Innovation can change, almost overnight, the established order, render obsolete what only yesterday seemed impregnable, make dominant what only yesterday was negligible. ¶¶¶

Economists tell us that the large business enterprise of today has a built-in momentum that may give it an advantage way beyond anything deserved by efficiency or managerial excellence, and may keep it strong, powerful and big long after it has ceased to be aggressive and competitive.

There is something in this.

Yet, of the hundred largest manufacturing companies in the United States only thirty years ago, more than half have disappeared from the list today.

Some have vanished altogether, others have fallen way behind.

Their places have largely been taken by companies which, thirty years ago, either did not exist at all or were insignificant.

The newcomers owe their present position not to financial manipulation but to new technology, new processes or new products—that is, to innovation. ¶¶¶

The risk of exposure in innovation changes the nature of international politics and international economics.

There is always present the possibility of a sudden landslide that can completely alter the international landscape and the position and balance of forces.

This might be a change in the international economy, in international resource-geography or transportation-geography.

It might be a change in political constellation, in military or industrial balance of power, or national policy—all capable of changing, almost overnight, the international position of a whole country, even of the biggest and mightiest. ¶¶¶

Such dramatic changes have of course occurred throughout history—but they came fairly infrequently.

The cause may have been that mysterious historical event, one nation's decline in vigor or another nation's sudden outburst of creative energy.

It may have been foreign invasion or a sudden shift in trade routes.

Once in a long while it was the result of new technology, especially military technology.

But what was rare "turning point" in the past has now become ever-present danger.

What happened as by-product is now capable of being purposeful goal.

What was *Fortuna*, in other words, is now risk. ¶¶¶

This not only applies to a country internationally.

It applies fully as much to institutions, groups and forces within a country, within an economy.

Each technology, each industry, each business lives under the risk of being made obsolete without warning, of being destroyed or damaged by innovation, technological or social. ¶¶¶

This risk cannot be avoided.

On the contrary, any attempt to prevent innovation, even any attempt to ignore it, can only make the risk greater.

Nor can the risk be shrugged off as "all in the day's work."

It must be accepted and provided for.

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Little needs to be said about the second risk in innovation, that of failure. ¶¶¶

Innovation must anticipate the future and must commit resources, efforts and destinies to this anticipation.

But no human being can possibly predict the future, let alone control it.

Innovation must therefore have a high failure rate.

It may fail because the innovation was faulty in vision, insufficient in design or premature in timing.

It may fail because of inability to produce the planned results or to produce them in the available time.

Or—perhaps the cruelest but also the most common risk—the innovating attempt may succeed brilliantly, only to be obsolete by the time it is completed, overtaken by events, by the growth of knowledge, or simply no longer appropriate.

Thus very few of the main lines of medical research that would have appeared to a well-informed man as most important and most promising thirty years ago have contributed much to the great medical advances since. ¶¶¶

These two risks lead to a paradoxical conclusion.

More and speeded-up innovation alone can protect against the risk of being overtaken by the innovation of others.

But this necessity only commits even more resources to a gamble in which failure is more probable than success.

«§§§»

Yet, both the risk of exposure and the risk of failure are minor compared to the third risk: that of the success of innovation. ¶¶¶

Innovation does not create new laws of nature.

It is not even primarily concerned with finding such laws.

It aims, however, at directing and channeling the forces of nature according to human needs and human vision.

It aims furthermore at directing and channeling the values, beliefs, institutions and human resources of society according to those needs and that vision. ¶¶¶

What impact beyond the desired one will a successful innovation have?

What new and unexpected changes will it produce?

What will it do to the fabric of society, its beliefs, its bonds of community? ¶¶¶

A minor example: The development of effective insecticides such as DDT was rightly considered a great achievement.

458 It made possible the truly innovating vision of control of disease-bearing and destructive pests.

459 But unexpectedly, the new insecticides killed beneficial insects as effectively as destructive ones, bees as well as malaria-bearing mosquitoes.

