

History of intel essay



**ASSIGN
BUSTER**

The microprocessor has changed our lives in so many ways that it is difficult to recall how different things were before its invention. During the 1960's, computers filled many rooms. Their expensive processing power was available only to a few government labs, research universities, and large corporations. Intel was founded on July 18, 1968 by engineers, Gordon Moore, Robert Noyce, Andrew Grove, and Arthur Rock. Rock became Chairman, Moore was President, Noyce was Executive Vice President in charge of product development and worked with Moore on long range planning, and Grove headed manufacturing. The purpose of the new company was to design and manufacture very complex silicon chips using large-scale integration (LSI) technology. Moore and Grove's vision was to make Intel the leader in developing even more powerful microprocessors and to make Intel-designed chips the industry standard in powering personal computers. Moore and Noyce wanted to seek Intel because they wanted to regain the satisfaction of research and development in a small growing company. Although the production of memory chips was starting to become a commodity business in the late 1960's, Moore and Noyce believed they could produce chip versions of their own design that would perform more functions at less cost for the customer and thus offer a premium price. Intel's unique challenge was to make semiconductor memory functional. Semiconductor memory is smaller in size, provides great performance, and reduces energy consumption. This first started when Japanese manufacturer Busicom asked Intel to design a set of chips for a family of high-performance programming calculators. Intel's engineer, Ted Hoff, rejected the proposal and instead designed a

Single-chip, a logic device that retrieved its application instruction from semiconductor memory.

There was a problem with this new chip Busicom owned it. Intel was convinced to repurchase the rights to the product. Intel then offered to return Busicom's \$60, 000 investment in exchange for the rights of the product. The Japanese agreed after struggling with the financial troubles.

Intel's first microprocessor, the 4004, was introduced in 1971. This \$200 chip delivered as much computing power as the first electronic computer, the ENIAC. After the 4004, Intel introduced the 8008 microcomputer, which processed eight bits of information at a time. The 4004 and 8008 began to open new markets for Intel products. Today, affordable computing power is available to designers of all types of products, producing creativity and innovation.

In 1981, Intel microprocessor family had grown to include the 16-bit 8086 and the 8-bit 8088 processors. These two chips created 2, 500 winning designs in the year. A product from IBM was one of those designs, which became the first PC. Intel was convinced IBM to choose the 8088 as the brains of its first PC. Because of IBM's intelligent decision, the PC business grew to tens of millions of units every year. In 1982, Intel introduced the 286 chip. It contained 134, 000 transistors and provided 3 times the performance of other 16-bit processors during the time. The 286 were the first microprocessor that offered software compatibility with its predecessors.

In 1985, the Intel 386 hit the market. The 386 could perform more than five million instructions every second. Compaq's DESKPRO 386 was the first PC based on the new microprocessor.

In 1989, Intel 486 processor was ready to hit the market. This new chip resulted in 1.2 million transistors and the first built-in math coprocessor. This chip was faster than the original 4004.

In 1993, Intel introduced the Pentium processor, which set new performance standards with up to five times the performance of the Intel 486 processor. The Pentium processor uses 3.1 million transistors to perform up to 90 MIPS, about 1,500 times the speed of the original 4004.

In 1995, Intel's first processor in the P6 family, the Pentium Pro processor, was introduced. It included 5.5 million transistors and contained a high-speed memory cache to accelerate performance. The Pentium Pro processor was a popular choice for multiprocessor servers and high performance workstations.

Intel introduced the Pentium II processor in May 1997. It contains 7.5 million transistors packed into a unique Single Edge Contact Cartridge and delivers high performance. Intel offers Pentium II processors for Mobile PC, carrying new levels of performance and computer capabilities.

In April 1998, Intel introduced the Celeron processor. This is the latest Intel processor created to meet the computing needs of Basic PC users. Intel's recent introduction is the Pentium III Xeon processor. This is the newest addition to Intel's Pentium III brand. It is Intel's first microprocessor designed

for mid and higher server workstation platforms. The company's success in memory chips was built from the resources involved in working on projects to design and develop the world's best microprocessor.

