

Reviews

E.A. FEIGENBAUM and P. McCORDUCK
The Fifth Generation
 Addison-Wesley, Reading (MA), 1983.

How would we like to become the first great post-industrial agrarian society? To be relegated to working the land because our increasingly important economic sectors, first industry then service, are being outperformed in every aspect by a nation which possesses superior technology. *The Fifth Generation* shocks us into addressing this question by examining Japan's bold move toward computer supremacy.

This book traces the development of artificial intelligence, espouses the virtues of knowledge as the industry of the future, and outlines Japan's desire to become the first nation to be able to commercialize knowledge.

Back in October of 1981, Japan first announced to the world that they had intended to build the Fifth Generation of computers. These computers would be intelligent, capable of conversing with humans in natural language, capable of learning and acquiring knowledge, and capable of making decisions. In April of 1982, an institute was formed to guide a ten-year research and development project, called the Institute for New Generation Computer Technology (ICOT). Funding for the initial three-year stage was to be provided by the Ministry of International Trade and Industry (MITI), and researchers were supplied by the eight industrial companies and two national laboratories that were backing the program. The subject of the research was to develop a parallel inference machine and a knowledge-based machine which would comprise the Fifth Generation hardware, along with a basic software system. Parallel processing is required to allow the system to work on more than one problem at a time, to operate more like the human mind. Knowledge-based mechanisms are necessary to provide large-capacity knowledge accumulation,

storage, revision, etc. The basic software system would handle problem solving and inference, knowledge base management, intelligent interfacing and intelligent programming.

After taking a detailed look at the Japanese Fifth Generation project, as well as the efforts of other industrialized nations at developing artificial intelligence, the authors go on to prod the reader into imagining the consequences of widespread knowledge information processing systems (KIPS) use. Given a machine that thinks faster, deeper and more carefully than the human mind exposes a myriad of uses, many of which are currently beyond our comprehension. As soon as knowledge is able to be easily transferred into software and knowledge bases (now a long, arduous task) and hardware is developed that can process the information, then we can take advantage of the speed and tirelessness of machine to perfect the task of thinking.

Such systems are already in existence in the U.S., and Americans have started to get a feel for their implications. Although their applications are still limited, they are used in such diverse areas as medical diagnosis and law. For example, it is not unreasonable to imagine expansion of a legal system to include every rule of law; every statute, code or piece of legislation as being included in a nationwide knowledge base along with the heuristics that connect these laws. With this available, any person contemplating an action with legal implications could obtain the knowledge necessary on his own. The system would be capable of explaining how it arrived at the end result, as well as reviewing each step processed along the way. The educational capacity of this arrangement is tremendous as it is essentially an instructional tool as well as a functional service. Knowledge is transmitted and received much more thoroughly than by traditional classroom or book learning because of the machines' capability to demonstrate how the thought process optimally works.

If similar systems were developed to capture the knowledge, rules and logic of all the areas of social activity including economics, industry, art, science, culture, education etc., then we will be dealing

with a way of life radically different from what we know today.

At this point, Feigenbaum and McCorduck begin to get worried. They applaud the ideas behind the Fifth Generation and what it can do for mankind in terms of efficiency and productivity, but they are concerned that Japan and not ourselves consider the project a national goal.

Being that the first computer was produced in the United States and that we have been frontrunners in computer technology and even expert systems, it is apparently a shame that another country, one adept at applied research, should make it a priority to be the first to perfect and take economic advantage of KIPS. Feigenbaum finds this particularly disheartening due to the fact that he has been a pioneer in the field for many years. In some respects, it seems as if this book is a plea for help. He is calling out for his fellow countrymen to coordinate efforts to offset the Japanese initiative. He looks at existing efforts both in the US and in Europe and concludes that the lack of governmental support, specifically in terms of financing and regulatory flexibility, are problems. But more importantly myopia, complacency and general inertia as far as recognition and reaction to this challenge, are our greatest weaknesses. The lack of a coordinated effort is chastised by the authors, 'The Japanese believe that human intelligence is a precious resource that must be carefully deployed. Money is also precious and cannot be wasted. We on the contrary, are currently betting that uncoordinated development of the information processing industry is a luxury we can still afford. We are behaving as if we have talent to spare and can use it on projects important or frivolous, depending on who has cash to put up. We behave as if there's plenty of such cash'.

Allowing one nation the advantage of a long lead in KIPS development is said to be disastrous for the United States economically. The Japanese will not only broker knowledge itself to this country, but they will sell products and services so knowledge intensive that their superiority will inevitably claim a large proportion of world markets.

