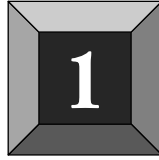




Section One

The Microchip Story—
Applying the
Aggregate System



Microchip: Before and After

MICROCHIP TECHNOLOGY INCORPORATED, established in April 1989, has its corporate offices in Chandler, Arizona. Microchip, a leading provider of microcontroller and analog semiconductors, focuses on the global embedded control marketplace. Its product line includes PICmicro® microcontrollers (MCUs); an extensive portfolio of analog/interface products; high-endurance Serial EEPROMs; microID® RFID tags; KEELOQ® security devices; and the dsPIC® family of Digital Signal Controllers. Microchip has manufacturing facilities in the United States and Thailand, has sales offices throughout the world, and employs over 3,900 people. The company designs, develops, and manufactures the vast majority of its products.

Humble Beginnings

For many years Microchip's outstanding performance has kept it in the top echelon of semiconductor companies. However, this is a far cry from its tumultuous beginnings. Figure 1.1 provides an insight into the status of Microchip in 1990. Sales were flat to dropping. The disc drive industry generated more than 60% of sales, and a single customer accounted for more than 25% of the business. Both of these factors made Microchip vulnerable to sudden and deep swings in sales. The company was losing \$2.5 million

Sales	Finance	Manufacturing	Products and Technology
<ul style="list-style-type: none">▪ Sales flat to dropping▪ Majority of sales on commodity EPROM products▪ Sales network built around commodity EPROM products▪ Gross margin of commodity EPROM products minus 25%▪ Largest customer represents over 25% of sales▪ Disc drive industry represents over 60% of sales	<ul style="list-style-type: none">▪ Losing \$2.5 million per quarter▪ Heavy negative cash flow▪ Less than 6 months of cash at burn rate▪ Bank credit line fully tapped▪ In violation of bank covenants▪ Expenses too high	<ul style="list-style-type: none">▪ Pathetic yields▪ Poor delivery performance▪ Lots of quality issues▪ Factory too large for business, yet too inefficient to meet demand	<ul style="list-style-type: none">▪ Most products and technology many years old▪ No significant new technology efforts▪ Majority of research and development (R&D) going into commodity EPROM products▪ Three different programs for EEPROM technology
			Result: Microchip up for sale/liquidation

FIGURE 1.1: Status of Microchip in 1990

per quarter, had less than six months of cash, had exhausted its bank credit lines, and expenses were out of control.

The product portfolio was mediocre and relied heavily on commodity EPROM products. Commodity EPROM products are often compared to jelly beans. They are memory chips that have no inherent defendability. It's easy to switch from one supplier to another. Therefore, price is everything. If your competitors are selling the same memory chips for less, customers will purchase the product from one of them.

Microchip was losing so much money, and the business situation was so bleak, that the company had starved its research and development (R&D) efforts to preserve capital. Moreover, the majority of R&D was still going into commodity EPROM products rather than into new technologies that could provide a higher-margin, more-defendable product line.

Exacerbating Microchip's woes, the manufacturing operation was underperforming. Quality issues ran rampant. The factory was too large for the level of the business, but too inefficient to meet demand. This meant

that factory yields (i.e., number of good product produced versus the total product the company attempted to produce) were so low that Microchip couldn't meet its meager demand. Therefore, Microchip had to start production of considerably more product than it actually required because such a large portion was scrapped during the manufacturing process.

In 1990, before we implemented the *Aggregate System* to change Microchip's culture and performance, we conducted anonymous surveys of all U.S. Microchip employees to gauge their perceptions. The results clearly indicated that the employees disdained Microchip's highly rules-based culture, disliked and distrusted management, and had low job satisfaction. We asked the employees how often (i.e., what percentage of the time) Microchip practiced each of the values we were going to install as part of Microchip's new culture. The results were eye opening. Employees stated that under the company's old culture, management, policies and systems, customer service, quality, continuous improvement, employee empowerment, cycle times, profits, communication, and ethics were not practiced or seen as important. In general, the employees did not like the managers, systems, and policies that governed them and the business.

Microchip's overall condition was so grim that the venture capital investors had the company up for sale. They had accepted an offer from Winbond Electronics Corporation of Taiwan for a mere \$15 million. Then, in May 1990, the Taiwanese stock market had a setback and Winbond backed out of the deal. In response, Microchip had to look inward to overcome its difficulties. The *Aggregate System* was implemented to provide the foundation for Microchip's transformation. At that time we understood many of the key elements of the system. The system continued to evolve and gain refinement over the years.