Intel's primary business into the mid 1980s was memory chips, which accounted for 70 percent of revenues. In 1985 and 1986, Intel closed eight memory chip plants. They were fighting a never winning battle with the Japanese produces of memory chips. Gordon Moore and Andrew Grove refocused the company on advancing the technology of microprocessors. Intel decided to create a new vision and strategy for the company. Their vision was to make Intel-designed chips the industry standard in powering personal computers. Intel supplies the computing industry with chips, boards, systems, and software. Intel's products are used as " building blocks" to create advanced computing systems for PC users. Intel's mission is to be the preeminent building block supplier to the new computing industry worldwide.

Intel has several objectives in order to pursue their vision. The objectives include PC and server management advances through new Intel hardware and software products, alliances with other industry leaders, education and development programs, and industry standards efforts. Most importantly, Intel's greatest objective was making the PC an indispensable and persuasive appliance, which would ultimately compete with the TV, VCR, and telephone.

Andy Grove crafted a series of strategies in order to reach Intel's objectives:

1. Introduce innovative products quickly. Andy Grove's vision of making the PC tomorrow's information appliance required the company to do more than be a leader in advancing microprocessors. Intel tries to bring innovative products to the market as quickly as possible. In 1995, Intel introduced the new high-end Pentium Pro processor. This came less than three years after the introduction of the Pentium processor, which is now the processor of choice in the mainstream PC market. Together, these products provide computer buyers with a wide spectrum of computing choices.

Due to the growing popularity of the Internet, Intel programmers developed a software product called Streaming Media Viewer that software developers could incorporate into their products and allow users to view video as it arrived from the World Wide Web. Also, Intel developed hardware based cryptographic technology that provided increased levels of security for data communicated over the Internet.

Intel's strategy of bringing innovative products to the market quickly has proven to be costly. In 1996, Intel spent \$500 million on R&D projects to develop products (other than microprocessors). Even though other producers were using joint ventures to build the extremely expensive fabrication plants, Intel chose to go alone.

Beyond their primary task of making microprocessors, Intel invests in a range of computing and communications applications that support their core business. Intel's supercomputer and network server efforts take advantage of the flexibility and power of Intel architecture, while their flash memory business supports booming communications applications, such as, cellular

phones. Intel executives saw the future PCs equipped with new features, such as, digital video, stereo sound, 3-D graphics, fax, and data communications. Intel decided to add these features into its next generation microprocessors. Intel decided to compete with the Taiwanese computer industry. They felt that the Taiwanese were too slow to adapt their products to the latest Intel innovations. By producing motherboards, it would enable Intel engineers to integrate new functions.

2. Promote the Intel brand. Intel invests in education and marketing programs that describe the benefits of genuine Intel technology. In 1990, Intel initiated a marketing program to build the Intel brand and make PC users aware of the benefits of genuine technology and products. Intel asked PC makers to put the Intel logo on their machines. The company also sponsored television and print advertising campaigns stressing that by choosing an Intel-based PC, users got the ultimate in quality, reliability, software computability, and value. The marketing program was a success and had become a prominent element in Intel's strategy ever since. Not only did Intel continue to sustain its dominant market share, but also customer feedback revealed that PC buyers, not just computer techies, really cared about their computer's chip and performance capabilities.

Instead of assigning its two new chip generations numbers like 286, 386, and 486 chip generations, Intel named them Pentium and Pentium Pro. This helped Intel build their brand name by allowing PC buyers to become familiarized with their products. Experts believed that Intel was spending over \$100 million annually on promoting their name among consumers.

3. Alliances with other industry leaders. The breakup of the old computer industry is what gave Intel its chance and made the mass-produced computer possible. The old computer industry was vertically aligned. Industries used to build their computers from bottom up. Now, these companies purchase products from other industries to build their computers. Because PCs contained components from so many different vendors, Grove believed industry participants in different horizontal specialties had to develop new products in parallel. Intel works with other industry leaders to develop new PC technologies, such as the PCI “ bus”, which has been widely adopted. This technology removes bottlenecks to provide greatly enhanced capabilities. They incorporate their chips into PC building blocks, such as, PC motherboards, to help computer manufacturers bring their products to the market faster. Intel also works closely with software developers to create rich applications, such as, PC video conferencing and animated 3D Web sites, that make the most of the power of Intel processors. Also, Intel is working with the U. S. Department of Energy to build the world’s fastest computer supercomputers.

