

# **Snooze**

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## **Section 1: Executive Summary**

The Snoozie is an innovative sleeping device that allows the user to efficiently wake up without having to disturb the people around them. We understand that restful sleep is the most important part of starting a good day and we want to change the way our customers get up every morning. The slick rectangular design of the Snoozie comes with the choice of two different fillings of choice and a mobile application which tracks the sleep cycle of the user.

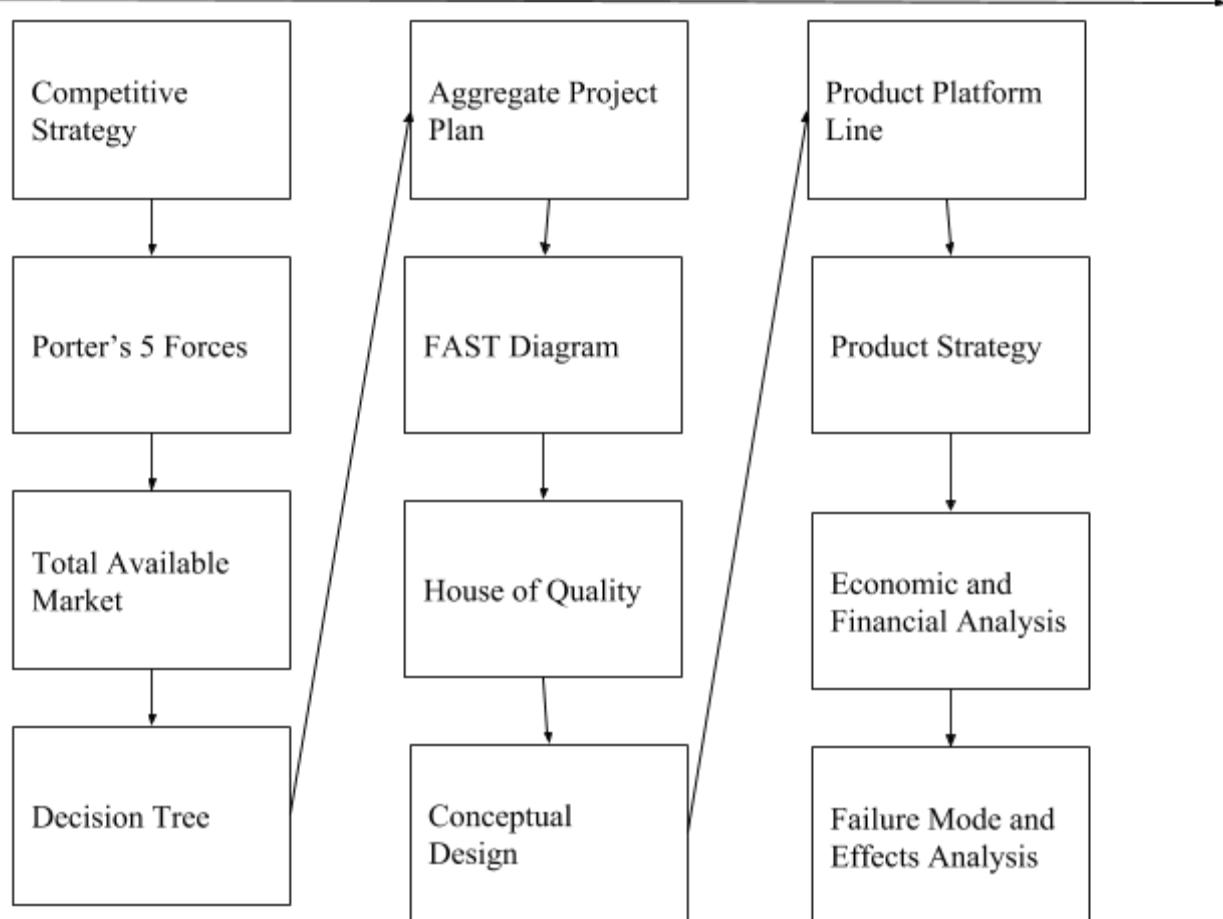
The Snoozie is suitable for all households, apartments, and dormitories due to its user-friendly design. With the Snoozie, you can not only use your pillow for sleeping, but also use as a trustworthy alarm clock. Our product takes healthy sleeping to the next level, providing efficiency and productivity that will make an everlasting impact on the way we sleep. In addition, our product is also focused on helping the hearing impaired individuals since they have trouble hearing the ring of alarm clocks. With the Snoozie, waking up every morning will bring no worries for being late because the smooth vibration will make sure our customers will wake up in time. We decided to develop the Snoozie for the benefit of customers who strongly believe that sleep is an integral part of daily function.

Our company aims to promote healthy sleeping habits and allow our customers to wake up on time without having to wake up everyone else sleeping around them. We focus on the core value of customer success and we put the customer in the front and center of everything we do. We are the pioneers of sleep technology and we believe that living a healthy lifestyle is most important.

## Section 2: Cross-referenced Description

### Section 2.1: A block diagram

Block Diagram: How our information is connected.



### Section 2.2: How the report should be used

In this report one can see how we have turned a detailed idea into a structured framework for introducing it to the market. Our first steps included understanding the market and the concept of the product. We then attempted to mold our product based on the needs of the market as well as the capacity of the technology available. We then planned our product strategy along with the aid of financial analysis.

## **Section 3: Our Company**

### **Section 3.1: Vision Statement**

To revolutionize the way people wake up in the morning so they never have to sleep through an alarm clock ever again.

### **Section 3.2: Mission Statement**

Our mission is to promote a healthy and happy lifestyle by supplying our customers with a product that will effectively wake them up in the morning through gentle vibrations.

### **Section 3.3: Business/Developmental Goal**

We plan to create a product called Snoozie. On a basic level, it is a vibrating alarm clock pillow. This pillow will have unique features that will give our company a distinct edge over our competitors. It will meet the many needs of our customers through its comfort, effectiveness, innovative idea, and advanced technology implementation. The Snoozie has potential to expand to updated versions, thus allowing for great product scalability.

Our product will not only be a crucial step for the future efficiency but it will also shorten the line of people with hard of hearing and the general public. It will be a great source of profit for our company. For example, we expect to generate the following monetary values:

- Overall project cost = 36.5M
- Sales Revenue = \$54.4M
- Profit = \$17.9M
- Profit Margin = 49%

Source: NPV Analysis

The following calculations further portray that our product will be a huge success and eventually we plan to accumulate a large chunk of the alarm clock market. Our development plans are to continually update our design, through investments in research and development, and we plan to make multiple designs, one high-end, one for traveling, and one for the low-end customers. It will be a product that will adapt easily to the current market because our company pays close attention to our customer needs.

## Section 4: Market Strategy

So, how will Snoozie fit in among the pillow market? Our pillow will fit in remarkably well because Snoozie, our product, functions as not only a pillow, an alarm clock, but as a vibrating alarm clock. The basic functionality is nothing out of the ordinary, it has the same mechanics as our competitors in the market. This helps us build it not only effectively and faster, but at a more affordable price.

### Section 4.1: Industry/Market Landscape

Here is the industry and market landscape we would be entering:

<i>Markets our product overlaps into:</i>
Pillow Market
Alarm Clock
Alarm Clock Pillow

### Section 4.2: Market Need Analysis/Target Market:

What challenges will the solution help the buyer overcome? Considering the pain of waking up to the sound of aggravating alarms, the smart pillow will satisfy the following needs and problems of users:

<i>Sleeping Challenges that Snooze will help the buyer overcome</i>	<i>Our Solutions</i>
Exhaustion/Poor Sleep Quality	Having a great start to the morning can determine how the day turns out.
Waking up in between REM cycles can often cause fatigue and exhaustion during the day.	Our pillow fosters starting the day with energy by detecting REM cycles via:  Heart Rate: detected through fiber optic sensors, which is capable of detecting a heart rate frequencies between 50 - 300 bpm with almost a linearity of 100%

	<p>Eye Movements: Detects the Rapid Eye Movement cycles to facilitate better sleep and the optimal time to wake up accordingly.</p> <p>Actigraphy Motion Biosensor technology: Detects and monitors</p> <ol style="list-style-type: none"> <li>1. Electroencephalography (EEG) [brain]</li> <li>2. Electrooculogram (EOG) [eye movements]</li> <li>3. Electromyography (EMG) [skeletal muscle activation]</li> <li>4. Electrocardiography (ECG) [heart rhythm]</li> </ol> <p>SWS deep sleep</p>
Disturbance Prevention	<p>The smart pillow will allow for only the user to wake up at a specified time while allowing others to continue their sleep with almost no disturbance via:</p> <p>Use of vibration as an alarm clock</p>
Sleeping Disorders	<p>With the advanced Actigraphy Motion Biosensor technology, the smart pillow has the ability to diagnose sleep disorders of:</p> <p>Narcolepsy (decreased ability to regulate sleep cycles)</p> <ol style="list-style-type: none"> <li>1. Cataplexy (sudden episode of muscle weakness), since cataplexy affects roughly 70% of people who have narcolepsy</li> </ol> <p>Idiopathic hypersomnia (EDS - excessive daytime)</p> <ol style="list-style-type: none"> <li>1. The smart pillow will readily regulate sleep cycles for the best quality of sleep and rest</li> </ol> <p>REM behavior disorder</p>

	<p>By preventing multiple sleeping disorders, the advanced polysomnography technology could also potentially assist the prevention of:</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Epilepsy</p> </div>
Hearing Impaired	<p>Since sleeping actively “charges” the brain, and epilepsy is a form of neurological disorder stemmed from exhaustion of the brain.</p> <p>The smart pillow will allow for facilitating waking up on time yet with ease for the hearing impaired via:</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Vibration from the smart pillow.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Eliminate traditional alarms for the hearing impaired.</p> </div>

**Subsection: Existing Technology:** existing channels in the market that are currently served to fulfil the market need

A similar product, the Neybox pillow

Neybox pillow technology features
Accelerometer/ gyroscope
<ul style="list-style-type: none"> <li>- Used to monitor movement in the user</li> </ul>
Microphone
<ul style="list-style-type: none"> <li>- Used to record the user's sleep noises</li> </ul>
Data collection
<ul style="list-style-type: none"> <li>- Internal storage that can trace patterns in the user's sleep</li> </ul>
Connectivity
<ul style="list-style-type: none"> <li>- Mobile device / app connectivity</li> </ul>

Similar channel analysis:

Although the Neybox Pillow is an advanced sleep tracking alarm clock that can “effortlessly measure and track your sleep quality, wake up refreshed and learn more about the benefits of great sleep”, it is operated on a handheld device with accelerometer and gyroscope technology, a technology that does not provide the best data on sleep cycles of individuals.

