SECTION 42

QUALITY IN THE PEOPLE'S REPUBLIC OF CHINA

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THREE THOUSAND YEARS OF QUALITY—AN INTRODUCTION

Historical Background. China's long recorded history can be traced back to the twenty-first century B.C., more than 4000 years ago. Its political history began taking recognizable shape during the period when the Yangtze River basin was dominated in succession by two great feudal dynasties, first the Shang, whose kings ruled from around 1750 B.C. until 1125 B.C., then the Zhou, who conquered the Shang people around 1125 and ruled until 250 B.C.

The last 2 centuries of Zhou rule were marked by warfare among the city-states of the Middle Kingdom, as the Yangtze region was then called by its inhabitants. The larger city-states began to conquer and absorb the smaller, weaker ones. The Zhou dynasty collapsed late in the third century B.C., bringing a temporary end to political order. In 221 B.C., Shi Huangdi, king of the western city-state of Qin, unified the Middle Kingdom politically for the first time, becoming its first emperor and the founder of the short-lived Qin dynasty (221–206 B.C.). (Though the dynasty ended with the death of its founder, its name lives on, in altered form, as "China.")

Over the next two millennia, China was ruled by a succession of imperial dynasties. When the Qing dynasty (1644–1911 A.D.) came to an end, relinquishing rule in 1911, the 4000-year era of feudal/dynastic rule in China ended with it.

For purposes of tracing the history of quality management, it isn't necessary to trace the history of the rise and fall of all of the dynasties which came to rule China. It is only necessary to point out

the fact of this succession. The emergence of a dynasty generally signaled a period of relative absence of threat, either from internal factions or external invaders, when social and technological development could take place. The eclipse of a dynasty, involving the transfer of great power, was usually accompanied by military action and social disorder which threatened all development.

The Shang and Zhou dynasties are associated with the earliest expressions of high civilization in China, especially their rich religious and ceremonial life. The production of bronze ceremonial artifacts was an important part of that tradition. By the early years of the Shang dynasty, the handicraft industry which produced these objects was already established. Its outstanding achievement is recorded in classical Chinese writings and is evidenced by archaeological relics and by the remaining items of handicraft. This industry was the foundation for the manufacturing tradition that survived the long succession of dynasties that followed.

All of this evidence leaves no doubt that the management of product quality has long been understood and practiced in China. However, the West has had access to few details of quality management as practiced by the ancient Chinese. The work of Jin et al. (1995) offers a rare exception.

It may be appropriate to review briefly what is known of the history of quality management, to better understand quality management as it is practiced in China today.

The Nature. In ancient times, quality management was applied only to the handicraft industry, which at that time included many trades, such as metallurgy, vehicles, ships, textile and leather, pottery and woodworking, weapons, musical instruments, and architecture. As written in *Zuozhuan, the Thirteenth Year of Cheng Gong* (Annals of the Zhou dynasty), "Sacred ritual and war are major matters of prime importance to the State." Strict quality control began first on those products to be used in offering ritual sacrifice and in making war. The fine quality of bronze vessels, sets of bells, and swords made in the Shang and Zhou dynasties are well-known and provides tangible evidence of attention paid to their quality.

China's ancient handicraft industry was dominated by workshops owned by feudal lords, especially by the emperor. (For simplicity, we will call all such workshops "officially owned workshops.") This does not mean that there were no civilian handicrafts made during the long history of China. But no matter whether in scale, or in sophistication of technology or of management, civilian industry was no match for officially owned industry. The civilian handicraft industry was mainly a collection of small family workshops. To create such an enterprise, a family spent a lot of energy and undertook a great deal of risk. Risk was especially high during the chaos which often accompanied a change of dynasties. Lacking official protection, an individual workshop was often too weak to survive. On the other hand, the officially owned workshops, recognized and valued by rulers in every dynasty, had the power to survive and develop. As an important element of the surviving officially owned workshops, the official quality control and quality management systems survived virtually intact, with only incremental change over time. This helps account for the continuity of the quality management system throughout China's 3000 years of feudal history.

There are three fundamental aspects of this ancient system of quality management which are of interest: its content, its limitations, and its lessons for the future.

Content. Of the content of the Chinese quality management system, four main points can be made.

Concept. From the earliest times, it was based on a clear concept of quality. In 403 B.C., in *Kao Gong Ji* (Records in Inspecting the Works), it was written that "Heaven having time, earth having energy, material having beauty, work having skill, add these four and the result is quality." The recognition that quality is the result of many contributing factors was reflected in the practices of later generations of workshops, including the way they applied the concept of division and cooperation of labor as well as management.

Training. The system paid full attention to training and caring for skilled labor. China's workers as a class were never treated well, nor did they attain high status in the social hierarchy of the feu-

dal system. In fact, during the early dynasties, craftsmen were slaves. Nevertheless, the emperor used to visit their workshops to inspect the quality of their product and to inquire about their techniques and skill. As slavery was gradually abolished, the officially owned workshops began to use conscription to recruit craftsmen. After the Qin dynasty, many generations of succeeding dynasties practiced the same methods of recruitment. As in the times of slave labor, the craftsmen working for the officially owned workshops were forced to live together in the workshop, to make it more convenient for their bosses to manage and train them. The craftsmen thus conscripted were of relatively high technical capability to begin with; living collectively with fellow craftsmen made them more skillful through mutual teaching and learning. In addition, the collective arrangement made it easier to enforce official standards and rules for production and quality, assuring the product's conformity and superiority.

Standards. From the time the first emperor of Qin unified the metrological system in China, succeeding dynasties all promulgated laws and decrees to enforce the adoption of a unified standard of measures and weights, which helped greatly in the uniform practice of quality control in all industries throughout the country. For instance, according to *Tang Lu Shu Yi, Za Lu Men* (Introduction to the Laws of the Tang Dynasty, Miscellaneous Categories), compiled in 635–640 A.D., a law stipulated that measuring tools were to be checked every August, and were to be used only after the seals were affixed. Moreover, the concept of standardization went beyond its application to measuring tools. Application extended to the industrial products themselves, as well as to production practice, with the introduction of interchangeability of parts. The famous terra cotta army buried in the tomb of the first emperor of Qin was actually assembled from parts.

