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T.I.M 105

s.Desa

T.I.M 105 MOT I: Final Examination

Schedule

12/6/18	• Receive Instructions for the Final Exam
12/7/18	• Carefully go over information again and start on problem number 1 • Create, a list of necessary activates/tasks, activities structure matrix, Gantt chart, and PERT chart. • Complete problem 1
12/8/18	• Start on problem 2. Refer to problem 3 on midterm exam • Provide a written statement for generating a feasible design concept. • Dissect the following products: Video game console, virtual reality headset, and video-game motion tracking sensor. • Implement structured process and create feasible concept. • Develop product platform and product line strategy for each segment • Develop an FEMEA of the product line design for the “serious gamer” user. • Identify three most critical failure modes. • Complete problem number 2.
12/9/18	• Start problem number 3 • Model the impact of the unit sales price of the NPV of the project. • Perform a four-year quarterly NPV analysis in order to determine the questions provided. • Complete problem 3
12/10/18	• Start on problem 4 • Develop my own product design and development framework. • Design an IT system to automate and integrate the steps and stages in your framework. • Use appropriate tools from other courses • Complete problem number four. • Start problem number 5 • Provide at least on example for each key lesson learned in class • Complete problem number 5

1. Problem 1 Planning

Define the Problem:

Create a non -trivial task-based plan for completing this final examination.

Plan the approach:

- Review the examination questions
- Make a list of necessary activities/tasks
- Draw and design an activity structure matrix showing task dependencies.
- Create Gantt chart to develop a schedule for completing the exam in time.
- Create PERT chart to schedule, organize, and coordinate tasks for the exam.

Execute the plan:

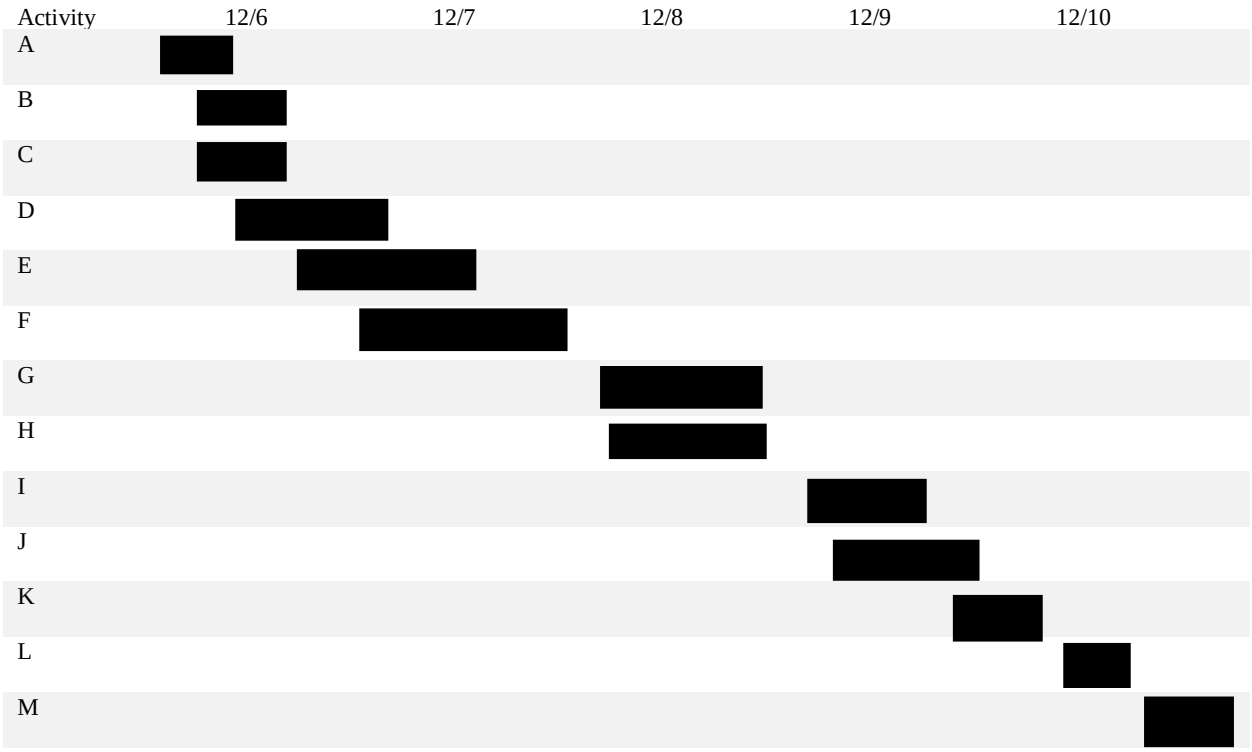
- Review the exam questions
- Make a list of the necessary activities/tasks:
  A – refer back to the information regarding the "Exbox" from the midterm.
  B – create a written statement of the structured process for generating a feasible design concept for further development.
  C- Create Functional Specifications, concept generation, an concept selection
  D – Implement this structured process and create a feasible concept for the "convergent" information system based on the functional requirements.
  E- Develop a product platform and product line strategy for the following two market segments. (1)" high-end" (mostly younger) users, who are almost exclusively interested in gaming and therefore want high performance computing and graphic processing capabilities and (2) "low-end" (mostly older) users who are interested in video chatting and internet streaming movies and music in addition to basic gaming functionality.
  F- Develop an FMEA of the product line designed for the "low-end" user.
  G- Model the impact of the product development cost on the Net Present Value (NPV) of the project.
  H- Use "intelligent trail-and-error" to determine the maximum development cost, be young which the NPV <0 and the project will not be profitable.
  I-Develop my own product Design and Development framework, based on the appropriate medication of the MCD framework handed out in class.
  J- Design am Information Technology (IT) system to automate and integrate the steps and stages in my framework
  K- Provide at least one example for each key lesson that I learned in this course.
  L- Answer #6 on the Final Exam if time permits
  M- Review, correct, revise, and finish final exam

Activity matrix

	A	B	C	D	E	F	G	H	I	J	K	L	M
A	A												
B	x	B	x										
C		x	C										
D		x	x	D									
E				x	E								
F					X	F							
G							G	X					
H							x	H					
I									I				
J									X	J			
K											K		
L												L	
M		x	x		x	x		x	x	x		x	M

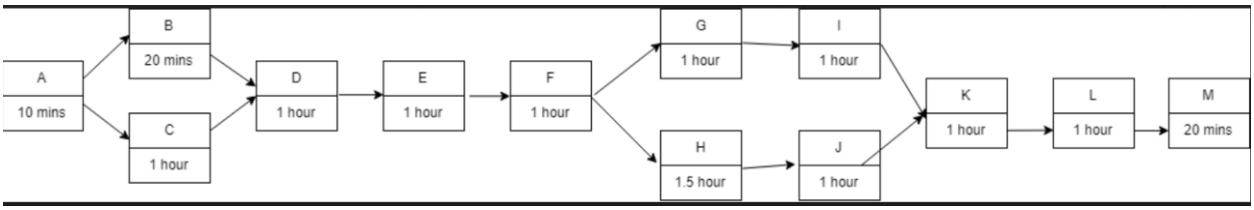
- Task B is dependent on Task A
- Task C is coupled with Task B
- Task D is dependent on both B and C
- Task E is dependent on Task E
- Task G & H are coupled tasks
- Task J depends on Task I
- Task M is sufficient and dependent on Tasks B, C, E, F, H, I, J and L
- After task M is complete, the final Exam is finished

GANTT Chart



The GANTT chart shows the progress of the final examination from December 6 to December 10. As we can see, there is an assigned task to each day to ensure that the final Examination will be completed on time.

Pert Chart



Comments:

- Tasks G and H are concurrent tasks with a ten-minute delay.
- Tasks B and C are concurrent tasks with a ten-minute delay.
- Tasks I and J are concurrent tasks with a ten-minute delay.

Critical path

A→ B →D→E→F→G→J→K→L→M

Task J is dependent on Task A, C, D, F and H. Even though tasks A, C, D, F, H are independent of each other, doing them in alpha order makes the most sense when completing the GANTT chart. Since Tasks B, E and G are supplementary to C, F and H they will get completed as the problems get completed.