As Intel introduced new generations of microprocessors, it was beneficial for Microsoft and other developers of operating systems and software to be ready to go to market with new software systems and products that capitalized on the speed of Intel’s new processors. Andy Grove and Bill Gates began meeting in the 1980s to explore how their organizations can share information. Intel believes that if computers work better, do more, and are easier to use, more PCs will be sold and more Intel processors will be needed.

As with any other strategy, it is necessary to evaluate performance and initiate adjustments in vision, long term direction, objectives, strategy, or implementation in the occurrence of changing conditions, new ideas, and new opportunities. For example, in 1994, a mathematics professor found a flaw in how Intel's new Pentium chip did division in certain situations. The media got a hold of this and there was negative publicity about Intel floating around. Intel explained to its consumers that the chances of this happening were minute. Intel admitted the flaw, but Andy Grove felt that it shouldn't concern anyone except the most demanding scientists. Intel wanted to stand behind their "Intel Inside" campaign, so they had to reevaluate their strategy. Within days of the incident, Intel offered all owners of Pentium based computers a free replacement of their Pentium chip and took a \$475 million write off to cover the costs. Even though it was considered a disaster, only a few owners took a replacement chip.

Intel focuses on being a best-cost provider. Their strategic target is the value conscious buyer. They want to give customers more value for their money. Intel's product line carries good-to-excellent attributes, several to many upscale features at low cost to the PC buyer. Overall, their focused strategies have kept them on the right track. However, Intel continues to attract competition, both from makers of software-compatible microprocessors and from makers of alternative-architecture chips.

To provide a good overview of Intel's business position and whether it is healthy or unhealthy, a SWOT analysis was conducted. This analysis will show if there is a good fit between Intel's resource capability and its external situation.

Intel is one of the most profitable companies in the world. It is a leader in its industry with over 80 percent of the world's 250 million personal computers powered by Intel microprocessors and over 90 percent of all new PCs currently being assembled with " Intel Inside". Intel is a recognized market leader with an attractive customer base and a good reputation of creating an advanced quality product. Some of Intel's strengths are its financial condition, brand-name image, good management skills and technical expertise.

One of Intel's major strengths is the ability to fund for research & development. The company has a high degree of profitability, cash flows from depreciation, and low dividend payout. Therefore, Intel can provide the financial resources and use their financial strength to fund the capital requirements associated with refurbishing existing plants and building new ones. Intel's strategy to maintain a leader status in the industry and to accommodate expected demand is necessary for them to stay ahead of competitors by producing more advanced products and building new plants or refurbishing existing plants. In recent years, Intel has built a new fabrication plant about every 9 months and announced that its goal is to reduce that to every 6 months. Also, for the past 6 years, it has led the semiconductor industry in new capital investments.

In 1990, Intel initiated a marketing program to build the Intel brand and show PC users the benefits of Intel technology and products. The reason for the program was to increase sales of the Intel brand and lower sales of AMD's cloned microprocessors. Their marketing strategy was to ask PC makers to put a distinctive " Intel Inside" sticker on their machines. They

also sponsored television and print advertising campaigns promoting that an Intel-based PC provided customers with ultimate quality, reliability, software compatibility, and value. This was a major success and created a good brand name image for Intel.

Management Skills and Technical Expertise

Talented and skilled individuals from the beginning managed Intel. They had the expertise to manage Intel by choosing the right individuals that had the technological know-how to bring it to the top. Intel's skill and expertise proved to be a strength back in 1985 when Intel's primary business was the memory chip. Japanese competitors started producing and marketing their memory chips at lower costs than Intel. However, Intel had the skills and expertise to abandon the memory chip business and put their full energies into a secondary microprocessor business. They wanted to become leaders of the industry and they proved that they knew what needed to be done to accomplish their vision.

Intel is one of the most successful companies and it is hard to find a weakness in such an established firm. Intel is known for its strengths, competencies, and capabilities. However, one of Intel's weaknesses is the focus on primarily microprocessors. The diversification of companies into other industries allows them to be less risky in case a rival developed a better product. For example, Microsoft is expanding into the Internet business to become more diversified. America Online and Netscape are merging to enhance their core business. Intel could become even more successful if it were to diversify into other industries. The company can be in

grave danger if another firm was to rise to the top with the manufacturing of microprocessors or if technology promoted a more efficient product than the microprocessor.

