Intel: Strategy for Future

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Table of Contents

I. Abstract

Under the certain market trend of the mobile communication products, Intel would also like to be one of the marketing leaders of this segment. At their transitioning period of focuses from chipsets manufacturing into the computing providing, Intel has made the decision on getting into the mobile computing market as a major change on their strategic plan and company's vision. With the strong R&D and manufacturing capabilities, Intel would be able to build-up their own mobile product portfolios based on their computing platforms, but they would still face a lot of pressures from the competitors as Qualcomm, and the shaped market environment. They are willing to make the Intel Inside® mobile devices into the market and make every user being connected with great using experiences. In this project, through research, interviews and competitive analysis, we are able to define why Intel would like to change their strategy into the mobile market, how they are doing, their major competitor, and the critical issues they need to define from the strategy implications. At the end, we would like to give out our strategic suggestions to Intel based on our analysis.

II. Introduction

In 1968, Gordon Moore, Robert Noyce, Arthur Rock and Max Palevsky founded Intel in California. Rober Noyce was the inventor of the silicon transition and integrated circuits, and Gordon Moore provided Moore's Law. Since then Intel has been on the relentless pursuit of the essential underpinnings of the industry of improving the silicon transistor. [1] Today the revolutions of devices are happening more rapidly than ever before. The introduction of 22nm and 14 nm transistors indicates the maturity of technology and the soon-coming end of Moore's law. There has been a shift from a CPU-based architecture to a system-on-chip-based architecture (SoC). [2] The combination of the rapid growth of mobile devices connected to the Internet and the infrastructure supporting the devices is driving fundamental changes in the computing industry. As a result, Intel is in the transition from the world's largest chip

manufacturer to a world class computing solutions provider. [3] On the other hand, the shrinking of PC market is threatening Intel's strength, and the rapidly growing market of tablets and smartphones has become Intel's challenge and opportunity. In this study, we will overview Intel's current situation, narrow down to Intel's mobile computing segments for further analysis and solutions.

III. Methodology

The objective of this research is to identify the main challenges for Intel in the new computing era and provide feasible solutions accordingly. Background information is mainly acquired through literature review and face-to-face interviews. The reviewed literatures consist of Intel's annual report, Form 10-K, Intel website information, academic paper from specialists, and other articles from both the Internet and the library. The three interviewees are Alix Gierke -- Intel organizational consultant, Eric Grimm -- former Intel software architect, and Dave Garten -- former Intel general manager. The interviewees were selected from different levels of Intel management structure and each interview question was designed based on different aspects of the interviewees. Analysis methods including SWOT Analysis and Competitor Analysis were applied to identify the strengths, weaknesses, threats and opportunities of Intel in the mobile computing industry.

IV. Research Background

a) Intel's History

In 1968, Gordon E. Moore, Robert Noyce, Arthur Rock and Max Palevsky found Intel in Mountain View, California. [4] Originally, the name "Intel" is a portmanteau of Integrated Electronics. [5] By 1970, Intel completed their initial public offering (IPO), and raised $6.8 million, with total initial investment $2.5 million convertible debentures and $10,000 from Arthur Rock. [6] However, by 1983 Intel's profitability of the market of the dynamic random-access memory chips has dramatically reduced by the increased competition from Japanese

semiconductor manufacturers and the sudden success of the IBM personal computer. Then-CEO Andrew Grove decided to shift Intel's focus to microprocessors, which has been proven successful by the end of the 1980s. In 1989, Intel launched its "Intel Inside" advertising campaign and made its Pentium processor household name in the 1990s.

After 2000, Intel's competitors, notably AMD, crossed the product range from low-end and mid-range processors and garnered significant market share. Thus Intel's dominant position in its core market was greatly reduced. [7] In the early 2000s, then-CEO Craig Barrett attempted to diversify the company's business beyond semiconductor, but most of the activities did not ultimately succeed. In 2005, then-CEO Paul Otellini reorganized the company to refocus its core processor and chipset business on platform. In 2007, Intel unveiled its Core microarchitecture to widespread critical acclaim; [8] the product range was perceived as an exceptional leap in processor performance that at a stroke regained much of its leadership of the field. [9]

b) Intel Today

Nowadays the number and varieties of devices connected to the Internet and each other is continuously growing. The combination of the rapid development of mobile devices connected to the Internet and the infrastructure supporting the devices is driving fundamental changes in the computing industry. [3] Therefore, Intel is transforming their primary focus from designing and manufacturing semiconductor chips for PCs and servers to delivering solutions consisting of hardware and software platforms and supporting services, as indicated by Intel's *vision*:

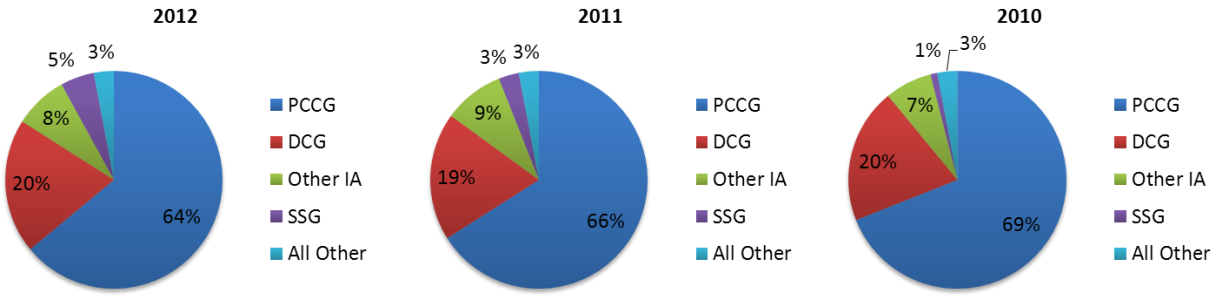
"This decades we will create an extend computer technology to connect and enrich the lives of every person on earth."[3]

Accordingly, Intel's Strategies are: [10]

- Grow PC and Datacenter business with new users and uses.
- Extend Intel Solution to win in adjacent market segments.
- Create a continuum of secure, personal computing experiences.
- Care for our people, the planet, and inspire the next generation.

