The Dynamics of Japanese Innovation

By Gene Gregory

In an age when innovation is the principal ingredient of the competitive power of industry, there is a growing recognition that the strength of Japanese firms is based not only on the quality and efficiency of their production but also on their ability to bring new products to market quickly and in good time to gain an early market-share advantage. No longer is it meaningful to ask whether Japanese industry is creative. The questions that now require answers are how and why Japanese firms manage to sustain such a rapid pace of innovation, seemingly at a lower cost than is usual elsewhere.

Although the pattern is far from universal, in a wide spectrum of high-technology industries—optics, consumer electronics, office equipment, semiconductors, motor vehicles, and pharmaceuticals, to name a few—Japanese firms have taken and maintained the lead in innovation. Not only do they now lead in the number of inventions and process innovations, but the evidence suggests a decisive advantage in the efficiency with which research and development is managed.

If this reality is now generally understood, there are as yet no ready explanations of how and why Japanese firms have been successful in gaining an advantage which only a few years ago was assumed to be firmly and eternally assured to Western enterprise where individual genius had freer rein.

At least part of the problem derives from the individualistic theories of creative behavior taken for granted in most Western countries. Based upon long social experience, these theories reflect a strong cultural bias which is of little use as a base from which to understand the dynamic forces that drive Japanese innovation.

No longer useful

In fact, these theories have long since outrun their usefulness as an explanation for creative behavior in Western industry as well. The assumption upon which they are based—the existence of an abstract individual inventor—has been sadly misleading. Throughout the 20th century, Western invention has been mainly a product of teamwork in industry rather than of individual genius exercised in a garret, garage or private laboratory. Invention has been increasingly a matter of deliberate planning to meet specific perceived needs through carefully organized and more-or-less well-managed cooperative efforts, as often of the big battalions of large-scale industry as of the heroic small-scale enterprise. And, as is becoming increasingly apparent in high-technology industries such as semiconductors, the larger vertically integrated firms that can afford complementary innovative capabilities have a decisive advantage for rapid and sustained technological advance.

The individual inventor, stripped of the facilities of modern industrial organization, has not played a significant role in the development of Western technology since its primitive stage over a century ago.

If this divergence of the individualistic theories of creativity from actual practice in the United States and other Western countries helped cause technological retardation, it also helped perpetuate the cultural bias which stands at the root of many misunderstandings about Japanese innovation. Not the least of these is the common expectation that once the resources of Western science and technology are exhausted, at some yet undetermined point in the future, Japanese industry, having lost the advantages of a late start, will slow to the pace of Western innovation. Or, alternatively, it is speciously argued that if Japanese industry is to "become creative," basic changes in the management system will be necessary to loosen group structures and allow the assumed natural forces of individual creativity their full rein.

But all this conveniently ignores the fact that the very performance which has led to the inquiry in the first place—the impressive rate and efficiency of innovation in Japanese industry—is precisely the product of the management system which it is assumed must change. In part, this blindness persists because it is assumed that innovation in Japanese industry is a relatively recent phenomenon. Once again, the assumption is not informed by reality.

Technological innovation, in the modern sense, had already begun in Japan before the end of the last century. Inventions as basic as the development of the first commercially produced enzymes were achieved by scientists in the Meiji era. The development of amino acid technology, ferrites, carrier telecommunications, radio antennae and a variety of other inventions gave rise to successive generations of venture businesses before World War II.

In the postwar period, freed of military preoccupations, Japanese industry has focused its energies on innovation for the civilian market. By 1968, the pace of invention in Japan had already surpassed that in West Germany; in 1972, patent applications in Japan overtook those in the United States. And throughout the 1970s, Japanese industry set the pace in both product and process innovation in sector after sector. Reflecting this advance, while imports of technology rose

Gene Gregory is a professor of international business at the Department of Comparative Culture of Sophia University.

by a modest 10% during the last half of the decade, exports climbed 140%.

Lower cost

What is more, this higher pace of innovation involved a substantially lower expenditure than in other leading industrial countries. Since innovation was cost efficient in Japan, it was possible for smaller Japanese firms to outflank the technological positions of much larger competitors abroad.

The dynamics of innovation which have made this possible can be understood neither as mere techniques of managing R&D, production, and sales, nor as methods of organizing personnel practices and finance, but must rather be seen as the function of a total system. Analysis must see the process as a whole, not simply as a sum of its many parts. Many of the techniques of managing innovation in Japan, indeed almost all of them, are of Western origin, as are the organizational forms within which they are exercised, but the total corporate cultural context differs essentially from that found in most older industrial systems.

The core reality is that the Japanese enterprise—the organizational system for the management of innovation—is an institutional arrangement that informs its individual members and various constituents and monitors its own performance in quite a distinctive way.. The basic purposes of enterprise are defined in terms that are intelligible to all those on whom it must rely for its performance, those people who must affirm its intelligibility and from whom the consensus that is essential to organizational efficiency must be elicited.

Since its inception in the early Meiji era, the modern industrial enterprise has been regarded not essentially as property intended to maximize profits for its owners, but as an organization bringing together the men and money required for the efficient management of modern technology. The ultimate purpose, defined as the enhancement of national wealth, was intelligible to all Japanese. The explicit objective was to maximize wealth creation, on which the survival of Japan, and therefore each Japanese, ultimately depended.

If the objective of enterprise was clearly expressed from the outset in terms consistent with public purpose, the task of communicating that consistency in intelligible terms was rendered easier by external threat and economic reality. Since the defense of Japan required wealth, and Japan had no natural wealth, it was the specific task of enterprise to create that wealth through the efficient management of industrial technology.