Transformation

Microchip needed to *reinvent* itself. This required an immediate and total transformation. The question facing the company was how to reinvent itself in the presence of so many impediments to success. Microchip didn't have great products, it wasn't making money, the operation was shackled by poor execution, and employee job satisfaction was understandably dis-

mal. There was trouble on all fronts. Therefore, we focused on the *foundational strengths to success*: the input factors that lead to success. These input factors are things such as strong workplace values, leadership, customer service, quality workmanship, employee empowerment, ingenuity, perseverance, problem solving, teamwork, adaptability, organization, communication, planning, a true hunger to improve, and so on. We needed to develop an approach (*Aggregate System*) to foster the proliferation of these input factors throughout the enterprise. We began Microchip's turnaround by empowering employees to improve every aspect of the enterprise and by rapidly applying these foundational strengths:

- Inspiring leadership
- A drive to continuously improve every aspect of the enterprise and ourselves
- A total, or aggregate, system for constructing the enterprise, consciously designing an exceptional culture built on strong workplace values (such as serving the customer, producing quality products, reducing costs, innovation, teamwork, and open communication) and practicing a highly effective management approach
- A vision and a roadmap to success outlined in our strategic formula (i.e., the company's vision, mission, strategies, business plans, and profit and loss [P&L]/balance sheet models)
- Outstanding executives and managers with great functional expertise despite being beaten down as a result of working within a highly rules-based, ego-driven, political, nonteamwork culture
- A belief in the capabilities of our employees if we could construct systems and a culture that would unleash their full potential by empowering them to consistently improve their area of responsibility
- In-depth management and organizational development expertise

Formation of the *Aggregate System*

During this period, several consultants proposed ways to improve Microchip. One suggested that Microchip focus on cycle time reduction to liberate cash. Another claimed quality improvement should be the priority.

Others recommended everything from implementing statistical process control to closing the factories and outsourcing manufacturing. Essentially, each consultant said that his or her particular field of expertise would lift Microchip out of its troubles.

We appreciated the validity of each consultant's proposal. For the past 50 years, educators, researchers, authors, and consultants have been promoting their specific area of expertise as the way to improve businesses. However, these piecemeal approaches were insufficient to turn around Microchip's performance and lead it into the top echelon of semiconductor companies. Instead, Microchip needed an approach and a system that *efficiently and continuously improved all aspects of the enterprise and involved each employee in this quest; only then could the company maximize its rate of improvement*. This inspired us to design the *Aggregate System*.

The *Aggregate System*, outlined in this book, was utilized to establish Microchip's culture of uniting employees through shared workplace values and to guide employees' strategies, decisions, actions, and job performance. The enterprise was consciously designed to achieve Microchip's strategic formula (i.e., the company's vision, mission, strategies, business plans, and P&L/balance sheet models). Microchip built the company around a set of core values that led the firm to attain its strategic formula. The company's policies, management practices, and the human systems that influence employees were aligned and integrated to Microchip's values. These human systems encompass how the company organizes, staffs, communicates, assesses, recognizes, compensates, develops, and advances individuals. The leaders served as a role model of Microchip's values through their decisions and actions. Eventually, the *Aggregate System* became self-perpetuating, with each element of Microchip aligning and integrating in unison, maintaining excellence.

Microchip's culture is now characterized by a relentless striving for continuous improvement, employee empowerment and involvement, teamwork, honest and free-flowing communication, problem solving, innovation, merit, frugality, systems thinking, continuous learning, and a results orientation in pursuit of the success of the customers, shareholders, and employees. Microchip possesses each of the elements that exemplify a thriving *Aggregate System*, outlined in Chapter 3. Though this book is ded-

icated to describing the *Aggregate System* approach, the reader should not assume that this is the primary reason for Microchip's success. Outstanding executives, managers, and employees will always remain the cornerstone of its success. Countless individuals striving to improve operations to better serve the customer have propelled Microchip to prominence. The *Aggregate System* has provided an environment where the employees realize their potential. We think this should be the goal of any great system.

Microchip's Prosperity

Microchip's transformation was successful. In 1993, Microchip conducted its initial public offering (IPO). Microchip was honored by *Fortune* magazine as the best performing IPO of 1993, with a first-year stock price appreciation of 500% and over \$1 billion in market capitalization. Figure 1.2 outlines the status of Microchip in 2005. Sales continue to be robust. The majority of the sales are on strategic, high-margin products. The customer base exceeds 46,000, with the largest customer representing only 3% of Microchip's sales. Four of the top ten global distributors sell Microchip products. Sales are nicely balanced among the United States, Europe, and Asia. Microchip sells products to a diverse application and customer base.