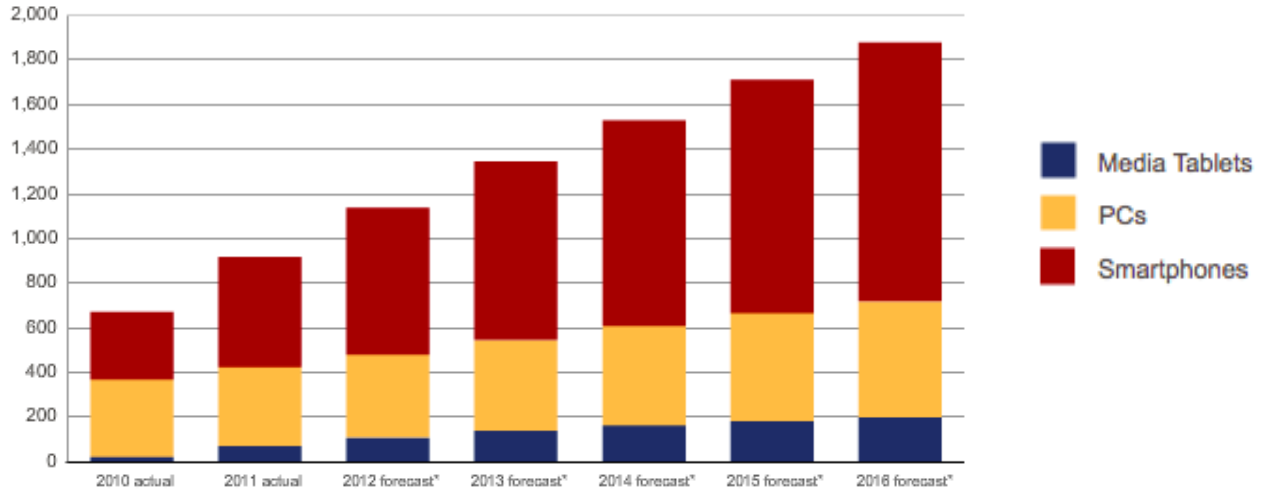
Intel's 2012 form 10-K report presents the net revenue for the PC Client Group (PCCG) operating segment, the Data Center Group (DCG) operating segment, the other Intel architecture (Other IA) operating segments, and the software and services (SSG) operating segments. [3] We can see that PC segments contribute the most for Intel's revenue, while Other IA segment that includes the table and phone segments remains less than 10% from 2010 to 2012.

Intel Percentage of Revenue by Major Operating Segment



However, International Data Corporation (IDC) estimates that PC shipment will have a 1.3% decline from 350.4 million in 2012 to 345.8 million in 2013, after a decline of 3.7% in 2012. IDC projects that world wide desktop PC market will have a 4.2% decline from 148.4 million unit in 2012 to 142.1 million in 2013 and desktop PC market will be flat until 2017 with 141 million units. [11] Fig. 2 show that PCs market kept shrinking, tablet and Smartphone market is rapidly growing. Therefore, Intel is facing the challenge of shifting their strength and market share form PC to mobile devices such as tablet and phones.

Worldwide Smart Connected Device Shipments, 2010-2016 (Unit Millions) [11]



c) Overview of Intel's Segments

Intel's operating segments in effect as of December 29, 2012 include: [3]

PC Client Group
Data Center Group
Other Intel architecture operating segments
Intelligent Systems Group | **Intel Mobile Communication** | **Netbook Group** | **Tablet Group** | **Phone Group** | **Service Provider Group**
Software and services operating segments
McAfee | **Wind River Software Group** | **Software and Services Group**
All other
Non-Volatile Memory Solutions Group

PC Client Group

PC Client Group includes platforms designed for the notebook and desktop market segments; and wireless connectivity products. [3] For the notebook market Intel offers technologies designed to improve performance, such as battery life, capability, and smaller, lighter, and thinner form factors. [2] Additionally, Intel has worked with customers to help develop personal

computing devices. Intel is making continuous effort to blur the lines between tablets and notebooks. [3] For the desktop market Intel offers products that provide increased manageability, security, and energy-efficient performance while lowering the total cost. Intel also focuses on the design of high-end PCs with high audio and video performance for desktop consumers. [3] Earlier in 2013, Intel announced their 4th Generation Core® product—Haswell. Intel developed the fist 14- nanometer PC using a Broadwell-based system and will be in production by the end of 2013. Intel has been working on so-called the 2 in 1, which has both of the functions of a tablet and a PC. By the end of 2013, Intel will have over 60 systems in market at price points as low as $400. [2]

Data Center Group

Data Center Group includes platforms designed for the server, workstation, and storage computing market segments; and wired network connectivity products. This segment offers products designed to provide leading performance, energy efficiency, and virtualization technology for server, workstation, and storage platforms. [3] Intel faces strong competition from businesses like Oracle and IBM in the data center market. The emerging markets, high-performance and mission-critical computing and the Cloud Computing services would be the core innovation points to add the development values to its date center further development. Intel® AtomTM C2000 family and Intel® Xeon® processor are the examples of Intel leading in architectural changes in the datacenter. [2]

Other Intel architecture operating segments

These segments include mobile communications market segment, embedded market segment, tablet market segment, and smartphone device market segment.

Mobile communication market segment is addressed by Intel Mobile Communications (IMC) group, to offer a portfolio of phone components covering a broad range of wireless connectivity options, while continuing their efforts to accelerate industry adoption of 4G LTE. [3]

For embedded market segment, in order to create a solution for embedded applications using Intel architecture, the Intelligent System Group (ISG) delivers long life-cycle support, software and architectural scalability, and platform integration. [3]

For tablet market segment, with the abundant library of operating systems and application ecosystems, Intel has begun accelerating the process technology development of the Intel Atom processor, which is highly adaptable and efficient offering increased battery life, performance, and feature integration. [3] Intel has product such as Lenovo tablet in market, and Intel will have devices with systems coming to market by the end of 2013 with price below $100. [2]

For smartphone device market segment, Intel invests time into developing reference designs that allow customers to see the capabilities of the Intel Atom processor technology for applications focusing on smartphones. This provides innovative content and services, which set Intel apart from competitors. [3]

Software and services operating segments

Software and services operating segments encompass software components that include: endpoint, network, and content security, risk and compliance, and consumer and mobile security from Intel McAfee business. These products also extend into embedded and mobile market segments, and software products and services which allow Intel to promote itself as a complete solution so that it may be used as a platform for software development thereby creating differentiated user experiences on such Intel-based platforms. [3]

d) New Computing Era

According to Intel's current president Renee James, we have driven three breakthroughs in computing. The first one is task-based computing, the second one is the lifestyle computing that we are living in today, and the next phrase is integrated computing. [1]

- Task-based computing

Task-based computing started with origins with the mainframe. It uses the scarce resources to calculate for important tasks, and decides what have to be done. In fact, Intel's first significant products were memory products for working in mainframes.