460 This unforeseen result not only threatens bird life deprived of its food; it threatens all the trees and flowers—among them our major fruit trees—dependent on insects for pollination. ¶¶¶

461 Innovation is thus not only opportunity.

462 It is not only risk.

463 It is first and foremost responsibility.

464 No one is responsible for chance; no one can do anything about it.

465 One can only welcome inevitable progress or bemoan it; at most one can attempt to delay it.

466 But innovation is deliberate choice; and we are responsible for its consequences. ¶¶¶

467 The essential choices are between values, in respect both to aim and to means.

468 Precisely because it makes technology and social structure open-ended, innovation poses the continuous question what its values are.

469 Should we aim at strengthening our traditions or at weakening them?

470 Should we aim high or be expedient? ¶¶¶

471 There may be areas where the values are given and outside the innovating decisions.

472 Industrialists in a free economy might claim that they must and do operate under an objective rule of profitability.

473 Industrialists in a socialist economy might similarly claim that production determines their decisions.

474 Neither is a clear and unambiguous measure.

475 Profitability over the long run is, for instance, something quite different from profits this year or next; the difference is one of basic values.

476 Similarly production may be measured by units, value, quality or cost—and all Soviet sources indicate that there is as much disagreement over the concrete meaning of production in that country as there is in a free economy over profitability. ¶¶¶

477 But inevitable to all social innovation is a value decision in respect to the objective, the specifications selected, the institution built and the methods chosen.

478 Every social innovation—whether by government or school district, business or labor union—expresses a view of what man and society are and what they ought to be. ¶¶¶

479 Innovation is therefore always ethics—as much as it is intellectual process and aesthetic perception.

480 It needs ethics (as a perceptive book[1] recently pointed out) as much to decide what value considerations are relevant as to decide which are right.

481 Traditional ethics, regardless of school, looked for the right response to a given situation.

482 We need ethics today that concern themselves with the problems of creating the right situation.

483 Ethics, most philosophers would agree, have been rather arid since Spinoza, though

hardly for want of books written on the subject.

The climate of "inevitable progress" could not have been congenial to a discipline that assumes choice to be both relevant and rational.

Now, perhaps, we can expect new fundamental and fruitful work in ethics—we certainly need it.

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[1] * Ethics for Policy Decisions by W. A. R. Leys, New York, 1952.

Plan or No Plan?

The risks and responsibilities of innovation require themselves major innovations.

The first risk, that of exposure to innovation, makes planning necessary.

The second risk, that of failure in innovation, prohibits, however, any central planning and demands a competing multiplicity of local plans.

The third risk, that of the impact of successful innovation, demands a new attitude to change, a new politics of change in society.

It demands essentially a new conservatism. ¶¶¶

Twenty-five years ago an English Socialist economist, Barbara Wootton, wrote a pamphlet, *Plan or No Plan*, which had a profound impact on public and policy-makers, at least in the English-speaking countries.

Her thesis was simple: Planning is a necessity; therefore centralized Socialist dictatorship, controlling alike society and economy, is a necessity.

For the only alternative to centralized planning by fiat from above is the mad, self-destructive chaos of "no plan." ¶¶¶

There were quite a few things wrong with the argument even then—it was naïve to the point of being disingenuous.

But the syllogism appeared almost a truism only a few short years ago—and by no means only to Communists and Socialists.

In those days American business also shared the view.

The National Recovery Administration (NRA) through which, with enthusiastic business support, Franklin D. Roosevelt first attempted to overcome the Depression, was in essence centralized planning from above for the entire economy. ¶¶¶

Today even the Communists, to judge by Russia's recent actions, have considerable doubt.

The rest of us have none.

Wherever the people in a country that had experienced centralized planning were given a free choice—in most of Western Europe for instance—they repudiated it.

They had seen how little resemblance the reality of planning from above bears to the theoretical picture of an orderly and harmonious efficiency.

But the alternative to planning by centralized fiat is not "no plan."

It is *planning by self-control*. ¶¶¶

Wherever we look today, we see planning.

Long-range planning is the central theme of today's businessman.

509 Every day my mail contains yet another speech or article on the long-range planning of a well-known company—in English, in German, in French, in Italian, in Dutch, in Spanish or Portuguese or in Japanese.