Accelerometer and gyroscope technologies measures linear acceleration based on vibration, initially created to give people a direction of gravity, and is further intended to determine an angular position based on the principle of rigidity of space. Technologies designed to measure the direction of gravity and the angular position cannot full and is not meant to be used for detecting sleepy cycles. Therefore, yes there are currently a handful of successful existing channels in the market that are fulfilling the market need, however we bring new polysomnography technology to the table to coinciding with our vibrating technology to ensure healthy and restful sleep.

With this in mind, we can make our own fit in the alarm clock industry and draw a loyal audience to our technology

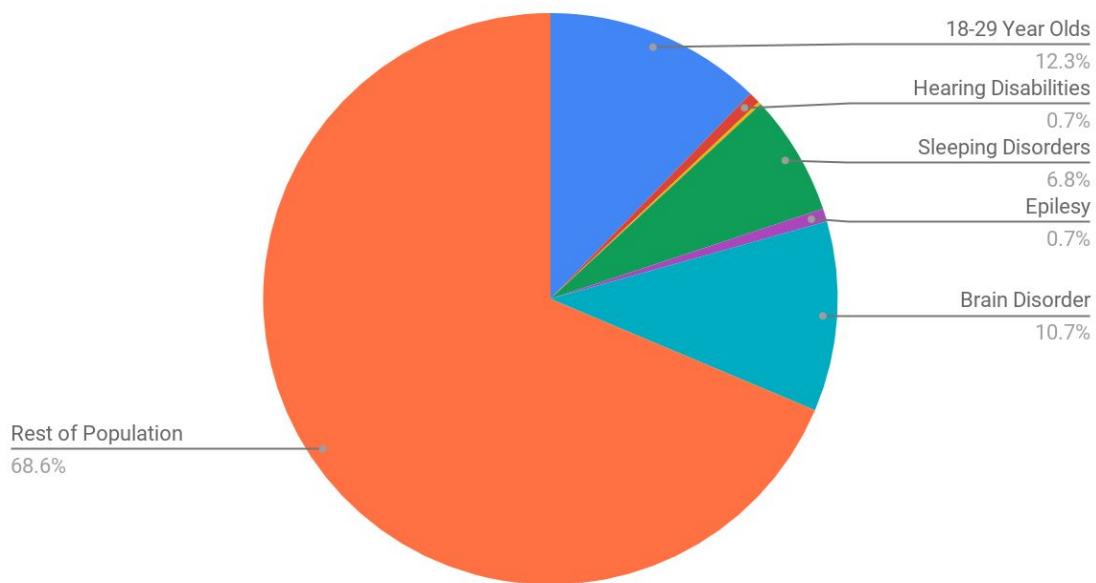
Key demographic base analysis.

Key audience	Size
College Students and Young adults who may be in a roommate or partner living situation in which an alarm clock would be too noisy for waking up	Men and Women 18-29 years old 47 million people (15%)
Individuals with hearing disabilities that don't have the extra help of someone else to personally wake them up.	Men and Women 18-59 years old 2.5 million people (0.8%)
Individuals who want the peace of a non-noise alarm clock and a system to help dictate healthy and restful sleep.	500,000 people (0.2%)
Individuals who are experiencing sleeping disorders such as Narcolepsy, Idiopathic hypersomnia (EDS - excessive daytime sleepiness), and REM behavior disorder	27 Million people (8.35%)

Individuals who are experiencing epilepsy and cataplexy from lack or disrupted sleep	3.2 Million people (0.9%)
Individuals who are experiencing brain disorders due to lack or disrupted sleep	42.5 Million people (13.15%)

### Section 4.3: Total Available Market(TAM)

Total Available Market Percentage (of US)



Given the described audience above and a feasible marketing strategy of a medium-sized company, our TAM would cover the US region. For example:

- College Students and Young Adults = 47 million
- Individuals with hearing disabilities = 2.5 million (1.75% of americans with moderate to severe hearing loss)
- Individuals with sleeping disorders: 27 million (8.35% of Americans)
- Individuals with brain disorders: 42.5 million (13.15% of Americans)
- Individuals with epilepsy and cataplexy: 3.2 million (0.9% of Americans)
- Various other individuals = 500,000 (at least interested and targetable)
  - This value is an incalculable number as it is very subjective, but you could expect at the very least that 1 in every 600 Americans could see themselves showing interest or even using this product.

#### **Section 4.4: Service Available Market(SAM)**

- Almost 10% of people in the US use alarm clock systems deviating from the traditional noise making clock (includes all forms of vibrating devices)
- Realistically, we can expect to capture 20% of the above 10% resulting in 5 million people of the 50 million total available market.

#### **Serviceable Obtainable Market (SOM)**

- Because SOM measures a short term goal, our revolutionary product technology can reach a customer base of 100,000 within the first year.

The following revenue estimate chart is with respect to a \$40 retail value.

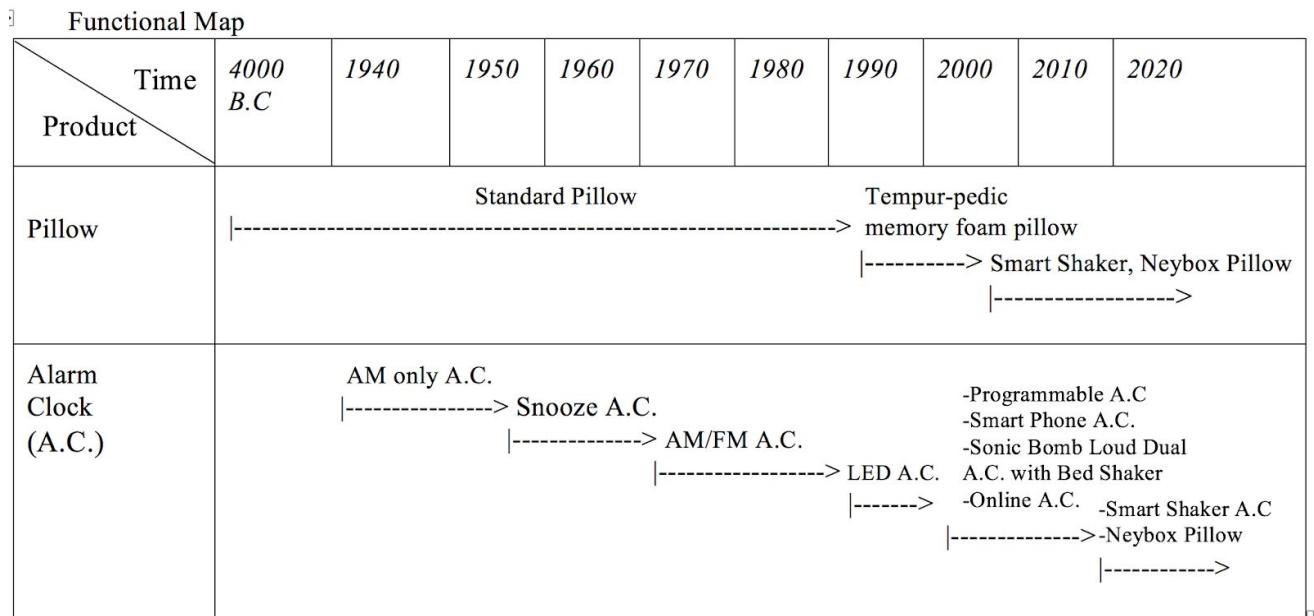
(Revenue Estimates)	Audience Size	Revenue
TAM	50,000,000	\$2,000,000,000
SAM	5,000,000	\$200,000,000
SOM	100,000	\$4,000,000

## Section 5: Competitive Strategy

Before beginning the designs of our product we needed to determine what our competition looked like and what they offered with their products. Here is a list of similar products to our vibrating alarm clock pillow, Snoozie, and the year that they were introduced to the market:

<i>Product</i>	<i>Product Category</i>	<i>Year</i>
Standard Pillow	Pillow	Back to 4,000 b.c.
AM only Alarm Clock	Alarm Clock	1940's
Snooze Alarm	Alarm Clock	1956
AM/FM Alarm Clock	Alarm Clock	1970's
LED Alarm Clock	Alarm Clock	1990's
Tempur-pedic memory foam pillow	Pillow	1991
Programmable Alarm Clock	Alarm Clock	2000's
Smartphone Alarms	Alarm Clock	2000's
Sonic Bomb Loud Dual Alarm Clock with Bed Shaker	Vibrating alarm and bed vibrator	2001
Online Alarm Clock	Alarm Clock	2006
HealthmateForever Vibrating Pillow	Vibrating Pillow	2007
Smart Shaker	Vibrating alarm and bed/pillow vibrator	2015
Neybox Pillow	Sleep tracking and analysis alarm clock	2014