Table 42.1 presents a sample of surviving writings which bear on the subject of managing quality over the period from 403 B.C. (during the Zhou dynasty) until late in the Qing (last) dynasty. All of these books contain compilations of industrial standards and specifications. *Tian Gong Kai Wu,* the last reference in Table 42.1, is an especially important example of writings on Chinese technology, and was praised by Joseph Needham, the world's pre-eminent authority on the history of Chinese science and technology.

TABLE 42.1 A Sample of Ancient Chinese Writings on Quality Management

Kao Gong Ji (Records in Inspecting the Works)	403 B.C.	A recognition of quality as the combined result of "the time of heaven, the energy of earth, the beauty of material, and the skill of the workman"
Tang Lu Shu Yi, Za Lu Men (Introduction to the Laws of the Tang Dynasty, Miscellaneous Categories)	Compiled in 635–640 A.D.	A law stipulated that measuring tools were to be checked every August, and were to be used only after the seals were affixed.
Wu Jing Zong Yao (Compendium of the Most Important Military Techniques)	650–950 A.D.	Subject: weapons manufacture
Ying Zao Fa Shi (Architecture Rules and Methods)	Song dynasty (960–1219 A.D.)	Subject: architecture
Zi Ren Yi Xun (Teachings of the Deceased)	Yuan dynasty (1279–1368 A.D.)	Subject: textiles
Long Jiang Chuan Chang Zhi (Records of the Long Jiang Shipyard)	Ming dynasty (1368–1644 A.D.)	Subject: shipbuilding
Cong Cheng Zuo Fa Gui Ze (Regulations in Engineering Projects)	Qing dynasty (1644–1911 A.D.)	Subject: construction
Tian Gong Kai Wu (Technology and Manufacture)	1637 A.D. by Sung Yingxing	Subject: manufacturing

Responsibility. The system provided for strict responsibility. From the time of the Zhou dynasty onward, the centralized autocratic state had a centralized system of quality control over the whole process of handicraft production. Special officials were appointed to manage specific organizations in charge of various production matters, from the administrative ministries down to the local workshops. Those officials, together with the craftsmen, were to be responsible for the quality of the product. For this purpose, a unique measure, entitled "Articles to be inscribed with the names of the craftsmen and the officials in charge," was enacted as early as the Zhou dynasty, and was continued in force by the governments of later dynasties. If someone made product of inferior quality, he could be traced and was to be punished properly. For the sake of justice and fairness, a system of product examination was devised, including in-process mutual, patrol, and final inspection. A method of sampling inspection was invented and used as part of the system. China's ancient quality management, though rather primitive in its early days, became quite systematic and efficient in its later development.

Limitations. This system had limitations. In the 3000-year period from the Zhou dynasty to the Qing dynasty, the basic political system changed little; so also did the basic organizational structure for control of industry, which, by and large, was a collection of officially owned and bureaucratically managed business. Despite the fact that these businesses faced no competition, and despite the fact that they were protected by state authority, their quality control and management were carried out with strict discipline. However, because all the products were demanded either for the luxury of the royal court or for the needs of the state, production cost was totally ignored. Furthermore, a state policy of "stressing agriculture and suppressing commerce" was adopted at the time of the Zhou dynasty, and maintained for the 2 millennia which followed. There may have been a valid argument for such an emphasis on agriculture at the expense of commerce 2000 years ago, but it goes without saying that clinging to this policy posed a severe hindrance to the development of a national manufacturing industry in China's feudal era.

As a consequence of these factors, the development of quality management stagnated—no further innovation was believed to be necessary. Another more serious consequence was that the science and technology of China also began to stagnate and to fall behind. Whereas until the sixteenth century China was among the most advanced nations of the world, it began a period of decline, the victim, perhaps, of its feudalism and its self-sufficient small-scale peasant economy.

Lessons for the Future. Without the felt need to innovate, and without the help of advancing science and technology, quality management could not evolve further. When we look at the China of today, we can find in its state-owned industries, in their administration by various ministries, and quality management by governmental regulations, a considerable resemblance to the ancient system. Yet this ought not to be surprising, as China is, after all, a country of tradition.

While tradition can sometimes stifle progress, it can stimulate it, too. The history of China's ancient quality management system reveals brilliant achievements associated with its application to the production of handicrafts. Today, China faces a new environment—political, economic, and scientific. One challenge of the new environment is to create a new quality management system. Should not the study of this history also provide useful guidance for the men and women of China who face this challenge?

QUALITY IN POSTREVOLUTION CHINA

Quality in the Early Years of the People's Republic (1949–1952). When the People's Republic was first established in 1949, the predominant task was to fully utilize the meager industry that was left following the Civil War to produce as much as possible to meet the needs of the country and people. All privately owned factories were turned over to the state and rebuilt into state-run businesses. How to run such reborn factories became a problem. There was no experience to follow, no lessons to learn from, and no knowledge base to refer to. What could be relied upon

were only the factory workers who had been just liberated and were full of enthusiasm for production. A new form of organization had to be worked out. Some new concepts for quality and productivity had to be put forward.

Worker Terms. First of all, a democratic management campaign was carried out in the whole country to abolish the feudal gangmaster system which had so cruelly exploited the workers. For example, the Ministry of Fuel Industry issued such an order in 1950 to all mines over the country. Then a new form of organization, the "Administrative Committee," was set up in every factory which was composed of workers of the factory and cadres dispatched by the government to discuss and decide important matters. Needless to say, the quantity and quality of products were the first items to be placed on the agenda. Consequently, laborers enjoyed a new status; they were workers of course, but also, in a sense, managers. A very harmonious relation between management staff and line workers was thus formed.

