

Disk Drive Industry:

Read the disk drive industry handout. Carefully study the functional maps in Fig 1.3, 1.4, 1.5, and 1.7. For each map answer the following: (1) what is the meaning and significance (value) of the map? (2) how would a disk drive company use this map? And (3) what high-level conclusions can be drawn from the map?.

Using the appropriate functional map attempt to predict the nominal price that a disk drive manufacturer would charge (in "1982 dollars") for 1MB of memory in the year 2016? Convert the "1982 dollars" price to an equivalent "2016 dollars" price, and attempt to compare your result against some actual manufacturer's price.

SPSP

1.Disk Drive Industry

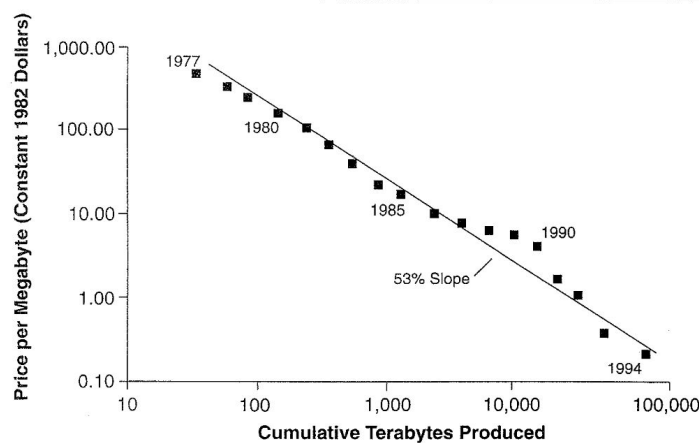
i. Define the Problem: We are analyzing the graphs of the Disk Drive Industry to figure out what the meaning and significance is. We also need to know how a company may use the maps. Lastly, we need to draw high-level conclusion from each of the figures.

ii. Create a Plan: I will first be reading and taking notes from the Disk Drive PDF. Then I will take a look at the maps and see what information I can draw from them. I will analyze the data on each map and see what it represents and how a company may use said data.

lii. Execute

Map 1.3

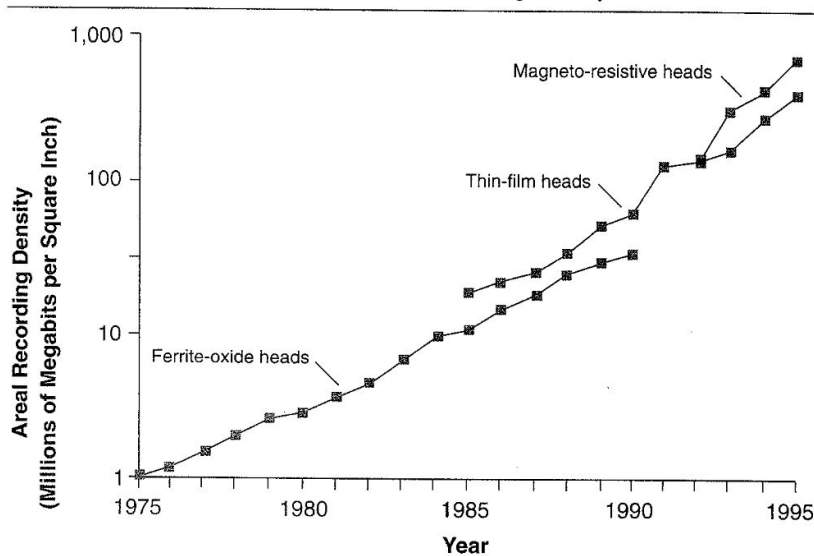
Figure 1.3 Disk Drive Price Experience Curve



Source: Data are from various issues of *Disk/Trend Report*.

(1.3) The meaning of this map is to find the correlation of the Price per a Megabyte and Cumulative Terabytes Produced. This displays the Disk Drive Price Experience Curve. The map shows the value of money per a cumulative Terabyte. It shows that the slope of the industry's experience curve (which correlates the cumulative number of terabytes of disk storage capacity shipped in the industry's history to the constant dollar price per a megabyte of memory) was 53 percent. This means that with each doubling of cumulative terabytes shipped, cost per megabyte fell to 53 percent of its former level. (2) A Disk Drive company would use this map to understand that the price per a megabyte has declined at about 5 percent per quarter for more than twenty years. It lead firms to find it so difficult to stay atop the disk drive industry - so it can help them make improvements. (3) A high level conclusion that can be drawn from the map is the price per megabyte has declined at about 5 percent per quarter for more than twenty years.