Conclusion: the final took longer than anticipated so next time consider for time to prepare for questions. I went over the time budget a few times partly because of more work than expected and other times I got distracted. So next time:

- Allocate prep time
- Remove distractions
- Work more
- Allocate more time for quality

Check your work

Check my activity matrix to see that the correlations are put improperly and my GANTT chart marks sense, which they do.

Date	Tasks Completed
12/6	A,B,C
12/7	D,E,F
12/8	G,H
12/9	I,J
12/10	K,L,M

Learn and Generalize

I learned that making a GANTT chart helps with time management. Since did not update it on the group chart, this is the first time I got to use it and found it helpful even though it takes time to do. U would make a GANTT chart for project management because it makes sense to have and it allows to see what needs more time.

2.Product Development for the Convergent Information System

Define the problem:

The software giant has successfully entered the market with the “Exbox” video-game console system. The company is now ready, in 2014, to develop the next generation of the video-game console following its success with the “Xbox." As the senior product/technology manager of the “Video Game Systems” division you have been asked to design and develop the next generation console that incorporates in immersive virtual reality experience where the user can move around and interact with a virtual world.

The proposed new virtual reality (VR) entertainment system, which will use the existing video game console as the basic platform, will need to have the following combination of subfunctions:

-Basic video game console functionality (you will need to identify/define these

functions)

-Display a virtual environment to the user in order provide the user with a visual

VR experience.

-Track user movement in order to allow the user to control the virtual environment, i.e. when the user takes a step-in real world then their avatar in the VR environment will also take a step.

Plan the treatment:

1. Assumptions:
   Who am I:
   Senior Product/Technology manager
   What information is available
   Lecture Note, Midterm, Online research

2. Provide a written statement of your structured process for generating a feasible design concept.
3. Dissect the following products:
   - Make a Fast Diagram and Function Structure for Video Game Console
   - Make a Fast Diagram and Function Structure for Virtual reality headset
   - Make a Fast Diagram and Function Structure for Video-game motion- tracking sensor

4. Implementing your structure process and create a feasible concept for the VR entertainment system based on the functional requirements listed above. Provide a concise explanation of how to select product concept works

   a. Create a House of Quality
      - Make a priorities list of "customer needs" and assess the importance
      - Make a list of "Technical metrics" and assess the importance,
      - Correlate the "Customer needs" and "Technical metrics" using a convenient scale
      - Correlate the "Technical Metrics" against each other using a convenient scale
      - Competitive Benchmarking with other companies in the market
      - Set target "Customer needs" and "Technical Needs"
      - Draw a HOQ

   b. Conceptual Design
      - What is the main/primary function of this product?
      - Draw a FAST diagram
      - Draw a Function Structure
      - Develop several product combinations by making a morphological table.
      - Construct a utility function to compare and assess design alternatives
        - Organize selection criteria that will be used to compare alternative designs
        - Assign relative weights for selection criteria
        - Compute the absolute weight of each selection criteria

5. Develop a FMEA of the product line design for the "serious gamer" user. From your FMEA analysis identify the three most critical failure modes.
   i. Create a FAST diagram for the product
      1. Identify the key sub-functions of these sub-systems
      2. Understand the key sub-function of these sub-systems

   ii. For each subsystem, identify potential failure modes, and characterize these failures modes using a Risk Priority Number (RPN)
   iii. Calculate the RPN:
      1. How severe would the effect of the failure mode be?
      2. How frequently does the failure mode occur?
      3. How hard is the failure to detect?
      4. Multiply each answer to get the RPN
      5. Describe suitable actions for each failure mode for RPN >10

Execute the plan:

1)Provide a written statement of your structured process for generating a feasible design concept

I have been asked to develop the next generation console that incorporates an immersive virtual reality experience where the user can move around and interact with a virtual world. The proposed new virtual reality (VR) entertainment system will need to have the following combination of subfunctions: basic video game console functionality, display a virtual environmental environment to the user to control the virtual environment, i.e. when the user takes a step-in real world when their avatar In the VR environment will also take a step.

To design a feasible concept, I will first begin by dissecting and creating FAST Diagrams of video game console, VR headset, and Video-game motion-tracking-tracking sensor. The I will use that information to create HOQ. Afterwards I will create different versions of the product in the conceptual design and will use the Utility function to select one to further develop. Using that one section, I will make a product platform for each of the three market segments. Finally, I will create a FAST diagram, analyze potential failure modes in each subsystems, and offer suitable actions for each failure mode.

2a) Dissect and make a Fast diagram and function structure for video game console

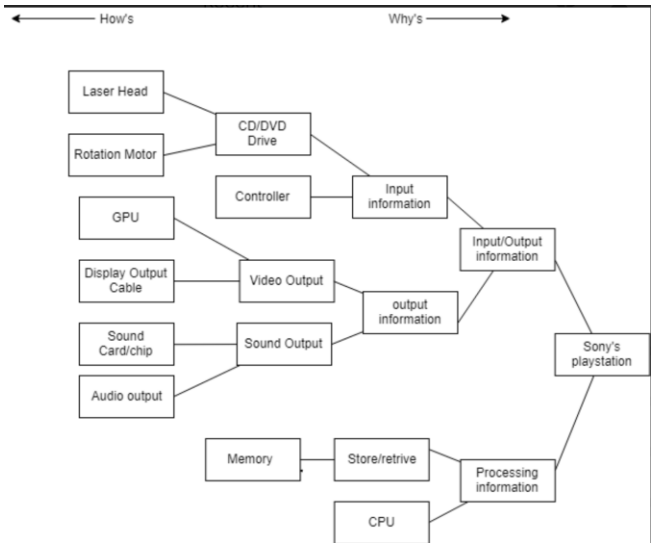
a) How do video game consoles work?

After research how PlayStation works with information form www.howstuffworks.com I will use the information to create a FAST Diagram.

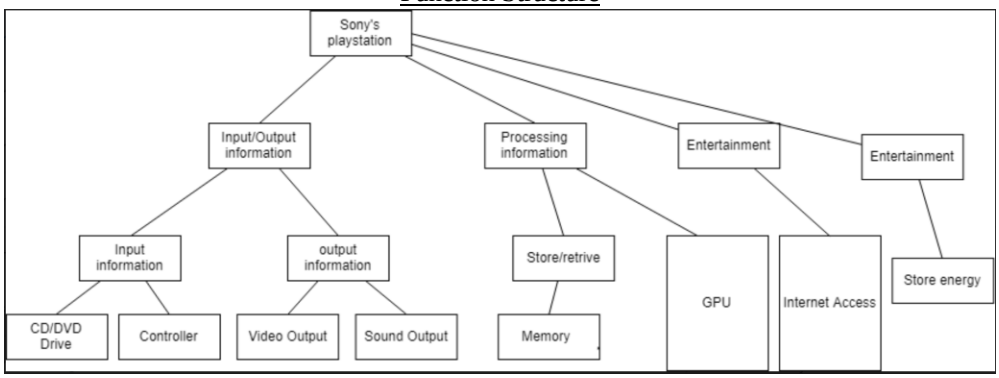
Parts for Console	CD/DVD drive (Laser Head/Rotation Motor), Sound Card/chip, Graphics Processing Unit (GPU), GPU display, Controllers, Audio Output Cable, Display Output Cable.

b) Draw a FAST diagram and Function Structure for Video Game console

Fast diagram



Function Structure



2b Dissect and make a FAST Diagram and Function Structure for Virtual Reality Headset

a) How do Virtual Reality headsets work?