In such a background and environment workers started to create their own teams. They began to be aware of their responsibility and improved their labor discipline and skill through team activities. A rationalization suggestion campaign spread spontaneously across the country. In August 1950 the Government Administration Council of the People's Republic passed a resolution to give awards for invention, technical innovation, and rationalization, putting the campaign on a more effective path. The consciousness of the labor did raise the industrial productivity and on the whole product quality reached a suitable level for civilian goods but was not satisfactory for more stringent requirements, particularly in military weapons. There had been a report saying that the point of fall of rocket shells produced in 1950 scattered very inaccurately due to the unevenness of charges used in different factories. The official view revealed the fact that inspections and quality control had not been taken seriously and properly. According to a statistical report of September 1950, which covered 29 weapons factories, only 21 had a quality inspection department. Of these, only 5 reported to the factory director. The remaining 8 factories had no inspection system of any sort at all. The sole dependence on the worker's individual consciousness of quality and productivity proved to be insufficient without a coordinated system of quality management.

Corrective Measures. In April 1951 the Central Government began to establish an independent inspection department within every factory. Meanwhile, the central industrial ministries and their local agencies were also asked to have a quality supervision department. In the years 1951 and 1952, a quality management and supervision system was completed, comprising three levels—central government, local authorities, and factory management. The first task was to unify the test and inspection procedures and standards for most of the products which had lacked interchangeability and maintainability. Efforts for this purpose could be seen from the decision promulgated by the central government in October 1951, which made clear the duties and rights of inspection and demanded test equipment to be consolidated, in-process-inspection to be implemented, and inspection specifications to be documented in detail.

Inspection and standardization on one hand, operations improvement on the other—these were the two hands on which China was relying to exercise her quality management in the period of the Korean War. Workers concentrated on the improvement of their operations, because they knew that the only thing they could do to guarantee their product quality and quantity, with machinery equipment being so old and raw material so inferior, was to operate more efficiently and more effectively. They understood that this was the only way to meet the needs both in the front and rear. In cotton mills, coal mines, iron and steel works, machine-building factories and in railroad transportation, there appeared heroic workers who not only created advanced operations methods but also inspired the morale of their group by their devoted labor. As a matter of course, a call from the laboring masses and then a campaign organized by the State to learn from those model workers followed. This kind of learning campaign has since become a tradition which formed an important part of quality management.

Quality Management Introduced from the Soviet Union (1953–1960). China started her first 5-year plan in 1953 with the ending of the Korean War. The basic task was to build

up an initial foundation of industrialization centering around the 156 major projects helped by the Soviet Union. All technology and management necessary were brought to China by the thousands of Soviet experts who came as advisers at every industrial construction site. By the end of 1957, industries that China had never before had, such as automobile, airplane, machine tool, electricity-generation equipment, and high-alloy steel, were successfully established. It was in this period that the rough outlines of quality management as a systematic and scientific activity was first proposed. Since then, quality management has come to have tremendous influence on the later stages in China's economic development.

Organization for Quality Management

Centralized Leadership. A sound quality management system is an institutional guarantee of product quality for which commitment of the leadership is most vital. Following the Soviet experience, the chief of each level in the industrial management hierarchy, governmental and factory, was supposed to bear the entire responsibility and absolute leadership in what was called the "one-boss system." The factory director was in such a position for the factory management, including quality, and the director of the inspection department was in the same position as far as the department was concerned. A circular promulgated in this connection by the Central Committee of the Communist Party of China demanded party organizations in every factory to help strengthen the system. Everyone in the factory had to obey any order from the chief of the group, section, department, and factory office to which he or she belonged. Though the "one-boss system" gave full attention to the accomplishment of every production task, it was criticized as neglecting democratic management and hence inhibiting the workers' initiative. The Soviet-style centralized leadership was abandoned finally in 1961; it was replaced by leadership on the basis of consensus.

The Organizational Hierarchy of Quality Management. During the early years of the People's Republic, China was divided into six large administrative areas. Each area had had its own relatively independent area government. In the years 1952 to 1954, the central government gradually eliminated the large administrative area and tightened up its integrated industrial management in order to push the 5-year plan more vigorously. Industrial Ministries were rearranged and charged with full power and responsibility of administration respectively. State-owned factories were put under the direct and strict administrative management of those ministries, each of which had a department of quality or technical supervision. At the level of provincial and municipal government, there were also established local industrial bureaus and corresponding departments to execute the administrative supervision delegated by the central ministries. Aside from the central and local authorities, the State Economic Commission was created to establish quality management principles and policies and to coordinate the quality management of different ministries and localities. In factories, quality management was carried out at different levels: factory, workshop, and group. The inspection department director had a private staff and posted inspectors in the workshops and on the line, and in worker groups. This is how quality management was deployed, through local agencies, from the central government down to the factory floor. So it remained for the whole period of China's planned economy.

Various Functions of Quality Management. Production units in China's factories were unique and simple, in that such important matters as purchasing and sales were not their business. Each factory was categorized by product and size and reported to a central ministry and local bureau appropriate to that category. Those administrative authorities planned and assigned production quotas to factories. Other commercial ministries provided materials to and acquired products from factories at prices set by the government. There were neither a market nor a commodity exchange, but only products delivered through official circulation channels. Factories could not be regarded as enterprises. Instead, in fact, they were only workshops, since there was no risk to take on the part of the factory, profit, if any, being turned over to the State, and loss, no matter how much, being made up by the State. Regarding quality management, quality standards (and sometimes even product specifications and drawings) were given to the factory by the department in charge of each ministry. The factory was concerned mainly with process specification and control, equipment control and maintenance, operation and work instructions, inspections (incoming, in-process, and outgoing), and disposition of nonconforming products.

In every factory the chief engineer was responsible for all the technical aspects of quality management, while the director of the inspection department was in charge only of the inspections. The independent position given to the inspection department assured the authority of inspection with the side effect that it lost contact with the engineering department and line workers. Consequently, the responsibility of product quality was always an issue of dispute. The inspection department, particularly its director, was supposed to take the final responsibility, but had no authority or responsibility regarding product design or process control. Quality should be the comprehensive result of the efforts of all departments. However, the quality management system of that time was a hindrance to the realization of that ideal.