Figure 1.4 Impact of New Read-Write Head Technologies in Sustaining the Trajectory of Improvement in Recording Density

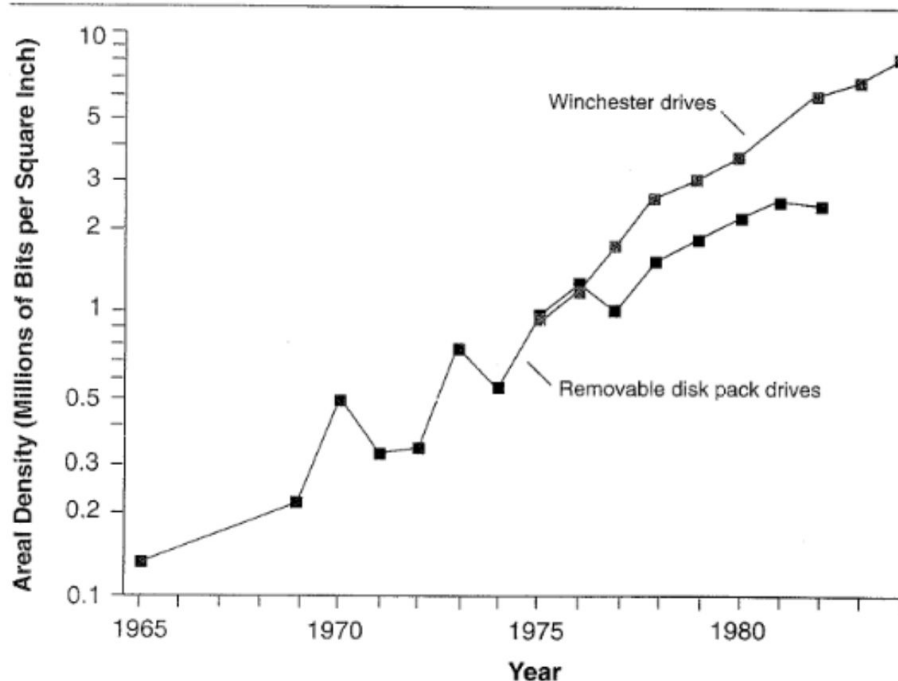


Source: Data are from various issues of *Disk/Trend Report*.

(1.4) This map compares the average recording density of the drives that employed successive generations of head and disk technologies, maps an example of this. The first curve plots the density of drives that used conventional particulate oxide

disk technology and ferrite head technology. The second charts the average density of drives that used new-technology thin-film heads and disks; the third marks the improvements in density achievable with the latest head technology, magneto-resistive heads. A disk drive company can use this chart to understand the different trends that are portrayed by each curve. They will understand the impact of new read-write head technologies in sustaining the trajectory of improvement in recording data. A high-level conclusion that can be made is movement along a given S-curve is generally the result of incremental improvements within an existing technological approach, whereas jumping onto the next technology curve implies adopting a radically new technology.

Figure 1.5 Sustaining Impact of the Winchester Architecture on the Recording Density of 14-inch Disk Drives