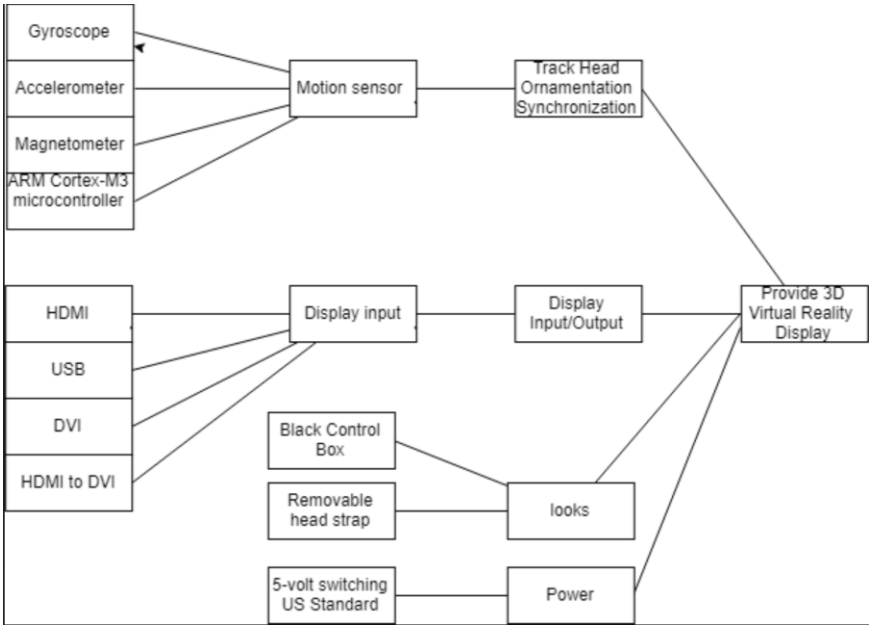
After Research how Oculus Rift Headset Works, with information form www.howstuffworks.com I will use the information to create a FAST Diagram

Parts of Headset	Removable overhead strap, 3 vison lenses of different focal lengths, HDMI cable, USB cable, DVI cable, HDMI to DVI adapter, 5-volt switching, US standard power supply, buttons(for controlling brightness, contrast, and power), LCD Display Screen, gyroscope, accelerometer, magnetometer, ARM cortex-3 Microcontroller.

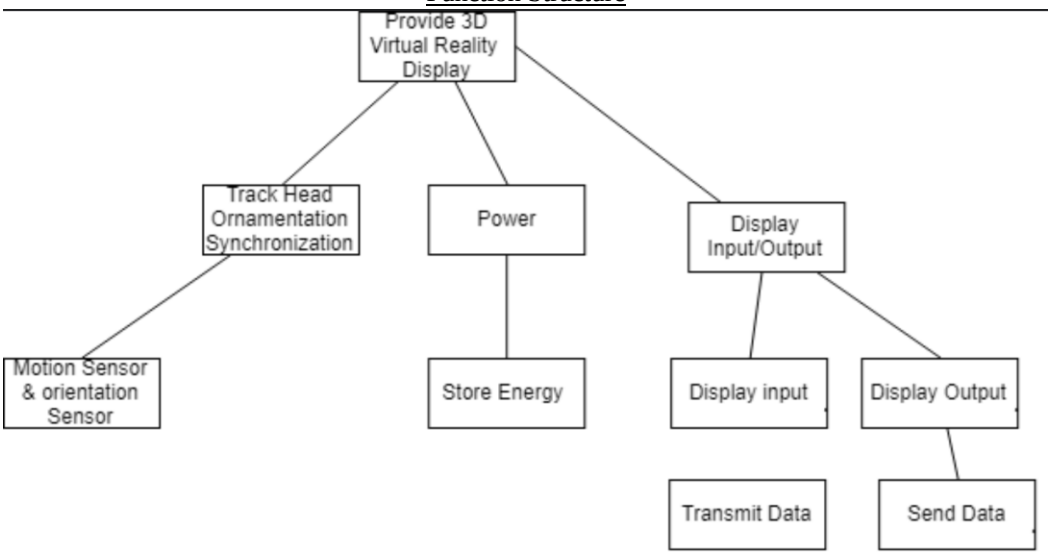
- The oculus uses 3 different lenses to create a 3D effect used in VR headsets
- The Display Input revives data from a computer/game console that runs through different cables.

b) Draw a FAST Diagram and Function Structure for a Virtual Reality Headset.(oculus Rift)

Fast Diagram



Function Structure



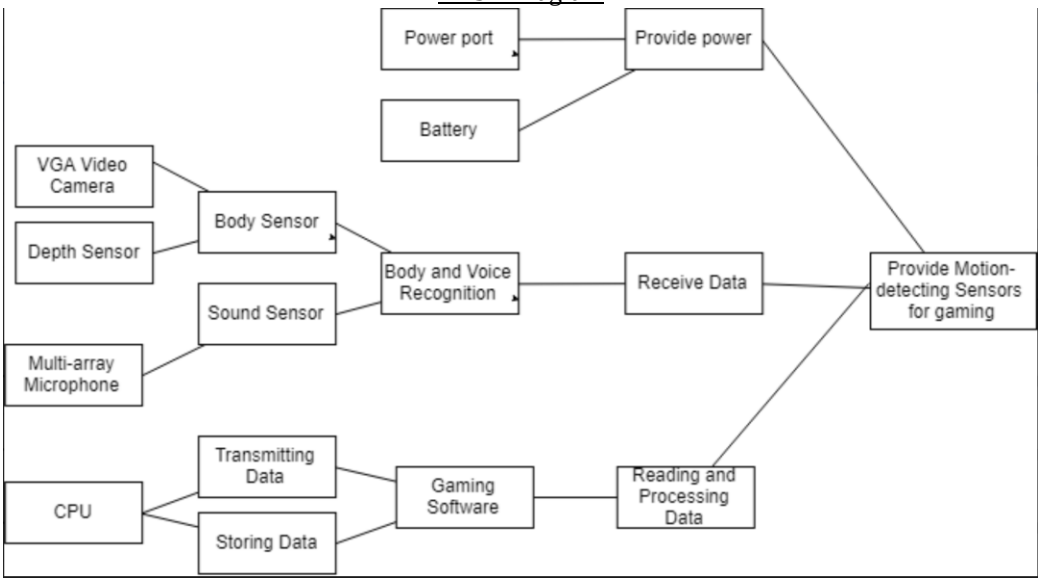
2c) Dissect and make a FAST Diagram and Function Structure for Video-game-motion-tracking sensor

a) How does a Video game motion tracking sensor work?

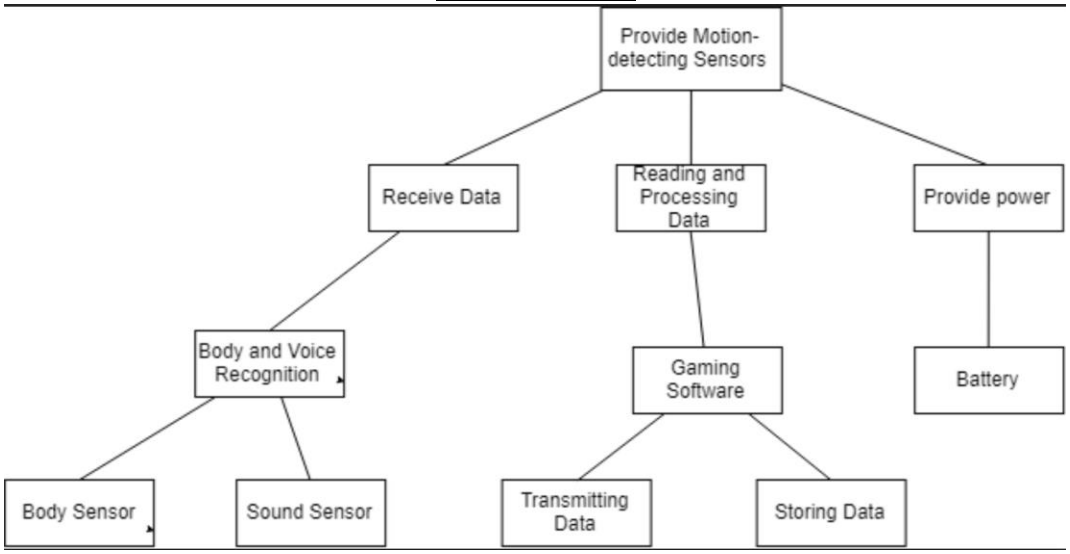
Parts of tracking sensor	*Power Supply, Color VGA video Camera, Depth Sensor, Multi-array microphone, software.*

b) Draw a FAST and Function Structure for a Video-game Motion Sensor.(kinect)

FAST Diagram



Function Structure



3) implement your structured process and create a feasible concept for the VR entertainment system based on the functional requirements listed above. Provide a concise explanation of how the selected product concept works.

