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TIM 105

HW2

1) 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.

Step 1: Define the real problem.

SP1: What is the meaning and significance(value) of the functional map in figure 1.3? How would a disk drive company use it? What high level conclusions can be drawn from it?

SP2: What is the meaning and significance(value) of the functional map in figure 1.4? How would a disk drive company use it? What high level conclusions can be drawn from it?

SP3: What is the meaning and significance(value) of the functional map in figure 1.5? How would a disk drive company use it? What high level conclusions can be drawn from it?

SP4: What is the meaning and significance(value) of the functional map in figure 1.7? How would a disk drive company use it? What high level conclusions can be drawn from it?

SP5: Which functional map can be used to determine the price a disk drive manufacturer would charge for 1MB of memory in 1982? What did they charge for 1MB of memory then, and what would that amount of money be in 2016 dollars?

Step 2: Plan the execution of the problem.

What information is available for solving the problem?

-- The disk drive case study has the figures to examine and info about the industry.

What assumptions do I need to make to be able to solve the problem?

-- I have the figures available to examine

-- I can find the price companies were charging for memory in 1982

Plan to solve each subproblem:

SP1: Analysis of functional map in figure 1.3

-- read the section of the case study pertaining to figure 1.3

-- understand the meaning and significance of the functional map

-- understand how a disk drive company would use it

-- think about what high level conclusions can be drawn from it

-- what does it say about changes in the industry?

SP2: Analysis of functional map in figure 1.4

-- read the section of the case study pertaining to figure 1.4

-- understand the meaning and significance of the functional map
-- understand how a disk drive company would use it
-- think about what high level conclusions can be drawn from it
-- what does it say about changes in the industry?

SP3: Analysis of functional map in figure 1.5
-- read the section of the case study pertaining to figure 1.5
-- understand the meaning and significance of the functional map
-- understand how a disk drive company would use it
-- think about what high level conclusions can be drawn from it
-- what does it say about changes in the industry?

SP4: Analysis of functional map in figure 1.7
-- read the section of the case study pertaining to figure 1.7
-- understand the meaning and significance of the functional map
-- understand how a disk drive company would use it
-- think about what high level conclusions can be drawn from it
-- what does it say about changes in the industry?

SP5: What should you charge for 1MB of memory in 2016 dollars
-- find the functional map or other info in the case study pertaining to what disc drive companies charged for memory
-- what did they charge for 1MB of memory in 1982
-- convert that to 2016 dollars
-- look up what was actually charged in 1982 and see if my estimate was close

Step 3: Execute the plan from step 2

SP1: Analysis of functional map in figure 1.3
-- price per megabyte mapped against cumulative megabytes produced
-- as firms ability to produce disks containing more and more memory increased, the price of each megabyte of memory decreased
-- each doubling of terabytes of memory shipped caused the price to fall to 53% of what it previously was
-- this is a much steeper decline in the price of the good than in other tech industries
-- disk drive companies need to increase the amount of memory each disk holds by at least 47% to keep up with the declines in price
-- if they can't make those increases the disks they ship in the future will have less value than what they currently ship
-- The rate of technological improvement is increasing incredibly fast (about 35% per year)
-- if existing firms within the disk drive industry don't stay up to date with tech improvement they will go out of business

SP2: Analysis of functional map in figure 1.4

-- impact of new read-write head technologies allowing sustained improvement of recording density (megabytes per square inch)

-- measures the improvement in recording density over time

-- most disk drive technology improves on an S-curve where improvements are consistent for a while, but taper off eventually

-- this happened with the ferite-oxite heads used to make disk drives. Grinding them finer allowed more recording density, but most disk drive firms realized there would come a point around 1981 where they could no longer be improved

-- to keep recording density improving firms moved to thin-film heads, then magneto-resistive heads as those technologies allowed for higher recording densities

-- this allows existing companies to keep their customers happy with increasing recording density

-- disk drive companies would use this functional map to see when their ability to improve existing tech is going to taper off to understand when they have to introduce new tech to keep customers happy

-- most tech has a point where it will not be improvable

-- new tech will always replace existing tech at some point

-- exiting firms are better suited to make sustained improvement than new firms are

SP3: Analysis of figure 1.5

-- Areal Density (Bits per square inch) of disk drives over time

-- Moving from removable disk pack drives to winchester drives allowed disk drive companies to increase the Areal Density of their products

-- Allowed for constant improvement through the introduction of a new process

-- Disk drive firms should use this to understand when they need to move to a new architecture in order to maintain constant improvement of their Areal Density.

-- Existing firms lead in this type of sustained improvement as they have the ability to finance it

-- In order to keep improving disks at a constant rate sometimes the architecture needs to be changed. In more general terms, sometimes the design process needs to be rethought to keep tech improving at a constant rate.