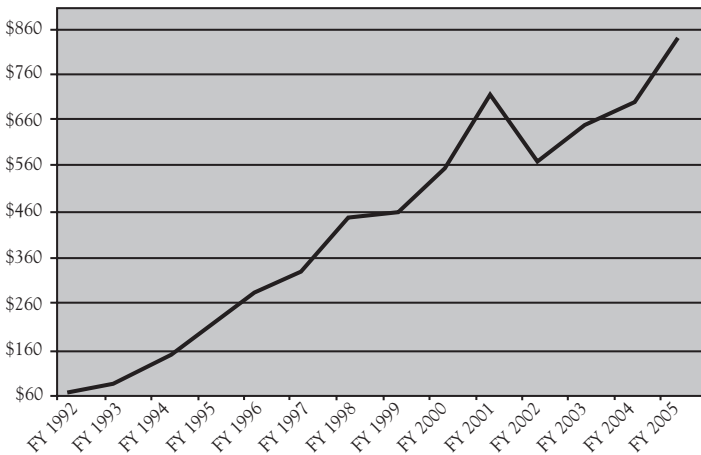
For many years, Microchip's financial performance has been outstanding compared to other companies in the semiconductor industry. It is considered to be one of the most profitable (by percentage of revenue) semiconductor companies in the world. Moreover, Microchip has experienced 60 quarters of profitability and has the best financial performance among its specific peer companies. Revenue in fiscal year 2005 was \$847 million (Figure 1.3 shows revenue growth over time). Microchip's pro forma gross margin was 57.14%. As shown in Figure 1.4, Microchip's fiscal year 2005 pro forma operating margin was 33%, and its ongoing profitability is illustrated in its solid earnings-per-share track record.

Since 1998, Microchip's market capitalization has increased from approximately \$89 million to \$5.3 billion (as of March 31, 2005). Microchip's long-term stock appreciation has been impressive. As of February 14, 2005, the stock price has appreciated more than 4,800%, splitting seven

<p>Sales</p> <ul style="list-style-type: none"> ▪ Sales growing rapidly ▪ Majority of sales on strategic high-margin products ▪ Sales network built around proprietary products ▪ Largest customer is only 3% of sales ▪ Four out of the top 10 global distributors sell Microchip's products ▪ Sales balanced among U.S., Europe, and Asia ▪ Sell product to a diverse application and customer base ▪ Over 46,000 customers 	<p>Finance</p> <ul style="list-style-type: none"> ▪ 60 consecutive quarters of profitability ▪ Best financial performance among peers ▪ 33% operating margin ▪ Market capitalization in excess of \$5.3 billion ▪ Expenses in line with P&L model ▪ Strong cash generation ▪ Strong balance sheet ▪ Now paying stock dividend 	<p>Manufacturing</p> <ul style="list-style-type: none"> ▪ World-class manufacturing ▪ Excellent delivery performance ▪ Excellent quality ▪ Converted to 8" wafer sizes ▪ High-yield plants in Arizona and Oregon ▪ Assembly and test plant in Thailand 	<p>Products and Technology</p> <ul style="list-style-type: none"> ▪ State-of-the-art technology ▪ Many highly successful new product introductions ▪ R&D focused on microcontrollers, DSC, and analog products ▪ PIC microcontroller: most popular architecture in the world ▪ Multiple product lines and extensive product portfolio
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Result: Microchip the top-performing IPO of 1993; 4,800% stock price growth since IPO

FIGURE 1.2: Status of Microchip in 2005



Source: Microchip Technology

FIGURE 1.3: Microchip's Fiscal Year Net Sales (Millions of Dollars)