Primary	*Secondary*	*Tertiary*
Video Game console Functionality	*Multipedal features*	*Entertainment Social Networking*
	Games	*Simple games* *Complex games*
	Creating self-imposed avatars	*Personalization*
	Internet Connectivity	*Ethernet Connectivity* *Wireless Connectivity*
Virtual Environment to the user in order to provide the user with a visual VR Experience	*Virtual Display*	
	Virtual Sound	
	Virtual Interaction	
Track user movement in order to allow the user to control the virtual environment	*Controller Interaction*	

Create a Criteria Chart and set its importance

Microsoft is aware of the completion. The entertainment industry has a wide array of consoles, thus Microsoft must strategize their competitive advantage in some way that can differentiate itself with its competition.

Criteria	Importance
Entertainment	10/10
Ability to play different games	5/10
8 bit- technology	6/10
Personalization	7/10
Simple games	7/10
Complex games	7/10
Voice chat party	8/10
Ethernet connectivity	5/10
Wireless connectivity	7/10
Applications	6/10
Downloadable content	8/10

Listed above are the attributes that can help characterize the basic video game console rather than focus on a specific console.

Create a list of "Technical metrics" and assess the importance of each metric

Technical Metric	Virtual Display Quality (Pixel)	Virtual Sound Quality (Hz)	Controller/ Motion Sensor	Processor	Internet Connectivity (Mb/sec)
Importance	10/10	8/10	9/10	7/10	9/10

Important to know technical metrics of a product in order to make sure that things run smoothly and can be analyzed

Correlate the customer needs and Technical metrics using a convenient scale. Result is a correlation matrix.
● = strong positive correlation △ = weak positive ○ = negative

	Technical Metrics	Resolution (pixels)(TM1)	Speed of Navigation (Time)(TM2)	Time required to load (Time)(TM3)	Internet Connection (mb/sec)(TM4)	Quality of sound with others (Hz)(TM5)
Criteria	Importance	10/10	9/10	7/10	8/10	6/10
Entertaining	10/10	●	●	●	△	●
Ability to play different games	5/10	△		○		
8-bit technology or better	6/10	●				△
Personalization	7/10	●	●			○
Simple games	7/10	○	○			
Complex games	7/10	●	●			
Durable	8/10				●	●
Ethernet connectivity	5/10		△	○	●	
Wireless connectivity	6/10		△	○	●	
Applications	6/10		●	○	△	
Downloadable Content	8/10			●	●	

Correlate the technical metrics against each other using a convenient scale.

+: strong positive correlation - : strong negative correlation x: no correlation

	Virtual Display Quality (Pixels)	Virtual Sound Quality (Hz)	Controller/ Motion Sensor	Processor	Internet Connectivity (Mb/
Virtual Display Quality	+				
Virtual Sound Quality	+	+			
Controller/ Motion Sensor	+	+	+		
Processor	+	+	-	+	
Internet Connectivity	x	x	+	-	+

Shows the technical metrics used against itself for a convenient scale.

Competitive benchmarking

Customer Needs	**PS4**	**Nintendo Switch**	**Xbox**
Entertainment	9	8	9
Social Network	9	9	9
Games	8	8	8
Personalization	5	8	8
Ethernet connectivity	7	9	8
Wireless Connectivity	2	2	2
Virtual display	8	5	7
Virtual sound	8	5	6
Virtual Interaction	7	10	5
Controller Interaction	9	6	8

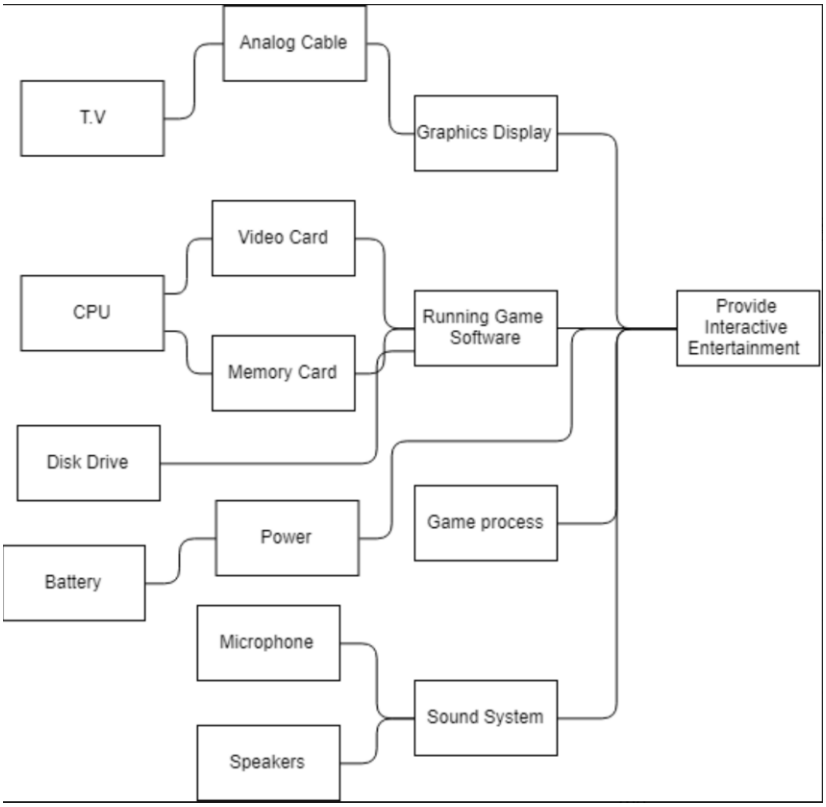
Target Customer Specifications

Criteria	**Importance**
Inexpensive	9/10
Aesthetics	7/10
GUI	8/10
Life Cycle	7/10
User Friendly	8/10

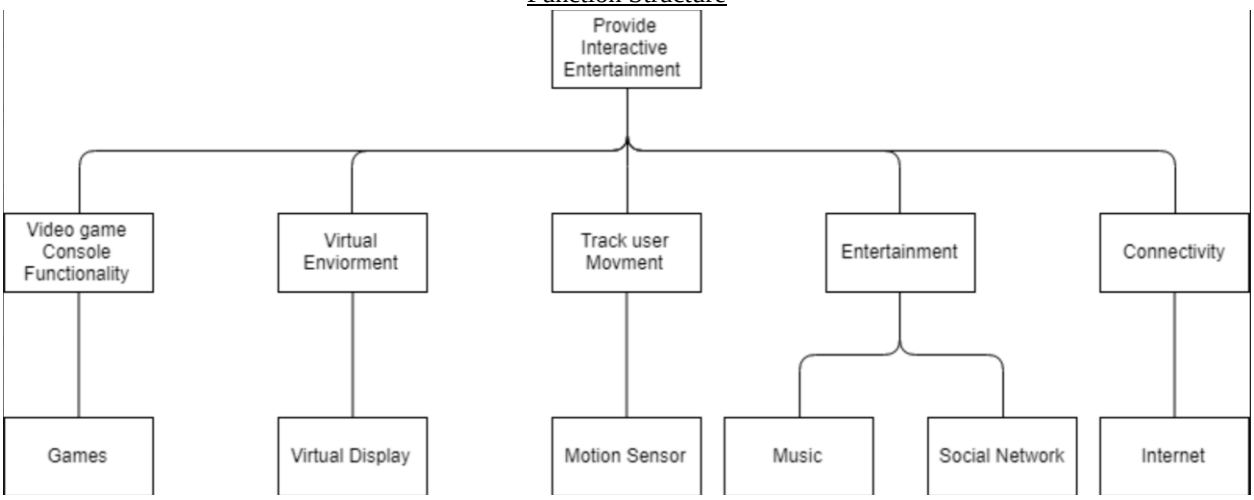
Target Engineering Specifications

Criteria	**Importance**
Virtual Display Quality	10/10
Virtual Sound Quality	9/10
Controller/Motion Sensor	7/10
Processor	8/10
Internet Connectivity(Mb/sec)	6/10