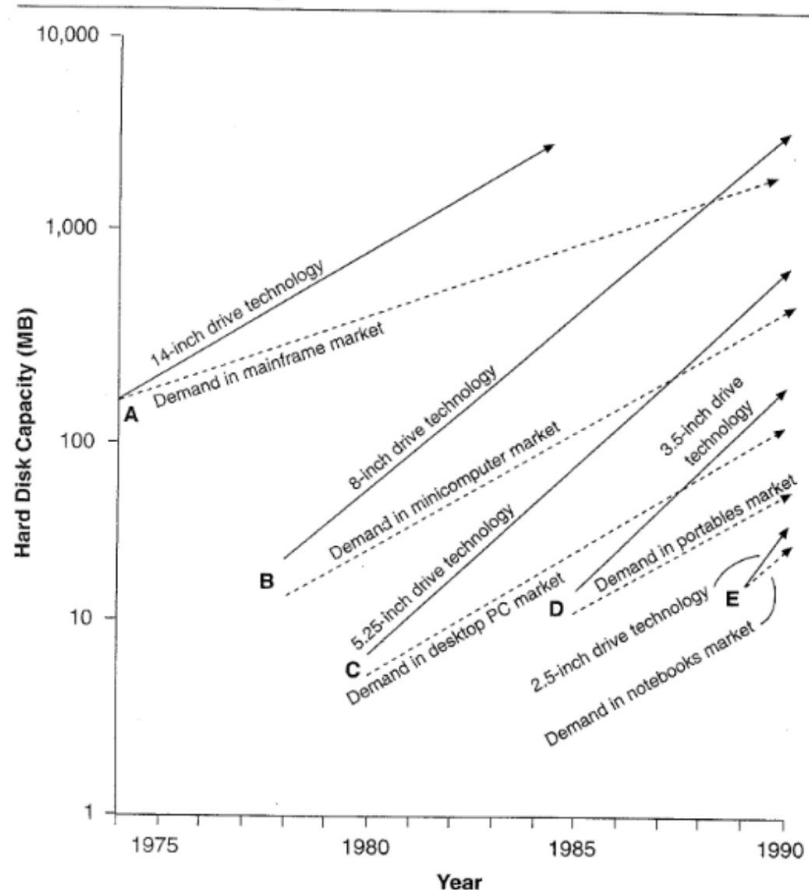


(1.5) This map describes a sustaining technological change of a very different character: an innovation in product architecture, in which the 14-inch Winchester drive is sub Figure 1.5 is showing how an innovation in product architecture can help sustain technological change. It has two curves. The first one are the removable disk pack drives. The second curve, the improved tech, is the Winchester drives. A company can use this map to see whether it is better to stick with existing product architecture or to use the new and more advanced product. The graph shows that you can keep up with the new product for a short time but eventually it will surpass as you reach the

maximum potential of the older product. The curve of the removable disc pack drives starts to even out while the Winchester drives steadily increase.

(1.7)

Figure 1.7 Intersecting Trajectories of Capacity Demanded versus Capacity Supplied in Rigid Disk Drives



Functional Map 1.7 Documents intersecting trajectories of hard disk drive capacity (MB) demanded vs capacity supplied. In all cases over time supply and demand for capacity both steadily increase slopes between the different sized drives vary discrepancies in intersections of the demands and supply lines- there isn't always only one supply fulfilling one demand line; the needs and consequent uses intersect. This map is useful for disk drive companies to see what products customers want so that the company can supply to their needs.

Using the above figures, we would charge about \$0.004 for 1MB of memory in 2016. We got this number by using this equation: $0.3 * 0.95^{84}$.

Check/Learn/Draw conclusions: This problem taught me how to read and interpret functional maps. It showed me how to determine the various uses for disk drive companies from the data given. I was able to find the meaning and significance, along with how the disk drive companies would use this map, and the high level conclusions drawn from the maps. By using the reading and comparing my work with the given, my answers match up.

2. Intel: Read the Intel Case Study and then work on the following problems.

a) Perform a competitive analysis of Intel's industry/market landscape using Porter's five (six) forces model. Be sure to clearly explain your approach and results. Draw appropriate conclusions.

b) What are the key relationships between (the players involved in) each "force" of the business landscape? (E.g., how did Intel deal with competitors, etc.)

c) Using the appropriate (clearly stated) framework, assess Intel's competitive, technology, and product/market strategy from the company's inception (in 1968) to 1997. How have Intel's technology strategy, product market strategy, and developmental goals changed from its inception in 1968 to 1997?

What were the key driving forces that triggered these changes?

Suggestion: Use the three-stage process on Pages 17-19 of the "Lecture Notes for Competitive Strategies in Technology Management" handout. Stage 3 of the process will require the creation of the appropriate functional maps for the evolution of technology, product, manufacturing, market, etc.

SPSP: Intel Case Study

Problem:

Main Subproblems:

- What are the key relationships between the forces of the business landscape?
- How have Intel's technology strategy, product market strategy and developmental goals changed?
- What were the key driving forces that triggered such changes?

In this problem we have to read the Intel Case study and work on 3 separate problems. The first entails performing a competitive analysis of Intel's industry/market landscape using Porter's 5 forces model. The second entails finding the key relationships between the players involved in each force of the business landscape. The third, and last entails using appropriate framework to assess Intel's competitive, technology and product/market strategy from the company's inception in 1968 to 1997. We will assess how Intel's technology strategy, product market strategy, and developmental goals changed from its inception in 1968 to 1997; and find the key driving forces that triggered these changes.