Andrew Groves has been the backbone of Intel for many years. Under Groves, Intel was very aggressive in protecting its technology. He is a hands-on manager whose high level of involvement and attention to detail inspired and intimidated subordinates. A big part of Intel's success is Groves' leadership style, competitive ability, and innovative mind set. Eventually, Groves will retire and the question will be what will happen to Intel? Will Groves' successor lead Intel to remain on top. Andrew Groves has proved to be an excellent leader, but the leadership after him is questionable.

Market opportunity is a big factor for shaping Intel's strategy. Intel is equipped with the right resources and has the capability to pursue many opportunities that exist. The company's innovation has helped build alliances to expand the firm's market coverage and competitive capability. Intel also has the ability to grow rapidly because of strong increases in market demand.

Andrew Groves has a vision of the PC as tomorrow's information appliance. He wants to have televisions, VCRs, game players, cable boxes, and telephones to be pushed to the background and bring PCs to be in the spotlight. Groves does not want to just lead in advancing the microprocessor, he wants to fully utilize the capability of the microprocessor and introduce a number of PC-based communications products to meet the broad range of consumer needs. Some of the products that Intel has available are chip

products used for keyboards, printers, copiers, and fax machines. These chip products are used to enhance cellular phones, pagers, digital cameras, and personal digital assistants. Intel is also manufacturing universal Serial Bus—single type of connector to attach printers, modems, CD-ROM drives, and other peripherals. Other innovative products include Intercast plug-in cards, a ProShare line of conferencing products,

Intel has a software lab in Shanghai developing multimedia and 3-D content in Chinese. They have created software to help popularize long-distance telephone calls on the Internet and a hardware-based cryptographic technology that provides levels of security for data communicated over the Internet. Intel is introducing new products and technologies on a weekly, sometimes daily, basis. They are gradually increasing their R&D budget to look for valuable ways to broaden their product line. Their reputation for innovation is among the best in the U. S. In fact, Intel was ranked third for its innovation in 1997.

Alliances expand the firm's market coverage and competitive capabilities. It is essential that Intel develop a close relationship with other PC component producers, manufacturers, software developers, cable TV companies, media and telecommunications companies, and entertainment companies. Before the mid-1980s the structure of the old computer industry was aligned vertically, in which each company sold their products based on their own proprietary technology. They designed and built their computers themselves. Buyers had to commit to the whole package of one manufacturer. Since then, the computer industry is growing horizontally. Each product depends on another product. This is why it is important to collaborate with others.

Products within each horizontal specialty should be compatible with other specialty products to make a powerful PC or other PC-based product.

Intel has the ability to grow rapidly because of strong increases in market demand. The process of making PCs has changed with that of the past. Only a few PC makers produced the components inside of the PCs. Therefore, the demand for Intel's products increased. Intel had the ability to grow rapidly because it responded quickly to market demand and had the capital and expertise to develop advanced powerful products faster than competitors.

Looking at Intel's external environment, there are some factors that create a threat to the company. Some of the threats Intel is facing are competition, slowdowns in market growth, and the bargaining power of consumers.

In 1997, Advanced Micro Devices (AMD) and Cyrix were the two major competitors that challenged Intel by cloning Intel's microprocessors and marketing them at lower prices. This created a major threat to Intel's market share. A third competitor was developed by the partnership among Motorola, IBM, and Apple Computer. They were producing and marketing Power PC chips for Apple's line of PCs and certain IBM PCs. For example, the Power PC offered a reduced instruction-set computing (RISC) processor which had a simpler instruction set and higher computing speeds than Intel's chips. This was an attractive feature for the end user, which also threatened Intel's market share.

The competitors mentioned above are just three of the major companies that are a threat to Intel. There is also the possibility of other companies making a technological breakthrough by developing a more powerful and cheaper

product that will outlive Intel. For such reasons, Intel has to be innovative and ready for any possible external threat.

Intel is always planning ahead of things. They refurbish or build plants two years before the new product ever is produced. This could be considered an advantage or disadvantage. It is an advantage to Intel because they are constantly developing technologically advanced and more powerful products, which allows them to compete and be a leader of the industry. However, the major disadvantage is the possibility of the PC market slowing down. Intel could be hurt tremendously if the market growth slows down because they have already planned ahead and invested a lot of capital into the plants.