Fast diagram for VR Entertainment System



Function Structure



Morphological Matrix

	SP1	SP2	SP3	SP4
SF: Video Game Functionality	Single player Games	Games Multiplayer		
SF2: Virtual Display	Projector	Scan Display	Retinal Display	OLED
SF3: motion sensor	Webcam	Remote	Camera Sensor	
SF4: Music	iTunes	SoundCloud	Pandora	Spotify
SF5: Social Network	Netflix	YouTube	HBO	Skype
SF6: Internet Connectivity	Ethernet	Wireless	3G/4G	

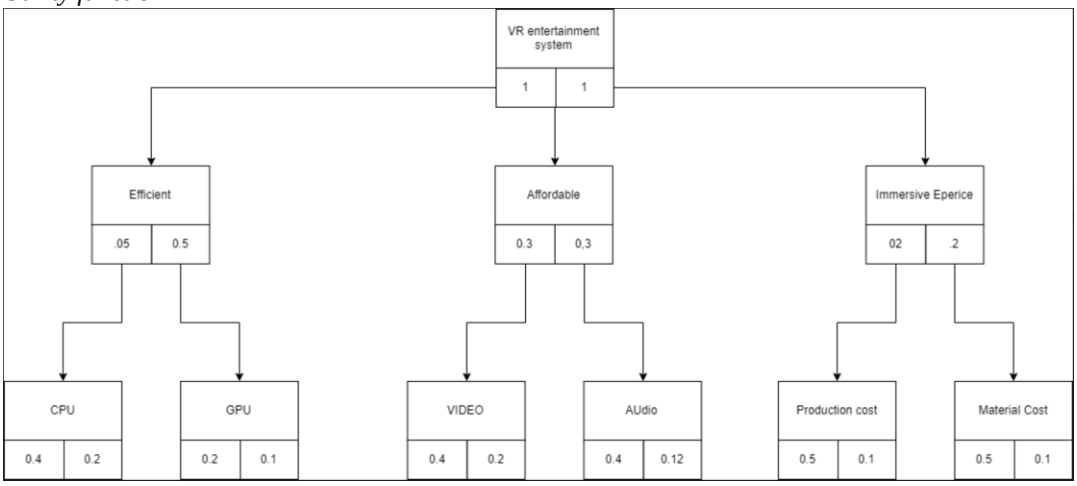
Blue = Concept 1
Red = Concept 2
Green = Concept 3

Concept 1 – concept one consists of a single player video game console that uses a projector as a virtual display. It senses that player motion via webcam. The entertainment includes iTunes and Skype since it is for a single player and they can interact with their friends. The internet connectivity is through the 3G/4G since they do not use that much power.

Concept 2 – Concept two consists of single player video game console that uses a retinal display as a virtual display. It senses the players motion via camera sensor. The entertainment includes SoundCloud and YouTube since it is for a single player is a younger target audience. The internet connectivity is through the wireless since it does not need that strong of a internet connectivity.

Concept 3 – Concept three consists of multiplayer video game console that uses a retina display as a virtual display. It senses the player motion via remote controller since it uses more than one person. The entertainment includes SoundCloud and Netflix since it includes more than one person, they can watch Netflix with their friend. The internet connectivity is through the ethernet since it uses a lot of power.

Utility function



Score of customer needs

Customer needs	Weight
Affordable	W_1 .30
Durable W_2.30	W_2.30
Efficient	W_3.20
Convenience	W_4.10
Wight	W_5 .10
Weight	Total=1.0

Score of customer needs scale 1-5

Customer needs	Weight
Affordable	S_1 4
Durable W_2.30	S_2.5
Efficient	S_3.4
Convenience	S_4.3
Weight	S_5 .3

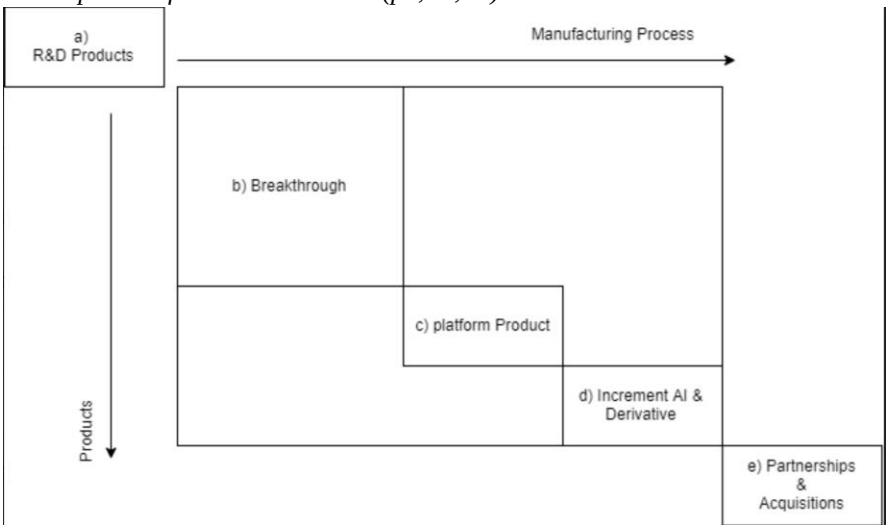
Cumulative Utility

Customer Needs	**Cumulative Weight**
1 - Affordable	0.3 x 4 = 1.2
2 - Durable	0.3 x 5 = 1.5
3 - Efficient (Productive)	0.2 x 4 = 0.8
4 - Convenience	0.1 x 3 = 0.3
5 - Size (Weight)	0.1 x 3 = 0.3

Cumulative Utility

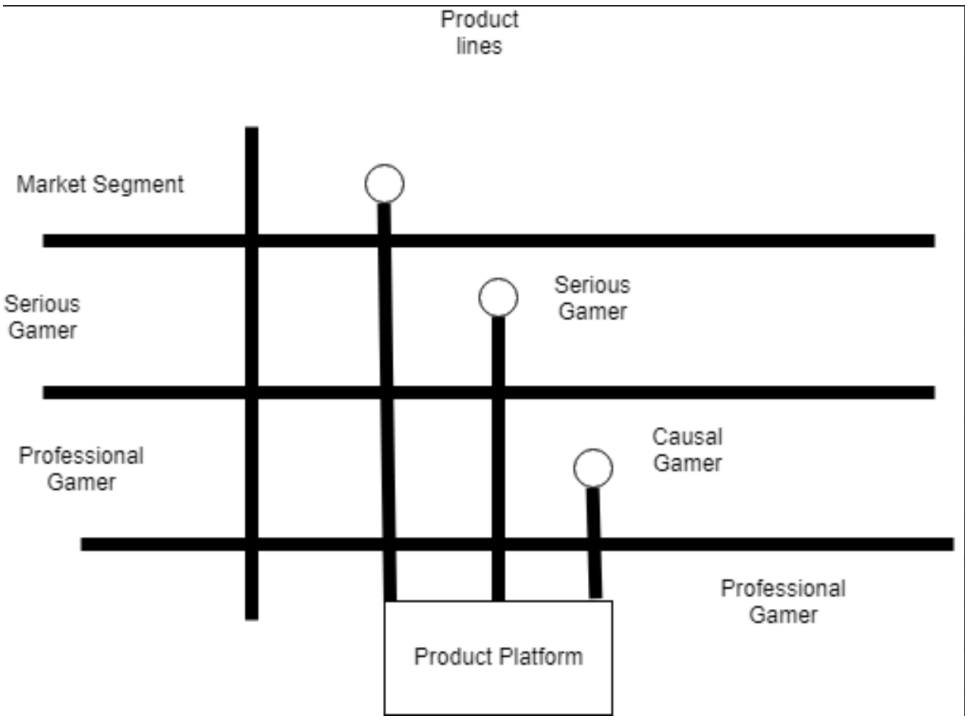
Customer Needs	**Weight**	**Concept 1**		**Concept 2**		**Concept 3**	
		S	**W**	**S**	**W**	**S**	**W**
Affordable	0.3	4	1.2	2	0.6	4	1.2
Durable	0.3	3	0.9	4	1.2	3	0.9
Efficient	0.2	3	0.6	4	0.8	3	0.6
Convenience	0.1	4	0.4	3	0.3	3	0.3
Size	0.1	3	0.3	4	0.4	3	0.3
Total	1.0		3.4		3.3		3.3