This brings us back to the notion of an agrarian society, where our vast stretches of land would serve us as it did in the days prior to the industrial revolution. Agriculture would dominate our economy, as the largest sector for employment, with

industry and service being imported from those who are most efficient at delivering it. This rather dramatic scenario serves its purpose to cause us to realize the importance and usefulness of artificial intelligence, and the hastening of the U.S. effort toward AI development is proof.

Whether one nation could attain such an advantageous position in ten short years is questionable, if not highly unlikely. This is due to the fact that changes in technology can occur much more rapidly than in social, economic and physical networks. Let's say that Japan is able to develop the hardware and software necessary to handle AI. What remains to be developed is the 'brainware' or the development of wide ranging uses, and the network to support those uses. What will happen to all of the unemployed experts whose jobs have been replaced by machines? They will eventually become entrepreneurs, or be hired by entrepreneurs to provide some service that will inevitably be required as the new way of doing things takes place.

This adjustment process is not instantaneous, however. It is reactive and will require considerably more time to equilibrate than the time necessary to develop the hardware and software in the first place. Americans have a bit of breathing room before they must begin investing in tractors and farm animals.

With the idea that considerable change must occur in the supporting network in any society that incorporates wide use of artificial intelligence, it can be argued that some societies by their nature are more flexible, and thus able to adapt more quickly. The United States, with its very foundation based on entrepreneurship, would appear to be better able to change than Japan, a nation steeped in tradition and rigidity. If this is indeed true, then we may be able to make up for any lead that we have so generously allowed the Japanese in their Fifth Generation computer development.

The essential argument becomes one of which country can best adapt the structure of their society to make the best use of this technology. After all, we are not dealing with a situation where one country discovers a process that gives them a cost advantage in producing some commodity, or has superior technology that results in higher quality of a consumer durable. The horror stories we are all familiar with in steel and in autos are not directly comparable to a situation where a new

technology has society-wide ramifications. We are indebted to the authors for enlightening us as to the values of AI, for their accurate assessment of worldwide research efforts toward AI development, and for the stimulation that this assessment has provided for the US effort. However, subservience to the Japanese has yet to be proven and is by no means inevitable.

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W.J. ABERNATHY, K.B. CLARK and
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Industrial Renaissance
 Basic Books, New York, 1983.

Industrial Renaissance is an excellent book written by three of the country's leading production experts from the Harvard Business School, W.J. Abernathy, K.B. Clark, and A.M. Kantrow. It is a detailed analysis of the events that have led to the decline of American industry, while others, (particularly the Japanese) have flourished; but more than that, it offers practical solutions that stem from the understanding of a few key issues.

The first three chapters of the book deal in general with the emergence in the 1980's of a production- and technology-based competition, as evidenced mostly by the automotive industry. Where previously unchallenged, domestic industries are being threatened by international opponents, technological change, and a new emphasis on excellence in manufacturing. We are also introduced to the 'natural consequences of maturity' view of the situation: just as biological organisms grow and decay, so do industries, and many of our industries have reached maturity. This view is not shared by the authors, who argue for the possibility of industrial 'de-maturity', the arrest and even reversal of the maturation process in certain cases. Finally, this first section of the book gives us a briefly history of the American system of manufacturing, from Eli Whitney to the car makers of the 1960's.

Part II of *Industrial Renaissance*, entitled 'The

Case of the Automobile Industry', is comprised of the next four chapters. As suggested by the title, this is a study of the auto industry to point out what it takes in today's environment to develop and employ production competence as a formidable competitive asset. First of all, we are told some of the underlying reasons for the domestic carmakers' problems of recent years. As recently as the post World War II period, Detroit had no competition from abroad, and was benefiting from a seller's market; having failed in earlier attempts to market smaller cars that were not as profitable as the larger ones, it had conceded this market to the imports, which had grown to 15% of the market by the early 70's. Then, of course, the oil shocks of the 1970's caused the explosion; over 20% of the cars sold in the U.S. today come from Japan.

The authors then make use of several tables to try to depict the source of the \$1,500 cost advantage that the Japanese are able to obtain over a similar U.S. product. The conclusion is made that Japanese superiority in productivity, cost, and quality is the result, not the cause of their excellent manufacturing system. This is evidenced by a tour of any of their plants, which reveals a strict adherence to a just-in-time inventory system, where inventory is kept down to a minimum in order to expose problems as soon as they arise.

The last chapter of this section is a crucial one. It is about the human resource; in Japan, the labor force is an essential part of the production system, and teamwork and esprit de corps prevail. This is not the usual case in U.S. plants, where a long history exists of excessive supervision on the part of management over wage-earners locked in dull, repetitive jobs. As the book states, after the formation of unions there was no management-union harmony, only a ceasefire. However, high levels of production were able to camouflage problems until recent years. Now we need cooperation from the labor force if we are to compete against foreign manufacturers.

The last three chapters of the book are devoted mainly to two topics; first of all, the authors present us with evidence in chapters 8 and 9 that the U.S. auto industry is in a period of de-maturity. (Which I shall cover in more detail.) Chapter 10 contains some integrating comments as well as an expression of hope for American industry.

This book is overflowing with concepts and supporting evidence, but I feel that there are three

main points that the authors are trying to make. First of all, the recent problems experienced by the auto industry are not a 'transient economic misfortune'; these problems are real and are not going to go away on their own. By the late 1950's, the domestic car industry had settled into maturity, that is, technological competition had been over for years and the prototype of the American car had been set, except for minor innovations. At the same time some world-class competition was emerging mostly from Germany and then Japan, aimed at the small car market, growing slowly through the 1960's, and accelerated by the oil shortages of the 1970's. These shortages have caused a change in the kind of car that is being demanded. What the public is buying today is a different product from that of fifteen years ago.

The second main point that Abernathy et al. try to get across is that the Japanese advantage in manufacturing over the U.S. cannot be attributed solely to simple factors like lower wages or differences in culture, but is the result of their ability to devise and maintain a world-class manufacturing system. In fact, the authors point out that the Japanese use less capital per vehicle than Americans do, and their process technologies are no more advanced. The difference is, as I pointed out previously, in their adherence to the just-in-time system.

The third main point that I see is made by this book is that in spite of its troubles, the situation of the U.S. auto industry is far from hopeless. First of all, evidence is shown that although Japanese cars are initially better in quality, the ratings are much closer for cars five to six years old, especially in the mechanical area. Secondly, and more importantly, the authors show that the domestic industry is in a state of de-maturity, so that technological competition can start again and the industry may survive. De-maturity is proven by: (1) increased visibility of technology evidenced by rise of emphasis on technology in advertising after 1979; (2) increased value of technology, as shown by estimated market premiums; (3) increased diversity, as evidenced by availability of different engines, front-wheel drive, diesels, etc.; (4) a shift in the nature of innovative activity. The industry is making more than trivial changes, looking for new opportunities.

The overriding theme of the book seems to be a message of the American industry: if you want to

compete in today's new economy, it will take a commitment to manufacturing excellence, renewed technological competition, and an integration of the skill of the work force into your system. And the message is loud and clear, although perhaps it might have been made clearer if we were spared some of the details of chapter 3 on the American system of manufacturing. But all in all I think *Industrial Renaissance* does a very fine job in a rather concise manner by concentrating on just one industry and allowing the reader to generalize on his own.

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S.P. SETHI, N. NAMAKI and C.L. SWANSON
The False Promise of the Japanese Miracle
 Pitman, Marshfield (MA), 1984.

The False Promise of the Japanese Miracle is one of the few books currently in publication that takes a critical view of the Japanese business and management system (JABMAS) as it functions in Japan and its ability to function well in America.

When many books are being written proclaiming JABMAS as the cure for unhealthy American Business firms, this book critically analyzes the limitations of JABMAS within the cultural and sociopolitical context of the United States.

The book has several objectives. It aims to describe JABMAS within the cultural and socio-political context of Japan. The American business and management system (ABMAS) is then described within its own cultural background. The limitations of both systems are analyzed in terms of their current operations. The book also tries to develop a conceptual framework of how change occurs and the elements necessary in society to evoke a positive response to change. The JABMAS is then evaluated with respect to its introduction into American companies and the reaction of Americans who work in Japanese run companies in the United States. Lastly, the authors provide guidelines for rejuvenating American business. They discuss the changes that are needed and

warn against implementing JABMAS in the United States. They further warn that attempts to dissect the Japanese system and implement only its desirable aspects will also lead to failure because JABMAS is a unit or a system which can not sustain dissection and still work.

JABMAS has strong roots in a homogeneous Japanese culture and society which emphasizes veneration of authority, paternalism and respect for seniority. Group conformity is viewed as indispensable since status is derived from one's social group, team or company, rather than from individual achievement. Business and government work in a cooperative manner supporting the efforts of the other.

The operational elements and personnel policies of JABMAS are clearly rooted in Japanese culture. Decision making by consensus, life-time employment, seniority-based compensation, company-based unions and promotion from within fit well with the Japanese drive for group harmony and avoidance of overt conflict at all times.

The authors, however, contend, that while much has been written about the benefits of JABMAS, the costs that workers must pay for the system have been largely ignored. They feel that these costs are reflected in a loss of individual freedom, a rigid social structure and the sacrifice of other important values.

The majority of workers do not benefit from life-time employment. This is bestowed on a small minority and women are totally excluded from this benefit. Other workers are put into temporary worker groups and do not enjoy job security, equal wages and other fringe benefits guaranteed to life-time employees. Life-time employment also forces early retirement between the ages of 55 and 58 years old. Retirement benefits are meager, forcing some retirees into temporary worker in other companies with a resulting loss of prestige and status.

Seniority-based compensation does not reward individual creativity and excellence, and may eventually reduce worker motivation.

Consensus decision-making, while promoting group strength and possibly better decisions, also creates inefficiencies in operations and imposes a rigidity in operating costs. When decision-making can not be done by consensus, in a crisis situation for example, employee morale may be impaired.

The operative effort of government and business has permitted, unit very recently, hazardous

and unhealthy working conditions and abuses of the environment.

ABMAS is concerned more with the individual and the immediate short-term future. It is in keeping with a heterogeneous American culture which emphasizes individualism, voluntarism and satisfaction of self-interest. Human relationships are governed by the concept of the supremacy of the individual, the maintenance of private property and the entitlement of individuals to certain rights. Constitutional pluralism and the acceptance of laws govern American thinking in the sociopolitical context and competition is the method of allocating financial rewards.

The major ABMAS management values which stress the importance of profit, professionalization of management, the value of segmenting decision making and rewards based on individual performance is in keeping with the heterogeneity of American culture.

The operational and personnel policies of ABMAS encompass a performance-based reward system, maximization of shareholders' wealth, top-down decision making, clarity and directness in communication, trade unionization and goal setting by top management. These too have their basis in American culture and sociopolitical environment.

However, ABMAS must bear much of the blame for the obvious decline in American industry and for the loss of its competitive edge by disregard for quality of product, work force, consumer and long-range perspective, as well as government's haphazard attempt to control the economy through uncoordinated regulation is the basis for the inability of American business to keep pace in the industrial arena.

The authors devote an entire chapter to a discussion of the Itoh (America) Inc. case in which Americans are bringing suit against the Japanese run company on charges of discriminatory practices. This case as well as several other chapters are used to support the authors' contention that the imposition of JABMAS in America can not work. They do not see the gap between JABMAS and ABMAS narrowing in the future and criticize theory 2 as not being a theory at all. Instead, Sethi et al. recommended changes that American business must make in order to regain its competitive edge.

American business and management practices, business and government relations, and interna-

tional trade and competition are the three areas of focus for change. The methods to use are based on American cultural norms and are, in keeping with our organizational structure, political system and societal traits. They are designed to use our strengths rather than cover up our weaknesses.

The authors discuss the need for focus to be placed on computer-integrated manufacturing processes, concentration on long-range results and the updating of plant and equipment. More emphasis must also be placed on innovation, R&D, and internal growth rather than acquisition and diversification. Quality of product and consumer satisfaction must also receive top priority.

In terms of personnel policies, greater participation by employees in decision-making, a more collegial and less autocratic style, and a reward system based on innovation, product life cycle and variable manufacturing costs should be implemented. A corporate culture needs to be developed so that goals are consistent with individual as well as societal needs. A decentralized-centralized system of organizational structure should be developed where authority and responsibility are assumed by individual 'cells' and 'cell' leaders and the corporation is defined by its accomplishments rather than by its CEO.

Lastly, the authors feel that the United States must take a firmer position vis-à-vis trade agreements with Japan.

The book is an interesting one and somewhat unique for its attempts at criticizing the Japanese system of business and management. It brings out many points which are little known in terms of the inequality of various Japanese personnel policies and provides a few innovative methods for change in American business practices. It seems that one of the book's objectives, although not specifically mentioned, is to provide the United States with a

belief in its ability to regain its competitive edge without relying on foreign models.

However, many of the solutions to the problems facing American business sound very much like what the Japanese are currently doing. Emphasis on quality of product and process, economies of scope, employee participation in decision making and 'cell' organization are American terms for Japanese decision making by consensus, group formation, JIT manufacturing approach etc.

Although it is probably easier to implement JABMAS in Japan due to cultural factors, culture should not be used as the primary basis for rejecting the idea that JABMAS could work in the United States. JABMAS was conceived by Americans and was rejected based on cost, not cultural factors.

The book is a little too long and repetitive. It is unconvincing in its attempts to prove that JABMAS could not be used successfully in the United States. The book would have greater credibility if its premise was to show how JABMAS should be modified in order to be more readily accepted and implemented in the United States, instead of criticizing and rejecting the system outright.

The work, however, should not be ignored because its attempts to demystify JABMAS are needed. American business has the tendency to be faddist, narrowly implementing new ideas without fully understanding all of the ramifications and subtleties. This tendency often makes failures out of possible successes.

The book therefore is worthwhile but should be read with a critical eye.

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