Shifting the Emphasis from the Product to the Process

Manufacturing Process Design. In 1953, the Ministry of Machinery Industry issued the "Regulations for the Work of Inspection Department" and "Regulations for the Trial Production of New Product," which together laid the foundation of quality management on both the industrial ministry and factory levels. Though these regulations put inspection first in quality management, they also incorporated Soviet-style technical supervision. This supervision began with the specification and design of product and then proceeded to the specification and design of the process. A trial production committee was set up and the inspection department was asked to participate to study the methods and results of test and analysis. The inspection department assisted in drafting technical standards and making modifications to correct deficiencies identified during the qualification test programs. So it could be said that in this way the inspection department was engaged in preventive actions. But it must be added that factories also received concrete help and guidance in their quality management from the ministries, where well-educated and talented technical personnel were concentrated. Therefore, in those days Chinese quality management was not carried out solely by factories, but was done in cooperation between factories and the ministries to which they reported.

Manufacturing Specification. It was gradually recognized through the implementation of trial production that product quality could not be guaranteed by inspection procedures and standards alone and was determined by good workmanship and proper process control, and that both of them should be stipulated by written standards, instructions, and other illustrations. Industries started to systematically work out process specifications and operation instructions. In every factory the inspection department organized its members to learn the process specifications and workmanship criteria and supervise their implementation in collaboration with process technicians and work-group leaders. A task was thus added to the inspection department: to check the integrity and applicability of the process specifications drawn up by other engineering departments. It was intended that the inspection department would reduce its degree of separation from other departments and its isolation in the factory. But things went in a contrary direction. So long as the problem of product quality responsibility had not been solved to the understanding of all parties concerned, disputes between manufacturing and inspection, which had always existed, now intensified. A complete solution had to wait for many years.

Establishing the Metrological System. Invasion by big powers brought different metrological systems to old China. One of the problems that the early industrialization of new China faced was the confusing state of metrological work. With industries and factories being built one after another, the administrative authorities felt it important to unify the system. Beginning in 1954, they set up special departments for metrology and standardization in factories. Measuring and test equipment was installed, qualified personnel were trained, and by 1957 a metrology system began to take shape in state-owned factories. The State Council established the State Bureau of Metrology in 1955 to unify and administer the metrological work nationwide, and issued a decree in 1959 which formally stipulated the adoption of the metric system.

The Disastrous "Great Leap Forward." Everything in quality management seemed to be developing fairly well. Management by the Soviet model, in spite of its shortcomings, had finally put the quality management of the newly built factories on a regular basis. At the same time, modern quality management developed in the United States was introduced to China. In 1957, an operations

research group was founded within the Chinese Academy of Sciences. They began their work with research in statistical quality control, offering courses, training staff, and conducting application experiments in factories. In August 1968, dizzied by the success of industrialization (though the success was in fact very preliminary), the politburo of the Communist Party ordered that a "Great Leap Forward" movement be launched. The backyard steel furnace and the people's commune were the two "indigenous" inventions that were promoted in this movement. They were meant to speed up the development of China's economy and to help China catch up with advanced countries. But they disregarded objective conditions and scientific reason. As a result, the national economy was badly hurt. Industrial management was discarded as a nuisance. In factories, inspection departments were all dismantled, and quality management was forced to disappear. The farce continued for 2 years. And who could have known at the time that when it was over an even madder one would take its place.

Quality in Self-Reliant China (1961–1965)

The Break with the Soviet Union and Its Management. In 1960, relations between China and the Soviet Union were suddenly ended. All Soviet experts were ordered to leave China, almost overnight, taking with them drawings and technical documents of unfinished industrial construction projects. This aroused in the Chinese people a spirit of self-reliance. From the beginning, the Soviet "one-boss system," the core of Soviet-style management, had been unpopular among Chinese workers. By 1959, some factories had begun quietly changing to a management style based on consensus. So, in March 1960, as an endorsement of this movement, the Control Committee of the Communist Party circulated an instruction generally known as the "Charter of the Anshan Iron and Steel Company," which stressed harmonious leadership through close collaboration of labor and management. It was so named because there had previously been passed to China the "Charter of the Magnetogorsk Iron and Steel Company" representing the stiff and rigid Soviet management. The Chinese edition of the "Charter" was apparently the antithesis of the Soviet one. It was intended to emancipate people's minds from blind worship of untested teachings and proved to be correct for conditions as they existed in China. It encouraged a mass movement of technological innovation and managerial reform.

The Emerging Chinese Model. In September 1961 the Central Committee of the Communist Party promulgated the "Seventy Regulations in Industry." Drawn from both the positive and negative experiences of economic development and administrative practices of the previous years, the regulations outlined the principles of industrial management to be carried out. It was actually the first comprehensive summary of the exploration of socialist economic management and it had far-reaching influence in later years.

Factory Director's Responsibility. The regulations clearly stipulated that the factory director took the management responsibility under the leadership of the Party committee in the factory. The decision left a question unanswered from beginning to end. It was expected that the Party committee could motivate the workers and establish good morale, and that the director could manage deputies and department heads in professional discipline. In fact, if the secretary of the Party committee and the factory director consulted and cooperated with each other, then the system would have worked well. If, on the contrary, they did not cooperate for any reason, the system would have led to an unstable or even a harmful situation.

In any case, the responsibility system was built on delegation by the director and regular division of management, and it cleared away the confusion and obstacles from various sources. As to quality management, inspection still played the leading role, but within a better framework than before. Beside the usual first-piece, patrol, and final inspection, there was implemented a combination of self-inspection, mutual inspection, and specialized inspections. A strong quality consciousness was to be consolidated through the new system of inspection.

Democratic Management. The gist of the "Charter of Anshan Iron and Steel Company" was the so-called two participation, one reform and three-in-one combination, i.e., management staff participate in line work, workers participate in management; reform through mass movement; management, technicians, and workers collaborate in combination to solve technological and managerial

problems. The "Regulations in Industry" also promulgated a democratic management system which embodied the principle that the factory director was responsible for duties under the guidance of the Party committee on the one hand and under the supervision of the Worker Congress on the other. Meanwhile, a campaign of "Learning from Daqing" took place all over the country. Daqing was the first big oil field, discovered in 1960. Within 3 years a huge oil refinery had been constructed there. Needless to say, Daqing contributed enormously to China's economy, but above all was its democratic management, of which the main point was its managerial training of all employees "to be honest, to be strict and to be same." That is, to be an honest person, speaking and acting honestly; to be strict in organization, requirement, attitude, and discipline; and to behave in the same way, no matter whether day or night, in good or bad weather, inspected or not inspected, whether the leader is on site or not on site.

Essentially, the Daqing experience was the revolutionary and scientific spirit which kept the workers' production enthusiasm alive and the enterprise management efficient and effective. With this spirit in daily work, quality management began to put prevention first. For instance, because line inspectors were chosen from quality-conscious and experienced line workers, they were asked to fill a triple role: first, to be a propagandist to explain to the line worker why quality comes first; second, to be an instructor, to tell the line workers how they should operate to protect their product from nonconformity; and last, to be the inspector—to decide whether the products meet the standards. This was a useful measure to prevent nonconforming products, but also proved to be a wise method to avoid the disputes between production and inspection which had often occurred in the past.

A National Campaign. From the beginning of the People's Republic, democratic management in factories was sought. In the best circumstances, democratic management is easier said than done; widespread distrust of the then-dominant autocratic Soviet management model made it even more difficult to achieve. By early in 1957, statistical quality control (SQC) had already been introduced to China by scholars returned from study in the United States. Courses had been offered, technical staff had been trained, and experiments had been done in some factories. However, while SQC remained a useful tool in the hands of the technicians and engineers in charge of inspection, it would be rejected by the management and labor as well. This lesson had already been learned at that time. When the call to "integrate theory with practice" sounded over the country, SQC people, research scientists and college professors, went down to the grass-roots units and realized that SQC had to connect itself with the democratic management movement then in progress if it was to become a useful element of quality management. Data collection, for example, would come to nothing without the wholehearted cooperation of the line workers. For another example, when the concept of the process capability study was introduced to factory people by lectures and experiments, the workers spontaneously grasped the meaning and intuitively recognized that this was the common language by which engineering, production, and inspection could communicate in order to guarantee product quality and was the practical way to implement the "three-in-one combination" and the "two participation" democratic management.

Advancing from product inspection to process control, management, technical staff, and workers got together to discuss quality problems and related matters, such as product specifications, equipment maintenance, work standards, and production costs. Here staff were able to get first-hand data and material in the workshop, and workers were able to work in concert with management. Appreciation of the new quality control thus grew gradually. In 1964, the Ministry of Machine Building decided to promote process control through process capability study in all its factories.

The Cultural Revolution (1966–1976). The so-called Cultural Revolution started, developed, and ended beyond rational imagination. It was a farce, a tragedy. It was a nightmare, a disaster. Daily life— political, economic, and social—fell totally into turmoil. Economic management systems—from the central government to local authorities—were gravely damaged. Order in work and production was disrupted completely. Every principle of the "Seventy Regulations in Industry," such as the proper relationship between the State's centralized administration and the enterprise's independent management, and the management responsibility system, were criticized as evil institutions which "bother, block, and suppress" the working class. Instead the "three-nil factory" was

recommended, which had no administration from above, no management of itself, no rules and regulations at all. Under these circumstances, quality management, which had been implemented and improved so much, became a taboo. In 1972, industrial product quality had deteriorated so dangerously that a proposal was raised by the National Planning Conference to re-emphasize "quality first"; it was overruled. The "Cultural Revolution" brought disorder, irresponsibility, and low morale to factories and put China's economy to the verge of collapse. What is more, intellectuals, engineers, and technicians were vilified as "stinking rascals," their endeavor to absorb knowledge from advanced countries abroad and to apply it to the economic construction of their own country was taken as "blind worship and faith in things foreign." Be it SQC or TQC, it was forbidden in those sad years.

Reform and Open Door (1977 to Present)

Cultural Revolution. The "Cultural Revolution" was ended in October 1976. Various efforts were undertaken to bring order out of the chaos created in those 10 years. Government organizations were gradually restored and replenished. Factories resumed regular production order and proper leadership, step by step. In April 1977, the State Council convened a national industrial conference which, among other things, decided to promote a nationwide campaign: "Trust me with quality." The campaign aimed to arouse the quality consciousness and sense of responsibility of workers, asking them to inscribe their names on their own products, a measure very like the old one carried out in the dynasties. Though the request was liable to make workers overintense on the processing production line, and could not continue for long, it did educate the workers that quality was a serious matter. Since then the campaign has evolved to an ordinary team-management of factories, where a group or team of good workmanship and quality product would be given the title "Team can be trusted." In April 1978 a new "Thirty Regulations in Industry" was issued, the main points of which were to rectify the management leadership of factories and to put product quality at the first place for factories in fulfilling the state-planned production assignment. A responsibility system was once more put forward and it was stipulated this time that a deputy director of the factory was to be responsible for product quality and related matters. A number of factories with difficult and long-standing problems thus recovered within a short time after the release of the Regulations.

Qinghe Woolen Mill. As a matter of fact, Total Quality Control began independently at Qinghe Woolen Mill in 1976 and at the Beijing Internal Combustion Engine Factory in 1977 with help from China's own experts, and the success achieved had drawn the attention of the country. But the dispatch of QC experts from Komatsu, a world-famous manufacturing company of Japan, working in the Beijing Internal Combustion Engine Factory under the guidance of Dr. Kaoru Ishikawa in the summer of 1978, gave a tremendous boost to TQC in China. All of a sudden, factory people were astonished to hear about a system of quality control in which all factory members had to participate, and rushed to the Beijing Internal Combustion Engine Factory from all over the country to learn what it was. Next year a group of technicians and engineers of the Factory was kindly invited by the President of Komatsu, Mr. Ryoichi Kawai, to come to its Koyama Engine Factory to practice TQC in the TQC atmosphere of Komatsu. The book written by members of the group, recording their experience in Koyama and published after their return, was circulated so widely that TQC in the early days in China was always connected with the names of Komatsu and Beijing Internal Combustion Engine Factory.