Cost pressures are also a threat to Intel. Consumers are demanding lower prices on products or higher quality for the prices they are paying. If a consumer can get the same product at a lower price from competitors, it can be a major threat to the company. Intel can influence bargaining power of the consumer by making sure the prices are low based on cost efficiency and the quality is maintained.

The SWOT analysis provided the opportunity to view the company's overall position. An evaluation of Intel's strengths, weaknesses, opportunities, and threats support the fact that above all Intel has established a healthy position in the industry.

The goodness of fit test determines if a company's strategy is suitable for its internal and external situation in order to obtain market success. Intel is a member of the technology sector and in the semiconductor industry. Firms involved with technology must deal with the quick obsolescence that is

inherent when dealing with computers. An example of this is Moore's Law coined after Gordon Moore, Intel's founder, who truthfully stated that "the power and complexity of silicon chips would double every year with proportionate decreases in cost". This external environmental situation causes two problems for companies in the industry. One problem is that a company must constantly innovate to stay on top and secondly, the company will need capital in order to create new technology.

Does Intel's strategy adequately deal with the constant change that is prevalent in its business environment? The Intel's strategy is to cannibalize its own products. In other words Intel strives to make its own products obsolete. A Company's profits and market position can be severely undermined if another company offers a faster chip with more capabilities. Intel is able to do this because of its internal situation. Intel has vast amounts of capital, "...a 'war chest' of about \$10 billion". This is useful when the average plant costs will be about \$2.5 billion dollars around the year 2000.

The competitive advantage test ascertains if a company's strategy leads it to have a sustainable competitive advantage over its rivals. The competitive advantages that Intel has are its brand image and research prowess. Intel's brand name is a competitive advantage because it helps keep the sale of silicon chip clones from rivals down so that these companies do not erode Intel's profitability and market share. If a company had a clone of equal performance, it would be easier for consumers to switch over if not for the power of brand name and awareness that keeps customers loyal. The

strategy that Intel has is to increase the awareness and preference for its products.

Research prowess is a competitive advantage for Intel. It has large amounts of capital compared to its competitors. For example, next year Intel will spend \$3 billion on research and development, “ which is more than AMD generated in sales in 1998”. Intel continues to produce innovative products faster than its rivals do in order to receive the lion’s share of profits so as to keep itself able to acquire the capital to produce these innovations.

The performance test ascertains if the company’s strategy is helping the company become profitable and help obtain long-term market position. Located in the Appendix are several profitability ratios for Intel from 1983 until 1998. In Appendix A-E are graphs representing this data? In Appendix F are the actual numerical data. After 1986 is when Intel changed its strategy to what it is presently. The data used to compute these ratios was from the Intel case in Strickland and Thompson’s Strategic Management 10th Edition. The 1997 and 1998 were compiled from data obtained from Intel’s homepage located at <http://www.intel.com>.

Appendix A shows the gross profit margin. The gross profit margin has, since 1986, been steadily increasing and since 1990, has remained above fifty percent. This profitability ratio shows the amount of money that remains after making a product that is available for the company to utilize. This shows that the company is strong in this aspect.

Operating profit margin is shown in Appendix B. This shows the profit of the company prior to interest payments and taxes taken out. The ratio was

negative for the years 1985 and 1986. After 1986, the operating profit margin has been strong reaching a peak of 39.44% in 1997.

Appendix C displays the net profit margin, which is the profit the company realizes. After posting a loss in 1986, the net profit margin of Intel has steadily improved and strengthened. Since 1990, Intel has been posting profits higher than fifteen percent. It reached a profit peak in 1997 with a net profit margin of 27.7%.

Intel has at the present time has a dominant 75.7% market share. This is a dominant position since its next closest rival, Advanced Micro Devices (AMD), has merely fifteen and one-half percent of the market share. Its other competitor Cyrix has only 5.6%. This data is represented in pie chart form in Appendix G. The data has shown that Intel's strategy has successfully completed all of the tests and is thus a winning strategy. Its present strategy is allowing it to respond to the business environment and maintain its competitive advantages while raking in profits.