510 Company after company is setting up a long-range planning department.

511 And so is city after city. ¶¶¶

512 Most universities work on a long-range plan.

513 So do hospitals and school districts, research laboratories, professional societies, newspapers and magazines, international bodies, the military, political parties, government departments and law firms.

514 Indeed long-range planning threatens to become something of a fad.

515 There is more than a grain of truth in the Washington gibe: "We don't want to do the job so let's set up another long-range planning study." ¶¶¶

516 In many cases planning is still weak in its understanding of the job and of the methods used.

517 There is the tendency to confuse planning with the futile attempt to outguess the fluctuations of the business cycle.

518 There is the tendency to try to do planning by projecting the trends of the past into the future whereas the starting point of planning must always be the recognition that the future will be different.

519 There is the all-too-common belief that planning eliminates risk—the most dangerous delusion of all, since planning is actually risk-creating and risk-taking. ¶¶¶

520 But there is also a growing understanding of the nature and function of planning, and growing knowledge of the proper tools and methods.

521 We are learning the difference between planning and prediction or forecast, and between what we would like to see happen and what we can try to make happen.

522 We are learning the difference between blind gambling and rational choice among risks based on informed judgment.

523 We are learning that the aim of planning is not to perpetuate the present but to anticipate and force the new.

524 The purpose is innovation. ¶¶¶

525 Above all we are learning that the only protection against the risk of exposure in innovation is to innovate.

526 We can defend ourselves against the constant threat of being overtaken by innovation only by taking the offensive.

527 The best statement of this new attitude comes perhaps from the world of business: The time to change the theory of the business on which a company operates, and to innovate in respect to its character, function, objectives, product, market and organization, is when the company is most successful and most profitable.

528 For every theory of the business eventually becomes obsolete.

529 If a company waits until it starts to go downhill, it has usually waited too long. ¶¶¶

530 This process requires an attitude that has been far from common.

531 It requires that rarest of human insights: the willingness to question one's own success.

532 But it is the only attitude that can make productive—can indeed make bearable—the risk of

innovation.

533 It is easy, for instance, to think through a country's foreign policy when it has failed—any editorial writer can do that.

534 It is much more difficult to innovate a new concept of the country's foreign policy when the present one is highly successful.

535 Yet this is the only way to prevent failure.

536 And the aim of long-range planning is to make effective this attitude in an organized, systematic, continuous effort of innovation.

537 Local Plan or No Plan

538 Because of the risk of innovation our choice is not between centralized plan and no plan but between centralized plan and localized plan.

539 But the risk of failure in innovation converts this into a choice between local plan (which alone can work) and no plan, into which central planning degenerates. ¶¶¶

540 The risk of failure in innovation makes centralized planning impossible, indeed converts it into chaos and tyranny, and makes its certain outcome collapse.

541 The odds are simply too heavy against the success of any one plan.

542 We have to commit present resources to highly uncertain future results, stake our selves on our ability to perceive the as yet unknown and to do the as yet impossible.

543 Therefore we have to plan.

544 But to expect any one such plan to come out right is folly, and so is the expectation that any one group of planners will come out right no matter how many alternative plans they develop.

545 Elementary mathematics shows that the outcome of such a gamble must be worse than to have no plan at all and to play random chance. ¶¶¶

546 At the same time the very stake in his planning forces the centralized planner to try to control everything; anything uncontrolled becomes a danger.

547 Centralized planners would probably tend to become tyrants anyhow; absolute power always hungers for more power.

548 But even if the planners did not want to tyrannize, centralized planning for the entire economy or for the entire society propels them inevitably toward it.

549 The more the central plan embraces, the riskier the venture, the greater the odds against its success. ¶¶¶

550 The inability to foresee, thirty years ago, the recent breakthrough areas in medicine may, at first glance, sound like an argument against organized systematic innovation.

551 But the major breakthroughs that did occur were all the result of genuine innovation rather than of chance.

552 The breakthroughs would not have been made if one man, or one group of men, no matter how knowledgeable, responsible or wise, had been the central planners of medical research.