- Lifestyle computing

The development of PC changed task-based computing. The PC democratized computing and allowed everyone to be able to do his/her own tasks. Each individual is able to work on their own task basked on their own data, at any time and any place.

- Integrated computing

As silicon devices become smaller, they can detect more detailed information within more areas, and the connection between them allow us the integrated computing. Quark is Intel's new family of products that are targeted at integrated computing. The following are the two examples of integrated computing.

Example 1: City management

Today Dublin in Ireland has a program called City Watch and City Sensing. Sensors in the street drainage system monitor the flood warnings in the city and send out signals through their cloud servers to the traffic system. They submit real time update reports that are available by using City Watch app. By 2050, 70 percent of the world's population is going to live in these megacities. Things like a clogged drain become a systemic problem that needs the ability to fix it quickly, to manage massive amounts of data, to alert a huge number of populations,

Example 2: Healthcare

Devices like a wearable from Sotera Wireless or a tiny patch from MC10 can constantly read and transmitting health parameters wirelessly to a service. They are up-to-date and accurate and allow us to move into customized care. All of the devices and applications are based on a fundamental building block of this industry--the silicon transistor.

The human genome was first mapped by Intel high performance computer, a Xeon-based computer, and that is one Big Data challenge. Today personalized genomic sequencing is within

reach. Using high-performance computers, the Knight Center for Cancer Research at the Oregon Health Sciences University is working on analyzing human genomic profiles and creating searchable DNA customized DNA map. In this next era, people are moving the biologic problem to a computational problem in the treatment of cancer.

V. Overview of Intel's Mobile Computing

With the market increasing demands on mobile devices and services, Intel also joined the mobile computing market, competing with some powerful major electronic companies such as Apple, Qualcom and Samsung in this market.

All these companies have their own technology capabilities and market advantages in the competition. It is saying that "Being Mobilize" is the future trend for the personal devices [12]

Now, Intel has their own Intel Mobile Communications (IMC) group. Based on the powerful technology capabilities on microprocessors, server chips, data center services, and computing platforms, Intel has developed several categories for the mobile computing market:

a) Intel Mobile Communication Products:

• *Mobile Phone Platforms:*

The Intel mobile phone system platforms combine cost-optimized ICs, reference designs, and functional software supports with professional customer support through the value chain.

• *Intel Bluetooth Solutions:*

Intel has the leading position on Bluetooth solutions, which provide the product portfolio from mobile phones to automotive, industrial and medical applications.

• *Intel GPS Products:*

Intel offers a broad range of high-performance LNAs (Low-noise Amplifiers) using cost effective SiGe;C technology for GPS [17]

b) Intel Wireless Product

Intel holds the original technology of 802.11ac WiFi data connection protocol to serve more users with more devices with even more on the way [17]

c) Intel' Mobile Computing in the Future:

1. Chips or Solutions?

Although Intel has already stepped into mobile computing marketplace, from their 2012 annual report, we still found out that the percentage of revenue from the mobile part was very small (8% of the overall revenue). Their major part of the revenue still came from the PC (64%) and the Data Center (20%) groups [12]

2. Making More Effective Communication Connections

The most important usage of Mobile devices would be making connections with each other through network accesses. Intel also made a clear sign that in order to provide better computing experience to the end users, they will work on providing more effective communication connections with the mobile devices through providing solutions and services that could enhance and secure mobile experiences. For example, as they bought the McAfee Security, they would like to provide the services as "Mobile Health Care", to protect the users' information while they are using the devices with their computing solutions. For another example, they would also provide the solutions for the devices that could make their connections to the mobile data services smoothly switches from different network structures, no matter 3G or 4G network [12]

3. Big Data and Cloud Computing

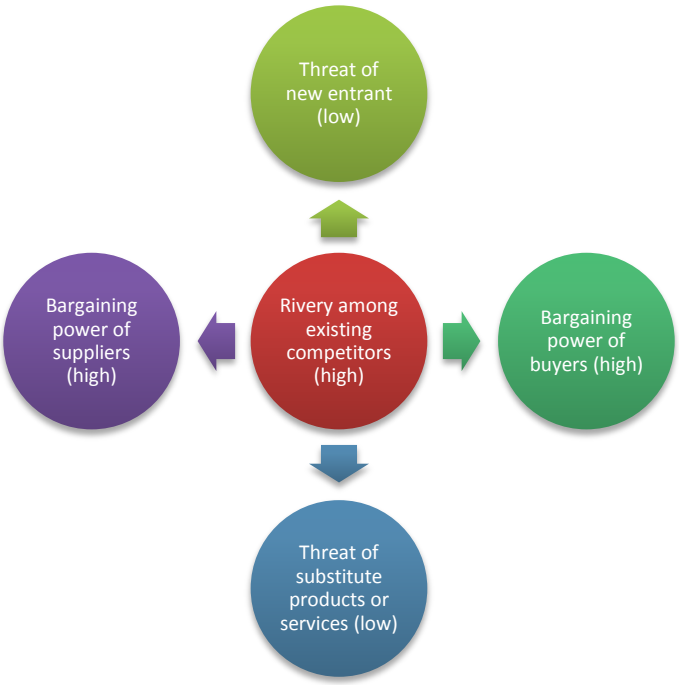
With the development of their data center, Intel has the capability to support the servers and traditional Internet users to get solutions that powered by their world biggest data center [12]

4. Application Enabling and Services

Intel would need to have their own capabilities to develop the applications that could help the users to experience the high-performance computing platform [12]

d) Competitive Analysis of Intel and Qualcomm in Mobile Computing

1. Porter's Five Forces Analysis of Mobile Computing Industry



1) Threat of New Entrants

Competition is high in the mobile computing market. Only US wireless telecommunications equipment manufacturing includes about 800 companies, plus rapid technology change, threat of new entrants is low [18]

2) Bargaining Power of Suppliers

Mobile computing gives suppliers more bargaining power, especially with the integration of social networking. If the application is extensive, supplier costs (or development costs) can be considerable. If buyers are demanding of a more extensive application (features, etc), the company has to choose that specific supplier [18]

3) Bargaining Power of Customers

As there are many options and avenues for customers, plus online shopping from all over the world, customers have a lot of buying power in the mobile world [18]

4) Threat of substitute products or services

Based on current consumer needs and technology development scale, everything is focused on mobile. Within next 10 years, the trend will still be in mobile computing, according to Gartner: Top 10 Strategic Technology Trends For 2014 [18]

5) Rivery among existing competitors

Again, competition is very high among excising competitors, major companies include Apple, Motorola Mobility Holdings, and Qualcomm (all based in the US); Foxconn and HTC (both based in Taiwan); and Ericsson (Sweden) [18]

e) Why we choose Qualcomm?