Andy Grove's Performance as CEO

It is imperative to acknowledge Gordon Moore, his mentor, before discussing the performance of Andy Grove. Gordon helped to set the Intel culture as being one of low bureaucracy and set the standard of holding one-on-one meetings with his subordinates in order to help the flow of information. Moore has his own 'law' which stated that the power and complexity of the chip would double every eighteen months with proportional decreases in costs. This helped Intel from the onset set its sights on innovation and being a leader.

Appendix F shows the numerical numbers for the return on stockholders' equity (ROE) and return on assets (ROA). Appendix D and E show their values graphically. These ratios are used to gauge how effective management is. Andy Grove became President in 1979 and was given more total control in 1987 when Gordon Moore served only as chairman. To adequately ascertain how well Andy Grove has been as CEO, an examination of the following these ratios are necessary.

The ROE since 1987 has been strong with most years above twenty-percent as displayed in Appendix D. The highest value being in 1997 with 35.99%. This ratio is put into perspective when one compares the ROE with that of the industry. The ROE-to-Industry ratio taken from Daily Stocks website which is 131.4%. The ROA since 1987 has also been steadily increasing into the teens and lower twenty's. The ROA-to-Industry for Intel is large 140.4% from Daily Stocks website.

This analysis shows that Andy Grove has done a superb job at Intel. Other factors concerning Andy Grove speak well of his performance as the CEO of Intel. His views have permeated into the corporate culture of Intel and have helped it become the dominant force in its industry. The strategy-making style that Grove uses is that of a master strategist. The master strategist exerts strong influence over the strategy of the company. Andy Grove's own view, which is his 'law', of "only the paranoid survive" has helped keep Intel on its toes and looking ahead to what is happening. This is shown by the fact that Intel builds factories years before they are needed in order to stay on top of the market. Andy Grove's leadership has helped Intel not fall into the pitfall of becoming stagnated by its own success.

The shortcoming that Andy Grove has in being a manager is he is too good. As stated in the SWOT analysis, Andy Grove's permanent retirement from Intel could set the company floundering unless the company finds someone as well qualified and with an analogous approach to management style.

The U. S. microprocessor industry comprises of more than 100 companies that design, manufacture, and market semiconductors to original equipment manufacturers and personal computer end users. The following information is a profile of the dominant economic characteristics of the microprocessor industry.

Market Size: \$300-\$350 billion worldwide consumption.

Scope of Competitive Rivalry: Global.

Market Growth Rate: 15-20 percent annually.

Stage in Life Cycle: Rapid growth and takeoff.

Number of Companies in Industry: About 174 companies.

Customers: 80 million microprocessors for use in PCs and network servers.

Degree of Vertical Integration: Mixed; forward and backward integration.

Ease of Entry/Exit: High entry barriers in the form of capital requirements.

Technology/Innovation: Rapid technological changes microprocessor production.

Product Characteristics: Highly standardized.

Scale Economies: Companies can realize economies of scale.

Learning and Experience Effects: Strong.

Capacity Utilization: Manufacturing efficiency is higher when capacity is increased.

The two pie charts above display the industry usage in 1995 and 1997. As shown, the computer sector is the main user of the microprocessor. Within two years, the computer sector increased its usage by 11% and is expected to continue increasing over the next several years. Computers are the main focus in the microprocessor industry, which is why many rivals are competing for market share in that sector.

THE FIVE FORCES MODEL OF COMPETITION

Rivalry among competing manufacturers in this industry is a strong force of competition. It is focused on such factors as performance features, new product innovation, quality, and brand image. New product innovation plays a major role in the microprocessor industry because it determines the intensity of rivalry among competing firms. Companies are trying to gain better market position and competitive advantage.

Threat of potential entry is a weak force due to the fact that it is hard for a newcomer to break into the market. Moreover, economic factors put a potential entrant at a great disadvantage because of the learning and experience curve effects. The existing microprocessor companies have advantageous positions in the industry from the experience they have gained from being in the industry longer than new entrants have. Leaders of

the industry, like Intel, have vertically integrated their manufacturing to make products at low efficient costs that entrants would not be able to compete and be exposed to fierce competition. Other entry barriers are economies of scale, brand preferences and resource requirements.

