

Intel (B): Responding to the Smart Phone Threat

Paul Otellini was getting ready to leave his position as CEO of Intel and turn over the reins to Brian Krzanich, who was currently Intel's COO.¹ Looking back, Otellini was proud of his accomplishments at Intel over the past eight years. Although revenue and the company's stock price had been flat during Otellini's watch, shareholder dividends had grown at an average rate of over 13 percent, and he had positioned the company for the future by growing capital investments and research and development expenditures in the face of slower sales and stock price growth. **Exhibit 1** displays Intel's financial performance over Otellini's tenure.

The company's biggest bets had come in diversification through acquisition; between 2005 and his retirement in 2013, the company purchased a dozen companies. By far the largest of these acquisitions was the 2011 purchase of McAfee for \$7.68 billion.² McAfee represented a huge gamble by Intel to enter the software security business, and whether Intel could create value through the purchase was an open question. Otellini realized it may be the biggest challenge his successor would face as he tried to regain Intel's leadership in a rapidly changing semiconductor business.

EXHIBIT 1 Intel Financial Performance, 2005-2012

Year	2005	2006	2007	2008	2009	2010	2011	2012	CAGR
Net Revenue (\$ billions)	38.8	35.9	38.3	37.6	35.1	43.6	54	53.3	
Growth Rate		-8.76%	8.19%	-1.83%	-6.65%	24.22%	23.85%	-1.30%	4.05%
Earnings per share (\$)	1.4	0.86	1.18	0.92	0.77	2.01	2.39	2.13	
Growth Rate		-38.57%	37.21%	-22.03%	-16.30%	161.04%	18.91%	-10.88%	5.39%
Dividends per share paid	0.32	0.4	0.45	0.55	0.56	0.63	0.78	0.87	
Growth Rate		25.00%	12.50%	22.22%	1.82%	12.50%	23.81%	11.54%	13.32%
Capital Expenditures (\$ Billions)	5.9	5.9	5	5.2	4.5	5.2	10.8	11	
Growth Rate		0.00%	-15.25%	4.00%	-13.46%	15.56%	107.69%	1.85%	8.10%
Research and Development (\$ Billions)	5.1	5.9	5.8	5.7	5.7	6.6	8.4	10.1	
Growth Rate		15.69%	-1.69%	-1.72%	0.00%	15.79%	27.27%	20.24%	8.92%
Closing Stock Price (\$, 01 July)	26.21	19.27	23.88	21.57	17.04	19.25	22.53	26.51	
Growth Rate		-26.48%	23.92%	-9.67%	-21.00%	12.97%	17.04%	17.67%	0.14%

Source: Intel Corporation, Annual Reports, 2008, 2012. And, stock price data from Intel Corporation.

A Changed Industry: The Rise of Arm-Powered Smart Devices

When Paul Otellini became CEO of Intel, the company was the undisputed market leader in both the personal computer (PC) and server markets. The PC market had grown from 218 million units shipped in 2005 to almost 353 million units in 2012 (6.2% CAGR), but it represented a declining share of the overall computing device market. Yet, since Apple introduced its revolutionary iPhone in June of 2007, the market for “smart phones” had grown from almost nothing to 700 million units shipped in 2012 (a CAGR of over 126%)³

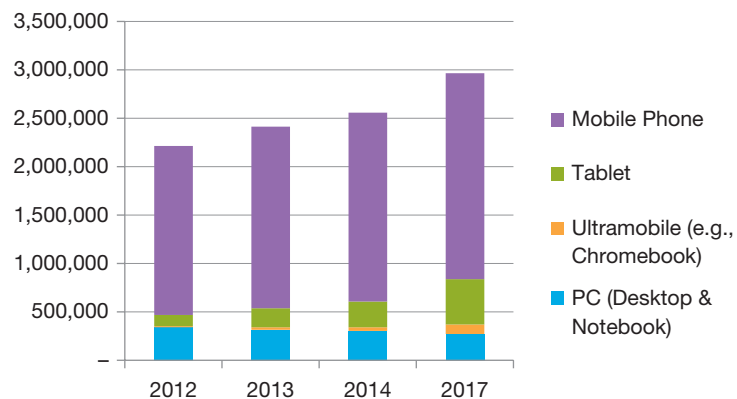
Tablet computers had also displaced the traditional PC, with Apple’s iPad leading the way. Introduced in April of 2010, the iPad shipped over 3 million units in its first quarter. By the end of 2012, there were over 121 million iPads in use,⁴ and every major computer company introduced its own version of a tablet computer. Although Intel’s core market for PCs had grown at a respectable rate, in 2013, the PC market was widely considered to be an industry in long-term decline. **Exhibit 2** shows projections for sales of different platforms of computing devices.