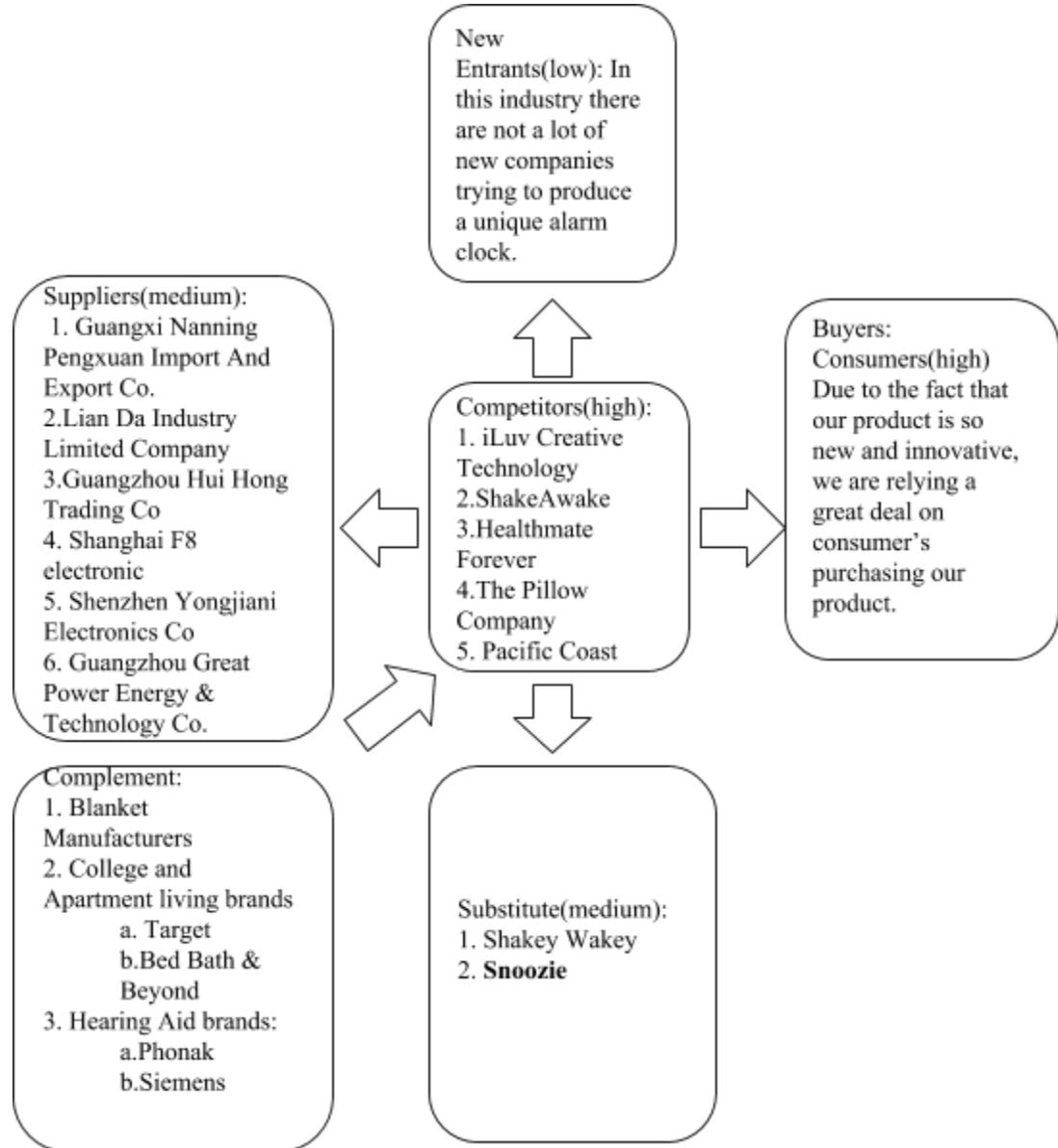
## Section 5.1: Functional Map



From this chart, we can see that alarm clocks have evolved from just playing music to waking people up by shaking their bed. We can also see that vibrating pillows are products that have been invested in and developed. However, most of the vibrating alarm clocks are separate devices, or mobile. These products can be placed on a bed or under a pillow. One important fault we generated from our competitor is that the alarms that shake the user's bed violently or play music are waking up their roommates or housemates.

## Section 5.2: Porter's Model

Here is a more complete analysis of the industry we plan to enter and eventually take control of using Porter's Model:

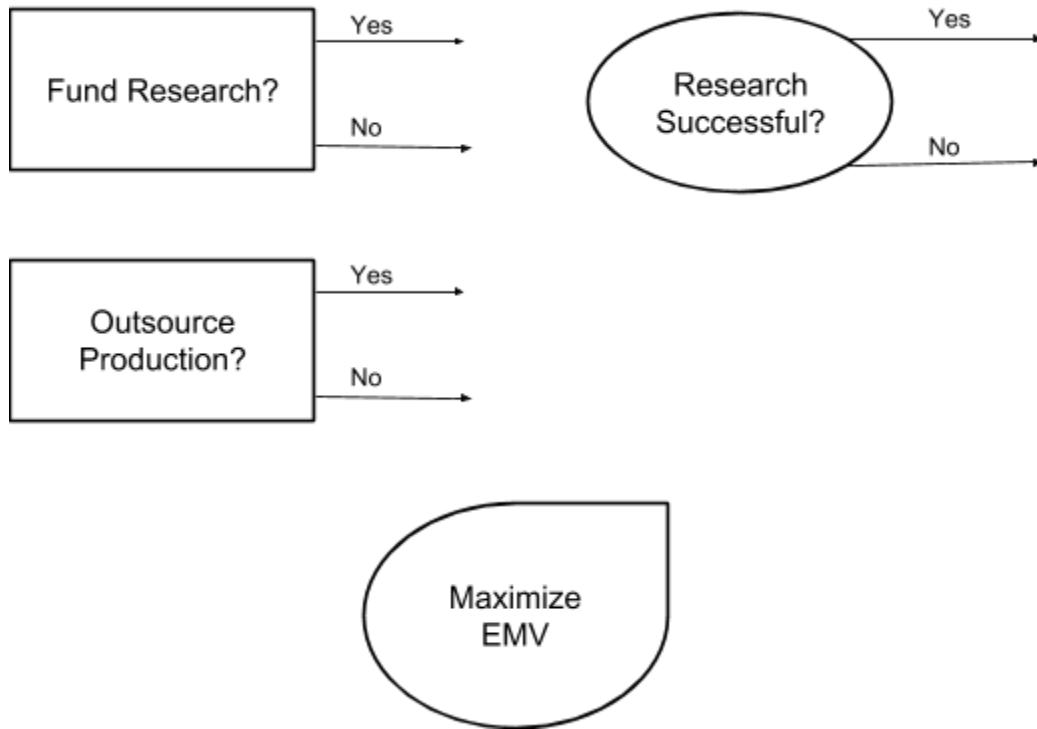


<i>Force</i>	<i>Key Determinants</i>	<i>Strength of Force</i>
Rivalry Between Competitors	Number and Size of competitors (concentration)	High
Threat of New Entrants	Existence of barriers to entry, product differentiation	Low
Threat of Substitutes	Switching cost Substitute performance	Medium
Supplier Power	Number and size of suppliers Uniqueness of service Switching cost	Medium
Buyer Power	Number of customers Differences between competitors Price sensitivity Switching cost	High

Results: There is a high rivalry between competitors and the buyers hold a lot of power. Therefore, we will be a substitute for our competitors. We will attract consumers by offering a low price product of the same quality.

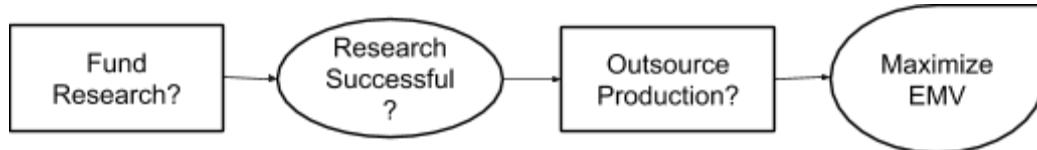
## Section 6: Expected Monetary Value/Payoff

### Section 6.1: Building Blocks



### Section 6.2: Influence Diagram

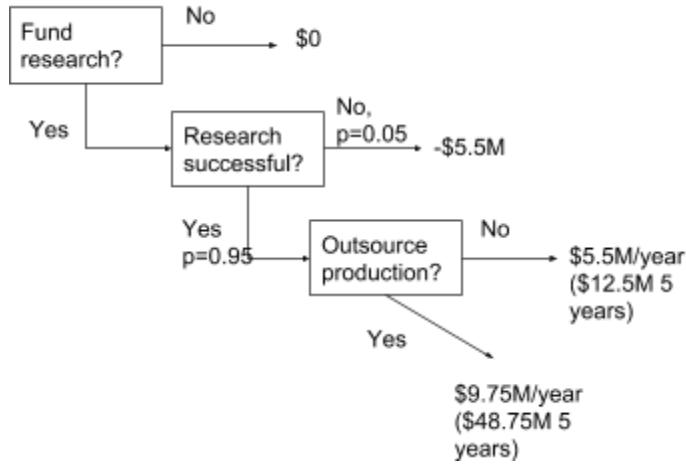
Chronological relationship between the building blocks:



### Section 6.3: Decision Tree Models

Basic model decision tree.

For this model we have modeled it after the smartsharker by iLuv



Research probability: this number comes from the fact that the design is somewhat simple and designing a working design is highly likely.

Research cost: again the iLuv product is relatively simple to design so for a mid level company this may not be too expensive compared to R&D research cost. Since we are planning to buy supplies from outsource companies.