As a chip producer, Qualcomm has been the leading mobile chipset designer and manufacture in the mobile marketplace. The reasons are discussed in the following:

1. *Qualcomm has more market share than Intel in the mobile chips*

According to the Deloitte Research Open Mobile Series, in the year of 2012, Qualcomm got over 33.3% of the market share on the mobile processors, while Intel had only got around 5.5% [“Rising tide Exploring Pathway to Growth in the Mobile Semiconductor Industry 2013”].

2. *Qualcomm has a more advanced sensitivity on mobile technologies than Intel does.*

The major problem of Intel's mobile processors comparing with Qualcomm is they could not be able to connect to the 4G LTE wireless networks, which made Intel loose the most of mobile market shares in the Higher-end Smartphone market. Not only on the mobile processors, but also on wireless communication protocols, Qualcomm is ready to develop the 3rd Generation-LTE protocol for the smartphones [Qualcomm Official Site: http://www.qualcomm.com]; while Intel is still planning to launch their LTE protocols in the year of 2015. From both of the hardware and software, Intel lost their first-into-market advantages.

3. *Qualcomm has a bigger growth than Intel*

According to the market research [Hoover's Company Report], Qualcomm has about 30.05% growth rate while Intel has only 1.22% through the 12-month revenue growth period; If Intel could not figure out a way of increasing the growth rate, the competitive pressure from Qualcomm will become bigger.

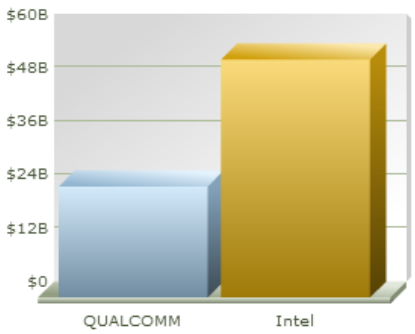
1. Company Overview

Intel holds about 80% of the market share for microprocessors that go into desktop and notebook computers, smartphones, tablets, and computer servers -- is #1 in the manufacturing of semiconductors.

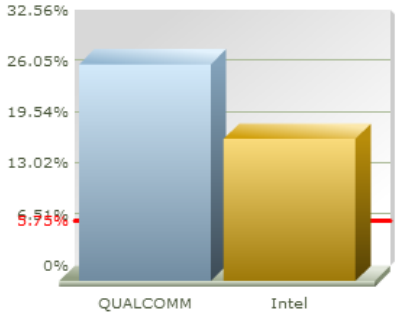
Qualcomm Incorporated is an American global semiconductor company that designs, manufactures and markets digital wireless telecommunications products and services. It includes the Qualcomm Technology Licensing Division (QTL), Qualcomm Technologies, Inc. (QTI), and Qualcomm CDMA Technologies. [15]

2. Financials

1) 2012 Annual Sales



2) 2012 Net Profit Margin



3) Other data

	Intel	Qualcomm
Employees	105,000	26,600
Market Capital	$101.95B	$113.43B

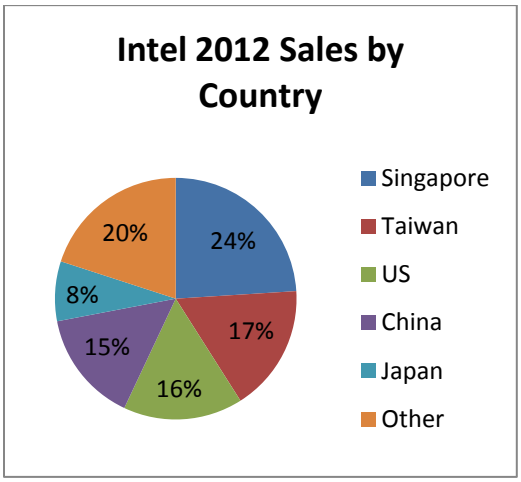
3. Mobile product summaries

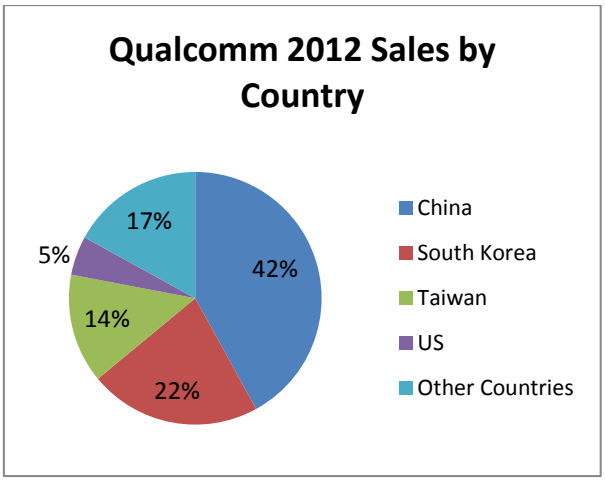
There are five groups in Intel, including PC Client Group (PCCG), Data center group (DCG), Other Intel Arquitecture (IA) (including mobile communications group, Internet of Things, etc), Software and service group, and all others. The Mobile and Communication Group delivers mobile phone, smart phone, tablet, connected devices and machine-to-machine (M2M).