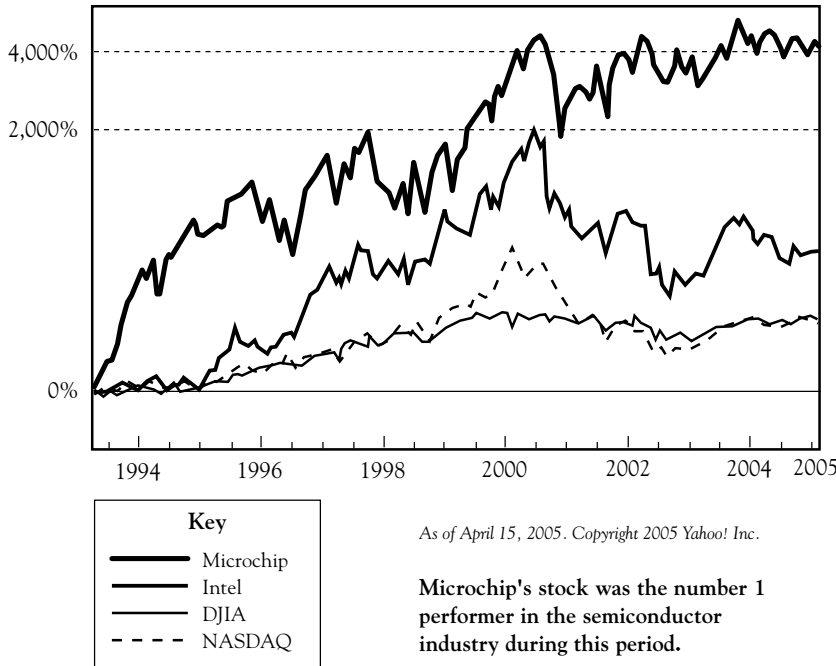
Source: Microchip Technology

FIGURE 1.4: Microchip's Fiscal Pro Forma Operating Margin and Earnings Per Share

times since the IPO in 1993. As mentioned, Microchip was honored as the top IPO by *Fortune* magazine that year. In 1993, *Fortune* magazine wrote, "The best performing IPO of this year's crop, Microchip Technology can wear the growth stock hat with panache." Figure 1.5 shows that over the past 12 years Microchip's stock outperformed Intel, the Dow Jones Industrial Average, and NASDAQ. Over the past 12 years, Microchip has also had the top performing stock in the semiconductor industry. In fact, dur-

ing this time period Microchip’s stock performance has handily outperformed the 11 “Good to Great” companies Jim Collins cited in his book *Good to Great*. This is a testament to Microchip’s stellar stock performance.

Microchip’s manufacturing operation is world class. Its yields are excellent and it performs to the highest standards. Its products are built with state-of-the-art technologies, and its product portfolio is extensive. Microchip’s PICmicro® microcontroller architecture is the most popular in the world. Figure 1.6 illustrates the increasing appeal of Microchip products. In 1990, Microchip was ranked 20th in global 8-bit microcontroller market share (in units); by 2002 it had jumped to number one, where it remains today. With its extensive portfolio of analog/interface products, PICmicro® microcontrollers (MCUs), high-endurance Serial EEPROMs; microID® RFID tags; KEELOQ® security devices; and the dsPIC® family of Digital



Source: <http://finance.yahoo.com>

FIGURE 1.5: Microchip’s Stock Performance as Compared to Intel, DJIA, and NASDAQ

No.	1990 Rank	1991-92 Rank	1993 Rank	1994 Rank	1995-96 Rank	1997-01 Rank	2002 Rank	2003 Rank
1	Motorola	Motorola	Motorola	Motorola	Motorola	Motorola	Motorola	Motorola
2	Mitsubishi	Mitsubishi	Mitsubishi	Mitsubishi	Mitsubishi	Microchip	Motorola	Motorola
3	NEC	Intel	NEC	NEC	SGS	ST-Micro	ST-Micro	ST-Micro
4	Intel	NEC	Hitachi	Philips	NEC	NEC	NEC	NEC
5	Hitachi	Philips	Philips	Intel	Microchip	Philips	Atmel	NEC
6	Philips	Hitachi	Intel	Microchip	Philips	Atmel	Supplus	Atmel
7	Matsushita	Matsushita	SGS	Zilog	Zilog	Hitachi	Hitachi	Supplus
8	National	SGS	Microchip	SGS	Hitachi	Toshiba	Fujitsu	Fujitsu
9	Siemens	National	Matsushita	Matsushita	Fujitsu	Samsung	Philips	Philips
10	TI	TI	Toshiba	Hitachi	Intel	Elan	Toshiba	Toshiba
11	Sharp	Zilog	National	Toshiba	Siemens	Zilog	Mitsubishi	Holtek
12	Okii	Toshiba	Zilog	National	Toshiba	Matsushita	Samsung	Samsung
13	Toshiba	Siemens	TI	TI	Matsushita	Infineon	Elan	Sanyo
14	SGS	Microchip	Siemens	Ricoh	TI	Fujitsu	Winbond	Winbond
15	Zilog	Sharp	Sharp	Fujitsu	National	Mitsubishi	Zilog	Infineon
16	Matra MHS	Sanyo	Okii	Siemens	Temic	Sanyo	Sanyo	Matsushita
17	Sony	Matra MHS	Sony	Sharp	Sanyo	Winbond	Matsushita	Sony
18	Fujitsu	Sony	Sanyo	Okii	Ricoh	National	Infineon	Zilog
19	AMD	Okii	Fujitsu	Sony	Okii	Sony	Holtek	National
20	Microchip	Fujitsu	AMD	Temic	Sharp	Holtek	National	Elan

Source: Microchip Technology. Based on unit shipment 1990-2003. Dataquest, July 2004

FIGURE 1.6: Worldwide 8-Bit Microcontroller Market Share

Signal Controllers, Microchip maintains a broad product offering to serve its customers and provide financial stability.