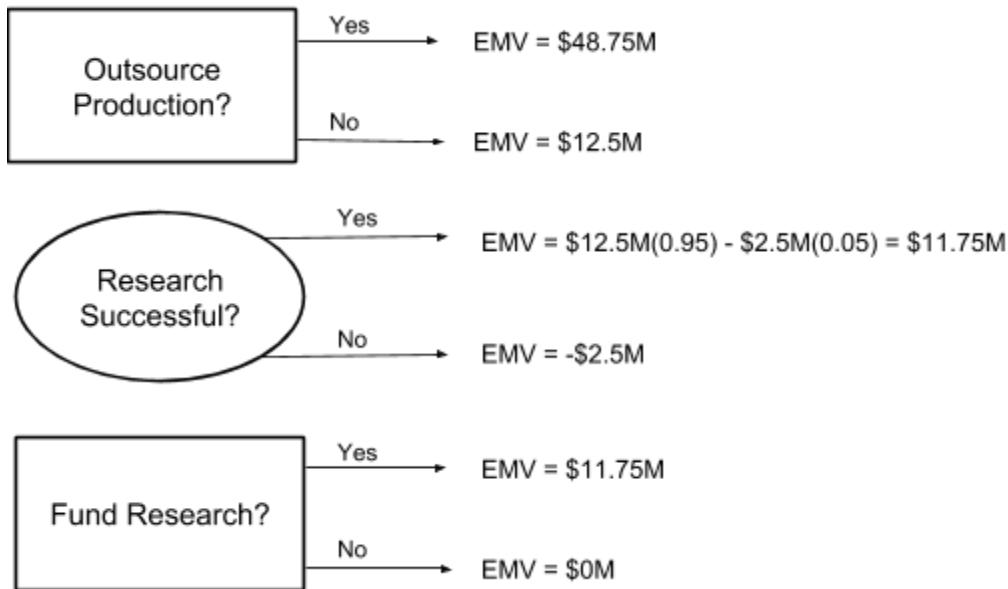
Per year revenue: From the Excel tutorial

Pricing sources:

[https://www.alibaba.com/product-detail/Factory-Directly-Sale-Soft-King-and\\_60708052486.htm  
?spm=a2700.7724857.main07.1.5f0559b2J2eCob](https://www.alibaba.com/product-detail/Factory-Directly-Sale-Soft-King-and_60708052486.htm?spm=a2700.7724857.main07.1.5f0559b2J2eCob)

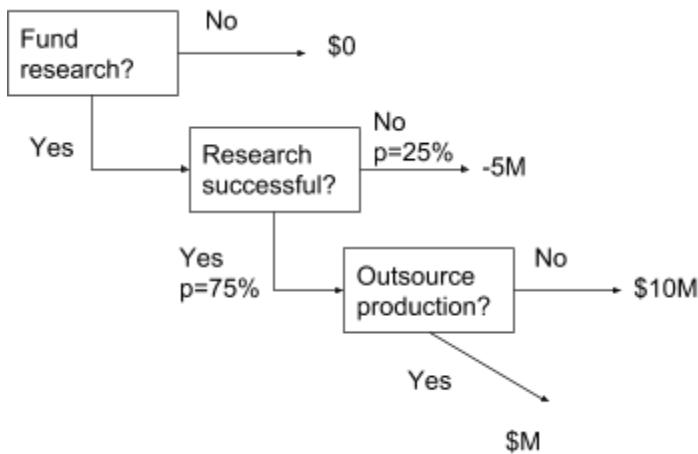
[https://www.alibaba.com/product-detail/1-5v-3v-mini-dc-motor\\_60439598262.html?spm=a2700.7724838.2017115.55.6f902ff4ZsWIQi](https://www.alibaba.com/product-detail/1-5v-3v-mini-dc-motor_60439598262.html?spm=a2700.7724838.2017115.55.6f902ff4ZsWIQi)

Fold Back the Basic Model Decision Tree to calculate payoffs associated with each decision.



After folding back the basic model decision tree, we see that by funding successful research we can achieve a minimum payout of \$11.75M. This is good research to fund since the probability of successful research is so high and the payoff nearly quadruples the investment cost.

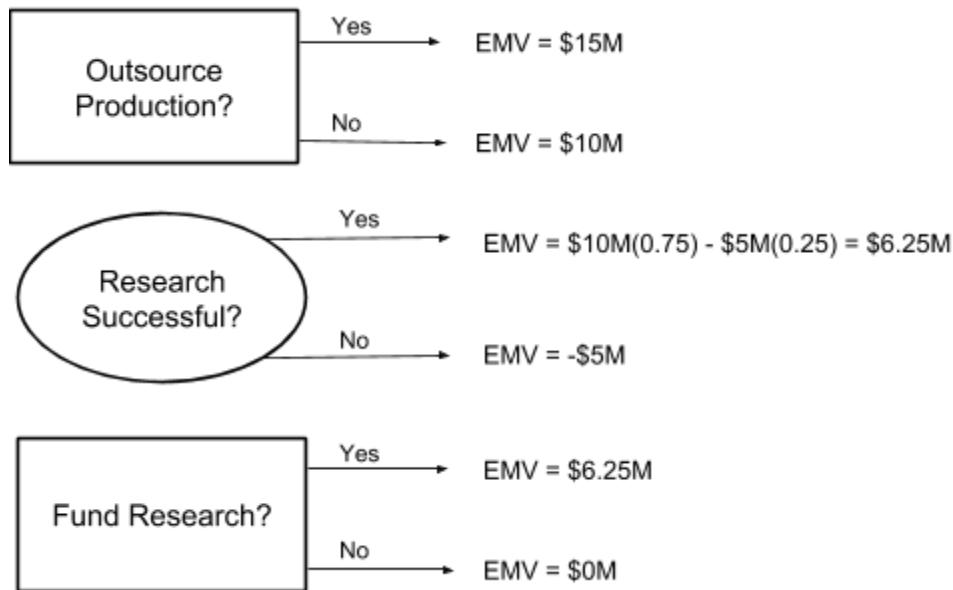
### Travel



Sonic Alert, a company that primarily focuses on developing specialized hearing solutions, is a company that has produced many products. In particular, they produced a vibrating alarm

clock(Super Shaker) for people when they are traveling at the price of \$69.99 per unit. As a basis for our project, we can determine that our outsourced research for a product like theirs to generate \$3 millions in expected monetary revenue. This is determined by multiplying \$69.99\*42,863(which is an approximate of how many units Sonic Alert sold per year).

Fold Back the Travel Model Decision Tree to calculate payoffs associated with each decision.



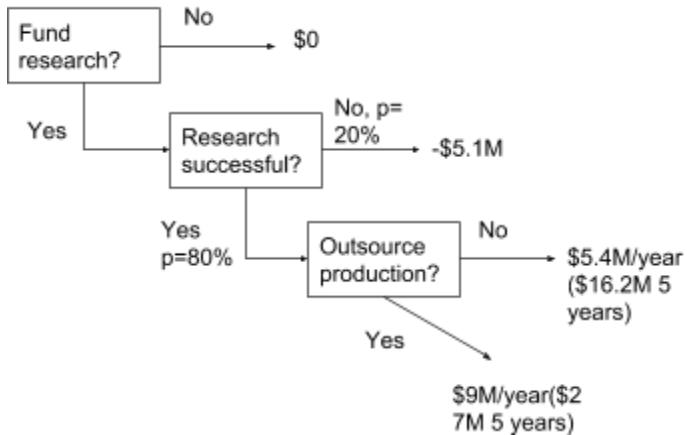
After folding back the Travel Model decision tree, we see that the minimum payout for successful research is estimated to be \$6.25M. While this is close to the expense of the research, it still exceeds that threshold and is enough to be considered a smart investment on research.

Pricing detail:

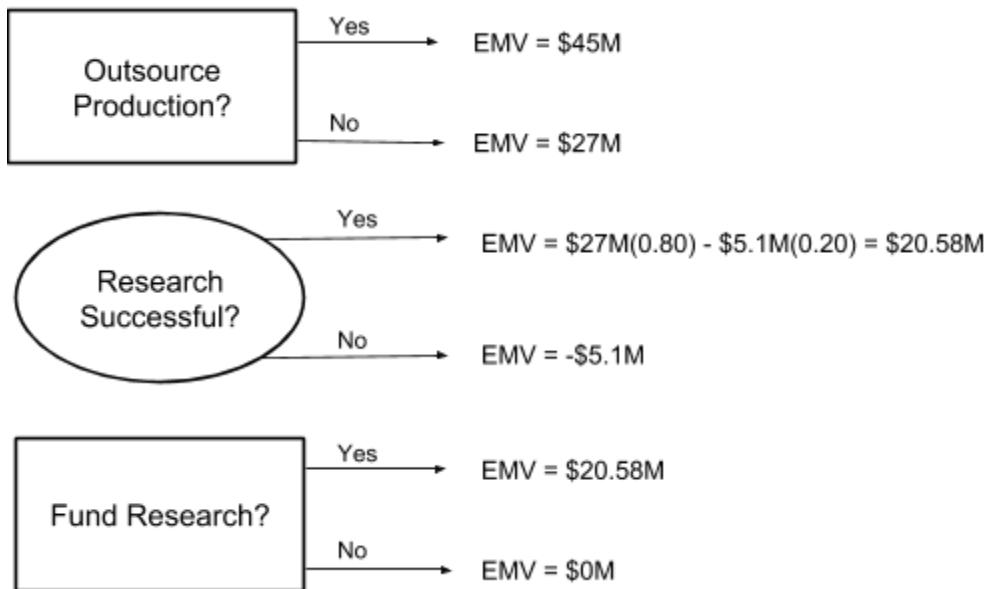
[https://www.alibaba.com/product-detail/Super-Soft-Memory-Foam-Neck-Support\\_60595314277.html?spm=a2700.7724857.main07.12.5f0559b2J2eCob&s=p](https://www.alibaba.com/product-detail/Super-Soft-Memory-Foam-Neck-Support_60595314277.html?spm=a2700.7724857.main07.12.5f0559b2J2eCob&s=p)

[https://www.alibaba.com/product-detail/1-5v-3v-mini-dc-motor\\_60439598262.html?spm=a2700.7724838.2017115.55.6f902ff4ZsWIQi](https://www.alibaba.com/product-detail/1-5v-3v-mini-dc-motor_60439598262.html?spm=a2700.7724838.2017115.55.6f902ff4ZsWIQi)