Develop a set of Potential Products(p1,P2,Pn)



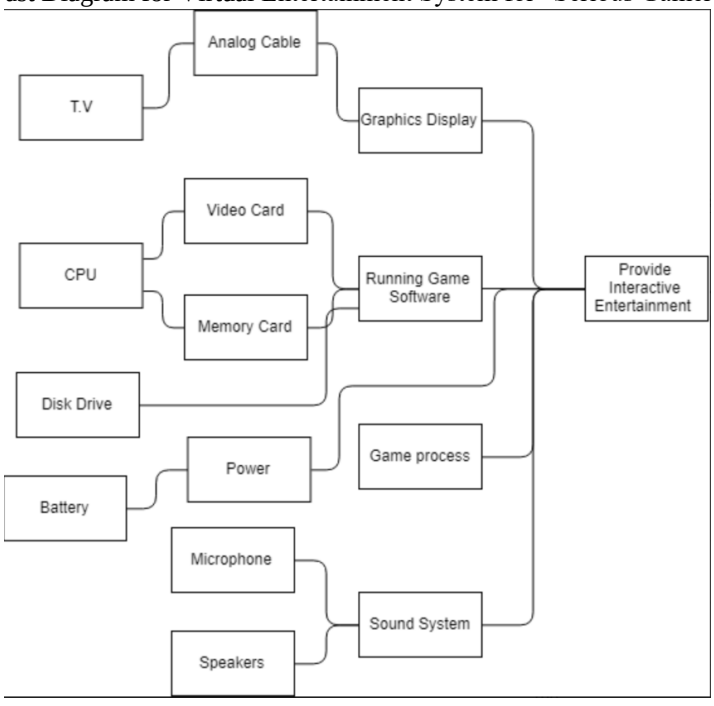
Create a product line to Serve Different Market Based on Segments

"Serious Gamers"	• Fast ISP Connections • Personalized GUI • High Resolution Graphics • Multiplayer playability • Memory • Quality sound board
"Casual Gamers"	• Simple GUI • Decent Graphics • Ample storage • Internet connection
"Professional Gamers"	• Advanced GUI • High Resolution Graphics • Ample Storage • Fast internet connection

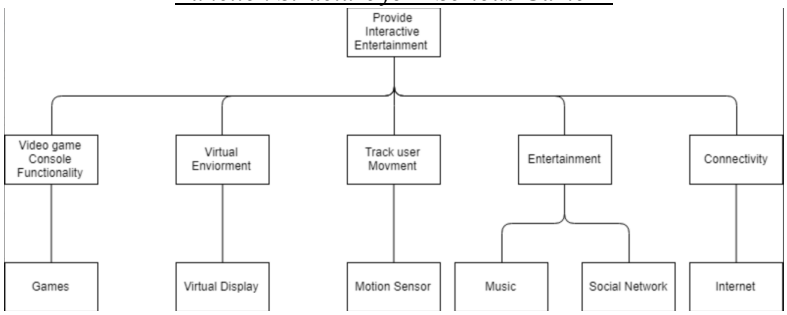


Develop an FMEA of the product line Designed for the "Serious Gamer" user

Fast Diagram for Virtual Entertainment System for "Serious Gamer"



Function Structure for "Serious Gamer"



Failure Modes and Effects Analysis

Typical and Expected failures of low end Virtual Reality Entertaining System

- *Hard Drive Failures*
- *Overheating*
- *Broken Cables*

FMEA Table to calculate the RPN

Subsystems	Potential Failure Mode	How sever is the effect?	How frequently dose the failure occur?	How easy is the failure to detect?	Risk priority Number (RPN)	Action Required
Hard Drive Failure	Parts worn	8	2	8	128	Yes, Provide a duel back up or have a reliable hard drive
Overheating	Over using the system	9	5	8	360	Yes, ensure that it doesn't overheat
Broken Cables	Ageing cables	6	2	7	84	Make sure capes are away from sharp objects

Severity of effect on failure mode is form 1 harmless to, 8 severe
Frequency of failure is 1 infrequent to, 8 frequent
Difficulty to detect failure 1 easy to detect, 8 difficult to detect

Preventing Actions:

Hard Drive Failures	Follow Manufacture directions on safely handling and using devices. Avoid extreme temperatures Proper power management – turn off if not in use
Overheating	Turn off system if not in use. Put to sleep whenever possible Keep in cool place
Broken cables	Keep cables in secure location Tie cables down

Chart shows how to prevent failures for the virtual reality system.

Check your work:

Learn and Generalize:

I learned how product develop a virtual reality entertainment system. Takes a lot of step and process to figure out the right system. There are also different market segments and each segment requires different

assessments. After creating the system, I had look at the failure modes and effect analysis to make sure that it is possible to prevent those failures.

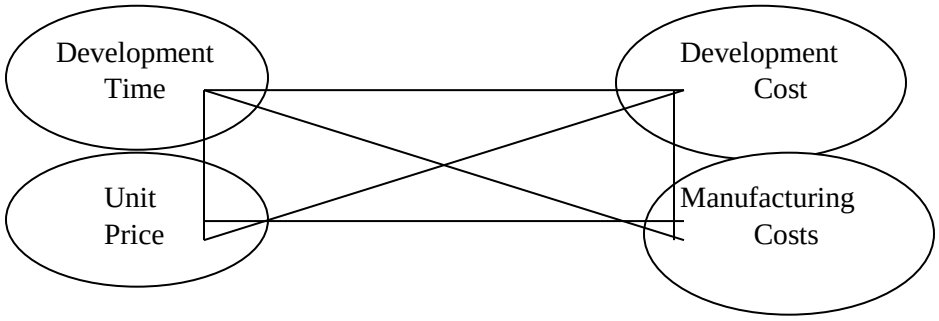
3.Financial modeling for the Virtual Reality Entertainment System

1. Define the problem

a) The minimum value, of the unit sales price for the product that will result in a positive NPV by the end of year 4 (Hint: first set unit sales price equal to the unit production cost and then adjust the sales price until the NPV is equal to zero)
b) What is the trade-off law between NPV and unit sales price?
c) What price would you recommend that the software giant charge a wholesale distributor for 1 unit of the VR entertainment system? Explain your answer.
d) What is the expected NPV based on your recommended sales price from part C

2. Plan the Treatment of the problem

Step 1: Retrieve the Excel file from the tutorial
Step 2: Perform a four- year quarterly NPV Analysis
Step 3: Find the minimum value of the unit sales price for the product that will result in a positive NPV by the end of the year 4
Step 4: Find the trade-off law between NPV and unit sales price?
Step 5: Find the price that you would recommend that the software giant would charge a wholesale distribute for 1 unit of the VR entertainment system.
Step 6: Find the expected NPV based on my recommended sales from the previous question



3. Execute

1. The minimum value, of the unit sales price for the product that will result in a positive NPV by the end of year 4 (Hint: first set unit sales price equal to the unit production cost and then adjust the sales price until the NPV is equal to zero)

Shows the parameters given

	A	B	C
1	Scenario Input Paramenters		
2	Sales & production	600,000	
3	Deveolpment cost	40,000,000	
4	unit price	150	
5	unit production cost	150	
6	ramp up cost	400,000	
7	marketing & support cost	2,000,000	
8	annual discount factor	10	
9			
10			
11	Base-Case NPV	-43,690	
12			
13			

	A	B	C
1	Scenario Input Paramenters		
2	Sales & production	600,000	
3	Deveolpment cost	40,000,000	
4	unit price	184	
5	unit production cost	150	
6	ramp up cost	400,000	
7	marketing & support cost	2,000,000	
8	annual discount factor	10	
9			
10			
11	Base-Case NPV	0	
12			
13			

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1																	
2	year 1				year 2				year 3				year 4				
3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q23	Q4	Q1	Q2	Q3	Q4	
5																	
6	-10000	-10000	-10000	-10000													
7				-200	-200												
8					-500	-500	-500	-500	-500	-500	-500	-500	-500	-500	-500	-500	
9						-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	
10						150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	
11						-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	
12						27568.8	27568.8	27568.8	27568.8	27568.8	27568.8	27568.8	27568.8	27568.8	27568.8	27568.8	
13						150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	
14						0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	
15																	
16	-10000	-10000	-10000	-10200	-700	4569	4569	4569	4569	4569	4569	4569	4569	4569	4569	4569	
17	-10000	-9756	-9518	-9472	-634	4038	3940	3844	3750	3658	3569	3482	3397	3314	3233	3155	
18																	
19	0																
20																	
21																	

The minimum value of the unit sales price for the product that will result in a positive NPV by the end of year 4 is 184 dollars.