Competition from substitutes is a weak force because there are no substitutes in the industry. The microprocessor is needed to manufacture many types of equipment, such as, TV sets, VCR's, cameras, wristwatches, kitchen appliances, mobile phones, and stereo equipment. There is no other product that can be used in place of the microprocessor.

Power of suppliers is moderate. Some companies rely on suppliers to supply a component more cheaply than industry members can make themselves. This can increase their leveraging power. However, suppliers also tend to have less leverage to bargain over price and other terms of a sale because the industry they are supplying is a major customer. A microprocessor company usually orders in large quantities, which in turn decreases suppliers leverage. Also, major companies are integrating backwards to self-manufacture the component. Backward integration allows companies to negotiate favorable terms with suppliers.

Power of customers is a strong force in the industry primarily because buyers are large and purchase much of the industry's output. Purchasing in large quantities gives a buyer enough leverage to obtain price concessions and other favorable terms. For instance, PC makers have a substantial bargaining leverage when deciding to use Intel's chips in their computers.

Due to fierce international competition, the microelectronics industry has become highly globalized. To compete effectively, U. S. microelectronics suppliers must sell to all domestic and foreign markets. The profit margins for certain products are so slim that only through international sales can a supplier generate profits adequate to remain in business. Survival in this highly international industry requires microelectronics manufacturers to be first to market with leading-edge products that focus on high-end technology. Only those suppliers who introduce the breakthrough products can maintain profit margins that will support research, development, and the purchase of new equipment for manufacturing the next generation product.

Intel's rivals: Advanced Micro Devices, Cyrix Corporation, Motorola, IBM, Apple Computer, and the Power PC are favorably positioned, but not in the same leading position as Intel. Intel dominates the computer industry. Intel works closely with alliances to introduce many innovative products that give them a leading edge over their rivals. Intel's products are distinguished from their competitors, which make it difficult to clone.

In 1997, Intel's two biggest competitors were Advanced Micro Devices (AMD) and Cyrix, both of which made " Intel-clone" microprocessors and marketed them at prices below those charged by Intel. A partnership among Motorola, IBM, and Apple Computer to produce and market Power PC chips for Apple's line of PCs and for certain IBM PCs represented a third competitor. Sun Microsystems was a fourth competitor, producing and marketing a microprocessor line that competed against Intel chips in a limited number of computing applications. These competitors can possibly take some of the market share away from Intel. Therefore, Intel needs to maintain market

dominance by continuing to make a high quality microprocessor with process technology improvements. These factors will help Intel stay ahead of their competitors.

Advanced Micro Devices (AMD) had carved out a niche providing less expensive microprocessors than Intel's mainstream offerings. AMD, confident that NexGen had strong technology despite its low sales, promptly scrapped its own design for a chip to compete with Intel's Pentium Pro in favor of a design (subsequently named K6) that NexGen had under development. Whereas previous generations of AMD chips had been clones of Intel's designs, AMD and NexGen engineers had designed the K5 and K6 from scratch. AMD hoped that its K6 chip would be an attractive alternative to Intel's higher-priced Pentium Pro chip. AMD was planning to introduce 180, 200 and 233 MHz versions of its K6 chip during 1997 and a 300 MHz version was the plans for 1998. AMD expected that 5 of the top 10 PC manufacturers would be using the K6 in some of their models during 1997; analysts projected that AMD could sell up to 5 million K6 chips in 1997. The K6 was expected to sell for about 25% less than Intel's Pentium

Pro chips. IBM and Compaq announced in 1997 that they would use AMD's K6 processors in their low-end machines. During the first three weeks of September, nearly half of all the desktop computers sold through retailers used the AMD K6 microprocessor, according to market researcher PC Data Inc. That is a dramatic improvement from last year when 92% of those same machines had Intel chips inside. Today, only 43% of retail PCs sold use Intel. Industry analysts expected Cyrix to be more successful in marketing its M2 against Intel's MMX Pentium in the price-sensitive home computer and

notebook segments. The stigma of a non-Intel chip posed a high barrier for Cyrix to hurdle in, penetrating the high-end desktop and notebook segments.