SP4: Analysis of figure 1.7

-- figure 1.7 shows how the size of disk drives has changed over time, the demand in the different types of computer markets over time, and the point when each of these computer markets moved to smaller disk drives

-- in 1975 only 14 inch disk drives existed, and they were used in the mainframe computer market. The disk tech improved at a faster rate than was demanded by the market.

-- about 1977 8-inch disk drives were created. There was no demand for them in the mainframe computer market, but there was in the minicomputer market as smaller disks were preferable there. Selling to the minicomputer market allowed 8-inch tech to improve

dramatically to the point where they could meet the memory demands of the mainframe market. 8-inch disks replaced 14-inch disks and the companies making 14-inch disks largely folded.

-- That process was repeated with smaller disks coming on the market, being used in new areas of the computer market, improving to the point where they were useful in existing areas of the market, and replacing bigger disk drives.

-- disk drive companies should use this functional map to see when they have to adopt smaller technologies. It's good for understanding the point in time when a smaller disk will have the capacity to meet the demands of the part of the market you're in, so you can figure out how to combat that threat.

-- existing firms typically fail when a disruptive technology is able to replace them

-- new technology improves faster than existing technology

Functional Map (figure)	Meaning and Significance	Use by Disk Drive Companies	High-level conclusions
1.3	- as firms ability to produce disks containing more and more memory increased, the price of each megabyte of memory decreased - each doubling of terabytes of memory shipped caused the price to fall to 53% of what it previously was	- disk drive companies need to increase the amount of memory each disk holds by at least 47% to keep up with the declines in price - if they can't make those increases the disks they ship in the future will have less value than what they currently ship	- if existing firms within a part of the tech industry don't stay up to date with technological improvement they will go out of business
1.4	- measures the improvement in recording density over time - most disk drive technology improves on an S-curve where improvements are consistent for a while, but taper off eventually - to keep improvement	- disk drive companies would use this functional map to see when their ability to improve existing tech is going to taper off to understand when they have to introduce new tech to keep customers happy	- most tech has a point where it will not be improvable - new tech will always replace existing tech at some point - exiting firms are better suited to make sustained improvement than new firms

	constant, use new technologies		
1.5	- Areal Density (Bits per square inch) of disk drives over time - Moving from removable disk pack drives to winchester drives allowed disk drive companies to increase the Areal Density of their products	- Disk drive firms should use this to understand when they need to move to a new architecture in order to maintain constant improvement of their Areal Density.	- Existing firms lead in this type of sustained improvement as they have the ability to finance it - sometimes the design or manufacturing process of a product needs to be rethought to keep tech improving at a constant rate
1.7	- How the size of disk drives has changed over time, the demand in the different types of computer markets over time, and the point when each of these computer markets moved to smaller disk drives - In 1975 only 14 inch disk drives existed, and they were used in the mainframe computer market. The disk tech improved at a faster rate than was demanded by the market. - about 1977 8-inch disk drives were created. There was no demand for them in the mainframe computer market, but there was in the minicomputer market	- Disk drive companies should use this functional map to see when they have to adopt smaller technologies. It's good for understanding the point in time when a smaller disk will have the capacity to meet the demands of the part of the market you're in, so you can figure out how to combat that threat.	- existing firms typically fail when a disruptive technology is able to replace them - new technology improves faster than existing technology

	as smaller disks were preferable there. Selling to the minicomputer market allowed 8-inch tech to improve dramatically to the point where they could meet the memory demands of the mainframe market. 8-inch disks replaced 14-inch disks and the companies making 14-inch disks largely folded. - That process was repeated with smaller disks coming on the market, being used in new areas of the computer market, improving to the point where they were useful in existing areas of the market, and replacing bigger disk drives.		

SP5: What should you charge for 1MB of memory in 2016 dollars

-- info found in figure 1.3

-- in 1982 1MB of memory was about $85

-- in 2016 dollars that would be about $241

1982 price for 1MB of memory	In 2016 dollars
$85	~$241

Step 4: Check your work.

My assumptions are reasonable, my work is correct, and the answer makes sense.

Step 5:

2a) 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.

Step 1: Define the problem.
Establish sub-problems:

SP1: What industry is Intel in?

SP2: What is the strength of the force provided by competition from Intel's intra-industry rivals?

SP3: What is the strength of the force provided by the threat of new entrants?

SP4: What is the strength of the force provided by the threat of substitute products?

SP5: How much power do customers of Intel's products have?

SP6: How much power do Intel's suppliers have?

Step 2: Plan to solve the problem.

What information is available to solve the problem?

The case study on Intel. The Lecture Notes for Competitive Strategy in Tech Management. Other information on the internet/in other books about Porter's five(six) forces model.

What assumptions need to be made to make the problem solvable?

Intel has intra-industry rivals, buyers, sellers, rivals selling substitute products, and threats from potential new entrants into the PC microprocessor industry.