- *I started at 150 dollars then slowly moved up my way up. I then narrowed the value down to somewhere between 190 and 180, and ended up with 184.*

2. What is the tradeoff law between NPV and unit sales price?

Base case

	A	B	C
1	Scenario Input Paramenters		
2	Sales & production	600,000	
3	Deveolpment cost	40,000,000	
4	unit price	184	
5	unit production cost	150	
6	ramp up cost	400,000	
7	marketing & support cost	2,000,000	
8	annual discount factor	10	
9			
10			
11	Base-Case NPV	0	
12			
13			

Sensitivity analysis

10% increase

	A	B
1	Scenario Input Paramenters	
2	Sales & production	600,000
3	Deveolpment cost	40,000,000
4	unit price	202
5	unit production cost	150
6	ramp up cost	400,000
7	marketing & support cost	2,000,000
8	annual discount factor	10
9		
10		
11	Base-Case NPV	23,542
12		

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Base Case																
2		year 1				year 2				year 3				year 4			
3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	($ values in thousands)	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q23	Q4	Q1	Q2	Q3	Q4
5																	
6	Development cost	-10000	-10000	-10000	-10000												
7	Ramp up cost				-200	-200											
8	Marketing & support cost					-500	-500	-500	-500	-500	-500	-500	-500	-500	-500	-500	-500
9	production cost						-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500
10	Production volume						150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000
11	unit prodcution volume						-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
12	sales revenue						30300	30300	30300	30300	30300	30300	30300	30300	30300	30300	30300
13	sales volume						150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000
14	unit price						0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
15																	
16	period cash flow	-10000	-10000	-10000	-10200	-700	7300	7300	7300	7300	7300	7300	7300	7300	7300	7300	7300
17	PV year 1, r=10%	-10000	-9756	-9518	-9472	-634	6452	6295	6141	5991	5845	5703	5564	5428	5296	5166	5040
18																	
19	Project NPV, $	23,542															
20																	

10% decrease

	A	B
1	Scenario Input Paramenters	
2	Sales & production	600,000
3	Deveolpment cost	40,000,000
4	unit price	166
5	unit production cost	150
6	ramp up cost	400,000
7	marketing & support cost	2,000,000
8	annual discount factor	10
9		
10		
11	Base-Case NPV	-23,003
12		

1	Base Case																	
2		year 1				year 2				year 3				year 4				
3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
4	($ values in thousands)	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q23	Q4	Q1	Q2	Q3	Q4	
5																		
6	Development cost	-10000	-10000	-10000	-10000													
7	Ramp up cost				-200	-200												
8	Marketing & support cost					-500	-500	-500	-500	-500	-500	-500	-500	-500	-500	-500	-500	
9	production cost						-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	
10	Production volume						150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	
11	unit prodcution volume						-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	
12	sales revenue						24900	24900	24900	24900	24900	24900	24900	24900	24900	24900	24900	
13	sales volume						150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	
14	unit price						0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
15																		
16	period cash flow	-10000	-10000	-10000	-10200	-700	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
17	PV year 1, r=10%	-10000	-9756	-9518	-9472	-634	1679	1638	1598	1559	1521	1484	1448	1413	1378	1345	1312	
18																		
19	Project NPV, $	-23,003																
20																		

The tradeoff law in Development cost is 23,542 Million in thousands per 10% increase sales price increase in NPV or expected profit.

3. Find the sales price that you would recommend that the software giant charge a wholesale distributor for 1 unit of your VR entertainment system.

   I would recommend that the software giant charge the wholesale distributor $500 per unit. This would be the best due to next generation consoles costing 500 dollars upon release. Thus, to compete with any next generation console and to gain market share I would price it at 500 dollars per unit.

4. What is the expected NPV based on your recommended sales price from part (c)

	A	B
1	Scenario Input Paramenters	
2	Sales & production	600,000
3	Deveolpment cost	40,000,000
4	unit price	500
5	unit production cost	150
6	ramp up cost	400,000
7	marketing & support cost	2,000,000
8	annual discount factor	10
9		
10		
11	Base-Case NPV	408,829

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																
2	year 1				year 2				year 3				year 4			
3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q23	Q4	Q1	Q2	Q3	Q4
5																
6	-10000	-10000	-10000	-10000												
7				-200	-200											
8					-500	-500	-500	-500	-500	-500	-500	-500	-500	-500	-500	-500
9						-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500	-22500
10						150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000
11						-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
12						75000	75000	75000	75000	75000	75000	75000	75000	75000	75000	75000
13						150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000
14						0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
15																
16	-10000	-10000	-10000	-10200	-700	52000	52000	52000	52000	52000	52000	52000	52000	52000	52000	52000
17	-10000	-9756	-9518	-9472	-634	45960	44839	43746	42679	41638	40622	39632	38665	37722	36802	35904
18																
19	408,829															
20																
21																
22																
23																

The projected project NPV is 408,829 in millions

4. Check your work

5. Learn and Generalize

Planning budgets for research and development as well as production and marketing is very consuming, but provides the company with a general profit margin before a product is launched and created. The trade-off law for NPV and development cost has hidden outcomes that cannot be represented or forecasted because they are external factors that are uncontrollable by the company. For example, if I were to decrease development cost, the product might have problems that may not be discovered during production due to budget cuts. It is also important to calculate the budget constraint for any given project because most companies would rather make a profit that lose money.

4. INFORMATION TECHNOLOGY FOR PRODUCT DESIGN AND DEVELOPMENT

1. Define the problem

The software giant would like you to develop an Information Technology system to support the design and development of the proposed Virtual Reality entertainment system

a) Develop your own Product Design and Development Framework, based on the appropriate modification of the MCD framework handed out in class.

b) Design an Information Technology system to automate and integrate the steps and stages in your framework. Your design should make use of the appropriate tools form this course, as well as tools from other courses such as software engineering, computer architecture, networking, and databases.

2. Plan the Treatment

Read the MDC framework handout

Modify the MDC Framework and present the modifications in a clear and concise manner. Select some key pieces of the MDC framework.

3. Execute the plan

a) Develop your own Product Design and Development framework, based on the appropriate modification of the MDC framework handout in class.

Original MDC Framework:

Management, Development, Commercialization (MDC) Framework

The following MDC framework addresses the management, development, and commercialization of a technology and its associated products.

Management (M)

Step 1 (Firm-level Strategy) Map the industry-landscape for the technology/product using Porter's Five Forces model, and then establish the overall competitive strategy, technology, and market strategy of the technology firm.

Step 2 (Business Goals) Establish the business goals and objectives (ROI, %market share, revenue, and growth aspiration). These business goals need to be clearly related to the vision and mission of the technology firm.

Step 3 (Developmental Goals) Define the overall development goals to align business goals, competitive strategy, technology strategy, and market strategy.

Step 4 (Functional Maps) Create functional maps (time-based evolutionary maps) for engineering, manufacturing, and marketing in order to rationally decide which technologies and products to develop. A revenue map based on product/market segmentation is crucial for the selection of the appropriate target markets.