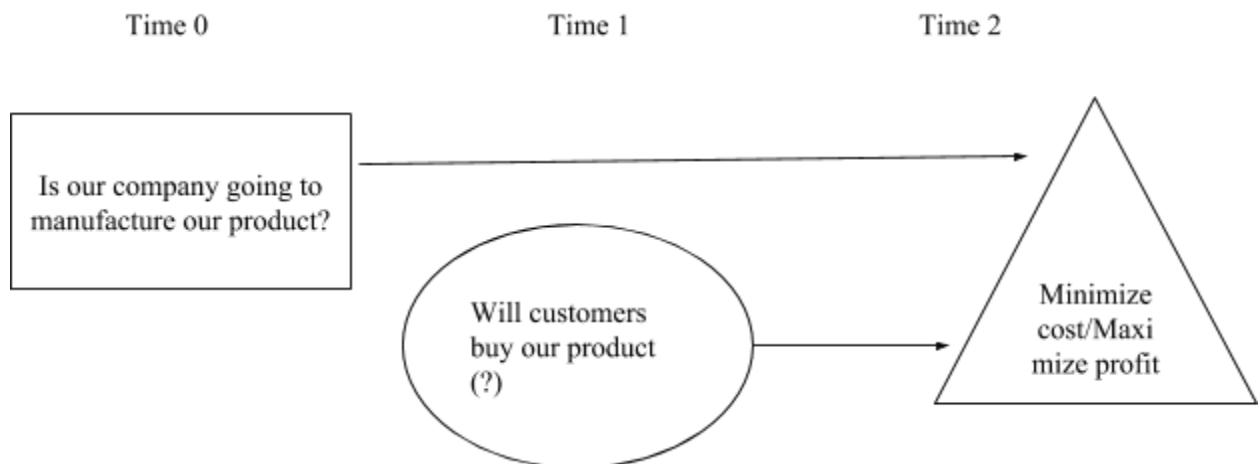
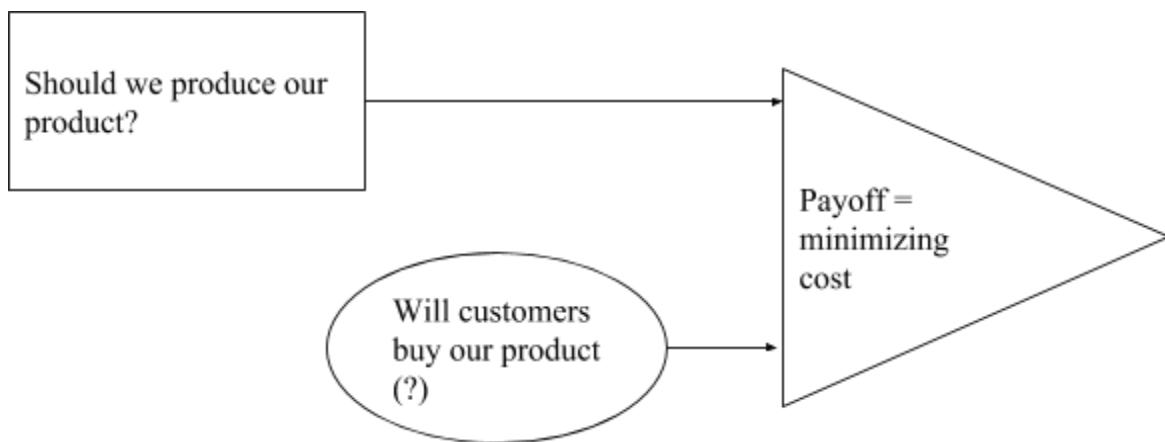
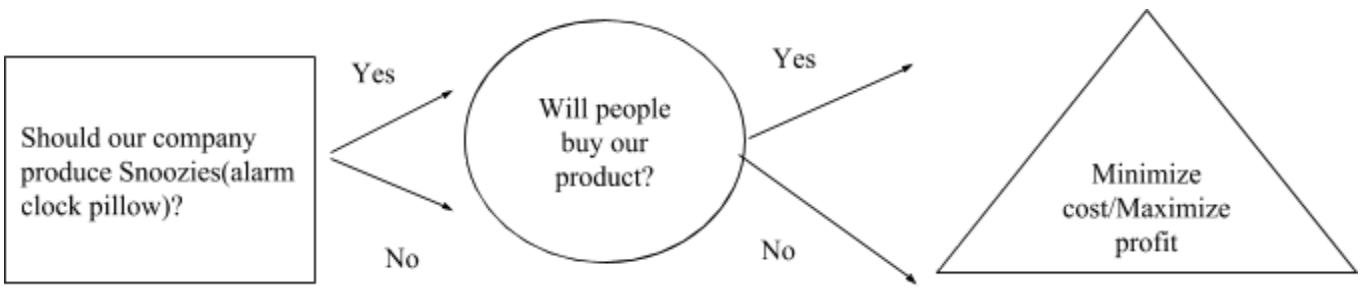
## High-End Model Decision tree of Zeeq Smart Pillow

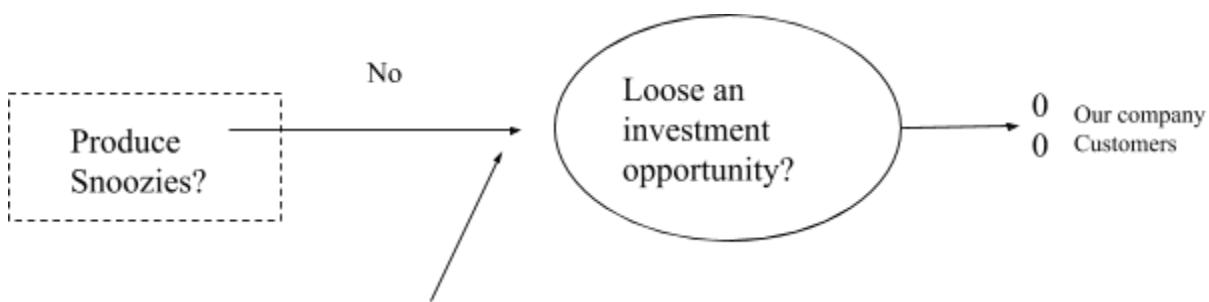


Fold Back the High-End Model Decision Tree to calculate payoffs associated with each decision.



Finally, after folding back the decision tree for the High-End model, the answer of funding the research passes with flying colors. The payoff is calculated to \$20.58M which far exceeds the investment for research of \$5.1M.

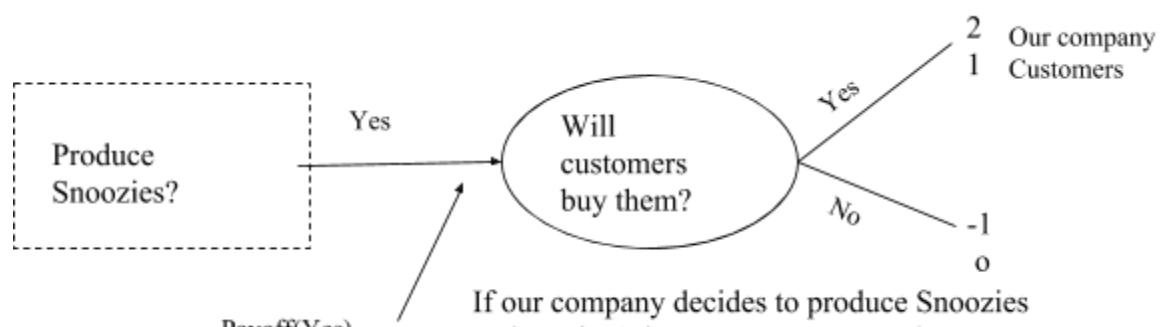




Payoff(No)

If our company does not produce our idea, then we will not gain or lose anything. We may always wonder if it would have been a profitable idea, but there is no harm in not manufacturing Snoozies.

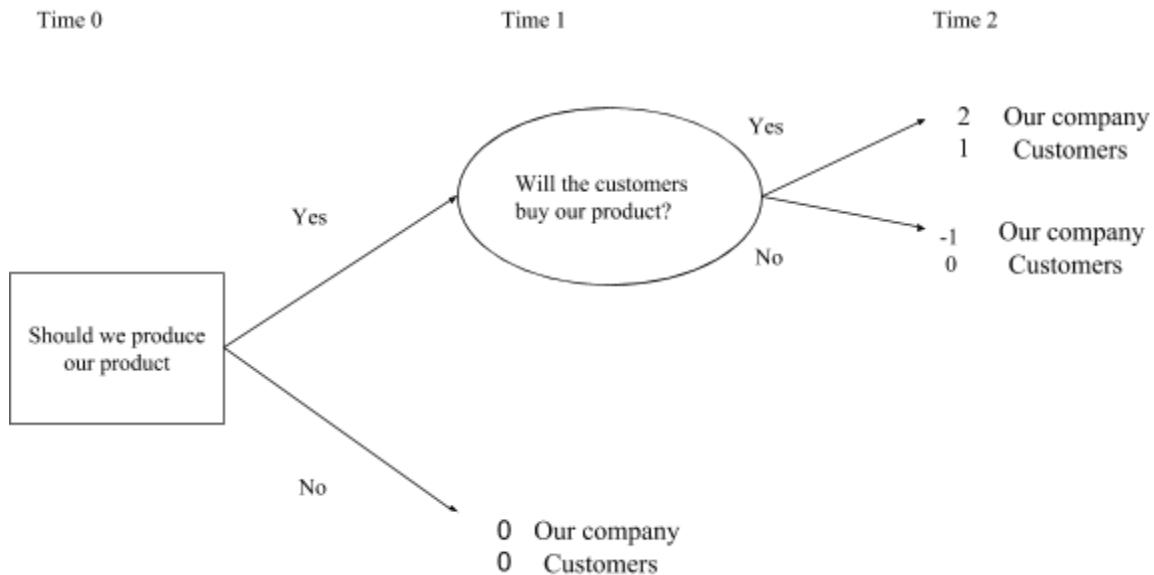
If we do not produce Snoozies then customers also gain and lose nothing.



Payoff(Yes)

If our company decides to produce Snoozies and we don't have any customers, then our payoff will be negative. All the money that our company invested would be money we would not make back.