Create a plan for solving each subproblem.

SP1: What industry is Intel in?

-- understand the industry Intel is in

-- understand what role they play in the industry, i.e. what they sell

-- read the case study on Intel to understand what these answers are

-- write down the answer

SP2: Intra-industry rivals

-- read Intel case study to understand who competes with Intel within their section of the PC industry

-- determine how strong the force from each of these competitors is

-- create a list of each competitor and how strong the force they provide to Intel is

-- determine how strong the cumulative force provided by all of these competitors is and write it down

SP3: Threat of New Entrants

-- read Intel case study to understand where potential new entrants Intel would have to compete with come from

-- determine how strong the force each of these potential new entrants could come from is

-- create a list of each potential new entrant and how strong it is

-- determine how strong these forces are overall

SP4: Substitute Products

-- read Intel case study to understand what firms are selling substitute products that Intel has to compete with

-- determine how the strong the force provided by each of these substitutes is

-- create a list of each substitute product and how strong the force it provides to Intel is

-- determine how strong the cumulative force of each of these substitutes is

SP5: Customer Bargaining Power

-- read Intel case study to understand who Intel's customers are

-- determine how much bargaining power each of these customers has

-- create a list of each customer and how much bargaining power they have

-- determine how strong a cumulative force customers bargaining power is

SP6: Supplier Bargaining Power

-- read Intel case study to understand who Intel's suppliers are

-- determine how much bargaining power each of these suppliers has

-- create a list of each supplier and how much bargaining power they have

-- determine how strong a cumulative force suppliers bargaining power is

Step 3: Execute the plan

SP1: What industry is Intel in and what do they sell within the industry?

Intel is in the microprocessor industry.

SP2: Force provided by intra-industry rivals?

-- There are not many companies in the microprocessor industry.

-- Intel's competitors are smaller than they are, and many of them are focused on RISC processors instead of CISC processors.

-- Aside from the RISC/CISC divide, there isn't much differentiation between processors, especially because they all largely need to be Intel compatible.

-- The industry grew well until the Internet took off in the late 1990's.

-- This is a medium force.

SP3: Force Provided by the Threat of New Entrants?

-- There are significant barriers to entry since the microprocessor manufacturing process is highly complex.

-- Developing economies of scale is difficult in this industry as manufacturing small numbers of microprocessors is very expensive, and it is difficult to capture market share in the industry.

-- Overall, this is a weak force.

SP4: Force provided by substitute products.

-- I'm going to say companies selling RISC processors were substitute competitors to Intel since they provide the only alternative to Intel's CISC processors.

-- Suppliers have a hard time getting into the microprocessor industry because customers want Intel compatible products.

-- RISC microprocessors are faster and simpler than CISC processors, but not by a large enough margin to entice customers to leave Intel.

-- This is a medium-low force.

SP5: Customer Bargaining Power

-- There are far more customers than microprocessor sellers

-- Little product differentiation since most microprocessors are Intel compatible

-- Potentially high switching costs in moving to a different microprocessor as they won't likely be totally Intel compatible forcing the customer to rewrite some code and change other processes.

-- Most customers preferred to stay with Intel microprocessors so long as they were relatively close performance wise.

-- Medium-Low force

SP6: Suppliers Bargaining Power.

-- Intel sourced from either one or two suppliers

-- When sourcing from one supplier bargaining power was very high

-- When sourcing from two suppliers bargaining power is still high but not as much as when Intel was sourcing from one supplier

-- Medium-high force

Player	Strength of force from player
Intra-Industry competitors	Medium
New Entrants	Weak
Substitutes	Medium-low
Customer Bargaining Power	Medium-low
Supplier Bargaining Power	Medium-high

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.)

Step 1: Define the real problem.

SP1: How did Intel deal with their competitors?

SP2: How did Intel deal with potential new entrants into the microprocessor market?

SP3: How did Intel deal with sellers of substitute products?

SP4: How did Intel deal with buyers?

SP5: How did Intel deal with suppliers?

Step 2: Plan how to solve the problems.

(a) What assumptions need to be made to make the solution process manageable?

Intel has relationships with firms in all parts of the microprocessor market that can be studied.

(b) What information do I need?

What relationships Intel pursued with all these other companies.

Create a plan for solving each subproblem.

SP1: How did Intel deal with their competitors?

-- read the case study

-- what did Intel do to deal with their competitors?

SP2: How did Intel deal with potential new entrants into the microprocessor market?

-- read the case study

-- what new entrants into the market did Intel face?

-- how did they deal with them

SP3: How did Intel deal with sellers of substitute products?

-- read the case study

-- what competitors selling substitute products did Intel deal with

-- how did they deal with them

SP4: How did Intel deal with buyers?

-- read the case study

-- who are Intel's buyers

-- what did Intel do to keep their business?