Plan:

Sources:

- Intel Case Study
- Lecture Notes
- Textbook
- Online Research

There are 3 stages for analyzing a company

Stage 1: Company analysis (Intel)

Stage 2: Industry analysis

- DRAM - > Microprocessor

Stage 3: Assessment & Evolution - looking at all the functional maps

- In the case of Intel, there are at least 3 eras (or epochs)
 1. Intel as a semiconductor (DRAM)
 - a. Company 1968-1986
 2. Intel, as a microprocessor company
 - a. Mid 70s -> 1997 and beyond
 3. Intel as the internet building block company
 - a. Mid 1990s onward

Steps that must be performed:

Step 1: Read Intel Case Study

The Company Analysis :

- (a) Read all the above material and do relevant research. Take notes on significant information in terms of major changes and strategy
- (b) When doing stage 1 (company analysis)
- (c) Ask & answer the following questions
 - What is the company's (Intel's) technology strategy?
 - What is the company's product / market strategy
 - Which products? Which markets?

Step 2: Then do the competitive strategy/ analysis:

Perform a 5 (6) force analysis of the industry/market structure

Process

- For each force, there are a set of determinants that affect the intensity (or strength) of the force

Example: Force F1 (Rivalry between competitors) is affected by concentration (# of competitors) & size (\$)

- A list of the key determinants for each of the five forces is given in table 1 of the lecture notes and competitive strategy

- For each force, determine the qualitative strength (High, Medium, Low) of that force based on the determinants in Table 1

Table 1 also shows the qualitative strength of each force in the qualitative

Step 3: Microprocessor industry Analysis

Determine the attractiveness of the industry as a whole (Qualitative: High, Medium, Low)

Def: The attractiveness (Profit potential measured by the ROIC) of the industry (e.g PC industry) is determined by the cumulative strength of the five forces

If the cumulative strength of the 5 forces is high, then the industry is not attractive for (say) a new entrant

Example: From table 1, which shows the qualitative strength of each force (in column 3) for the PC industry of the 1980s, the cumulative strength of the industry is medium to high

-> PC industry (of the 1950s) is probably not attractive to new entrants or substitutes

Step 4: Determine or decide on the companies position or competitive strategy to compete successfully in the industry/market landscape. Assess Intel's competitive technology and product.market strategy from companys inception to 1997. What's changed? What are key driving forces that triggered these changes?

Process: Create a 2-dimensional grid:

- Product dimension has 2 extremes
 - Unique product as perceived by the customers, differentiated by aspects such as additional functions, reliability, get user interface...
 - Lowest cost
- Market dimension (Target market for the product) has 2 extremes
 - Product for the entire market
 - Product for a particular market segment (focus)

According to Porter for a company to be successful in a particular industry it must adopt one (and only one) of the following 3 strategies

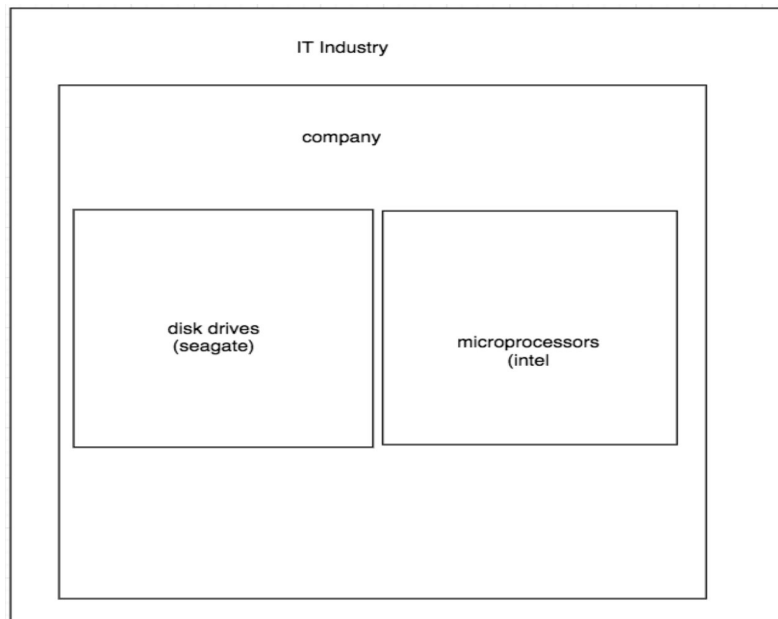
- Differentiated strategy
- Cost leadership
- Focus

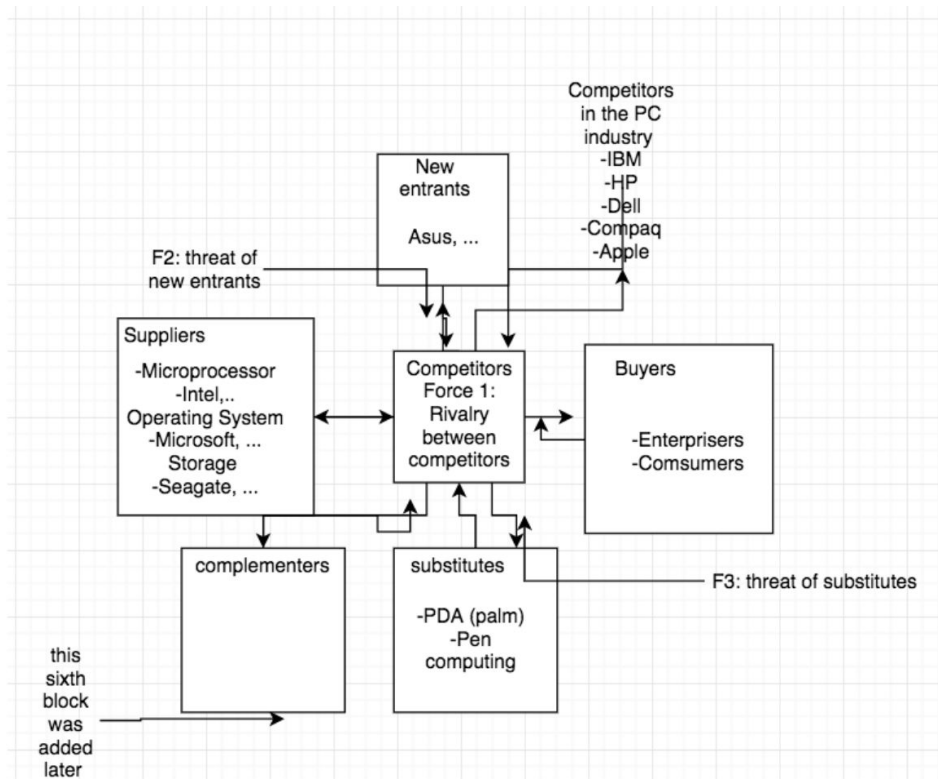
Comment: Competitive strategy is dynamic (evolutionary)

- Companies change their CS over time
- The creation of functional maps guides the evolution of strategy

Execute:

1. Read Intel Case Study
2. Perform competitive analysis of Intel's industry/market landscape using Porter's 5 forces model
 - a. Semiconductor company
 - b. Develop memory chips for mainframe computers and minicomputers
 - c. Designed DRAM (dynamic random access memory)
 - d. Adopted microprocessor technology rather than memory advanced technology
 - e. Leave DRAM in 1986 and focus on microprocessors
 - f. IBM made Intel as leading player with only one supplying one product
 - g. Introduced 4th generation microprocessor in 1989
 - h. Fought AMD regarding microprocessor rights in 1995
 - i. Dominant supplier of microprocessors
3. Find key relationships between the players involved in each force of the business landscape. & Assess Intel's competitive technology and product market strategy from companies inception to 1997. What's changed? What are key driving forces that triggered these changes?





4. Create a force analysis and relationship between players chart explaining the key relationships between each force

- Buyer Power: Intel's two main buyers are IBM and Compaq.
- Supplier Power: Intel has a dual-sourcing policy for supplies to make sure production is on time and reliable.
- The threat of new entrants: The threat of new entrants is real. They tend to be innovative and fast-paced. Intel, stays true to their strategy and process. They keep ahead of the game, and manage to maintain a good pace with new entrants.
- The degree of rivalry between the competitors: Intel has been around for a while and has face many competitors. DRAM was up against AMD, Motorola and others. But by being innovative, putting customers first, and the best product out there, they have been able to come out ahead each time.
- The threat of substitutes: Currently Intel is the best product out there for the best price, so the threat of substitutes is not very likely.

What are Intel's technology strategy, product market strategy and developmental goals?

- Technology Strategy:
 - Intel has changed and adapted to the market.
 - From SRAM to DRAM to microprocessors they have been in the forefront every time.

b. Product Market Strategy:

- i. Intel competed with Motorola, AMD, and others to get exclusive contracts with places like IBM.
 - 1. They won this contract which made them very popular and helped their business tremendously. However they still have contracts that are not exclusive.
- ii. Intel now sells to top selling PC companies such as HP, Dell and more.

c. Developmental Goals:

- i. The reading shows that Intel has clearly developed in the years in production and revenue.
- ii. They have grown at an exponential and very fast rate and have become one of the top companies.

Conclusion: This showed me the history of Intel. We are shown that the journey of a company is dependent on how well they do and what the market looks like. By studying models like Intel's we can pick up what they've done incorrectly and correct and how to ensure future companies are making smart decisions when it comes to their business and technology