If our company produced Snoozies and sold them to consumers, then we would be making money to cover our cost to manufacture and eventually generate profit. The consumers will also benefit because they are gaining an amazing and new household item.



In summary

We learned that our company analysis proved to be very useful, in not only strengthening our ideas, but also with ways of surpassing the functions of our competitors. After adhering to provide the best way to wake up while optimizing sleep and sleep cycles, the smart pillow will be able to cater to our targeted market with proficiency, while reducing sleeping and neurological disorders. We can also see in our decision tree that producing Snoozies could hurt our company or help increase its profitability. Our payoffs will help us decide what decision is the smartest and most logical.

## Section 7: Aggregate Project Plan

Based on the three different variations we can use, here is what investing in a combination of each one would look like:

Invest / No invest formula:

\*0 for no investment, 1 for invest in the columns 1-7 for each project followed by the cost for each one in millions in columns 8-14.

R&D	Basic Model	Travel model	High End Model	Total cost	Return on investment
0	0	0	1	5.1	39.9
0	0	1	0	5	10
0	0	1	1	10.1	49.9
0	1	0	0	2.5	46.25
0	1	0	1	7.6	86.15
0	1	1	0	7.5	56.25
0	1	1	1	12.6	96.15
1	0	0	0	2.25	17.75
1	0	0	1	7.35	57.65
1	0	1	0	7.25	27.75
1	0	1	1	12.35	67.65
1	1	0	0	4.75	64
1	1	0	1	9.85	103.9
1	1	1	0	9.75	74
1	1	1	1	14.85	113.9

R&D project cost research:

<http://blog.marketresearch.com/4-tips-for-determining-your-market-research-budget>

<https://www.investopedia.com/terms/r/research-and-development-expenses.asp>

Best aggregate project plan mix (conclusion):

If our budget is within \$15M then we can afford to take on all projects for an estimated profit of \$113.9M. If the budget only allows for \$10M we take on all project except travel pillow development for an estimated revenue of \$103.9M.

## **Section 8:House-of-Quality**

Here is a prioritized list of customer needs for bed essentials based on market research. Rate these needs on a 1-10 scale of importance.

- a. Successfully Awakens User - 10/10
- b. Sleep Comfortability is Unwavered - 7/10
- c. Device isn't distracting of its goal - 4/10
- d. Easy to maintain - 6/10
- e. Tracks sleep habits - 5/10

(Importance determined from a student survey)

Here is a list of technical metrics and assess the importance of each metric on a 1-10 scale.

- a. Material 8/10
- b. Vibration strength and effectiveness 8/10
- c. Screen 4/10
- d. Electronic connectivity 4/10
- e. Battery life 7/10
- f. Durability 9/10
- g. Electrical Component's Weight - 4/10
- h. Electrical Component's Size - 7/10

\*Importance determined from a student survey

Correlate customer needs and technical metrics using a scale.

High positive - ●

Medium positive - ○

Medium negative - ◇

High negative - ◆

No correlation -

Minimize - ▼

Maximize - ▲

Target - ✘

	Waking up	Sleep comfortably	Lack of distraction	Easy maintenance	Track sleep habits
Material (✖)		●		○	
Vibration strength and effectiveness (✖)	●	◇		◇	
Screen component (✖)			◆	◆	
Connectivity (bluetooth) (✖)			◇	◇	●
Battery life (▲)				●	
Durability (▲)		○		●	
Vitals tracking (✖)	●	●	●	●	●
Electrical Component's Weight (▼)		○			
Electrical Component's Size (▼)		○	○		

Correlate just the technical metrics between each other and place half of that matrix on the top of the diagram made in step 9.

	Material	Vibration strength	Screen component	Connectivity (bluetooth)	Battery	Durability	Vitals tracking	Electrical Component's Weight	Electrical Component's Size
Material	-	-	-	-	-	-	-	-	-
Vibration strength	◇	-	-	-	-	-	-	-	-

Screen component			-	-	-	-	-	-	-
Connectivity			○	-	-	-	-	-	-
Battery			●		-	-	-	-	-
Durability					●	-	-	-	-
Vitals tracking			●	●	◇		-	-	-
Electrical Component's Weight								-	-
Electrical Component's Size		◇				◇		●	-

Waking up		●					●		
Sleep comfortably	●	◇				○	●	○	●
Lack of distraction			◆	◇			●		●
Easy maintenance	○	◇	◆	◇	●	●	●		
Track sleep				●			●		

habits									
--------	--	--	--	--	--	--	--	--	--

Assess a set of related competing products from the viewpoint of the customer, viewpoint of the engineer, and the viewpoint of the engineering unit of measurement for technical benchmarking.

Product:	Customers:	Engineers:	Engineering Unit:
Smart Shaker (iLuv)	Shaker not strong enough for deaf, power cord too short, good for traveling, multiple vibration settings, app isn't very useful.	Shake and/or alarm for waking options, connects via bluetooth to phone, multiple alarm options, long battery life, small device	<ul style="list-style-type: none"> <li>• 0.15 lbs</li> <li>• 3.5" x 7.9" x 3.5"</li> <li>• Micro USB cable</li> <li>• iOS/Android compatibility</li> <li>• Up to a month of charge</li> </ul>
Pillow by Neybox	Compares sleep cycles, offers sleep recommendations, records what noises influence sleep cycle, optimal wakeup time option.	Sleep tracking and analysis, Sleep sound recordings, alarm clock, sleep recommendations	<ul style="list-style-type: none"> <li>• Phone app (only iOS compatible)</li> <li>• Size = User's iPhone Dimensions</li> </ul>

Set customer needs and technical metric targets for your project.

<i>Customer Needs:</i>	<i>Technical Metrics Target:</i>
Waking up	Vibration strength and effectiveness
Sleeping comfortably	Soft material used, Small Electrical Components
Easy to maintain	Removable clock
Reliable	Battery life, Electronic Connectivity

## **Section 9: Conceptual Design**

### **Section 9.1: Reverse Engineering Similar Products using FAST Diagrams**

Similar existing products and reverse engineer them using FAST

#### 1. [1] Smart Shaker by iLuv

##### a. How does the product work?

- i. This small round alarm clock provides two waking options (Alarm and Shake). The device can be placed either on the bed or under a pillow for proper use. Connect wirelessly via bluetooth to a smart device to set-up the desired alarm/shake combo and time.

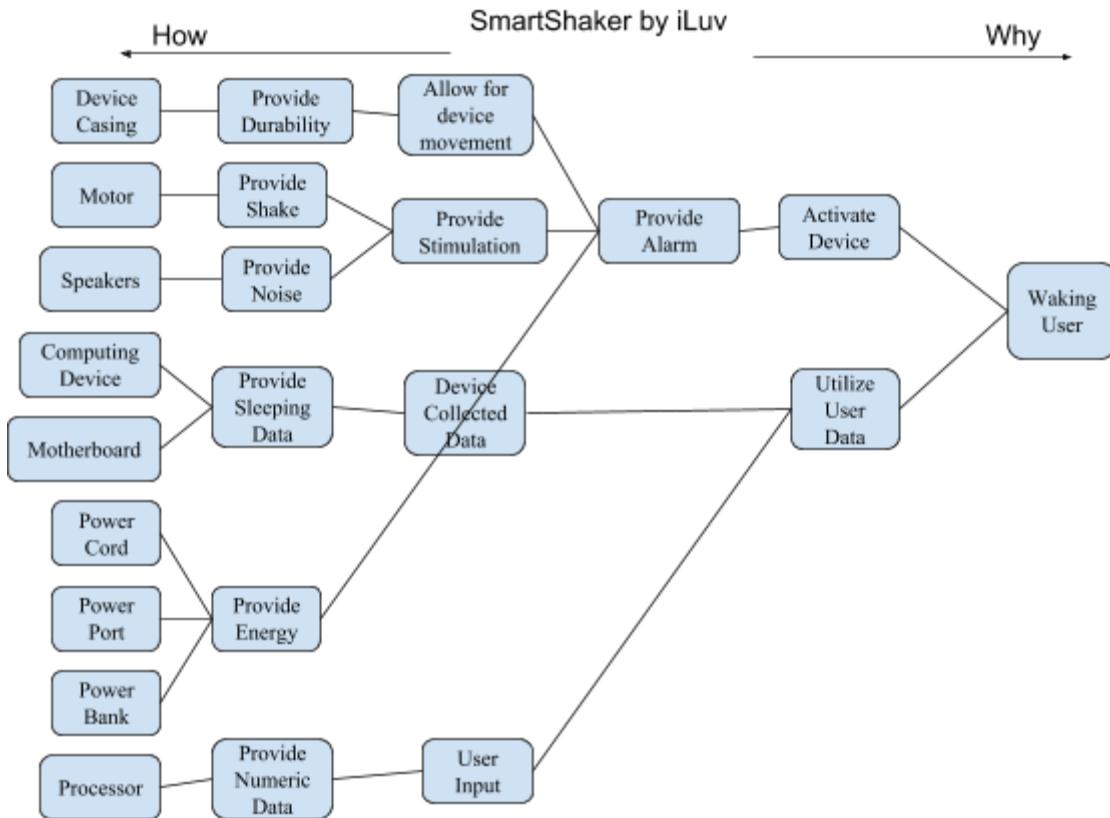
Make a list of important subsystems and components

##### a. Subsystems

- i. Device casing - protects hardware
- ii. Motor - shakes entire device
- iii. Power Bank - powers technical components in device
- iv. Computing Device - computes information that device records
- v. Speakers - makes noise for alarm

##### b. Components

- i. Plastic shell
- ii. Power Cord
- iii. Power Port
- iv. Motherboard
- v. Processor