Motorola, Apple, and IBM initiated a partnership in 1991 to develop the Power PC chip as an alternative to Intel chips. After production delays and disagreements over design, IBM and Apple finally agreed to a common design in 1995. The Power PC along with Sun Microsystems' UltraSPARC chip was a reduced instruction-set computing (RISC) processor, whereas, Intel, AMD, and Cyrix chips were complex instruction-set computing (CISC) processors. Chips incorporating RISC designs used simpler instruction sets to achieve higher computing speeds than CISC processors. Also, RISC designs had better floating-point performance.

Intel has many key success factors that helped it prosper in the market place. Intel has product innovation capability and the funds available to invest in research and development. Intel's reputation for innovation was among the best of any U. S. company, it ranked third on innovation among all U. S. companies. Besides investing in R&D, Intel had to gut and refurbish its existing fabrication plants every three years to produce the new chips and sometimes build a new plant to accommodate the expected demand. Year after year, building new plants became very expensive because they used exotic tools and equipment to etch finer and finer lines on a silicon chip. Finer etching also required more labor and production time. Intel estimated that each succeeding generation of microprocessors required more than twice the capital and manufacturing capacity for production. Intel

intended to be among the handful of chip producers that could afford to build top-of-the-line chip fabrication plants.

Intel has the flexibility to manufacture a range of models and sizes. Besides the products already in the market, it has additional products in various stages of development. For instance, Intel has a segmented brand including the Celeron, Pentium II, and Merced chip which is expected to be available in 2000.

Intel works closely and distributes to PC component producers, PC manufacturers, software developers, cable TV companies, media and telecommunications companies, entertainment companies, and information-communications appliance for both the home and the workplace. Intel is involved with Microsoft, Pointcast, America Online, IBM, Cisco Systems, and others to develop and promote Internet software.

To diminish the sales of clones of Intel microprocessors marketed by AMD, Cyrix, and others, Intel initiated a marketing program in 1990 to build the Intel brand and make PC users aware of the benefits of genuine Intel technology and products. Intel asked PC makers to put a distinctive “ Intel Inside” sticker on their machines. Manufacturers who used Intel microprocessors in their PCs also used the logo on their packaging and in their ads and brochures. The company also sponsored many television and print advertising campaigns to promote the Intel’s brand name image.

Intel has the ability to develop innovative products and product improvements. Also, it has the ability to get newly conceived products past the R&D phase and out into the market very quickly. They are always ahead

of their competitors and always find new ways to improve their product.

Intel's team consists of many experienced employees using top of the line technologies.

Intel has the ability to respond quickly to shifting market conditions and customer needs because of its many years of experience and the ability to invest in R&D. Andy Grove's management style also plays a major role in organizational capability. His concern for the flow of information helped instill Intel's corporate culture and allows every employee to contribute to the company.

INDUSTRY PROSPECTS AND OVERALL ATTRACTIVENESS

The factors that make the industry attractive are the large use of computers at home, work, libraries, coffee shops, and bookstores. Computers allow easy access to Internet, e-mail, and research. PC's use up-to-date technology, which makes life easier and daily tasks simpler. The fastest growth was expected to occur in Asia outside Japan, where use of PCs was still relatively limited and where the market potential was largely untapped. The Chinese market was the largest in the Asia-Pacific region (with projected growth of 25-35 percent annually over the next several years), followed in order by Korea and Japan. Also, PC sales in Europe were expected to grow 8% annually. The profit outlook seems favorable because a computer at home or work will be a necessity.

The factors' making the industry unattractive was that Intel was producing new products too quick for the market to catch up. New developments were occurring at such a fast and furious pace that the end result was

unpredictable. There was a lot of competition going on. The Internet was central to most of the forthcoming developments in information technology. This is the reason why Intel is mainly focused on the computer sector. As Andy Grove put it, “ The Internet is like a 20-foot tidal wave coming thousands of miles across the Pacific, and we are in kayaks. It’s...gaining momentum, and its going to lift you and drop you. It affects everybody...the computer industry, telecommunications, the media, chipmakers, and the software world.”

Their commitment to R&D creates future generations of products and the manufacturing processes they use to make them, while their capital expenditures ensure the availability of state-of-the-art factories that allow them to deliver high-volume, high-performance microprocessors efficiently. Looking into the future, they will continue to manufacture quality microprocessors that will live up to the Intel name and strive towards perfecting their existing ones.

Bibliography: