Sloanism

12

As the era of American social and industrial history dominated by Fordism evaporated with hard times, a new era was being inaugurated at General Motors under the leadership of Alfred P. Sloan, Jr.

Ford had remained stubbornly committed to the Model T as a single, static model in a dynamically changing technological milieu. Except for minor face-liftings and the incorporation of such basic improvements as the self-starter and the closed steel body, the Model T remained essentially unchanged long after it was technologically obsolete. Even David Hounshell, who documents "significant changes" in the supposedly changeless Model T, concludes that "by the standards of the mid-1920s, the Model T was outmoded. The ignition, carburetion, transmission, brake, and suspension systems, as well as the styling and appointments, made the Model T appear antique." [1]

The Model T was intended as a farmer's car for a nation of farmers. Its popularity was bound to wane as the United States urbanized and as rural America got out of the mud after passage of the 1916 Federal Aid Road Act and the 1921 Federal Highway Act. Better roads rendered needless the once functional high clearance and hard springing of the rugged but rough-riding "Tin Lizzie." Model T owners tended to trade up to larger, faster, smoother riding, and more stylish cars; and the demand for low-cost, basic transportation that Model T had met tended increasingly to be filled from the backlog of used cars piling up on dealers' lots as the market became saturated. By the mid-1920s, a secondhand car of a more expensive make in good condition could be bought for the same price as a new Model T. In addition, the onset of market saturation for new cars forced general price reductions after 1925 that, for example, pegged only

$200 higher than an obsolete Model T an annually restyled, larger, and far better equipped Chevrolet, which could be bought on the installment plan.

Ford closed his mind to the advice of his executives, the pleas of his dealers, and mounting complaints about the Model T from his customers. He denounced the new emphasis on style and comfort as extravagant and wasteful, and tried to meet the competition by drastically reducing prices to a low of $290 for the coupe and making "everybody dig for profits." The speedup of the assembly line enforced by the Service Department drove workers "to the highest point of efficiency." Ford dealers, too, were forced "to the highest point of efficiency." As Model T production was cut from 1.8 million units in 1923 to 1.3 million units in 1926, the number of Ford dealerships was increased from about 8,500 to 9,800, in the hope that heightened competition among them would stimulate more aggressive salesmanship. Seven out of ten Ford dealers were losing money by 1926; and as some went bankrupt and others switched to General Motors, about a third of the Ford dealerships turned over that year.

Even Henry Ford was forced at last to recognize that the Model T era had ended. Production of the car was halted on May 27, 1927, and the Ford plants were shut down while its successor, the Model A, was hastily designed. A mild recession in 1927 was attributed in part to hundreds of thousands of automobile owners deferring their purchase of a new car until Ford came out with his new model. Some 400,000 orders were received before the Model A had even been seen by the public. At a retooling cost of $18 million, for what was probably up to that time the most extensive changeover of an industrial plant in American history, the assembly lines at River Rouge began to turn out limited numbers of the Model A in November 1927.

The initial response to the four-cylinder, 40-horsepower Model A was enthusiastic. Unlike the revolutionary Model T, however, the Model A was a very conventional car for its time. In 1929 Ford briefly regained the industry lead in sales that had been lost to Chevrolet in both 1927 and 1928. Ford production surpassed 1.5 million units in 1929 and 1.15 million units in 1930, compared with Chevrolet's 950,000 and 683,000 units for those years.

Nevertheless, the decline of the Ford Motor Company vis-à-vis GM and Chrysler continued into the 1930s, despite the fact that the 65-horsepower V-8, introduced in fourteen body styles on March 31, 1932, was a truly advanced automobile in all respects, selling at an exceptionally low price. "I have driven Fords exclusively when I could get away with one," bank robber Clyde Champion Barrow informed Henry Ford in a letter dated April 10, 1933. "For sustained speed and freedom from trouble the Ford has got ever [*sic*] other car skinned and even if my business hasn't been strictly legal it don't hurt enything [*sic*] to tell you what a fine car you got in the V-8."[2] Only a few years earlier Henry Ford had dismissed six-cylinder cars with the quip, "I have no use for an engine with more cylinders than a cow has teats." His radical move from the four-cylinder Model A to the V-8 was calculated to outdo Chevrolet, which had gone to six cylinders in 1929. The seventy-year-old Ford personally supervised the designing of the V-8 and the conversion of the River Rouge plant for its production. V-8 production was introduced gradually and necessitated less extensive and less costly changes than had the 1927 changeover to Model A production. The $450 to $650 V-8 featured streamlined styling, double drop-frame construction, safety plate glass in all windows, and synchromesh transmission. It was, in the words of Allan Nevins and Frank Hill, "very much the handsomest of all the company's creations."[3]

Neither the Model A nor the Ford V-8 could regenerate the Ford Motor Company. Between 1931 and 1970 Chevrolet outsold Ford in every year except 1935 and 1945, and the latter year was an exception only because Ford was the first automobile manufacturer to get back back into civilian production following World War II. Plymouth also cut into Ford sales in the low-priced field after it was introduced in 1929. And Ford's cars in the luxury and moderate-priced brackets—the Lincoln, acquired from the Lelands in 1921, and the Mercury, introduced in 1939 to compete with Pontiac and Dodge—failed to become popular. Only in the sale of light trucks did the Ford Motor Company enjoy a slight lead over its competitors. In the oligopoly that had come to dominate the American automobile industry, by 1936 Ford had dropped to third place in sales of passenger cars, with 22 percent of the U.S. market versus 43 percent for General Motors and 25 percent for Chrysler.

As automobile sales and registrations declined in general, Ford production collapsed from over 1.5 million units in 1929 to a low of only 232,000 units in 1932, before bouncing back to 600,000 units in 1941, the last full year of civilian automobile production before American entry into World War II. During 1931–1933 the Ford Motor Company lost $120 million after taxes. Profits of $17.9 million in 1936 and $6.7 million in 1937, during a brief revival of the economy, went far, however, toward canceling out an estimated total loss of $26 million over the preceding decade.

Sloan's GM: Multidivisional Structure, Product Policy, and Financial Controls

In sharp contrast with the Ford Motor Company and almost all other automobile manufacturers, General Motors weathered well both the onset of market saturation in the 1920s and the evaporation of the market for new cars during the Depression. GM income after taxes rose from slightly over $72 million (10.32 percent of sales) in 1923. when Alfred Sloan became president, to over $248.48 million (18.94 percent of sales) in 1928. Better forecasting techniques at GM permitted Sloan to predict the onset of the Depression and to pull in the giant corporation's horns. Net income after taxes dropped to only $169,979 (0.04 percent of sales) in the trough of the Depression in 1932 before recovering to $238.482 million (16.57 percent of sales) in 1937. The GM payroll was cut about two thirds during the Depression, while stockholders continued to earn annual dividends ranging from 21 to 75 cents a share on common stock, versus annual common stock dividends ranging from 11 cents in 1923 to 63 cents in 1928. Because investment needs were slight, GM paid record dividends in 1936 and 1937, while working capital increased by more than a third over its 1929 level. Sloan later reported that "in no year did the corporation fail to earn a profit."[4]

Sloan was the automobile industry's first "gray man." First, last, and always an organization man, he abhorred the autocratic rule of colorful "personal" entrepreneurs such as Henry Ford and Billy Durant. Under his leadership General Motors became the archetype of the depersonalized, decentralized corporation run by an anonymous technostructure.

In the "multidivisional structure" that Sloan introduced at GM, strategic decisions affecting the setting of corporate goals and the long-term allocation of resources were centralized in executive and finance committees, while tactical decisions on the day-to-day utilization of these resources were decentralized in the firm's various operating divisions. At du Pont this had resolved problems stemming from a lack of overall cooperation and coordination among operating divisions making very different products. At GM the structure had the opposite function of decentralizing operating decisions down to an appropriate level in a formerly too-centralized firm in which the divisions made essentially the same product. For still different reasons, the multidivisional structure was adopted as well in the 1920s at Standard Oil of New Jersey and at Sears, Roebuck. It was at GM under Sloan, however, that the financial controls and coordination of operations that the structure engendered underwent the most refinement and formalization and were most publicized.[5] To a large extent this was the outcome of GM's ill-fated attempt to introduce an air-cooled engine designed by Charles F. Kettering.

Chevrolet's 1919–1923 experiment with Kettering's invention marked the last attempt by an American automobile manufacturer to pioneer to the stage of production a truly radical engine design. Kettering's "copper-cooled" engine was for a short time seen by GM as the key to bringing out a lightweight, inexpensive car to compete with the Model T. Air cooling offered several theoretical advantages over water cooling, including better fuel economy from an engine that weighed less per horsepower, savings from the elimination of a radiator and other cooling accessories, and an end to engines' freezing in winter and overheating in summer. In practice, however, the air-cooled engines of the day overheated badly, resulting in a loss of power and burned valves. Kettering sought to utilize the superior thermal properties of copper to eliminate this problem and to produce an air-cooled engine with a higher compression ratio, thus affording greater fuel economy and power for a given displacement. Heat was to be dissipated by a front-mounted fan, driven at faster than engine speed, pushing air through copper fins that had been brazed to the engine in a specially designed oven. The project had the enthusiastic personal support of Pierre S. du Pont, the GM president until 1923.

The copper-cooled engine was doomed by a lack of coordination and cooperation on the project among GM units. Production problems were the inevitable result of a lack of communication between Kettering's Dayton, Ohio, Delco laboratory, where the engine was designed, and the factories at Flint and Pontiac, Michigan, where the car that the engine powered was to be produced. Design problems arose also, because it had not been foreseen that numerous other components would have to be redesigned to accommodate to the light weight of the new engine. The copper-cooled Chevrolet was introduced at the 1923 New York automobile show, but only 759 were ever produced, and 239 of these were scrapped in production. Only 100 of the remainder were ever sold to retail customers. "After initial sales," relates Stuart W. Leslie, "complaints came in concerning excess noise, clutch problems, wear on cylinders, carburetor malfunctions, axle breakdowns, and fanbelt trouble." Reduced to a research project in 1923, the copper-cooled-engine program was terminated in 1925. General Motors would not produce another air-cooled car until the 1960–1969 Corvair. "The significant influence of the copper-cooled engine was in what it taught us about the value of organized cooperation and coordination in engineering and other matters," recalled Sloan in 1964. "It showed the need to make an effective distinction between divisional and corporate functions in engineering, and also between advanced product engineering and long-range research."[6]

After the copper-cooled-engine debacle, GM not only paid far more attention to such interrelationships within the firm, but under Sloan's leadership adopted a market strategy that discouraged technological innovation and eschewed technological leadership. Sloan took the position that "the primary object of the corporation ... was to make money, not just to make motor cars.... The policy...was valid if our cars were at least equal in design to the best of our competitors in a grade, so that it was not necessary to lead in design or to run the risk of untried experiments."[7] He considered even the safety plate-glass windows of the 1928 Cadillac an unjustified cost.

Control in the corporation under Sloan passed from engineers like Kettering to cost-cutting accountants. Donaldson Brown, the GM vice-president for finance, worked out with Albert Bradley a system of financial controls. They set a 20-percent return on investment as the corporation's expectation. And GM became insulated from the adverse effects of short-term fluctuations in the market for cars by basing unit cost estimates (hence car prices) on a conservative assessment of how many cars GM could expect to sell over a period of years at given prices and average utilization of plant capacity. When demand exceeded these expectations, GM would gain windfall profits, because unit prices had been set on the basis of a lower and consequently costlier level of production. This was called "standard volume pricing." The system of controls called for only a conservative amount out of actual profits to be reinvested in expansion of the business, including research and development. It was thus a strategy geared not for producing a technologically superior product at a lower price, but for guaranteeing the safety of invested capital and ensuring high rates of return in a market assumed to be both saturated and technologically mature.