Step 5 (High-level HOQ) Identify customer needs and translate these needs into high-level technical requirements (for the technology, products, and projects to be developed) using Quality Function Deployment (QFD) and, in particular, the "House of Quality".

Step 6 (Aggregate Project Plan) Use probabilistic decision analysis to develop an initial aggregate project plan, which is the mix of products to be developed.

- Research & Advanced Development
- Breakthrough
- Platform
- Incremental (Enhancements, derivatives, hybrids)
- Alliance or partnered projects

Step 7 (Developmental Funnel) Create an appropriate development funnel to refine and firm up the aggregate project plan. The development funnel is a process for identifying and screening projects over time.

Step 8 (Project Planning) Establish a cross-functional team for each technology/product development project. Develop a project plan using the design/development structure matrix, GANTT, PERT, CPM crts.

Developmental (D)

Step 9 (Quality Function Deployment) Develop a comprehensive House of Quality (HOQ) to correlate customer needs to technical metrics and specifications.

Step 10 (Reverse Engineering) Dissect existing products which are similar to the proposed new product using the Function Analysis Systems Technique (FAST).

Step 11 (Conceptual Design) Create a function structure (FS) for your product, and use this FS to generate a morphological matrix (MM). Use the MM to generate several design concepts. Select one (or more) concepts using a utility function, which is based on an appropriate set of weighted selection criteria.

Step 12 (Prototyping Strategy) Develop an appropriate prototyping strategy (physical vs. analytical; focused vs. comprehensive). Build and test proof-of concept and other appropriate prototypes based on the prototyping strategy.

Step 13 (Product Architecture/ Product Strategy) Establish the technology platform and product platform. Define the appropriate product lines to serve the target market segments.

Step 14 (Detailed Design) Develop the detailed embodiment design of the product.

Step 15 (FMEA) Perform a failure modes and effects analysis (FMEA) of the detailed design.

Step 16 (DFX) Perform DFX: Design for manufacturability(X=M) and quality (X=Q).

Commercialization (C)

Step 17 (Financial Model) Develop a base-case (nominal) Net Present Value (NPV) financial model in order to determine the expected profits (payoffs) from the product development projects. The NPV analysis models the appropriate cash-flows (sales revenues, development, production, marketing, and

other relevant costs). Perform sensitivity analyses on the base case financial model in order to understand and quantify trade-offs between time, cost, and quality.

Step 18 (Robust Design) Design the product for performance and robustness using "Design of Experiments".

Step 19 (Product Release Map) (Product Release Map). Create the product release roadmap.

Modifications

Management

Step 7: Development funnel can be a sub-function of step6. Aggregate project plan because the development funnel is a technique used to refine the APP process.

Design

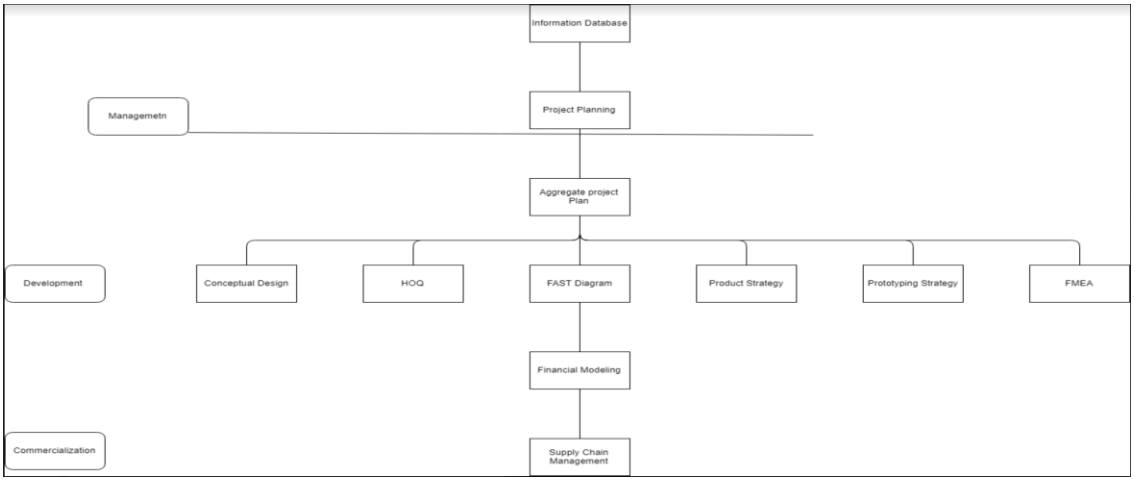
Steps 13, 14: can be combined because the detailed embodiment is derived from the product platform and product strategy. Just like a FAST diagram, one could work form both ends- using the details to find the appropriate product platform and product strategy

Commercialization

Step 19: could possible be completed concurrently with step 17 because the product roadmap deals closely with the development and production time of the product.

B) Design an information Technology system to automate and integrate the steps and stages in your framework. Your design should make use of the appropriate tools from this course, as well as tool for other courses such as software engineering, computer architecture, networking, and databases.

This is a design of Information Technology system to automate and integrate the steps



- An IT system to automate and integrate this process can help save a lot of time and resources making the entire project a lot more efficient.
- Should build an IT system that can help with the commercialization by automatically creating the base case, sensitivity analysis, and calculating the NPV. The user should be able to input all of the financial parameters (development cost, ramp-up cost, unit production cost, etc.) and they system should then create a spreadsheet of the scenario.

4. Check your work

5. Learn and Generalize

I chose to automate the financial methods because it seemed to be the most straight forward part of the design and development process. Every other process has multiple steps and wouldn't make sense. The MDC framework shows how complicated everything is. There are Many high-level decisions that can be tough choices to make. With an Automated system this makes the framework problem solving more efficient allowing project managers to make better and faster decisions.

I learned how to develop my own Product Design and Development framework. I realized how well structured the MDC framework really is; it gives the user a very detailed guideline to walk through every step when creating a new product. However, some changes could be made to adapt to products. Although the MDC is just used to product a product idea, it could become more when touched up and could be used to pitch product designs and more.

5. Conclusion

1. Define the problem

Problem:

- What are the key lessons that you learned in this course?

- Provide key examples

2. Plan the Treatment

- Review lecture notes, handouts, ect … Any materials form the course

- Make a list of key lessons I learned from the course and an explanation of each one.

3. Execute

Key lessons	Examples
Take Notes	One thing that differs Subhas from other professors is that he tends to write out all his notes, and this helps the class follow along. This has helped me a lot and coupled with the homework relying on the notes taken in class makes notes extremely useful.
Work in this class can be transferred to the real world	Though case studies we looked at big companies throughout the course and applied certain techniques and steps of the MDC framework to solve problems. I

	believe the problems we did and the approach we took to them are the steps industry professions would take. The simple problem-solving structure can be applied to everyday life.
Time management	Time-phased planning helps dissect the work and makes the process of completing the task easier because I do not need to worry and waste time thinking about what to do next. The fast that his is what gives the class an enormous amount of work. That is very important for me to manage my time in order to finish the tasks at hand. This skill is important in fast cycle companies.
Team work can effetely achieve goals one cannot do alone	Being put into teams with people who don't know each other has helped me tremendously. Not only did It help me with some soft skills, it also encouraged me to step out of my comfort zone and interact with others. In the future I will work with a team and knowing how to communicate to achieve deadlines

4. Check your Work

Since this problem is based off my personal experience, there shouldn't be a reason to have a mistake. I chose the most important lessons learned from the class I can apply them to real life and my future careers.

5. Learn and Generalize

While this class was difficult, I felt I had learned a tremendous amount of life lessons that can be carried over. I don't think I would have been able to gain such structured learning process in any other class. I'm glad that I'll have a chance to learn more in TIM 125 next quarter. I also felt to be much more carful when solving questions than I have done in the past because of this last step of the problem. I encouraged me to reflect on the quarter and what I have learned.

Some other things that I've learned not included in the chart, I believe are more technical. I've learned a lot in this class. I also believed that I learned how to obtain more information not only form normal calculations, but from those generated form real life situations.