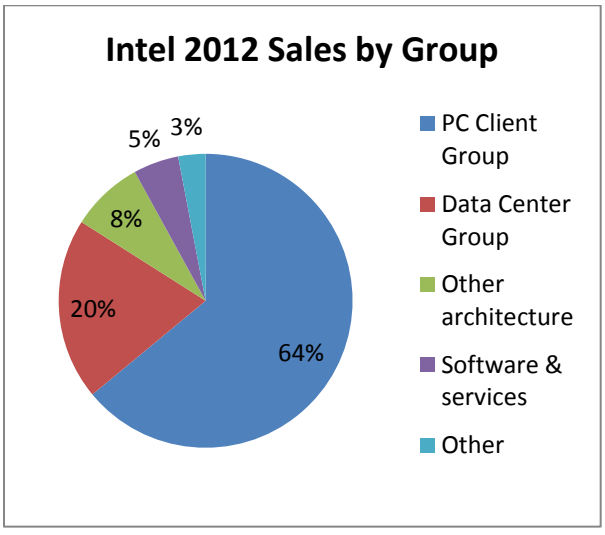
Mobile devices with Intel inside include Lenovo, ZTE, Motorola, etc. Tablets with Intel inside include Lenovo, HP, Samsung, and Acer. Connected device solutions include Huawei, TomTom, etc [15]

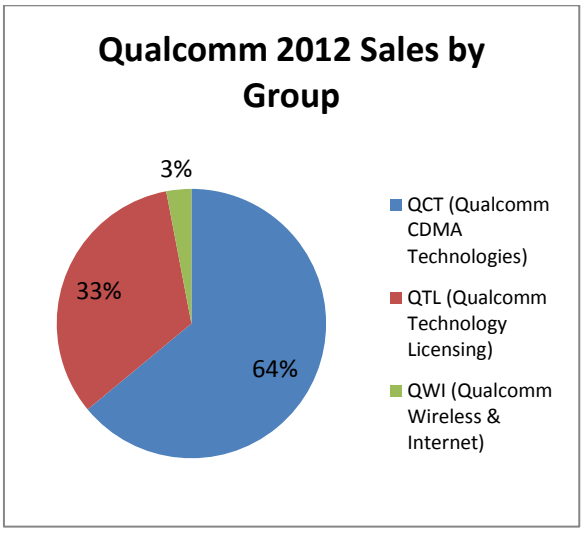
Qualcomm Mobile & Computing offers comprehensive portfolio of wireless chipsets from smartphones, tablets, feature phones and data cards, to notebooks, routers and M2M applications.

4. Products and Operations









(Images generated from data of Hoover's)

5. The strategies used by each company in their mobile computing

- *Intel Mobile and Communication Group:*

Establish Intel as the provider of revolutionary experiences on mobile, tablet, and emerging devices by delivering leading-edge platform and wireless technologies that delight and amaze our customers [14]

- *Qualcomm Mobile Computing Group:*

QMC's holistic approach is to build smart mobile systems results in more useful and exciting mobile experiences for consumers [14]

6. Intel and Qualcomm SWOT analysis

INTEL SWOT Analysis

Strength: 1. Strong Operational Capability

A wide business offering with strong manufacturing facilities report the strong operational capabilities of the company [19]

Strength: 2. Robust Research & Development Capabilities

Intel is committed to invest in world-class technology development, particularly in the design and manufacture of integrated circuits, a good example is its well-known 'tick-tock'. The company's R&D expenditures were $10.1 billion in 2012 as compared to $8.4 billion in 2011 and $6.6 billion in 2010 [19]

Weakness: 1. Declining Profitability

The company exhibited a weak financial performance for the fiscal year ended December 2012, reflecting its inability to fulfill operational and business expansion needs and resulting the need to enter mobile computing [19]

Weakness: 2.Small growth rate

From the company financial ratio, the sales growth in 2011 was 23.79%, but in 2012 the sales growth fell down to -1.22% [19]

Opportunity: 1. Strategic Growth Initiatives

The company's new expansion initiatives and investments provide an opportunity to enlarge its operations and profit margins in the future. In May 2013, Intel launched sweeping company reorganization and created a unit aimed at growing its market share in the mobile computing – IMC [19]

Opportunity: 2. increasing adoptions of Wireless connection technologies

Since Intel is also working on the wireless connection protocols and other network solutions, this one could also be Intel's opportunity in their future growth.

Threat: 1. Rapid Technological Changes

In mobile computing, companies' offerings are characterized by rapid technology changes, which affect their business operations. To compete effectively with its peers, Intel should continually introduce new products that meet and exceed customers' requirements [20]

Threat: 2. Competitive Pressure

As mentioned above, fierce competition in the mobile computing industry brings high pressure and threat to Intel's mobile development and growth.

Qualcomm Incorporated - SWOT Analysis

Strength: 1.Focused R&D Activities

Qualcomm invested more than 20% since of their total revenue to their R&D department since year 2008. And the department has been involving in development and commercialization of Orthogonal Frequency Division Multiplexing Access (OFDMA) based technologies [21]

2. Strong Patent Portfolio

Qualcomm has a competitive edge in the markets with its wide patent portfolio and vast technology expertise. It holds a very strong portfolio of issued and pending patents related to GSM, GPRS, EDGE, OFDM, OFDMA and/or Multiple Input, Multiple Output (MIMO) technologies. It also holds a wide range of IP portfolio with over 12,600 US patents for wireless technologies, where they were licensed by more than 180 telecommunications equipment manufacturers worldwide [21]

Weakness: 1.Over Dependence on International Sales

As shown in chart “Qualcomm 2012 Sales by Country”, international sales accounts for more than 90% of the company’s total revenue.

Opportunity: 1. Strategic Agreements and Acquisitions

Qualcomm is constantly looking for opportunities to enhance its business portfolio through various agreements, acquisitions and introducing new products and service offerings. In August 2012, Qualcomm acquired DesignArt Networks, a company active in small cell modem and system design for cellular base stations and high-speed wireless backhaul infrastructure [21]

Opportunity: 2. Market Demand for Smartphones

The company could capitalize on the growing demand for smartphones, which is emerging as a major growth opportunity for mobile device manufacturers. Considerable demand is expected from developing countries, particularly the Asia-Pacific region.

Threat - Rapid Technological Changes

Like Intel, Qualcomm has to face rapid technological change of the mobile computing.

7. **The market outlook/growth** [15]

	Intel	Qualcomm
12-month revenue growth	1.22%	30.05%
12-month net income growth	14.97%	12.18%
36-month revenue growth	14.94%	31.28%
36-month net income growth	36.06%	28.27%

VI. Strategic Implications and Suggestions for Intel

Through our researches, some of the strategic implications of Intel's mobile segment would be as the following:

- **Market Shift perspective**: The growth of mobile communication market provides opportunities for semiconductors suppliers including Intel. As indicated in McKinsey report, over the past few years, the market for wireless semiconductor has been under dramatic shift, with new operating system and emerging high performance smartphone. It was estimated that the industry growth rate is about 6 percent from 2011-2015, where connecting devices and smartphones are considered the major growth drivers. [22] Some reports indicate that Intel may be late for entering mobile communication market.[23] However, considering the shrinkage of PC market, moving towards tough mobile communication market is still full of opportunities for Intel to pursue its diversification product strategy and leading position in each market segment.