What Sloan chose to call "constant upgrading of product" is more accurately described as planned obsolescence through cosmetic changes. In diametric opposition to the Ford Model T product philosophy of a single, static model at an ever decreasing unit price, GM attempted to produce "a car for every purse and purpose." Sloanism called for blanketing the market with a car at the top of every price range and encouraging the consumer to trade up from Chevrolet to Cadillac via Pontiac, Oldsmobile, or Buick. Sloanism also called for stimulating sagging sales in a replacement market by inducing the consumer, long before his present car's useful life was over, to trade it in for a newer and higher-priced one. Consumer dissatisfaction with today's car was engendered by the innovation of the annual model change, which called for major styling revisions every three years, functional or not, with minor annual faceliftings in between. The three-year styling cycle was geared to die life, so that retooling costs would not be excessive. The trick here was to maintain an overall GM product identity while differentiating GM car lines from one another and the GM car models in a given line from year to year. GM initiated bringing out annual models in 1923. But the concept evolved gradually and was not fully formalized and regularized until the 1930s.

Sloan intended that this product philosophy would result in GM's gaining each year a larger share of the consumer's dollar.

Styling Comes of Age

The new emphasis on styling engendered by Sloanism was not in itself dysfunctional, especially not in the automotive designs of the 1930s. Styling would only become dysfunctional with the excesses of the 1950s. Indeed, lower-slung, wider, aerodynamically designed cars became essential for safety and performance as cars with more powerful engines cruised at higher speeds on better roads. GM cars of the mid-1920s were 70 to 75 inches in height and 65 to 71 inches wide, compared with heights of 51 to 57 inches and overall width of about 80 inches in the mid-1960s. Sloan explained, "The new closed car [of the 1920s] was a high, ungainly contraption, with narrow doors and a belt line (that is, the line between the windows and the lower part of the body) high above the already high hoods. . . . [A]s cars were driven more rapidly by more efficient motors, it became dangerous to have vehicles with their center of gravity so far above the ground."[8]

As early as 1921 the GM product policy had stressed "the very great importance of style in selling," and in a letter dated July 8, 1926, to Harry H. Bassett, the general manager of Buick, Sloan expressed his "general views about the need [for GM] to develop a styling program." Sloan was particularly impressed with the low-slung lines of the 1924 Chrysler Six, necessitated by the car's 70-mph cruising speed. He had purchased small wire wheels to get his own Cadillac nearer to the ground. His views about the importance of styling were shared by Lawrence P. Fisher, the general manager of Cadillac, who had been impressed by the special bodies turned out for the cars of Hollywood movie stars in the Los Angeles custom body shop of Don Lee. In early 1926 Fisher hired Harley J. Earl, Lee's chief designer, under special contract as a consultant to Cadillac. Prior to that, in September 1925, Fisher Body (annexed as a division of GM in 1918) had acquired the old-line Fleetwood custom coachbuilding firm of Reading, Pennsylvania, and moved its operations to Detroit to do custom bodies for Cadillac chassis and aid in designing production-car bodies. Then on June 23, 1927, Sloan proposed to the GM executive committee a plan for a new Art and Color Section of fifty persons, to be headed by Earl and funded by the Fisher Body Division. Renamed the Styling Section in the 1930s, its purpose was "to direct general production body design and to conduct research and development programs in special car designs."

Earl's Styling Section gave GM a "long lead" in making the styling of automobiles an institutionalized activity carried out by professional designers, rather than a haphazard activity of engineers or salemen as the need for a new model arose. After World War II both Ford and Chrysler emulated GM in forming styling departments, which were staffed largely by personnel trained under Earl at GM. Earl, who ended his career as a GM vice-president, summed up his design approach in 1954: "My primary purpose for twenty-eight years has been to lengthen and lower the American automobile, at times in reality and always at least in appearance. Why? Because my sense of proportion tells me that oblongs are more attractive than squares." [9]

Earl used modeling clay in developing his designs instead of the then conventional wooden models and hammered metal parts. This permitted him to conceptualize more fluid, rounded shapes. He also departed from common practice by "designing the complete automobile, shaping the body, hood, fenders, headlights, and running boards and blending them into a good-looking whole. This, too, was a novel technique." The 1927 La Salle, Earl's first design for GM, was also, in Sloan's words, "the first stylist's car to achieve success in mass production." Sloan still waxed enthusiastic over the La Salle in 1964. "The effectiveness of the new design can be seen by comparing it with the 1926 Buick," he observed. "The La Salle looked longer and lower; the 'Flying Wing' fenders were drawn deeper than their predecessors; side windows had been reproportioned; the belt line had a new type of moulding; sharp corners had been rounded off, and other design details were added giving it the unified appearance that we were looking for." [10]

The most important innovation in lowering the lines of 1930s cars was "drop-frame" construction. It was used not only in Earl's GM designs but also in the 1932 Ford V-8, various Chrysler cars, and other competitive makes. In drop-frame construction the frame dipped, bringing the passenger compartment down from its high perch upon the axles to its now familiar position between the front and rear axles. This lowered the height and center of gravity of the car, eliminated the need for running boards to help passengers step up into the car, and moved the motor forward over the front axle.

Aerodynamic styling, or streamlining, was another functional styling innovation widely adopted in the 1930s. It reduced drag coefficient, resulting in better fuel economy and performance. Though it only now began to be employed extensively, streamlining had a long history in automotive design. The first streamlined automobile was Camille Jenatzy's 1899 La Jamais Content, an electric car with a sheet-steel body that set a land speed record of 65.9 mph. After that numerous designers used elements of streamlining to reduce air resistance. Streamlining was particularly evident in the Benz Tropfenwagen, a teardrop-shaped racer of the early 1920s, and it reached a zenith in the 1931 Wikov Streamline Saloon, of Czech design. Ferdinand Porsche used aerodynamically styled bodies designed by Reutter of Stuttgart and Drauz of Heilbronn in several Volksauto prototypes that he developed for Zundapp in 1932 and for NSU in 1933. These bodies bear an unmistakable resemblance to the "beetle" body of the Volkswagen prototypes that Porsche developed for Hitler between 1933 and 1939. That the Volkswagen combined a 60-mph cruising speed with 35-mpg fuel economy was in large part due to its advanced aerodynamic styling.