But, unlike profit maximization, which is intelligible only to those who own an enterprise or provide capital to one, wealth creation is consistent with the interests of all those essential to its performance—owners, managers and workers. Each group has a demonstrable stake in the net product. And since the net product of the enterprise can ultimately be enhanced only through the management of technological advance, innovation—beginning quite naturally with imitation, then followed by invention at the appropriate time—becomes imperative for the common good. And a system which clearly informs its operative members of this message elicits the consensus necessary for the efficient management of innovation.

Lifetime employment

It is in this context that the principal features of the Japanese management system have evolved. Lifetime employment, its most distinctive characteristic, is essentially an instrument for equitable wealth distribution within the enterprise. Not only does security of employment recognize the critical role of all employees in the creation of wealth; it assures them of future participation in the rewards from the stream of innovations generated through their collective efforts. Moreover, it implicitly acknowledges that innovation, on which wealth creation depends, is a collective activity which becomes more efficient through experience in working together, and it enables those permanently employed to reap the added benefits of

accumulated experience. This, in turn, is consistent with human reality.

Just as group members tend to work together better over time, thus contributing to the net productivity of the organization, their individual consumption needs and those of their families increase over their lifetime. An enterprise system which seeks to assure the fullest advantages of cooperative efforts as well as reward its members in accordance with their needs over their professional lifetime tends to attain synergistic results, otherwise elusive.

Moreover, this clearly defined temporal dimension of Japanese enterprise is consistent both with the exigencies of innovation and with the need of the individual for self-development under conditions of rapid technological change. The pace of innovation is increasingly a function of the investment which companies are prepared to make in continuing the upgrading of human skills. For the enterprise as well as the individual, optimal attainment of objectives requires education over the full length of the professional lifetime of each member.

The increasing investment required to assure the continued development of the human resources required for sustained innovation, in applied as well as basic technology, can be made only if the total cumulative effects accrue to the enterprise through lifetime employment. And, since innovation in high-technology industries is inherently a cooperative effort which is enhanced by the experience of working together, it becomes more efficient if training is experienced together too.

Large Japanese companies function, by design, very much like educational institutions. Each new class of annual recruits has its own identity which is strengthened over time by a steady and orderly training program that begins immediately upon employment. The entire corporate communications system is structured around a program of continued education. Since any cooperative effort is only as efficient as the communications system which informs its members and facilitates their interaction, corporate training programs in Japan are organized and conducted to assure optimal functioning of this system. People who are trained together tend to communicate better, not only because they have common information, but because they obtain shared experience and interests in the process.

Most engineers understand the inherent advantages of this system. Not only does it match their practical inclinations, but it assures them of the continued development of their professional skills. If they are capable, diligent team workers, chances are good that the system of in-company training will afford them the opportunity of practicing their art at the forefront of advanced technology. And the same is largely true of skilled workers in the factory.

Not the least of the results of this total system is the remarkable lack of technophobia. Members of Japanese enterprises implicitly understand that innovation is consistent with their own best interests and those of the nation. The purposes of enterprise as affirmed in word, action and ritual are intelligible and are communicated in a stable, structured system of meaning, making sense of what would otherwise be a chaotic flux of events.

Equally important, the system of corporate training and communications assures a relatively high level of technological knowledge at all levels of employment.

Man-technology perception

Add to this the difference in perception of the man-technology relationship which derives from the cooperative mode of management. While the atomized and lonely individual may see himself as an unequal match for the machine, for technology, or 'the system' that combines them, people working together cooperatively are more inclined to be confident that they can master and manage all these. And the understanding that by so doing they are serving the common interests of all involved fortifies the will to do so.

Although this reality has been socially constructed over time, its understanding and management requires measurement and a whole system of accountability. If the ultimate test and confirmation of the purpose of enterprise and its consistency with the shared values of its members is embedded in day-to-day practice, as manifested in physical demeanor and surroundings, it is also necessary to have a system of quantitative measurement to assure efficiency in the attainment of goals and give precision to the information from everyday life. Just as the profit-and-loss account provides the measure of performance for the profit-maximizing enterprise, a method of measuring wealth creation through innovation is necessary.

For this purpose an elaborate system of value-added accounting has been evolved and is widely employed in Japanese enterprise management as well as in public policy-making. The imperative of constantly shifting resources to higher value-added technology and production is broadly understood and espoused as a common objective by government, management and unions. Industrial policy points the way, indicating the technological and investment options for maximizing value added at the national level. Corporate strategists use the value-added measure to allocate resources in the enterprise among technologies, products and production processes. And everyone —government, management, banks, and labor unions—uses value-added accounting to monitor both the creation and the distribution of wealth in the enterprise.

To ensure the necessary flow of data, there are at least nine different value-added statistical reporting systems in Japan. Common purposes are therefore informed by a common set of data which measures enterprise and industrial performance generally in terms which are commonly intelligible. In brief, the value-added accounting system constitutes a method of keeping score which is meaningful to all the players on the corporate team—owners, managers and workers—as well as to all its vital constituencies.

Just as in athletics, this system of score-keeping comprises the surface symbolism of team performance, particularly performance in innovation, but it also reinforces and helps to motivate innovation, increasing the efficiency of the process.

In the final analysis then, innovative activity in Japanese enterprise derives its efficiency from a dynamic interactive system of cooperative endeavor to create a universe of values shared by all involved. The purpose, organization and management of the enterprise combine to affirm and reinforce those values which elicit the consensus essential to the efficiency of the system. In a word, to make sense of innovation the system makes innovation sensible. Efficiency is the logical result. ●