553 They were achieved only because the planning was multiple, pluralistic, autonomous, local.

554 The example is thus both a cogent argument against centralized planning and a cogent argument for local planning. ¶¶¶

555 We are concerned here with control, not with ownership, with centralized planning rather than with nationalization (though the two may tend to go together).

556 Centralized planning by nationwide industrial cartel—such as Roosevelt's NRA attempted—would be just as bad as centralized planning by the dictatorship of the proletariat.

557 Altogether this is not just a matter of the economy where it has traditionally been fought out, but of all innovation, technological and social, by economic, by political, or by cultural institutions. ¶¶¶

558 There are, it should be said, qualifications.

559 As long as an economy is purely imitative of other, more highly developed economies—as Soviet Russia was and largely still is—centralized planning is possible.

560 It is wasteful.

561 It is beset with serious risks—Russia's economy has broken down unnecessarily into famine, uncontrolled inflation or paralyzing purges every five years or so.

562 It is inevitably tyrannical.

563 But it is not impossible.

564 The moment, however, that innovation becomes as necessary as it is highly desirable, centralized planning becomes impossible.

565 It is no accident that the Russians are now busily engaged in decentralizing their planning. ¶¶¶

566 Centralized planning is also possible where the objective is sharply defined, the planning period very short and the costs not very important.

567 The best example is war.

568 It is no accident that the very idea of planning came out of the experience of World War I, especially out of the work of the American and German War Industries Boards.

569 Even for war, however, experience argues against centralized planning for innovation; what can be planned centrally is the use of resources available, in existence and known.

570 One of Churchill's strengths as a wartime leader was to understand this.

571 He centralized decisions, even on details, in his own hand.

572 He set up complete controls over existing resources.

573 But he encouraged, initiated, pushed and fought for decentralized, autonomous, competing planning for all innovations, technological, strategic and social. ¶¶¶

574 The argument against central planning is not an argument against planning by the central organ—whether the government of a country, the general staff of an army or the top management of a business.

575 On the contrary, without effective planning by the central organ, planning altogether is impossible.

576 The central organ must plan in respect to its own jobs: foreign policy and defense in the case of a government for instance, or basic objectives, financial policy and organization structure in the case of a large business—for it too faces both the risk of exposure and the risk of failure in innovation.

577 In addition the central organ must represent the common interest in respect to local, autonomous planning.

578 It must co-ordinate, balance and guide.

579 It must make the final risk-taking decisions.

580 It must set standards of conduct and of performance.

581 Above all it must stimulate the local organs to plan rather than to drift.

582 But it must not be the planner, must not even insist on conformity in the local planning efforts, but rather encourage diversity, competition and independence. ¶¶¶

583 There is plenty of room to disagree where the line should be drawn between the sphere and authority of the center in planning, and the sphere and authority of local planning.

584 We find this disagreement in international and national affairs.

585 It is a live issue in a university between the central administration and the faculties, departments and individual scholars, and in a large business between top management and divisions, functional staffs and individual managers or professionals.

586 There is also plenty of room for argument over the best pattern of co-operation, competition and autonomy between the pluralist innovating efforts of a society, a government, an army, a university or a business.

587 But the principle is simple and clear: The risk in innovation is too great to allow uniformity and centralization; it requires different, autonomous, alternative, competing, local efforts. ¶¶¶

588 Despite all the ink spilled over it, central planning is no longer the real issue.

589 More real and much more difficult is the question: how "local" should local planning be?

590 If too small or too narrow, a local organ will have neither the vision nor the resources to plan for innovation.

591 If too large or too diverse, it will in itself become a central planner. ¶¶¶

592 The Soviet Union has recently announced a policy of decentralizing planning by large geographic regions.

593 It is almost certain that this is wrong and will work badly.

594 On the one hand, the unit is both too large and too diverse.

595 On the other, it is also too small and too narrow—both for industries that are national in their economic character and for real technological innovation.

596 Peter Kapitsa, the Soviet Union's most distinguished physicist—and by no means a friend of planning—warned publicly against the decentralization of technological research which, he predicted, would become subordinate to regional expediency and immediate need and thus slight real innovation.

597 Many managers of important businesses in the Soviet Union have at the same time—though much more discreetly—protested that the decentralization did not go far enough; the region is still a central planner whereas genuine local planning autonomy for each major business is needed.

598 To anyone familiar with government, armed services, universities or business in the Free World these arguments will sound familiar. ¶¶¶

599 What makes the question of the best unit of local planning so difficult—but also so important—is that different purposes require different definitions of what "local" means and different organs for the job.

600 There is no formula; and there should be no uniformity. ¶¶¶

601 This concept of local planning may seem disorderly, wasteful, illogical.

602 But the greatest planner of all knows otherwise.

603 Nature provides against the risks of life by multiplicity and competition.

604 It would be so much more orderly if there were only one plant and one animal.

605 But when the mighty dinosaurs succumbed to a change in environment, there were available some obscure, wretched creatures, ancestors of the present mammals, to take their place—for they had produced an apparently useless innovation: self-control of their body temperature.

606 It would be much less wasteful if the female frog laid only two or three eggs, or if there were just one sperm cell in the human semen to fertilize the female ovum.

607 But rather than eliminate the overwhelming odds against the embryo frog's surviving to maturity or against the sperm's reaching the ovum, nature provides millions of both.

608 And it is this multiplicity, this purposeful duplication, this result-focused logic, this cooperative competition, that is the true order. ¶¶¶

609 Centralized planning was a first reaction to the new power of innovation and its new risks.

610 But it attempted to organize a manifestation of the post-Cartesian world-view by Cartesian means: Centralized planning sees the world as a machine.

611 Planning we need; but the risk in innovation alone forbids centralized planning and demands autonomous, competing, local innovation.

612 Centralized planning attempts to order our search for new vision and a new capacity of achievement on the model of mechanical order, the measure of which is efficiency.

613 But productive planning has to be modeled after a higher order—that of life, the measure of which is creativity.

614 The aim of innovation is not a static conversion of input into output but a dynamic transmutation of ignorance into knowledge and of impotence into power.

615 Its operational problem is not efficiency but risk.

616 Innovation as Responsibility

617 Perhaps the most important—though the least tangible—consequence of innovation is the new responsibility it requires.

618 It is above all a political responsibility. ¶¶¶

619 If value choice is both inevitable and meaningful, a genuine, constructive conservatism becomes both possible and necessary.

620 For then it becomes essential to take responsibility for the strengthening of basic values and the observance of fundamental principles; to demand respect for the historical roots of a society but to despise its self-glorification; to respect one's fellow man but to know one's own weaknesses, limitations and fallibility; to demand a high goal and to take the long view.

621 These are traditionally the qualities of the conservative temperament. ¶¶¶

622 Conservatism found its profoundest spokesmen in the age of "inevitable progress": Burke and Acton, John Adams, Marshall and Calhoun, Stahl and De Tocqueville.

623 It was the creed of great statesmen: Washington, Hamilton and Lincoln; Castlereagh and Disraeli; Metternich.

624 But it could not be fully effective as a political force—not even in the countries of the Anglo-American tradition—because it either became pure reaction or it resigned itself to the role of retarder and brake, rather than creative force.

Individual conservatives—George Washington is the great example in this country, Disraeli in England—could rise above this by becoming great and yet truly conservative innovators.

But conservatism as such could only be an antibody (though a badly needed one).

The age belonged to the liberal, the radical, the progressive, if not to the revolutionary. ¶¶¶

Today both liberalism and conservatism in their traditional meaning are moribund.

Indeed ideological parties are probably obsolete and certainly meaningless.

And any revival of traditional conservatism is most unlikely. ¶¶¶

We need something new: the conservative innovator, who accepts innovation and with it accepts, indeed asserts, responsibility for its risks and results.

Precisely because an age of innovation can no longer ask whether there should be change or even how fast, but only argue over what it should be, aim for and do, this may well be the age of those who believe that responsibility rather than success is the measure of man: the age of the conservatives.

[The memo THEY don't want you to see]