- **Mobile Technology perspective**: As mentioned previously in overview of Intel's Mobile Communication, Intel has established Mobile Communication Group, striving to design and develop a portfolio of phone components with features on low power consumption, innovative design and multi-standard platform solutions. However, its competitor such as Qualcomm, which has been regarded as successful in its ability to save battery power and responsively launch new products. Therefore, how to become more agile and lean in designing and developing innovative mobile technology to quickly meet the needs of dramatic changing market and response to effective competitors' technology strategy is indeed a critical issue for Intel to evaluate its competitive technology advantages.

- **Strategic Alliances perspective**: Collaborative agreement has been used to gain competitive advantage by Intel and its competitors. For Intel, some of strategic alliance have been formed for enhancing mutual benefits in mobile communication markets. For example, Intel and Nokia entered into a "strategic relationship" to develop innovative

mobile computing devices in 2009.[24] LG Electronics (LG) and Intel have strategic alliance to jointly promote Intel Wireless Display technology in 2011.[25] Visa Inc. and Intel established strategic agreement to develop mobile commerce solutions tailored to consumers in developed and developing countries in 2012.[26] Similarly, some of Intel's competitors such as TSMC, which has signed the long term agreement with ARM in 2010 aiming to provide their mutual customers with compelling benefits by means of the combination of ARM's industry leading IP and TSMC's world-class technology and manufacturing.[27] The performance of competitor's alliance strategy has been deemed better than the Intel and having significant impact on Intel's mobile communication market development and growth.[28] Intel may need to reevaluate its current agreement and alliance strategy with mobile companies in order to create more effective synergy.

- **Supply Chain perspective:** Challenges on being selected as supply chain partner by key smartphone manufacturers may have significant impact on Intel's vision as a mobile leader. For example, Apple's mobile devices including the iPhone, iPads, and iPod touch, mainly rely on processors based on designs from ARM. These chips are featured with cheaper and power efficient function compared to Intel's mainstream chips and are considered more suitable for mobile devices like smartphones and tablets. [29] Another example is Lenovo, which used Intel's Atom chip to power its K900 smartphone. However, for its successor device K910, Lenovo decided to use a chip from Qualcomm. [20] It seems that Intel has had a tough time convincing phone makers to use its chips, which may increase challenges in its mobile communication supply chain strategy.

- **Business Model perspective**: Intel mainly spend years to research and develop new chip architectures, and then develops its processors itself. This may cause to charge more to vendors. However, in the mobile communication arena, speed and price-savings is more important. Adjusting business model might become one of the key issues that Intel need to put it into consideration. According to Forbes report, Intel has agreed to build ARM chips based on its prime competitor's architecture. [21] It may be inferred that Intel has

been adjusting its business model in response to this dramatic changing mobile marketplace.

Here for giving out the strategic suggestions for Intel, we would like to adopt the method of TOWS Strategy Matrix, in order to make reasonable suggestions based on our SWOT analysis.

S-O Maxi-Maxi Strategies:

- **Increasing investments on R&D for mobile products**. Since Intel has a great producing and innovation capabilities, with the increasing trend of the mobile communication market, they would be able to do more product development for the mobile segment. Intel could either restructure the investments to put more money on supporting the mobile segments; or they could leverage parts of their profits from the PC and Server processors' segments.

- **Finding Strategic Alliances.** Intel used to have many strategic alliances in the market place with Microsoft, Dell, ZTE, etc. As Microsoft is working on plant Windows 8.1 OS into the smartphones, Intel could work together with Microsoft for this great movement.

W-O Mini-Maxi Strategies:

- **Building up the emotional-touch with customers.** One of the most important thing for pushing the mobile communication market is to leading the customer-experiences. As Intel now is also working on build up the experiencing-store with the Intel Inside® physical productions, they are also changing their marketing strategy for end-users.

- **Tablets for global market and lower-end smartphones for developing markets.** As Intel's mobile chips could not get access to the 4G LTE connection yet, together with their powerful computing system, they could do more for the tablets which are not necessary for the 4G LTE connections; and they could also provide the chips and solutions to the lower-end smartphones for the developing markets as China and Indian,

where are currently not using 4G LTE widely over the country. There will be a huge market space over these segments.

S-T Maxi-Mini Strategies:

- **Staying on their own capabilities on the computing solution systems.** One of Intel's core mobile products is their mobile computing system which could provide better data and connection performances for the mobile devices. "To deliver a better customer experiences" [22] is also the major vision of their mobile products. Intel should stay on their own strength. If they could not win the market through their mobile processors, they could still gain the market by their high-performance systems.

- **Rushing the "Tick" of 14nm Chips.** [23] The next wave of the mobile chips should becoming smaller and higher-intelligent. The movement to the 14nm chips of Intel should be rushed from the previous schedule, or they will lose the market opportunity again.

W-T Mini-Mini Strategies:

- **Getting a better insight of mobile technology trend.** The reason for Intel to miss the best opportunity to get into the mobile market is their less sensitivities on the mobile technologies. They should create new trend now.

- **The TOWS Matrix is showing as the follow:**

VII. Conclusion

- Intel is a company with strong technology innovation capability and striving to lead in each of their domain market segments as well as emerging mobile communication marketplace.
- Experts' opinions indicated that Intel's strength consist of innovation, R&D, quality, strong company culture and manufacturing capabilities.
- The current major challenge for Intel may include its intention to create new market trend and the competitive pressures from the shaped mobile market.
- Critical issues faced by Intel are identified in strategic implications including market shift, mobile technology, strategic alliance, supply chain, and business model perspectives.
- Using TOWS matrix method to provide strategic suggestions for Intel's future strategic direction towards leading and embedding in its core products as well as challenging mobile communication marketplace.

VIII. Appendices

a) Interview with Alix Gierke

Location: Starbucks, 603 SW Jackson St #116 Portland, OR 97201

Time: 9:00 – 10:00 am, Oct 27, 2013

Q: What is your responsibility in Intel?

A: HR aligns the business groups and we directly work with all groups. We have a team of 23 people across the company. Right now the company is involved with **CEO transition** so there are a lot of restructures and reorganization. We are doing Internal Consultant, which is relatively new, comparing with traditional External Consultants.

Q: How do you interact with Intel business strategy?

A: We are doing particular, a hundred percent transform business. We think of what we do, how we get there, and then purposely design in. At company level, we are project-based. Every project has a clear beginning and a clear ending. We work on wherever that needs help.

Q: What kind of project do you mean?

A: We have all different kinds of project. For example, last year, we were focusing on user experience. We listened to the responses and organized user experience. Another example is platform engineering. Every engineer has a different idea and we work on how to bring everything together. Also, now the new CEO looks the world differently, so there is a leadership conflict. There is no shortage of work.

Q: How you build platform? Is it new business strategy?

A: We have many strategies. The top one is to connect everyone. *(Intel's vision: This decades we will create an extend computer technology to connect and enrich the lives of every person on earth.)* Now the new CEO's view is to grow and lead every single market.

About platform, we aren't historically integrated. The CPU, server, etc. are turning design quickly enough. We need to share learning as efficient as possible, so that we don't waste our time on reinventing everything. We need to do everything at the same time, on the same vertical level, and the same horizontal level. That is the challenge. We reuse and organize different ideas.

Q: How long will this plan be implemented?

A: Last year, we made many changes, but we are not changing much on the **vision** level. From 2010 to 2011, we shifted from historic market, i.e. CPU and server. In the last a few years, the entire market shifted, computing shifted. Our advantages work very well for computer and servers, but not for mobile device. We realized it's the **wrong market** and we need to change to to survive in the future. It's very **hard for people to change**. So we have to bring the right people, and sometimes we have to deselect people. Most of the work now is **creating a new normal for people**. We work on everything from servers to laptop computer, such as working on improving the power of batteries.

Q: When did Intel enter the software market?

A: 3 years ago. Around 2009/2010 we started to hire software people. We didn't know exactly what type of software people we wanted back then. But now we have a huge number of software employees. We need them to integrate all new software to hardware.

Q: Can you talk more about Intel's transition?

A: We are moving to user's experience, and this is one aspect to bring in and change the mind of the employees. We are changing on server, laptop, PC, mobile, all different areas. We need to think about, where is the need in market, which one do we want to serve, which one do we have to serve, i.e. the pressure form our competitors, and then we make a decision. We had hard time before, for example, we didn't defensively create products as our competitor AMD did. Although it's not always necessary but we need to stop and think. Service is another way to generate revenue after selling product, and get monthly payment plans.

Q: Is this similar to what Apple did?

A: Apple has actually thought through everything. Steve Jobs controlled the whole end of the product, and required everything seamless works well. If you don't do that, other companies will come in and create barriers to prevent you from releasing your new product. Intel is now targeting on Android, Windows 8, Apple, and Samsung. The company level strategies are so broad. We need to consider the market, communication with developers, etc., to make sure we are growing and diversifying, in order to succeeding very fast.

You have to be very careful about products putting customers, such as Samsung Oes. As our customer, Samsung wants specific things into market. We are very focused on what Samsung's customers want. They are not our direct customers, but we deliver the products through Galaxy etc.

Things like servers, CPUs, people are more likely to think that Intel is good at system-security. And there is not much competition there. Our recognition is strong enough. Samsung's customers can use Amazon to use service, and Amazon will need the computing power from us.

Q: For mobile, how do you diversify?

A: We work on things like tablets, phones; we're selling a solution to customers. We don't mark our band on it, while we provide integrated devices.

We use research capability to understand where the transit is at and we create solution. It's hard to get every part in the company to align and work fast enough. Right now a cycle takes a couple of years, we need to shorten it to a few months.

People don't like change, but we are having a new CEO, and things are changing. We need to think about, how people interact with technology, what we need in the future, how we productize it, what is the product roadmap, what customers want, etc. We have a process called CSPs *(Chip Scale Packages).* We think about if this is the new challenge, how do we deliver it. We're in transition, and changing things to be more formalized

Q: One of our team members showed a graph of Intel's strategy, what do you think about it? (Please refer to Jerry file we assigned last Sunday)

A: This graph is only IT, not the whole company. And this is a short-term goal, which is only 2 to 5 years. Intel has people doing long-term goals about 10 to 20 years in the future.

Q: What is your decision making model?

A: I don't think we have a decision making model in Intel. It's just like your relationship with friends does not have a model.

Q: What is the difference between the new and previous CEO?

A: The previous CEO, Paul Otellini, is from sales in marketing. He really cares about people. He is responsible for shift to look at market segment (every device, every person). He made us half way there in the transition. He has been the CEO for 8 years and it's time to make a change. While the current CEO, Brian Krzanich, is from manufacturing. Paul is more like verbal vs process, and is not disciplining enough.

The new-leadership is responsible of delivering results. They are very disciplinary, from their culture and style. But the other half of the company is not like it. So it's hard to integrate the two parts together.

There are 4 segments there: **server, PC/laptop, mobile, and Internet** *(I took it quick, these 4 need to be verified.)* We need to think of how to get the market, and be the right player. We're now so far behind at the right side of the market. We have to constantly deliver new technology, and the timing is as fast as possible, because we're behind. We know that we'll be downturn in the market, but we invest the downturns. We intentionally make investment on downturns even though everyone is stepping back. This is a unique strategy.

Q: You mentioned Intel is falling behind, is there any company feeling comfortable and not falling behind?

A: Our customers: Dell, Microsoft, are all terrified. We need to shift strategy to go after the market. Apple may feel combatable. But right now Samsung has platform targeting on Android, which has more users. Samsung is right now the number one in manufacturing phones. I don't think anybody could feels

confident. Business leader has to look at outside, not just look at the inside and feel comfortable. We have to constantly watching our competitors and environment etc.

Q: As we understand, one examples of Intel becoming customer-oriented is the collaboration with Samsung. By collaborating with other companies (Intel's customers), Intel indirectly reached the sub-customers through other companies. Is this correct?

A: Yes.

b) Interview with Eric Grimm

Time: November 10th, 2013, 3:00-4:00 pm

Location: PSU Library Study Room 504

Q: Is there and difference in quality standard between tablet/smart phone and computers?

A: We have extraordinary quality standard for anything, and it doesn't change in any ways. CPU architecture allows us to build. Cell phone business has large number of interacting of interfaces. I work for test solution.

Q: How do you develop a test for phone?

A: We created a branch in Finland, and stole a bunch of people from Nokia and Xerox. We also have hard ware people in our group. We have the Oregon team and Finland team cooperate.

Q: Is the quality standard from Intel or customers, or both? How?

A: Intel's quality standard starts with chips. They have a whole system of sophisticated process used for whether process works properly. Test includes two sides: next generation processor, and my side the product test, such as memory etc. Chip manufactory contains several hundreds of input and output; we have to do vector testing, then function text, then next test, and next test. We have a new system CMT/HDMT tester software stack that saved Intel a lot of money. And six sigma has been a standard. Maintenance was lowered down.

Q: How are quality standard different from China and US?

A: We have to work hard to make sure they meet our standard. It's a relatively new industry in China.

Q: Do you use the ISO standard or your own?

A: ISO standard is much lower than Intel standard. Ours is much broader. The data on our documentaries has to go to the factories and engineers. We have to know they work before they are shipped to customers. We were transitioning ownership of testing process to sites. The text equipment changed.

Q: Do you have user-experience team?

A: Not my team. User-experience is for design.

Intel's goal is to lead, to know what customers need before customers need. We're doing much better than we were 5 years ago.

Q: What kind of data are you testing?

A: When you do a function test, you do a test, all binomial data for functional testing, that's what I work with. There are a lot of other tests of calibration etc. that I don't do. We have to monitoring the data to make sure they're working.

Q: Do you have a lot of lab? Where do you content the test?

A: In Finland, in China, in Oregon.

My function is strategic in the sense of giving all the solutions; the software infrastructure is going to support the system.

Q: Example of mobile device?

A: Red hood bay. It was a prototype and we transited to "black hood bay" etc.

Q: Is it for specific phone?

A: We had a line of CPU we want to demonstrate the CPU works. They are the component and aren't for a specific phone.

Q: How do you know the company will need the new chip?

A: It's fairly obvious from the market. You always want to extend battery life, lower the heat, make it faster, and work for Android or IOS. When I was there, I provide a chip that Apple would buy. The strategic goal is fairly obvious. If we sell them a product, we have a handcuff until they have them delivered to their customers. It's high visibility, if our chip doesn't work for Apple, no one else would buy.

I always worked with quality engineer. We'll have a product owner. Someone owns the product from engineer point, business point, manufacture point, and quality standard point. Q&A (quality and assurance)'s job is to make sure our product meet the customers' need. That's very important for test. There are so many teams and test people. Making sure the communication happens is very challenging.

We do use project level matrix. Mostly we provide software. We have one manager, and he helps us decide things. This manager (product owner) doesn't have any direct report and he makes sure every piece put together and the product delivered to customers.

Our team is half in Oregon, half in Malaysia. 15 years ago we were building in Malaysia and later moved to china for lower cost. Keep the Malaysian team because they provide values, there's no reason to let them go.

Q: Between people management and technical expertise, which one weighs more?

A: All depends. For example, we worked on a type of memory device, in a Taiwanese factory, with Chinese and Malaysian team. But the business manager didn't like so many people, so Malaysia and Oregon team stepped back, only Shanghai team worked with it.

Q: Big challenges you can recall about your work?

A: My job was to develop test architectures. What I do is relatively simple; we have a team of people write tests on software, and the computers I own collect the results. People came ask me for test for new devices and they think we already have built something, why can't we just use it for new devices. But they don't understand the requirement of numbers of test devices changed.

You want to least amount of space/time for the most amount of product. It's a trade-off. Every minute you spend on testing is costing you.

Last one I worked on has requirement for car. Automotive company has much higher standard. We had to prove the device works for variable temperature repeatedly.

Our test is post-assembly test. Each device has been put together and has several components. We use X-ray, vector test, function test, etc. Other company can't come to ask for solution. But we provide manufacture on how to test our device.

Q: Does tick-tock strategy affect your timelines?

A: We don't care about tick or tock, we are always tick tick tick. Environment changes fast. The challenge is the insertion point, how do you do vector testing, etc. We work with device designers, getting test points is very big a challenge.

Q: How is test important contributing to quality?

A: It's really important. Business doesn't want to pay for testing. You have to balance the cost and quality. Sometimes the device is easy to build, but in order to test, the functionality test takes longer than the device development. You have to think which test you need at each point. Test strategy to deliver capability as they needed.

Q: How are you related to marketing and research department?

A: We only do post-manufacturing test. Prior to it, every component was made sure that they are qualified for market requirement. We make sure that the devices are built correctly, but we don't test whether it's functioning correctly. Anything that is not testable cannot be manufactured.

The real challenge when Brian took over is to fulfill the orders. He did a great job of coordinate in the company.

c) Interview with Dave Garten

Date: Nov. 14, 2013, 12:00-1:00pm

Location: Office 451 in the Business School

1. What is Intel's strategic planning process?

Ans: Intel adopts two kinds of strategic planning process. First one is "Strategic Long Range Planning" which includes several future years of planning and environment scanning activities. This generally begins at summer each year. The second planning process is called "Product Line Business Plan (PLBP)" and begins in fall each year. This is for annual plan cycle and focuses on the annual budget planning.

2. Any special features for Intel's planning process, compared to other competitors/companies?

Ans: There is no major feature for Intel's planning process. There are some examples/companies using similar strategic planning process.

3. In your opinion, what is Intel's core competency?

Ans: Intel's specialty/core competency may include complex semiconductor design and manufacturing, project management, R&D capability and for forth.

4. What is the challenge faced by Intel to move toward mobile/cell phone market?

Ans: There is technical challenge. Intel may need to think whether to make or to outsource the demand for mobile chip manufacturing.

5. Why Intel needs to move toward the mobile phone market segment?

Ans: Intel is good at server chips which are high value and good profit. Mobil phone chip is considered as high volume and low value. Probably, market trend report and financial data need to be collected and analyzed to justify why Intel is moving toward the mobile segment.

6. How Intel use innovation to gain competitive advantages?

Ans: Intel has done a lot of R&D including pure research. In order to make the chip thinner and better, it requires designing more advanced manufacturing equipment and tools. Intel has invested a lot in designing the required manufacturing equipment. In addition, Intel's supply chain management (SCM) may also contribute to gaining competitive advantages.

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