SP5: How did Intel deal with suppliers?

-- read the case study

-- who are Intel's suppliers?

-- what did Intel do to keep their business?

Step 3: Execute the plan to solve the problem.

SP1: How did Intel deal with their competitors?

-- In the 1980's Intel began to patent their products to keep other competitors from cloning their products. This led to a 10 year legal battle with AMD which made Intel rethink the strategy. Instead, starting in the 90's, Intel focused on investing in research and development to keep from falling behind other firms.

SP2: How did Intel deal with potential new entrants into the microprocessor market?

-- Intel largely didn't have to deal with new entrants in the microprocessor industry and never did anything special to deal with them.

SP3: How did Intel deal with sellers of substitute products?

-- Intel didn't have to do much to deal with sellers of substitute products as they only threat they faced in that area was from companies producing RISC processors. Intel realized that customers would keep using their processors so long as the performance was comparable to all others since most customers were already using Intel gear and wanted to avoid the changes that would come with using a new processor. All they had to do was keep performance up to industry standard.

SP4: How did Intel deal with buyers?

-- To build customer loyalty Intel came up with an advertising campaign called "Intel Inside" where they reimbursed their customers for part of their advertising costs in exchange for putting an Intel Inside sticker on all their products. This got customers to prefer products with Intel microprocessors, making it harder for customers to switch from Intel products to other microprocessors.

-- Intel also build brand loyalty by offering cutting edge products so customers were excited to see what new products they could create with them.

SP5: How did Intel deal with suppliers?

-- Intel switched from sole-sourcing their production inputs to dual sourcing their production inputs to take away bargaining power from their suppliers.

Force	Intel's relationship
Competitors	A mix of using patents to protect intellectual property, and investing heavily in R&D to stay ahead of competitors
New Entrants	There aren't many new entrants into the microprocessor industry, and Intel didn't do anything special to deal with them.
Substitutes	Intel didn't have many substitutes to compete with, so they didn't have any special relationships with substitute competitors.
Buyers	Intel had their "Intel Inside" campaign to build brand loyalty with their customers. They also built brand loyalty by providing cutting edge products so customers wanted to keep using Intel products.
Suppliers	Intel switched from sole-sourcing their production inputs to dual sourcing their production inputs to take away bargaining power from their suppliers.

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?

Step 1: Define the real problem.

SP1: Porter's five forces model.

SP2: Determine the attractiveness of the industry.

SP3: Determine Intel's competitive strategy and how it has changed over time.
SP4: Determine Intel's technology strategy and how it has changed over time.
SP5: Determine Intel's product/market strategy and how it has changed over time.

Step 2: Plan to solve the problem

SP1: Done above in part a.
SP2: Determine the attractiveness of the industry.
-- sum of the forces
-- what is the inverse?
SP3: Determine Intel's competitive strategy and how it has changed over time.
-- What was Intel's competitive strategy in 1968
-- What was Intel's competitive strategy in 1997
SP4: Determine Intel's technology strategy and how it has changed over time.
-- What was Intel's tech strategy in 1968
-- What was Intel's tech strategy in 1997
SP5: Determine Intel's product/market strategy and how it has changed over time.
-- What was Intel's product/market strategy in 1968
-- What was Intel's product/market strategy in 1997

Step 3: Execute the plan

SP1: Done in part a.
SP2: Determine the attractiveness of the industry.
-- Overall the sum of the competitive forces in the industry is medium-low
-- Therefore the industry is attractive to be in.
SP3: Determine Intel's competitive strategy and how it has changed over time.
-- Intel used a differentiation strategy when they started in 1968, focused on making high quality products.
-- Intel used a differentiated strategy within the microprocessor industry, as they were one of a few companies still making CISC processors.
SP4: Determine Intel's technology strategy and how it has changed over time.
-- Intel started as a semiconductor company in 1968
-- In 1997 Intel was producing microprocessors
-- moved to making microprocessors after making chips for a calculator company
SP5: Determine Intel's product/market strategy and how it has changed over time.
-- Intel was in the DRAM market in 1968.
-- Intel was in the microprocessor market in 1997.
-- moved to making microprocessors after making chips for a calculator company

Area of competition	1968 strategy	1997 strategy	Reason for switch
Competitive strategy	differentiation	differentiation	Never really needed

			to switch, Intel always high quality products, and were at the top of each market in terms of performance
Technology Strategy	semiconductors/ DRAM	microprocessors	Intel was contacted by a Japanese calculator company in 1970 to make chips for a calculator. Intel then realized they could make microprocessors, and sell them to computer manufacturers.
Product/Market strategy	DRAM/ semiconductor	microprocessors	Intel was contacted by a Japanese calculator company in 1970 to make chips for a calculator. Intel then realized they could make microprocessors, and sell them to computer manufacturers.