When Otellini assumed command at Intel in 2005, the company enjoyed huge margins and, in spite of the cyclical nature of semiconductor sales industry, robust and profitable sales growth. Intel had almost no market share in the new market for smart phones and tablets, with sales barely reaching 1% of the mobile market in 2012.⁵ How had Intel missed the boat in this new industry? After all, Intel had created the microprocessor, the basic component that powers PCs, smart phones, and tablet computers. Since the introduction of the first chipset, the 4004 processor, Intel had relentlessly pursued a simple strategy: Obey Moore’s law, which states that every 18-24 months the number of transistors on a silicon chip doubles, dramatically increasing performance while halving the real cost of that performance.

Intel had followed Moore’s law, with the result being a product line of very powerful chips for a wide array of uses. The Achilles heel in the Intel strategy could be found in the power usage of its chips. In the PC world of the 1980s to the 2000s, when PCs were all plugged into a

EXHIBIT 2 Growth in PC Market and Related Industries (all numbers in millions)

Device type	2012	2013	2014	2017	CAGR
PC (Desktop & Notebook)	341,263	315,229	302,315	271,612	-3.73%
Ultramobile (e.g., Chromebook)	9,822	23,592	38,687	96,350	46.31%
Tablet	116,113	197,202	265,731	467,951	26.15%
Mobile Phone	1,746,176	1,875,774	1,949,722	2,128,871	3.36%
Total	2,215,386	2,413,810	2,558,469	2,966,801	4.99%



Source: Data from the Gartner Group.

wall socket, a power drain didn't matter. Intel's processors, the Core i7 line, introduced in 2008, had a thermal design power of between 95 and 150 Watts.⁶ Thermal design power refers to the amount of power a computer's cooling system requires to dissipate the heat generated by the microprocessor. In chasing increased processor performance, Intel had created a product line that consumed massive amounts of battery power. In contrast, Intel's new competitor in the mobile space, ARM, had chips in use that required only 1.9 Watts.

In a word, Intel had seen its growth potential disrupted.⁷ Mobile device users valued a sustainable "untethered experience," the ability to use the device for long periods of time *without* draining the battery. In the power-rich world of PCs, performance mattered, and the greater the performance a chip could provide, the more intensive the software applications could be. Complex and sophisticated programs such as Microsoft Office ran very well on Intel's high-performance chips. Mobile devices such as smart phones used very simple mobile apps and downloaded basic versions of websites and other internet material. Performance, rather than being a competitive advantage, now became a disadvantage because unneeded capacity simply exhausted the battery more quickly.

Intel's New Competitor: Arm

The company that would become ARM Holdings, PLC, began operations in 1979 as Acorn Computers, a company hoping to create—and cash in on—what it believed would be a huge demand for very low-priced personal computers.⁸ By 1981, the company produced a computer sold as a kit to be assembled by the end user. The kit sold for £ 40 (about \$80).⁹ To reach such a low price point, Acorn designed all of its components in-house. Acorn won a contract with the British Broadcasting Corporation (BBC) to produce a new computer, the BBC Micro. The company assigned two engineers, Sophie Wilson and Steve Furber, to design a new microprocessor for the machine.

As a part of the design process, Wilson and Furber visited the Western Design Center in Phoenix, Arizona, a company that had been working on a similar chipset. They expected to find a large engineering center and fabrication facility. What they found was a very small operation and no production facility. As Furber later recalled, "A couple of senior engineers, and a bunch of college kids. . . were designing this thing. . . We left that building utterly convinced that designing processors was simple."¹⁰ Furber and Wilson also realized that, to be profitable, a company did not need to incur all the expenses of production; licensing their designs to others and earning a nice royalty could be a path to profit.

Wilson did most of the design work for the new chip back in England. The new 32-bit chip, developed by 1984, used 25,000 transistors. By contrast, Intel's 286 Chip, introduced in 1982, featured 134,000 transistors. The goal of the design process had been to produce a very inexpensive chip, so the team used plastic packaging, which meant the chip needed to have thermal resistance somewhere under 1 Watt. When Wilson and Furber tested the chip, they had the surprise of their professional lives. The power meter they used to test the equipment didn't even register: the pair had designed a chip that ran on no more than one-tenth of a Watt! The Acorn chip was a simple chip that ran with very little power. Acorn Computers did not survive, but the chip would live on as the design team subsisted on design work for other chip manufacturers and small sales throughout the 1980s. In 1990, ARM incorporated, with Apple and VLSI (their fabrication partner) as the major investors in the new company.¹¹ ARM's big break came in 1993 when Apple decided to use its chip design in the Newton, the first personal digital assistant. Although the Apple device flopped (it was 5-10 years ahead of its time), ARM also had a toehold in the market, with contracts to power Samsung phones. The company also sold chips to Texas Instruments and became a fixture in the Nintendo DS handheld gaming system in 2004.

ARM chips powered the Nokia 6110 phone, introduced in 1997. The phone featured several firsts. It was the first phone that worked on both analog and digital networks, the first phone to feature visual menu icons, and the first phone to include a game built in to the device.¹²