Richard Burns Carson argues that the enthusiasm for streamlining among automotive designers in the 1930s emanated from a "new consciousness of aviation that permeated all mechanized transportation after Lindbergh's [epic 1927 trans-Atlantic] flight." Even more important, Carson makes some critical distinctions among three different forms of streamlining—a term that he generally defines as the "unification of formerly uncoordinated elements." First, he distinguishes between "visual streamlining," which "integrates the car's visible features into ever larger, more flowing gestalt wholes," and "aerodynamic streamlining," which "organizes the invisible air currents passing around the car's outer features into larger, smoother, and less turbulent ones. There is a divergence between these two approaches, between appearing streamlined and being aerodynamically streamlined. For the designer, visual streamlining is usually an intuitive process and certainly always an artistic one. By contrast, aerodynamic streamlining seeks reduced air drag and wind noise and increased stability at speed as its goals and uses scientific tools in achieving them." Only in the most advanced automotive designs of the mid-1930s did true aerodynamic streamlining become evident. A third type, "structural streamlining," operated independently of the first two, "concerning itself with hidden structure rather than with outer contours. This 'structural streamlining' transformed distinct component frameworks into supporting aspects of a larger framework, thereby eliminating duplication of structural rigidity throughout the car. The end result of structural streamlining was the unitary welded body that merged chassis and body strength into one."[11]

The first integration of all three types of streamlining in an automotive design was achieved in the revolutionary 1934 Chrysler and DeSoto Airflow models. Carson calls the Airflow "Art Moderne's furthest extension of influence in American auto building" but asserts that it was also "the first American production car whose shape was fashioned according to scientific rather than aesthetic standards." He goes on to observe that "the Airflow's heterodox [welded unitary] construction required a technology that was, at that time, beyond the custom coachbuilders, eliminating the possibility of custom-bodied Airflow cars." Carl Breer, Chrysler's executive engineer, and his staff developed the Airflow body style by testing models in wind tunnels to achieve reduced air resistance and noise. The car's more rigid welded body structure was designed by Dr. Alexander Klemin, chief engineer at the Guggenheim Foundation for Aeronautics. Consequently, it was a "totally engineered car designed from the inside out." At the Chicago Century of Progress fair, an Airflow sedan was displayed next to the new Union Pacific M-1000 Streamliner to suggest similarity in design concepts.[12]

Powered by an eight-cylinder, 4.4-liter engine, the Airflow in motion developed 40 percent less drag than competing models. The five-passenger Chrysler sedan sold for a moderate $1,345. It was one of the first cars to feature welded unitized construction, in which the body and chassis frame are built as an integral structure, rather than the body being a separately built structure bolted onto the chassis frame in assembly. Unitized construction permits greater rigidity for a given weight and a roomier passenger compartment for a given width of body. The full aerodynamic shape of the Airflow combined a deco grille, headlights mounted flush in the front fenders, a split slant windshield, seating entirely within the wheelbase, and an integral trunk. Although the Airflow was a superior automobile in all respects, it was far too revolutionary for consumers. Fewer than 54,000 units were sold before it was withdrawn from production in 1937. Chrysler hurriedly brought out conservatively designed Airstream models in 1935 and after its Airflow experience remained the most conservative of the Big Three in styling policy for several decades.

Unlike his father, Edsel Ford was very style conscious. As president of the Lincoln Motor Company, in 1925 Edsel introduced the "catalogue custom body." By ordering custom bodies in small lots of three to ten, Edsel was able to offer them as options in the Lincoln catalogue at prices significantly lower than one-of-a-kind bodies cost; yet because there was small chance that the owners of the same custom body would ever cross paths, the bodies could be considered individualized. Edsel also pioneered in formalizing the relationship between stylists and automobile manufacturers by bringing Raymond H. Dietrich to Detroit in 1925 from his New York City coachbuilding firm, Le Baron. A new independent firm, Dietrich, Inc., did catalogue custom body work and acted as a consultant on the styling of Lincoln production cars.

Le Baron had been formed in 1920 by Dietrich and Thomas L. Hibbard. Both had begun their careers as draftsmen at the New York City carriage-building firm of Brewster and Company, which began building custom automobile bodies in 1910. "As draftsmen," Carson explains, "their talents were totally subservient to those of the master woodworkers and metal shapers, just as they would have been at ... any other coachbuilding house of the time ... making full-scale drawings of component body parts to aid in the construction of templates." But at Le Baron, Dietrich and Hibbard turned the tables to establish the primacy of the designer, to innovate the "free form designing idea" of conceptualizing the design of the car as a whole, and to develop "a larger new theme of 'automotive architecture,' which amounted to applying the architect's traditional role to the field of luxury auto building.... [T]he customer didn't buy an automobile body from Dietrich and Hibbard; what he bought were the complete plans with which an automobile body could be built." [13]

Dietrich's move to Detroit at Edsel Ford's behest presaged the moves there of other designers from the east and west coasts, with the result that by 1929 Detroit was the center for building custom-designed automotive bodies as well as production cars. With the failure of the coachbuilders in the early years of the Depression, the custom designers found employment in the newly created styling departments of Detroit's automobile manufacturers. Dietrich, for example, was hired by Walter Chrysler as a special consultant on body design in 1932.

Under Edsel Ford's leadership, after 1922 the Lincoln was progressively restyled to improve its appearance. And it was Edsel's prodding that caused the Model A to be designed to resemble the much higher priced contemporary Lincoln in its overall styling. With annual modifications in the appearance of the low-slung, streamlined V-8 during the 1930s, the Ford Motor Company in effect followed GM in instituting the annual model change. One of the classic and more distinctive aerodynamically and structurally streamlined automotive designs of the prewar period was the twelve-cylinder 1936 Lincoln Zephyr, designed by John Tjaarda and Eugene T. "Bob" Gregorie. Like the Airflow, the Zephyr featured unitary construction.

The Lincoln Zephyr, the Airflow, and the 1936–1937 front-wheel-drive, unitary-built, coffin-hooded Cord 810–812, designed by Gordon Buehrig, demonstrate that neither the most revolutionary nor necessarily the most aesthetically pleasing aerodynamically and structurally streamlined cars of the 1930s were designed by Earl's GM Styling Section. Nevertheless, it was at GM that a program of streamlining to eliminate projections and to make cars appear lower and longer first became institutionalized. This overall effect was evident in the extended rear deck and integral trunk, which hid the spare tire, innovated in the 1932 Cadillac and then incorporated into the design of the low-priced 1933 Chevrolet. On the so-called A-bodies of the 1933 Chevrolet, the radiator was hidden behind a grille, the gas tank was covered by a "beaver tail," and fender skirts (innovated on the 1932 Graham-Paige) were added. The one-piece steel "turret top" introduced on 1935 GM cars was a styling innovation that both made cars safer and permitted more economical stamping processes in automobile manufacturing. It became possible as a design concept with the perfection of the high-speed strip mill, which produced sheet steel in eighty-inch widths. The elimination of running boards for the first time in a production car in the 1938 Cadillac 60 Special enabled the "standard-size" American car to hold six passengers, because the basic body could now be widened to the full tread of the wheels. A sedan styled like a convertible, the 60 Special was a forerunner of the retrogressive, unsafe "hardtop convertible" introduced in the 1949 Buick, Cadillac, and Oldsmobile models. The styling of the 60 Special so appealed to consumers that they were willing to take smaller trade-in allowances when purchasing it. This demonstrated to Sloan "the dollars and cents value of styling."

What was good for General Motors in this instance, however, was not necessarily good for most automobile manufacturers. The effects of the annual model change and increased emphasis on styling were greatest on stamping processes, where the greatest economies of scale accrue to large-volume producers in automobile manufacturing. So Sloanism combined with the contraction of the automobile market to drive the last nails into the coffins of most of the remaining independents. Many honored marques disappeared. Only a handful would survive into the post–World War II era to compete with the Big Three at the fringes of the market. Furthermore, some stylistic changes put various accessory manufacturers out of business. Sloan recalled, for example, that the integral trunk "was another case where styling changes made some people unhappy, for these developments meant an apparent loss of accessory business in trunk racks, tire covers, and the like, at a time when accessories were very profitable items. But such is the price of progress." [14]

Flexible Mass Production

The annual model change and diversity of product were incompatible with Fordist production methods. At the Ford Highland Park plant, "every machine tool and fixture was fitted for the production of a single product whose every part had been standardized to the minutest detail." [15] Even small changes in the design of the Model T bottlenecked its production. The switchover to Model A production was chaotic. Machine tools highly specialized for Model T production could not be converted to

Model A production, with the result that more than half of the 32,000 machine tools used to produce the Model T had to be redesigned and rebuilt and half of the remaining ones had to be scrapped. That the plant layout optimal for Model T production was not well suited to production of the Model A is evidenced by the change to a final assembly line at the Rouge that was only half as long as the Model T final assembly line at Highland Park.

The switch from Model T production at Highland Park to Model A production at the Rouge involved closing down the Ford assembly lines from late May to November 1927. For some time after that the expansion of Model A production was hampered by the Ford practice of extremely close spacing of machine tools, which exacerbated problems of rearranging plant layout. Hounshell estimates the total cost of the changeover to the Model A, "including experimental and design work, tooling and loss of profits," at about $250 million. Such a disruption of production and the consequent inordinate expense were irreconcilable with bringing out the essentially new model every three years that Sloanist marketing strategy envisioned. It is no wonder that at the Rouge, as a consequence of this costly initial lesson, "Sorensen aimed for greater flexibility in assembly rather than cost advantages through a single-purpose [machine tool] approach." There was an almost complete turnover of supervisory personnel at the Rouge as production-head Sorensen tried, in his own words, "to get rid of all the Model T sons-of-bitches ... get away from the Model T methods of doing things."[16]

Sorensen adapted to the Model A production techniques that had been developed at Chevrolet by William Knudsen, who had set up the Ford branch assembly plants. He had been hired by Sloan on February 1, 1922, a few months after he had resigned from the Ford Motor Company over being constantly overridden by Sorensen and Henry Ford. Knudsen's first assignment at GM was to work out a long-range production plan for Chevrolet. He went on to become president and general manager of Chevrolet in 1924 and, when Sloan moved up to chairman of the board, president of General Motors in 1937. More than any other single factor, it was competition from Chevrolet in the low-priced field that caused the great decline in Ford's share of the market for new cars after 1925.

GM production was far more decentralized and far less vertically integrated than Ford production. Sloan had reasoned that GM would have to make the same profit on capital invested in plant and equipment for the manufacture of its various components as outside suppliers charging reasonable prices for those components. So GM depended more on outside suppliers. This alone gave GM far more flexibility than Ford. Additionally, Knudsen decentralized Chevrolet components manufacture among specialized plants at Toledo, Ohio, and at Flint, Detroit, and Bay City, Michigan, and bought still other components from other GM divisions and from outside suppliers. Assembly, too, was decentralized. "At four assembly plants (Tarrytown, New York, Flint, Michigan, St. Louis, Missouri, and Oakland, California) ... subassemblies and thousands of parts purchased from vendors were brought together to make the Chevrolet.... Knudsen [also] had convinced GM executives that a Fisher body plant should be attached to each assembly plant so that body production could be coordinated precisely with the daily output of each assembly plant." The major innovation at Chevrolet, however, according to Hounshell, was that Knudsen replaced single-purpose machine tools with standard general-purpose machine tools. "For this reason, Chevrolet could accommodate change far more easily than could the Ford Motor Company."[17]

Hounshell dates "flexible" as opposed to "rigid" mass production from these developments at Chevrolet. Perhaps so. Yet it can also be argued that true flexible mass production came not so much with the annual model change as with individualization of product within model runs. And this in turn resulted not from a reversion to general-purpose machine tools but from the advent of the automated automobile factory equipped with automatic transfer machines, other highly specialized automatic machinery, and the computer-controlled assembly line. The automated automobile factory did not become a reality until the 1950s.

Flexible mass production, explains Gerald Bloomfield, "allows a wider range of options of body style, colors, trim, power train, but within permissible standardized limits. The products of this type of mass production have a greater appearance of diversity. Flexible mass production involved a high degree of planning, and became more capital intensive than the earlier stages of rigid mass production." The resulting individualization of product is summed up by Brock Yates: "A Yale physicist whimsically calculated that a 1965 Chevrolet, offered in 46 models, 32 different engines, 20 transmissions, 30 colors, and 400 options, could be purchased in almost as many permutations as there are atoms in the universe." With the automated, computer-controlled assembly line, it became not merely theoretically possible but indeed likely that no two cars from the same model run would be precisely identical.[18]

Automatic production began with the introduction of the transfer machine, described by James R. Bright as "a number of machining stations mounted upon a base (or bases so closely integrated that the effect is the same), and having a work-feeding device integral with the machine and common to all stations." Bright believes that the first transfer machine in automobile manufacturing was used by Morris Motors in England about 1924 and that in the American automobile industry Graham-Paige installed the first true transfer machine in 1929 and the first transfer machine system, using automatic jigs and fixtures in 1931. During the 1930s the use of transfer machines became commonplace in automobile manufacturing, then spread to the production of other items. Transfer machines proved "extremely important in cutting labor cost, increasing quality through uniformity and reduced tolerances, and in reducing manufacturing cycle time."[19]

Because transfer machines alone do only a part of the total operations required in assembly, a system of transfer machines would not in itself constitute automation. Robert Bendiner defines automation as "the controlled operation of an entire factory or process in which the machines as linked units automatically perform their manipulations in specified sequences, with electronic judgment substituted for the perception of the machinist or foreman." For that to occur, automatic controls had to be added to systems of transfer machines. Control was at first (1954–1957) by coded punched or magnetic tape, but increasingly thereafter by the computer.[20]

Under the leadership of Delmar S. Harder—rightly known as "the father of automation"—the Ford Motor Company in 1947 became the first corporation in the world to establish an Automation Department. In 1949 Ford began work on the first factories built to make any notable use of automation—its Buffalo stamping plant and its Cleveland engine plant. In 1955 Peter Drucker hailed the application of automation to automobile manufacturing as "a major economic and technological change, a change as great as Henry Ford ushered in with the first mass production plant fifty years ago."[21]

Until the very recent development of the microprocessor, which permits machine tools to be programmed for a large number of tasks, automation was compatible with individualization of product and the annual model change only in the manufacture of those components which remained basically unchanged from car to car and from model year to model year, such as engines and transmissions. Consequently, automation was first and most fully applied to the production of large runs of standardized mechanical components. Heavy investment in specialized machinery in turn militated against technological innovation in mechanical components, so cars had to remain much the same under the hood. The MIT Report points out that "by contrast, large amounts of semiskilled labor were used in the body plant and the final assembly line to accommodate the year-to-year changes in the product.... In the body plant the producer faced a choice between inflexible automation, with very high production volumes and long unchanged product runs to justify its cost, and flexible manual systems with higher labor content." Because high-volume production of a single static model was essential to realizing economies from replacing workers with automated machinery, the full automation of body welding and final assembly was first instituted in stages between 1953 and 1966 at Volkswagen's Wolfsburg plant in the production of the Beetle, one of the most standardized cars of all time. "This meant low labor content, and it was suited to the labor shortage in postwar Germany," the MIT Report observes. "The alternative system, as developed by most of the other world producers, involved greater use of semiskilled labor for practically all operations and was suited to frequent model changes and simultaneous production of many body styles and accessory combinations."[22]

Sloanism thus had the effect of intensifying the amount and pace of dehumanizing work in automobile manufacturing at the same time that automation theoretically promised to shift it to the machine. This is what Emma Rothschild meant by her 1973 claim that "certain advances in automated production cannot be used (are not 'suitable' for) auto manufacturing" because of "a contradiction between auto marketing and productive improvement."[23] In the mid-1970s about 75 percent of the jobs in automobile manufacturing remained semiskilled or unskilled, versus only about 10 percent for the rest of American industry.

Even where automation displaced human operators, there was degradation of labor to lower skill levels and intensification of the production process. The General Motors Lordstown, Ohio, plant was the most costly and technologically advanced factory in modern automotive history when it opened in June 1970 to produce the subcompact Vega, a design that was expected to remain fixed for several years to enable economies of scale to be realized. The major feature of the plant was twenty-six Unimate robots (programmable, multipurpose automatic machines), capable of welding Vega bodies more precisely and uniformly than could humans. Some 95 percent of body welding was automated, compared with 20 to 40 percent at older automobile factories. Unskilled workers were still needed, however, to feed the robots materials. Maximum possible automation controlled by computers was combined with rigid Taylorization of the work force, permitting Lordstown to run the fastest assembly lines in the world. Each hour, 104 cars were turned out, versus the then usual 55 to 60 per hour. Despite (or because of) extensive automation, Lordstown became a hotbed of labor discontent. A series of labor disturbances, during which over 5,000 grievances were filed against management, culminated in March 1972 with a spontaneous vote by 97 percent of the plant's 8,000 workers to strike in protest against the tempo and discipline of work at Lordstown.

The Bean Counters Take Command

Sloan moved up from the GM presidency to replace Lammot du Pont as chairman of the board on May 3, 1937, with the position redefined at his behest as "chief executive officer." With or without that title, and despite his disdain for "personal" business leadership, gigantic General Motors was largely Sloan's creature from his assumption of its presidency on May 10, 1923, until he retired as GM chairman in favor of Albert Bradley on April 2, 1956. Sloan wielded his immense power with the backing of GM's largest stockholders—particularly the du Ponts. By the time Sloan retired, the du Pont interests owned 23 percent of the GM common stock, collected about 25 percent of the GM dividends, and had five seats on the board of directors. By then, too, GM was purchasing annually more than $26 million worth of du Pont products. These facts are strikingly incongruent with the image of GM as a firm guided by the "objective" decisions of professional management separated from ownership projected in Sloan's 1964 *My Years with General Motors.*

An era ended at GM on June 3, 1957, as hard on the heels of Sloan's 1956 retirement came the decision of the United States Supreme Court that the du Pont controlling interest of GM violated the 1914 Clayton Antitrust Act. The key piece of evidence for the government's case was John J. Raskob's December 19, 1917, report urging the E. I. du Pont de Nemours finance committee to invest $25 million in GM, which "will undoubtedly secure for us the entire Fabrikoid, Pyralin [celluloid], paint and varnish business of those companies, which is a substantial factor." The court ordered that du Pont divest itself of its controlling interest in GM and that no individual sit on the boards of both corporations. "The sundering of the two corporations left General Motors entirely in the hands of professional managers, men whose stock holdings were comparatively smaller," Ed Cray points out. "Executives and board members . . . no longer could muster a controlling interest in the company's stock to enforce their decisions. Ironically, the shift in leadership, which might have induced corporate 'democracy,' with the individual shareholders' votes more crucial, had virtually the opposite effect. . . . Even without the great block of shares voted by du Pont representatives, the new elite routinely would pile up massive majorities on the few proposals upon which the stockholders at large were permitted to vote."[24]

A significant difference between GM and Ford, especially after the 1957 du Pont stock divestiture, was that Ford was a family-controlled firm. The Ford Foundation was established in 1936 as a legal device to maintain family control of the Ford Motor Company while avoiding

Roosevelt's "soak-the-rich" taxes. The Ford Foundation was given a 95-percent equity in the Ford Motor Company in nonvoting common stock. A 5-percent equity of all voting common stock was retained by the Ford family. Had the Ford Foundation not been conceived, Henry Ford's heirs would have paid federal inheritance taxes estimated at $321 million and would have lost control of the company in selling the stock necessary to raise the money. Ironically, however, by the end of 1955 the Ford Foundation had disposed of some $875 million of the Ford fortune and announced plans to diversify its investments. This involved selling nearly 7 million shares of Ford common that were reclassified as voting shares. The result was that almost three-fifths of the Ford voting common stock ended up in the hands of key Ford executives and the general public. Still, that left over two fifths of the stock in the hands of the Ford family.

After a generation of gross mismanagement, Ford was losing about $10 million a month when Henry Ford II took over on September 21, 1945. The Service Department had made fear and demoralization a way of life at Ford. Few executives worth their salt were left. The company lacked both a program of research and development and college-trained engineers. Accounting was so primitive that at least one department estimated its operating costs by weighing the invoices. There was no coordination between purchasing, production, and marketing. For years the financial statements had been closely guarded secrets even within the firm, because of fear that they might damage prestige or prompt an investiagation.

Henry Ford II began the turnaround by hiring at the war's end a team of eight former Air Force officers from the Office of Statistical Control who had been trained at the Harvard Business School. First called the Quiz Kids because of the many probing questions they asked about Ford operations, they soon came to be known as the Whiz Kids for their analyses of Ford's problems. Six of the eight ultimately became Ford vice-presidents, and two—Robert S. McNamara and Arjay Miller—presidents of the Ford Motor Company. Also in 1946 Ford hired as executive vice-president the accountant Ernest R. Breech, president of Bendix Aviation and former general assistant treasurer at GM. Breech recruited an executive team from GM and reconstructed at Ford the GM committee structure and system of financial controls.

The revitalized Ford Motor Company surpassed Chrysler to regain second place in the industry. Ford sales doubled from 549,077 in 1948 to almost 1.2 million in 1950 with the introduction of the 1949 Model B-A, the first new postwar Ford car. The Model B-A's "envelope body," a styling feature previously incorporated in the postwar Kaiser-Frazer cars, eliminated both conventional fenders and running boards. Its incorporation in the Model B-A set a styling trend still in evidence. The Model B-A also featured independent, coil-spring front suspension, called Hydra Coil, which softened the ride. In Leon Mandel's opinion, "it was this change that put the company in contemporary engineering competition with Chevrolet and Plymouth. But its use by all three led the American car down the road to handling complacency.... The B-A's ride ... [was] the clear beginning of the marshmallow feel that would characterize Detroit's products for the next three decades." The sign identifying the Model B-A in the Henry Ford Museum says, "It was visible evidence of the successful revitalization of the Ford Motor Company." [25]

Chrysler alone among Detroit's Big Three failed to institutionalize Sloanism. After the death of Walter Chrysler in 1940, leadership in the firm passed to K. T. Keller, an engineer, then in 1956 to Lester Lum Colbert, a lawyer. Chrysler's deserved prewar reputation for technological innovation and engineering excellence was preserved into the postwar period. Experiments with the gas turbine engine began shortly after the end of World War II. And Chrysler led among American automobile manufacturers in the introduction of disc brakes (1949), the hemispheric combustion chamber (1951), power steering (1951), hydraulic shock absorbers (1952), improved torsion-bar suspension (1957), and the alternator (1960). Yates calls the 1956 Chrysler Torqueflite automatic transmission "the finest automatic ever built." [26] Chrysler also led the industry in 1962 in offering extended warranties. Paradoxically, its products gained a reputation for poor quality control. And throughout the postwar period Chrysler turned out what were overall the most conservatively styled cars in the industry.

Chrysler came to be headed in the 1960s and 1970s by the accountants Lynn Townsend and John J. Riccardo. No one held more than a one-percent equity in Chrysler, and GM management practices were well known and had been popularized in Sloan's 1964 autobiography. Nevertheless, Chrysler failed to emulate GM by instituting even a rudimentary committee structure, clear lines of authority, or a system of financial controls. Lido A. "Lee" Iacocca took over as Chrysler president in November 1978, a few weeks after being fired as Ford president by Henry Ford II. He replaced Riccardo as chief executive officer in September 1979. Iacocca was horrified to learn that Townsend and Riccardo "hadn't brought in any serious financial analysts" and that "nobody in the whole place seemed to fully understand what was going on when it came to financial planning and projecting." No one was responsible for cost control. Overproduction for dumping to dealers at regular sales was a company policy. Manufacturing was not geared to marketing. Design was not geared to manufacturing. A self-perpetuating managerial bureaucracy had left Chrysler fat with highly paid unnecessary executives. Iacocca was dumbfounded that "after thirty years of postwar, scientific management ... in 1978 a huge company could still be run like a small grocery store." The problem was compounded because "for years, Chrysler had been run by men who really didn't like the car business.... [E]ngineering, which had always been Chrysler's ace in the hole, became a low priority under Lynn Townsend. When profits started to fall it was engineering and product development that paid the price."[27] As a consequence, by 1978 the Chrysler Corporation was in debt to some four hundred banks and on the verge of bankruptcy.

The mismanagement at Chrysler was unique, especially the failure to institute financial controls. The other problems described by Iacocca, however, had come by the 1970s to be shared by Ford and GM. Like Townsend, Robert McNamara, who became Ford president in 1960, was a "bean counter," not an engineer. So too was Arjay Miller. John Bugas was a former FBI man who had headed first industrial relations, then overseas operations for Ford before becoming president. Although he received an M.A. in mechanical engineering from Princeton, except for a nine-month stint as an engineering trainee, Iacocca's background at Ford was entirely in sales. Among the postwar Ford presidents up to Iacocca's tenure, only Semon E. "Bunkie" Knudsen, the son of William Knudsen, lured away from GM to become Ford president briefly in 1968–1969, was a trained engineer, with a degree from MIT. Iacocca also points out particularly forcefully that both the Ford committee system and the board of directors were overwhelmed by the personal power wielded by Henry Ford II, with the aid of his brother, William Clay Ford.

So long as Sloan was chief executive officer, some semblance of decentralized decision making remained a reality at General Motors. And during the presidency of Charles E. Wilson, the production people in the GM operating divisions in Detroit actually gained in representation on the board of directors. But the GM decentralized structure and committee system of decision making began to deteriorate during the 1953–1958 presidency of former bookkeeper Harlow H. Curtice. "In operational matters, Curtice was Billy Durant reborn—given to quick decisions, disposing of problems with lavish hand and absolute authority," writes Cray. "Like Durant, he toured factories and instantly dispensed millions of dollars for expansion without so much as a by-your-leave to the finance committee. The committee system of which Alfred Sloan and Pierre du Pont were so proud gradually slipped into disuse; Curtice was frank to assert, 'The best committee is the committee of one.'" Under Curtice and his immediate successors in the GM presidency, the accountants John F. Gordon (1958–1965) and James M. Roche (1965–1967), GM led the American automobile industry in emphasizing nonfunctional styling over engineering, to produce at higher unit profits bigger and bigger cars loaded with more and more accessories. The "automobile men" began to return to power at GM in 1967, when Roche was replaced by Chevrolet general manager Edward N. Cole, an engineer trained at the General Motors Technical Institute. Cole was succeeded in 1974 by Elliott "Pete" Estes, an engineer with long experience at Oldsmobile and Pontiac.

The trend toward control of General Motors by cost-cutting accountants inaugurated by Sloan in the 1920s was exacerbated during the chairmanship of his successor, the accountant Albert Bradley (1956–1958). And during the 1958–1967 tenure of Frederic G. Donner as chairman of the board, the famed GM decentralized structure became largely mythical as power within GM came to be centralized in the corporation's New York City financial headquarters. Under Donner's leadership the "bean counters" took command of giant GM. His successors as chairman all had financial, as opposed to engineering or sales, backgrounds. James M. Roche (1967–1971) moved up to the job from the GM presidency. He was followed by Richard C. Gerstenberg (1971–1974), who had described himself to Senator Abraham Ribicoff's U.S. Senate Government Operations Committee in 1968 as "old Gerstenberg the bookkeeper." Cray characterizes Gerstenberg as "the paradigm of General Motors executives; he was cautious, colorless, virtually unknown beyond the confines of the industry, and a diplomat who brokered adroit compromises between factions on the fourteenth floor.... Within the company he became known as an expert on pricing, budgets, and cost-control—the very heart of the corporation's new emphasis on profits." Thomas A. Murphy, the GM chairman from 1974 to 1980, had spent his entire career in finance after joining GM in 1938 upon his graduation from the University of Illinois. Cray concludes, "The appointments of Gerstenberg and Murphy underscored the shift from a production and merchandising company to a financial and marketing firm."[28]

As Yates says, "Detroit and its dealers were playing a dangerous game of immediate gratification—and eventual self-destruction." He points out that the "numbers-oriented executives" who "came to dominate industry thinking on all levels ... were obsessed by the financial structure of the car business and viewed the product mainly as an abstraction out of which profit or loss could be generated."[29] Consequently, high short-term profits were generated at the expense of manufacturing quality and technological development, to the detriment of the long-range well-being of the American automobile industry. As sales were lost, first to European, then even more dramatically to Japanese competitors in the post–World War II period, American dominance in automobile manufacturing ended. The U.S. share of the world market for motor vehicles plunged from 76.2 percent in 1950 to only 19.3 percent in 1982, as Japan in 1980 overtook the United States to become the leading producer of motor vehicles in the world.

American Challenge, European Response

13

The idea that Sloanism, like Fordism, would become dysfunctional when carried to its illogical conclusion was inconceivable in the pre–World War II era of American dominance in world automobile manufacturing. In 1928 North American manufacturers produced some 84 percent of world motor vehicle exports and had captured some 35 percent of the world automobile market outside the United States. About 10 percent of American automobile production was being exported. Additionally, both Ford and GM had become multinational enterprises. By 1928 Ford was assembling cars in twenty-one countries, GM in sixteen. James Foreman-Peck observes, "By 1928 American multinational production abroad exceeded the total output of both the French and German motor industries. A survey of the mid-1930s concluded that there were very few major markets of the world in which assembly plants had not been established by Ford or General Motors." [1]

The establishment of Ford and GM factories in Europe was particularly notable, for it marked recognition of a newly developing mass market there for cars. While the North American market stagnated during the Great Depression, there was a gradual but steady increase in middle-class motoring in Europe, where economic recovery occurred earlier than in the United States. British registrations increased from 1.4 million in 1929 to 2.59 million in 1938; French registrations increased from 1.3 million in 1929 to 2.27 million in 1938. In Hitler's Germany registrations jumped phenomenally, from only 654,400 when he assumed power in 1932 to 1.67 million in 1938.

With the expansion overseas of Ford and GM, and the emergence of a European-owned industry producing for a mass market, the relative position of the Canadian industry deteriorated. From its inception the