Effectiveness of Microchip's Culture

Microchip takes its culture seriously and seeks its employees' input. The company periodically surveys employees to gain insight into the health of the company's culture, the percentage of time the company's values are practiced, the employees' perception of management, and their job satisfaction. When the findings suggest that issues are present, corrective actions are implemented.

The entire U.S. Microchip workforce participates anonymously in these assessments. Figure 1.7 shows the results of Microchip's 2004 assess-

<u>Values</u>	<u>Mean</u>	<u>Mode</u>
▪ Customers Are Our Focus	86%	90%
▪ Quality Comes First	86%	90%
▪ Continuous Improvement Is Essential	83%	90%
▪ Employees Are Our Greatest Strength	77%	90%
▪ Products and Technology Are Our Foundation	86%	90%
▪ Total Cycle Times Are Competitive	85%	90%
▪ Safety Is Never Compromised	89%	100%
▪ Profits and Growth Provide for Everything We Do	89%	100%
▪ Communication Is Vital	86%	90%
▪ Suppliers and Distributors Are Our Partners	82%	90%
▪ Professional Ethics Are Practiced	85%	90%

Note: Mean score is the average.

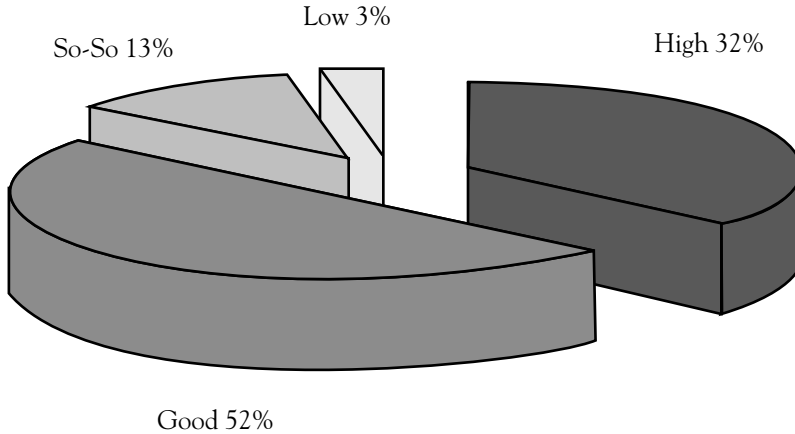
Mode score is the most frequent score given

Source: Microchip Technology's 2004 Survey of U.S. Employees

FIGURE 1.7: Percentage of Time Microchip Practices Its Guiding Values (as Rated by Entire U.S.-Based Employee Population)

Average for U.S. workers: 50%

Microchip's High and Good scores combined: 84%



Source: Microchip Technology's Survey of U.S. Employees National averages from study conducted by the Conference Board

Figure 1.8: Job Satisfaction of Microchip's Entire Employee Population

ment. The employees concluded that Microchip practices are consistent with its stated core values (i.e., guiding values). Figure 1.8 shows that the employees had an 84% job satisfaction rate, compared to the national average of 50%. The results of Microchip's assessment are impressive and consistent with previous surveys.

Perspective

Microchip exemplifies the power of the *Aggregate System* at work. The application of the *Aggregate System* provided the foundation for the company, positioned for failure in 1990, to transform itself. Microchip's success was a result of its ability to sustain its optimum rate of continuous improvement. This superior rate of improvement allowed Microchip to lift itself from mediocrity. Microchip empowered and required all employees to con-

tinuously enhance their area of responsibility. Microchip's strategic formula and workplace values, combined with alignment and integration of everything that influences the employees' performance (e.g., culture, management, policies, and systems), united employees in achieving Microchip's mission. As demonstrated in the success of Microchip's long-term financial and stock appreciation performance, Microchip has not lost the ability to maintain its impressive rate of continuous improvement. Every aspect of the enterprise is constantly enhanced. The *Aggregate System* ensures that all desired changes are permanent and self-perpetuating.