Reform and Opening. In December 1978 China adopted a policy of "reform and opening to the outside world." It proposed emancipating the mind and at the same time seeking truth from facts. It demanded that issues in management methods and management institutions as well as economic policies be studied and solved carefully. A common acknowledgment was reached that management and technology were the two wheels of the vehicle of production in which China's technology lagged behind the times and management was even further behind. The new policy greatly encouraged Chinese people to strive for a better understanding of the outside world and a better way to rebuild

their country. High official delegations were sent to Japan, the United States, and Western European countries, one after another, to learn business management. They brought back new knowledge and fresh excitement. The China Enterprise Management Association and the China Quality Control Association (CQCA) were set up separately in 1978 and 1979 at the suggestion of one of these delegations. The mission of CQCA with its local and trade branches was to promote TQC among enterprises and to provide consultation and advisory services to governments of different levels. When the State Economic Commission began to take the responsibility of promoting TQC in state-owned factories within the conditions of the planned economic system, CQCA actually became the acting body of the Commission in this respect.

In 1978, the State Council approved the proposal from the quality professionals to make September "Quality Month," during which prestigious awards were given to the enterprises with outstanding quality product and quality management. Propaganda on TQC was conducted on a national scale. Mass media were mobilized. In 1980, a TV program on TQC was broadcast for the first time and repeated in different versions in succeeding years. The TQC TV program was specially featured as an educational course.

Students were recruited through industrial ministries and were qualified if they passed the examination directed by CQCA and other authorities. It was reported that more than 10 million people of different occupations have watched the TQC TV program in the past 15 years. By the time the "Provisional Regulations for the Implementation of TQC" was issued by the State Economic Commission in 1980, TQC had been disseminated broadly throughout the country. Beginning in 1978, QC circles were organized in state-owned factories, and they have held their local and national conventions every year since. In 1983 the "Provisional Regulations for QC Circles" was issued by the State Economic Commission which put the QC circle activities on a healthy footing and in a more influential position. In 1980, the number of QC circles was estimated to be 40,000; by 1995, the officially registered QC circles had increased in number to 1,360,000, with an economic benefit to the enterprises of more than 20 billion yuan ($US 1=8.31 yuan). By the end of 1985, 38,000 state-owned factories in a variety of industries had implemented TQC with special departments in charge of the effort. On the basis of the Seventh Five-Year Plan (1986–1990), which stressed repeatedly the importance and necessity of quality management, the State Economic Commission made a corresponding resolution to examine and reinforce the TQC of 8200 medium- and large-scale factories within the 5-year plan period. Though small in number, these factories account for 60 percent of the entire annual industrial output of China. The heavy promotional task fell on CQCA. A new set of criteria was designed for this purpose which focused on the establishment of a quality assurance system.

New Era. Thus a new era of quality management arrived, a result of the Reform and Open Door policy. The foremost breakthrough was the exchange of ideas and experiences with foreign quality professionals and organizations. As mentioned above, Dr. Ishikawa came first in 1978 and came almost every year thereafter until his death in 1988. Dr. Lennart Sandholm, Dr. Genichi Taguchi, and Dr. Yoshio Kondo were among the earliest experts to visit China. In 1982 in Beijing, Dr. J. M. Juran delivered a week-long series of lectures. Despite Dr. Juran's advanced age, the lectures were moving. Dr. H. James Harrington's enthusiastic help was welcomed. Dr. Hitoshi Kume was also a frequent visitor. Their personal lectures and advices had been most valuable to the development of TQC in China. Doctor A. V. Feigenbaum, though he did not come in person, consented warmly to be an honorary advisor to CQCA. There were so many foreign experts who came to help that it would be impossible to give all their names here. In addition, quality organizations such as the Japanese Union of Scientists and Engineers (JUSE) and the American Society for Quality Control (ASQC) were not reluctant to render their aid and hospitality to China. Numerous delegations and study groups from China also visited many foreign countries, and it must be noted that the first official QC delegation to the United States was invited by the American Association for the Advancement of Science in 1983, and had the honor of meeting prominent American scientists and entrepreneurs on the occasion arranged by the American National Academy of Sciences and the American National Academy of Engineering. Yet the big event would be the First Congress of the Asia-Pacific Quality Organization convened at Beijing in 1985, where Chinese quality professionals were able to become acquainted with so many colleagues from abroad at home. The exchanges of

knowledge and experiences not only enriched the QC expertise on the China side but also enhanced mutual understandings among experts of different countries, the latter being by far the most beneficial and valuable outcome.

Readjustment. In the years since the Reform of 1977, China's economy has undergone several periods of readjustment, restructuring, consolidation, and improvement. In each period it has been emphasized that enterprises should strengthen themselves by improving quality rather than expanding in quantity. This message undoubtedly supported the promotion of TQC. Nevertheless, it has not always been clear for TQC. For instance, in 1988 the "Law on the Industrial Enterprises Owned by All the People" was promulgated, which made a clear separation between ownership and management, assigning more power and responsibility to the enterprise manager.

In the process of enforcing the law, the administrative functions of the government department shifted from exerting tight control on the management of enterprises to creating a better environment for the development of enterprises. This shift should be very helpful to the implementation of TQC in enterprises, but enterprise managers widely misjudged the intent of the Law and took advantage of their enlarged power to pursue quick profit by expanding quantity at the expense of quality. Under these circumstances, quality management was weakened and the inspection department was even abolished in some cases. From this bitter experience several conclusions were drawn. First, Total Quality Control must be "Top's Quality Control" meaning that the top management must learn first and be committed in person if there is to be a really effective and sustainable TQC. Second, product quality must have a veto over other production performance. In the computation of workers' wages and bonuses, their work quality must have priority over quantity and other matters. Third, in the final analysis quality is in the hands of workers. Therefore, their quality consciousness must be first motivated before the training of skill. Equally important was the legislation for product quality and quality management. "The Law of Standardization," effective on April 1, 1989, encourages adoption of international standards. In December 1993, the State Economic and Trade Commission, State Planning Commission, State Science and Technology Commission, and State Technical Supervision Bureau jointly issued the "Regulations of Adoption of International Standards and Foreign Advanced Standards," which supplies preferential merits to enterprises which do so.

As early as December 1988 China adopted the ISO 9000 series of 1987 for national standards in quality management, adding a few technical complements and changing the coding system. The converted standards posed some problems in communication and cooperation with foreign experts because of their nonconformity with the original. In December 1989, a National Technical Committee, as the counterpart of ISO TC 176, was formed to be the technical authority over the standardization of Quality Management and Quality Assurance in China. The "Provisions of Quality Product Certification," issued by the State Council in May 1991, made existence of a quality system a necessary condition for an enterprise to apply for the certificate. As of the end of May 1996, 721 certificates of accreditation had been issued by state-recognized authorities to enterprises in China. Overseas organizations, such as Underwriters Laboratories Inc. in the United States, Canadian Standards Association, British Standards Institute, and others are also involved in quality certification in China. The whole certification system is helping China's enterprises to produce commodities of better quality and safety, in conformity with international standards. In August 1992, the State Council issued the "Decision on Further Strengthening Quality Management". The document summarized the achievements and shortcomings of quality management since the beginning of the Reform and Open Door Policy, and stressed the crucial meaning of quality and quality management. It required governments and enterprises at all levels to have a sense of urgency and crisis regarding quality.

The spirit of the 10 articles of the State Council's decision was to emphasize three elements: the full utilization of the market mechanism to force enterprises to improve their product quality, provision of a framework of laws to guide and regulate enterprises' quality management, and the education of the people to exercise their legal rights regarding product quality. Accordingly, in September 1993, the National People's Congress (NPC) passed the "Laws of Product Quality" stipulating the rights and duties of the producer, and introducing for the first time in China the idea of product liability. A month later, in October 1993, NPC passed the "Laws of Consumer Rights Protection," which made clear the consumer's right to complain and to be compensated for inferior quality.

Though not perfect, these two laws have already begun to put pressure on producers to pay due attention to their product quality, and encourage consumers to seek compensation instead of accepting inferior quality goods in silence.

Quality Long March, a TV Program which began in 1992, is a lively example of educational work in consumers' rights. TV reporters travel around the country to collect and broadcast consumers' opinions on product quality and at the same time secure responses to their complaints from the producers concerned. The TV program did a good job in making known to the consumers their legal right to protect themselves from inferior-quality products and in warning producers of their duties to produce quality goods. Quality Long March has now become a regular national program every year during Quality Month, and has invited quality experts to tour-lecture on quality since 1995. Another event of Quality Month, the China High Level Forum on Quality, also began in 1992. High officials of the State, business representatives, quality experts, and scholars meet at the Forum to discuss quality issues and make pertinent proposals to the parties concerned. Vice premier Zhu Rongji told the Forum in 1992 that quality should be the life of China's economy. In 1993, another vice premier, Li Langing, proposed to the Forum that China could prosper only through superior quality. Their words greatly encouraged China's quality professionals to strive for better quality of products, services, and life.

QUALITY AND THE TRANSITION TO THE MARKET ECONOMY

China's quality and quality management cannot be separated from the economic system of China. A brief introduction to the changes of the economic system is necessary for a clear discussion of quality and quality management. From the first 5-year plan period (1953–1957) to that of the fifth (1976–1980) China had practiced the centralized planned economic system. The Reform and Open Door Policy was proclaimed in December 1978, halfway through the fifth 5-year plan period.

In 1980, the first test of a different economic system was implemented at Shenzhen, a small area near Hong Kong. A system of "mainly planned economy supplemented by adjustment of market" was proposed favorably in the Twelfth National Congress of the Communist Party of 1982. This was equal to admitting the law and function of the market. In the Thirteenth National Congress of 1987 the wording changed to the "planned commodity economy."

How much difference there is between these two phrases is a question which has puzzled many people. In any case, one thing was felt for sure: The economic system of China was going to change. The Fourteenth National Congress of 1992 made the proposal of the "Socialist Market Economy," and the resolution passed by the National People's Congress in 1993 determined officially the new economic system. During the whole process of change of economic system, administration of enterprises by the government and enterprise management itself changed too. So did the management of quality.

The Challenge for China in the World Market. The transition from the centralized planned economy to the socialist market economy is a challenge as well as an opportunity. The challenge comes from the market. If China meets the challenge with success, then China will prosper. In this way the market offers the opportunity as well. To meet the challenge China must deepen the Reform and widen the Opening.

Nature and Status of State-Owned Enterprises. The first important and urgent task is to restructure and rejuvenate the state-owned enterprises, which lost their vitality during the almost 30 years of planned economy. The separation of ownership and management power stipulated by the State Industrial Enterprises Law of 1988 has to be accomplished by restructuring the state-owned enterprises to corporate organizations which make their own managerial decisions, take full responsibility for their own profit and loss, develop themselves by their own efforts and resources, and restrain themselves by observing laws and regulations. In 1992, the government issued laws and regulations for State enterprises to change their management mechanism and defined the modern corporation system as the goal of enterprise reform. In 1994, from the tens of thousands of State-owned enterprises, 100

large- and medium-sized ones were chosen to take part in the experimental introduction of the modern corporation structure. The crucial and difficult task in this experiment was transforming the existing administrative relationship between the government and the enterprise into an economic one; that is, the government is the owner of the enterprises' property, which is operated by the enterprise manager. The results were satisfactory and the reform began to spread nationwide in 1996. Though there are many problems, such as property rights, huge debts, and inactive employees, the reform of State-owned enterprises will be achieved with the successful macro economic control.

Unification of Democratic Management and the Legal System. According to the State Industrial Enterprises Law of 1988, the state is supposed to ensure that staff and workers enjoy the status of the masters of their enterprises, and the enterprise should, through the staff and workers' congress, practice democratic management. The trade union in the enterprise should represent and safeguard the interests of the staff and workers, and should organize them for participation in democratic management and democratic supervision. It is the first time in history that democratic management has been thus stipulated by law. The establishment of a modern corporation system is combined with democratic management. The "Law on Corporations," effective on July 1, 1994, further stipulates the relationship among owner, manager, staff, and workers and the right of the staff and workers' congress and trade union to send representatives to the meeting of the Board of Directors in case there is discussion of matters concerning the interests of the staff and workers. The "Labor Law," effective on January 1, 1995, stipulates the rights and obligations of labor. Under this law, democratic management not only assures the right of employees to participate but also imposes a duty to obey the rules and regulations of the enterprise.

International Business Environment. Foreign trade has increased rapidly since the Reform and Opening, particularly after the change to the market economy. China has become a country relying heavily on foreign trade; in 1995, the combined total value of exports and imports was more than 40 percent of Gross Domestic Product (GDP). In the same year, foreign investment in China amounted to 150 billion U.S. dollars. Competition in both the domestic and foreign marketplace is becoming more and more intensified. In recent years, the sharp cut in China's import tariffs has especially accelerated the import of foreign-made commodities, which in turn, has put pressure on State-owned enterprises. Competition is good, but Chinese producers of commodities lack competitiveness. This is precisely one of the reasons that the State has speeded up the reform of State-owned enterprises in order to improve product quality and cost. The ISO 9000 family of quality-management and quality-assurance standards is currently popular for the same reason.

An Assessment of Quality in China Today.

Much has been said about quality management at different stages of China's economic development. Let us turn to the question of the status of quality today and the impact on quality of the changes described in the economic system and in quality management.

Quality in Manufacturing Industries. In the early period of the planned economy, product quality as a whole was guaranteed, though the quality standards were low and the variety of products was limited. But, in parallel with the progress of economic reform, collective and private enterprises mushroomed, suddenly enlarging the workforce without prior and proper training and without resources for management and supervision of product quality. State-owned enterprises expanded their production in pursuit of quick profit by emphasizing quantity at the expense of quality. Even shoddies and counterfeits appeared in the market. A sampling survey of product quality, conducted quarterly by the State Technical Supervision Bureau, shows the percentage of the product tested which met the applicable standards. The summary results for some representative years from 1985 through 1995 are

1985	65.4
1987	77.0

1991	80.0
1992	70.1
1993	70.9
1994	69.8
1995	75.4

The kinds of products and producers inspected vary in each survey; hence, strictly speaking, the figures are not comparable. Particularly, the survey is intended to inspect enterprises whose products caused consumer's complaints. Therefore, the results are not fully indicative of the general situation but rather reflect the product quality of those enterprises whose quality management was poorer and often ignored the national standards. The State-owned large-scale enterprises are usually much better. For instance, the survey results for the first half of 1996 reveal that an average of only 80 percent of products inspected met quality standards, 10 percent higher than the worst years. The large-sized state-owned enterprises in that survey achieved 91 percent.

Quality in Service Industries. It is perhaps a remnant of the "Cultural Revolution" that the service provided by State-owned enterprises is notoriously poor. A TV program on TQC jointly sponsored by the Ministries of Commerce, Post and Telecommunications, Railways, and others was broadcast for the service industry of China over and over again from 1987 to 1992. It introduced the activities of outstanding QC circles in the service industry and some very simple QC techniques presumably helpful in improving service quality. The response from society was unexpectedly favorable. The Beijing municipal government asked the TV network to broadcast it for the citizens of Beijing on the eve of the Beijing Asian Olympic Games. In 1995 another TV program introduced ISO 9004-2. In it, the Director of the State Technical Supervision Bureau, Li Chuanqing, presented the opening address.

Quality in Government Service. The 40 years of economic construction of China can be divided into three stages: In the first stage (1949–1952) government took over the economy; in the second stage (1953–1978) government ran the economy, in the third stage (1979–present) government has undertaken to reform the economy. Now economic reform has come to a crossroad which demands reform of government itself. As mentioned above, the key to the establishment of a modern corporation system lies in the separation of government from enterprises. A 3-year plan which began in 1993 has been implemented to reform the administrative management system and the functions of government departments. It set out first to reduce administrative personnel in the departments affiliated with the State Council by 20 percent and local government departments by 25 percent. (The first target was achieved by the middle of 1995, and the outlook for the second is good, according to the report sent to the central government by local institutions.)

It then began to readjust government department functions and the relationships between different government departments to avoid duplicating their functions and to improve their efficiency. Readjustment on the central level has basically been completed. Internal branches and personnel have been established. Government departments thus strengthened their supervision and macro guidance of economic development through prices, taxation and other financial means without touching concrete matters of the management of enterprises. Government services probably is the only area where TQC has not entered yet, though most of the ministries have a quality control association under their administration as a peripheral organization through which the ministry provides guidance of quality management to enterprises and engages in international exchanges of information and experience in quality management.

EPILOGUE

Quality versus Speed. In retrospect China's product quality has not met expectations, and the reasons are many. However, the dominant one lies in the "go-for-speed" policy explicitly or implicitly

cherished by government officials and followed by enterprise managers. In years past, when officials in charge of a department or a locality were evaluated on their administrative performance, economic growth was almost the sole factor on which they were judged. It was not unusual that stock or products unsold or even useless were calculated as output value. The result was a large output value but small economic benefit.

The "Outline to the Ninth Five-Year Plan (1996–2000) for National Economic and Social Development and the Long-Term Target for the Year 2010," passed by the National People's Congress in April 1996, pointed out that "high speed" is contingent on efficiency and quality, and put forward two fundamental changes necessary for maintaining the sustained, rapid, and healthy development of the national economy: first is the shift from the traditional planned economy to the socialist market economy; the second is the shift of the economic growth mode from extensive to intensive. For this end, it is necessary to bring the role of market mechanism into full play and to reform China's State-owned enterprises from extensive management to intensive management so that they can compete in the market to their advantage. Total Quality Management as an effective means of quality improvement and as a philosophy of management can definitely serve well the demand of an intensive-growth mode.

"Outline of Rejuvenation of Quality." On September 3, 1996, the fiftieth meeting of the State Council discussed and passed a national program, "Outline of Rejuvenation of Quality." The document was drafted by quality professionals of many fields under the leadership of the State Technical Supervision Bureau in July 1993. The draft had been sent to all ministries to solicit opinions, and the final version was once again discussed and revised by members of the State Economic and Trade Commission in August 1995. The long duration of drafting, discussing, revising, and approving illustrates the complex nature of quality. Everybody knows it, everybody can say something of it, and in the end nobody knows truly what it is.

The outline points out that quality is a matter of strategy in the development of the national economy; the economy will pay heavily if quality is neglected. It set goals for product quality and quality management to be achieved by the year 2010. To promote TQM continuously and to seriously implement the ISO 9000 family of standards, "Quality Management and Quality assurance," are the two important items among others in the national program. Introduction of foreign advanced technology and management is also stressed.

Since this day, September 3, 1996, China finally has had a national program of quality rejuvenation.

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