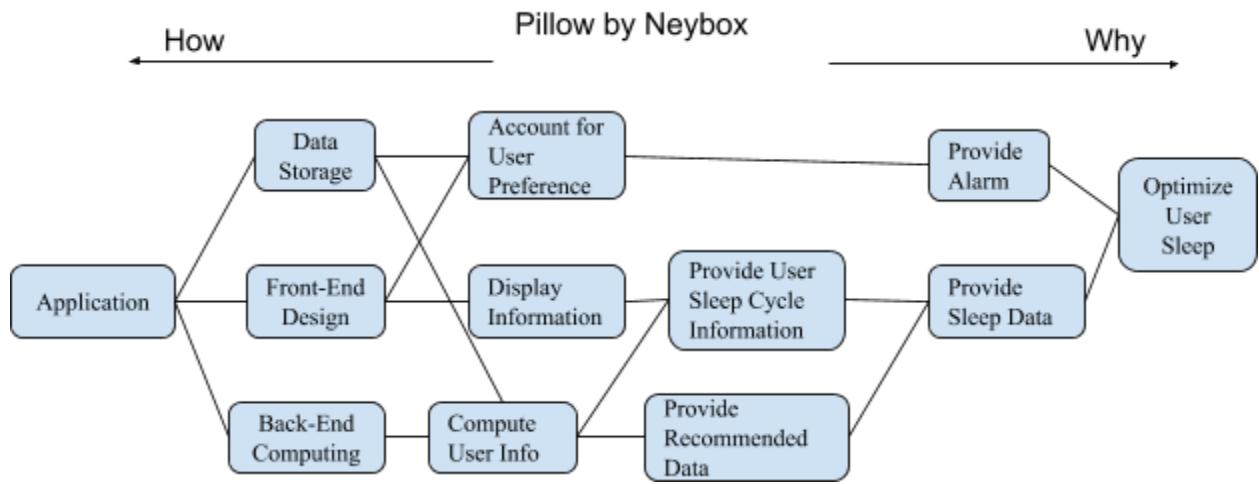


[2] Pillow by Neybox

- How does the product work?
  - This app runs on the user's apple device and can measure sleep cycles, provide sleeping recommendations, record sleeping audio (for further sleep analysis), and provide an alarm clock to wake up at a specific time or at recommended optimal awakening time. The user places the phone with the app running on the bed as he/she sleeps. Additionally, a smartwatch can be added to analyze heart rate and even more precise information about sleep movement.

Make a list of important subsystems and components

- Subsystems
  - Application - provides primary user interface
- Components
  - Data Storage
  - Front-End design
  - Back-End computing



After reverse engineering two specific but relevant products, we can see the exact elements that allow our competitors to excel in revolutionizing sleep. By combining and improving upon elements outlined, we can better develop our product and ultimately outperform the competition.

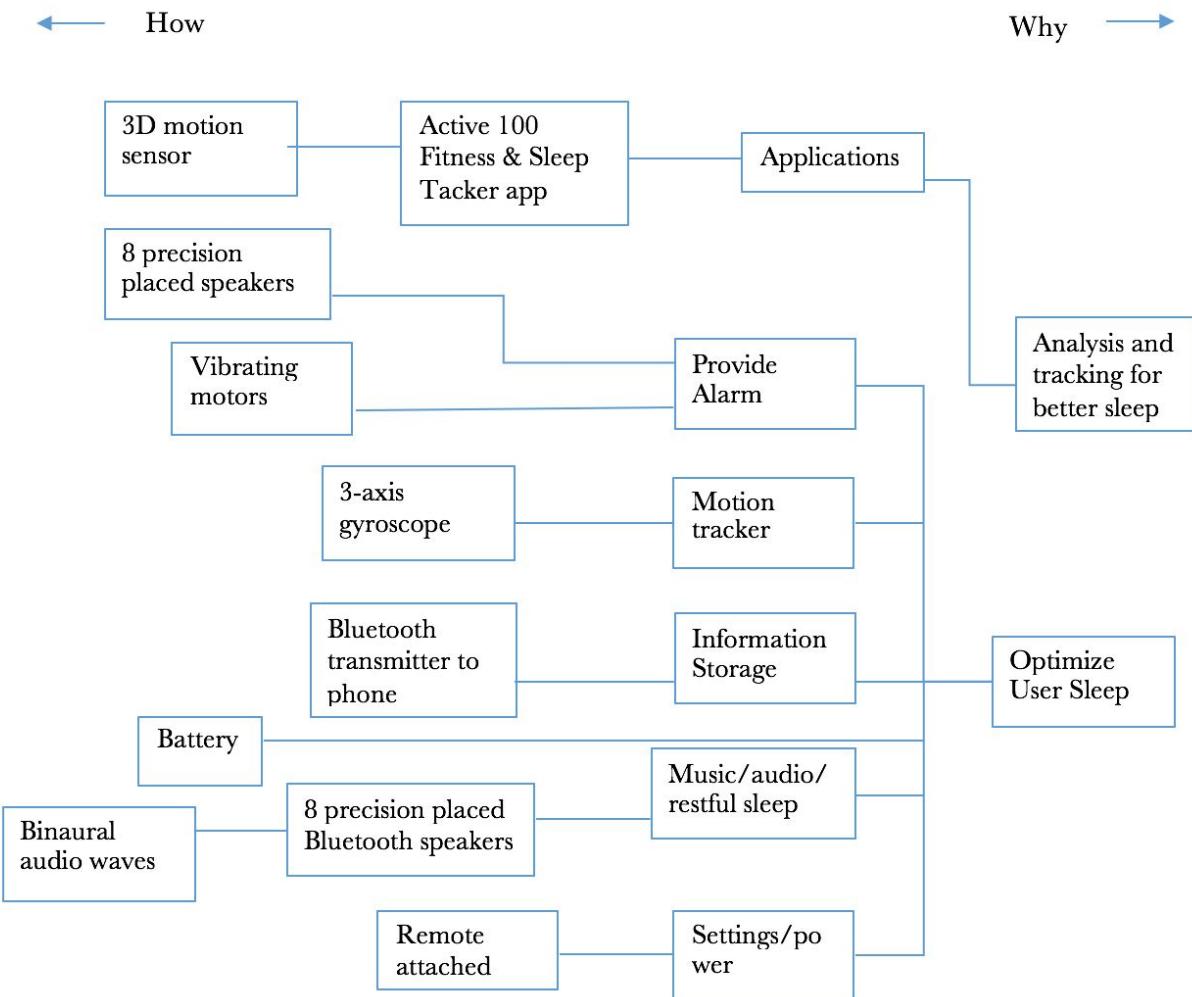
### [3] Zeeq Smart Pillow

- How does the product work?
  - Functions:
    - Stop snoring
      - Decibel-tuned microphones would monitor snoring intensity
        - Zeep vibrates, encouraging users to switch positions to open constricted air ways
    - Music & Audio
      - 8 built-in speakers connected wirelessly to bluetooth devices, with a remote attached - only users will be able to hear the music without disturbing others in the room
        - Music Sleep timer - automatically shuts off music & audio at set times by user
      - Remote attached for volume & power control
      - 8 precision placed wireless speakers
      - Binaural audio waves technology promoting restful sleep
    - Sleep Tracker
      - Sleep tracker sensors tracks:
        - Snoring volume
        - Sleep duration
        - Sleep movements
    - Sleep Analysis

- a. Analysis of:
  - i. Sleep cycles
  - ii. Sleep duration
  - iii. Snoring volume & restfulness movement
- b. Provided in a daily report, tracking sleeping habits in a long-term view
- c. Using 3D motion sensor
- 5. Smart Home Compatible
  - a. Connects to smart products (smart home), and Amazon Echo for sleep reports
- 6. Smart Alarm
  - a. Wakes users up at the optimal time in sleep cycle
- 7. Materials
  - a. Tencel Lyocell Fabric Pillow Cover
    - i. Soft, hypoallergenic fibers
    - ii. Inhibits bacteria growth
    - iii. Offer moisture-wicking temperature control
  - b. Removable Shredded Memory Foam Filling
    - i. Adds memory foam/comfort fill for more comforts
    - ii. Comfort foam outer shell
- 8. 2-week battery Life
  - a. Dual Slot USB Charger
  - b. Charging cable
- 9. Application
  - a. Connects through the Active 100 Fitness & Sleep Trackers
- b. Zeeq list of important subsystems and components
  - i. Subsystems:
    1. Vibration (Alarm, prevent snoring)
    2. Sound Alarm
    3. Microphone to track snoring/movement
    4. Movement tracking
    5. Restful sleeping technology
    6. Music/Audio
    7. Connects to phone & Amazon echo
  - ii. Components
    1. Application - Active 100 Fitness & Sleep Tracker app
    2. 2 adjustable Vibration Motors
    3. 2-week long battery
    4. Motion tracker - 3 axis gyroscope

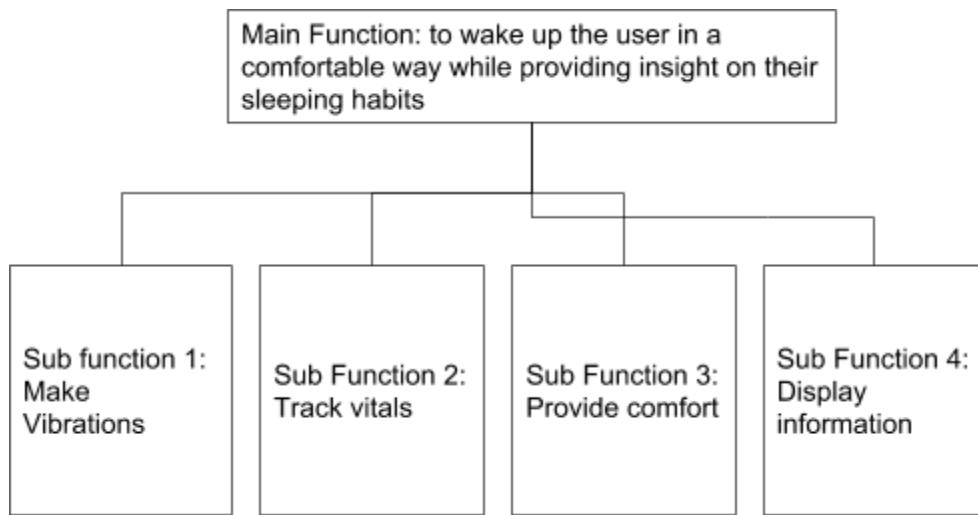
5. Speakers - 8 precision placed wireless bluetooth speakers
  6. Microphones - Decibel tuned microphone monitors
  7. Remote - with power & volume

Zeeq by rem-fit

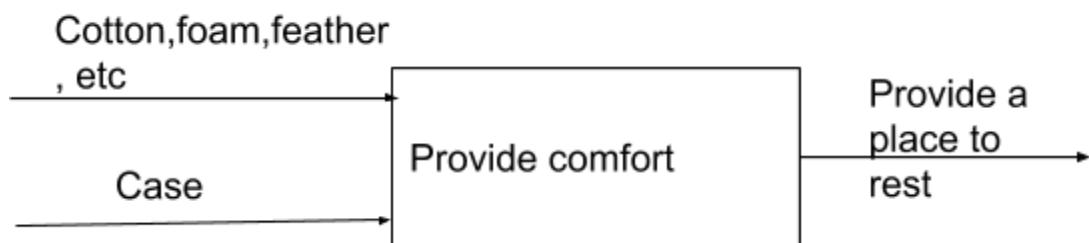
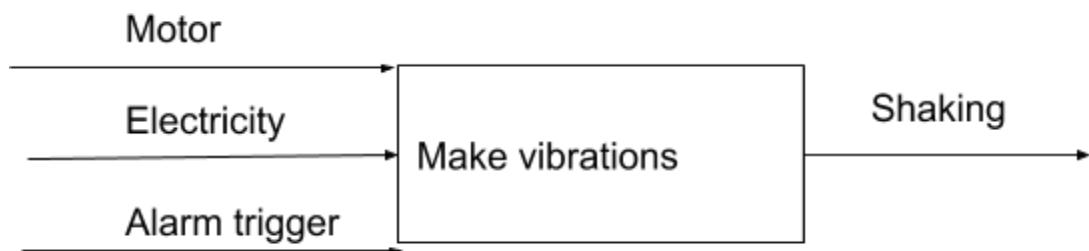


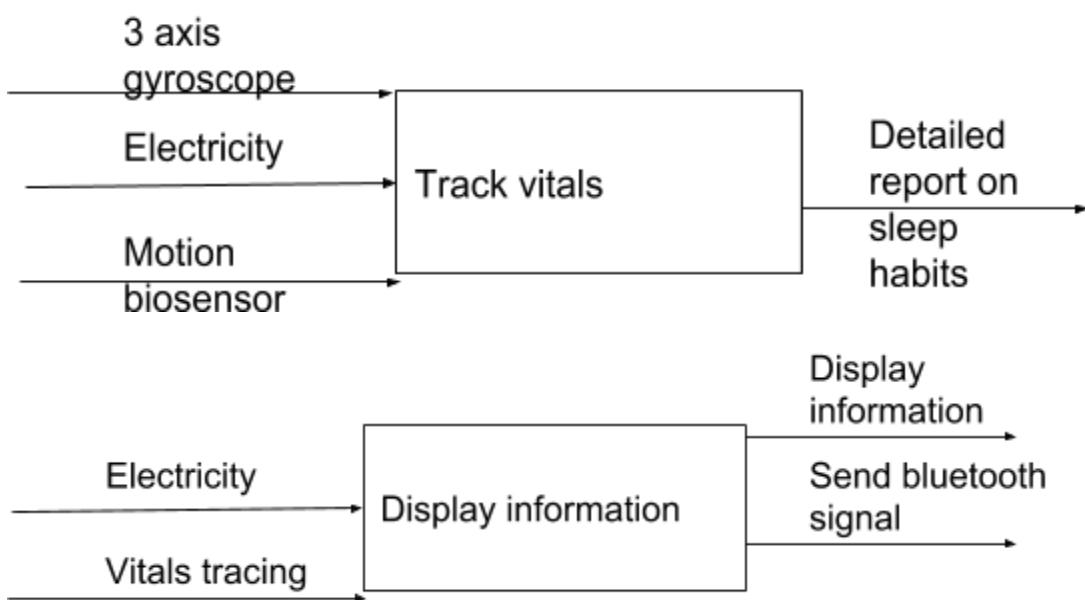
## Section 9.2: Determine the Sub-Functions

Function structure diagram for alternative design concepts:



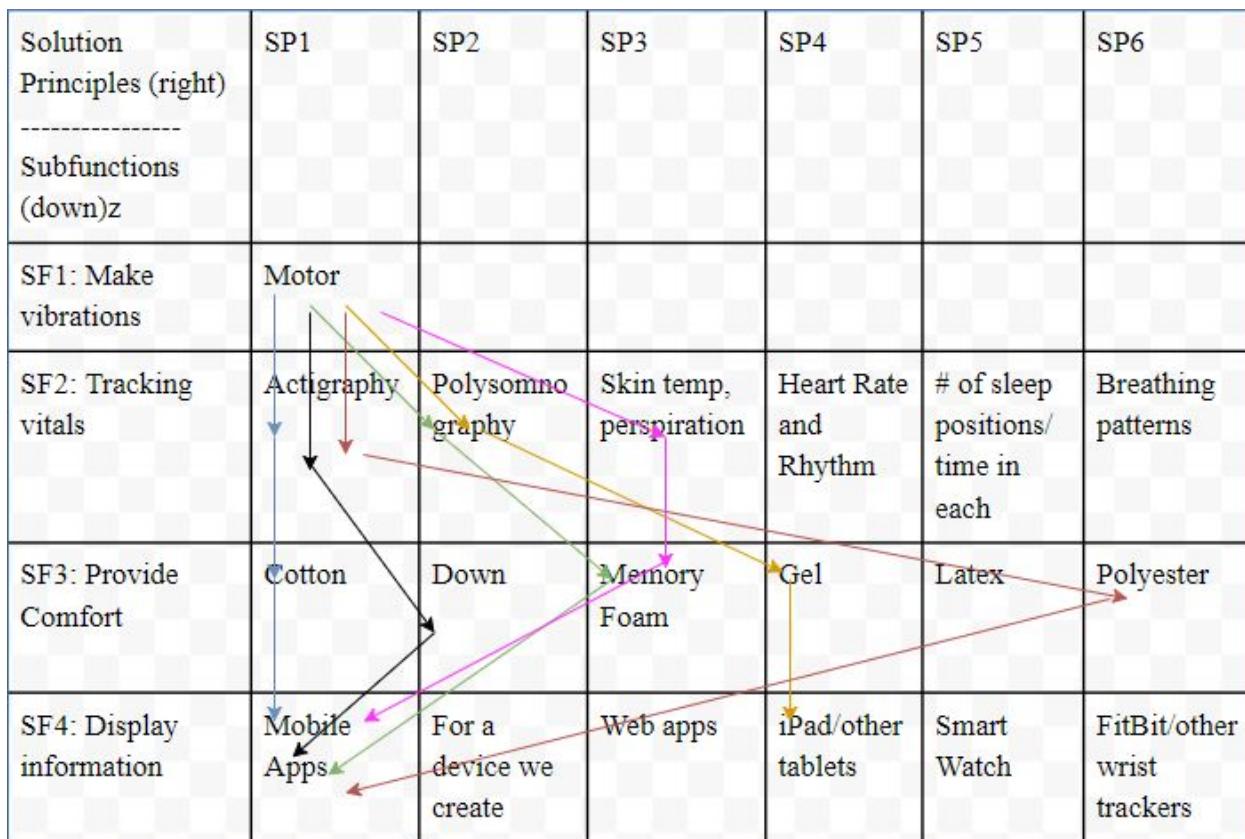
Sub functions breakdown:





### Section 9.3: Morphological Matrix

Morphological Matrix Key:	Concept 1: black	Concept 2: blue	Concept 3: green	Concept 4: orange	Concept 5: red	Concept 6: pink
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Conceptual Designs:

Concept 1:

We use a motor to cause the pillow to vibrate, track the user's vitals using actigraphy, use down as the material, and develop mobile apps for the user to see data about their sleep habits. Using down as the pillow material raises the price of the pillow since down is a more expensive material, but all other aspects of the pillow are well developed and relatively cheap. Actigraphy technology is able to measure how long the user is asleep, but not the stages (REM, deep, etc) of that sleep. This concept works well for people who want high quality pillow that works well as an alarm clock, but aren't concerned with the pillow's sleep tracking ability.

Concept 2:

We use a motor to cause the pillow to vibrate, track the user's vitals using actigraphy, use cotton as the material, and develop mobile apps for the user to see data about their sleep habits. This concept would be marketed as a cheaper version of the pillow. Actigraphy technology is well developed and relatively cheap, cotton is one of the cheapest pillow materials, and the other solution principles used cost very little. Developing mobile apps is more beneficial than developing web apps as most people have a smartphone, and people are more likely to use a smartphone app to check their sleep habits than a web app.

Concept 3:

We use a motor to cause the pillow to vibrate, track the user's vitals using polysomnography, use memory foam as the material, and develop mobile apps for the user to see data about their sleep habits. This concept would be marketed as a high quality version of the pillow. Memory foam is a high quality material to make the pillow with, and polysomnography is the gold standard of sleep tracking technology. The issue with this concept would be implementing the polysomnography technology as multiple different aspects of the user's sleep have to be tracked. Thus, there would be a high chance of technological failure while developing the pillow.

Concept 4:

We will use a motor to cause the pillow to vibrate, polysomnography to track the user's vitals, gel as the pillow's material, and develop apps that work for both Android and iOS. Some people prefer the comfortness of gel however the material containing the gel would have to be very durable so it doesn't pop and leak all over the user's head and bed.

Concept 5:

We will use a motor to cause the pillow to vibrate, actigraphy to track sleeping patterns, polyester for the pillow's material, and mobile applications to track it through phones. This will be another addition to the cheaper model of the pillow. Polyester is one of the standard materials for pillows and actigraphy is well developed and easy to get.

Concept 6:

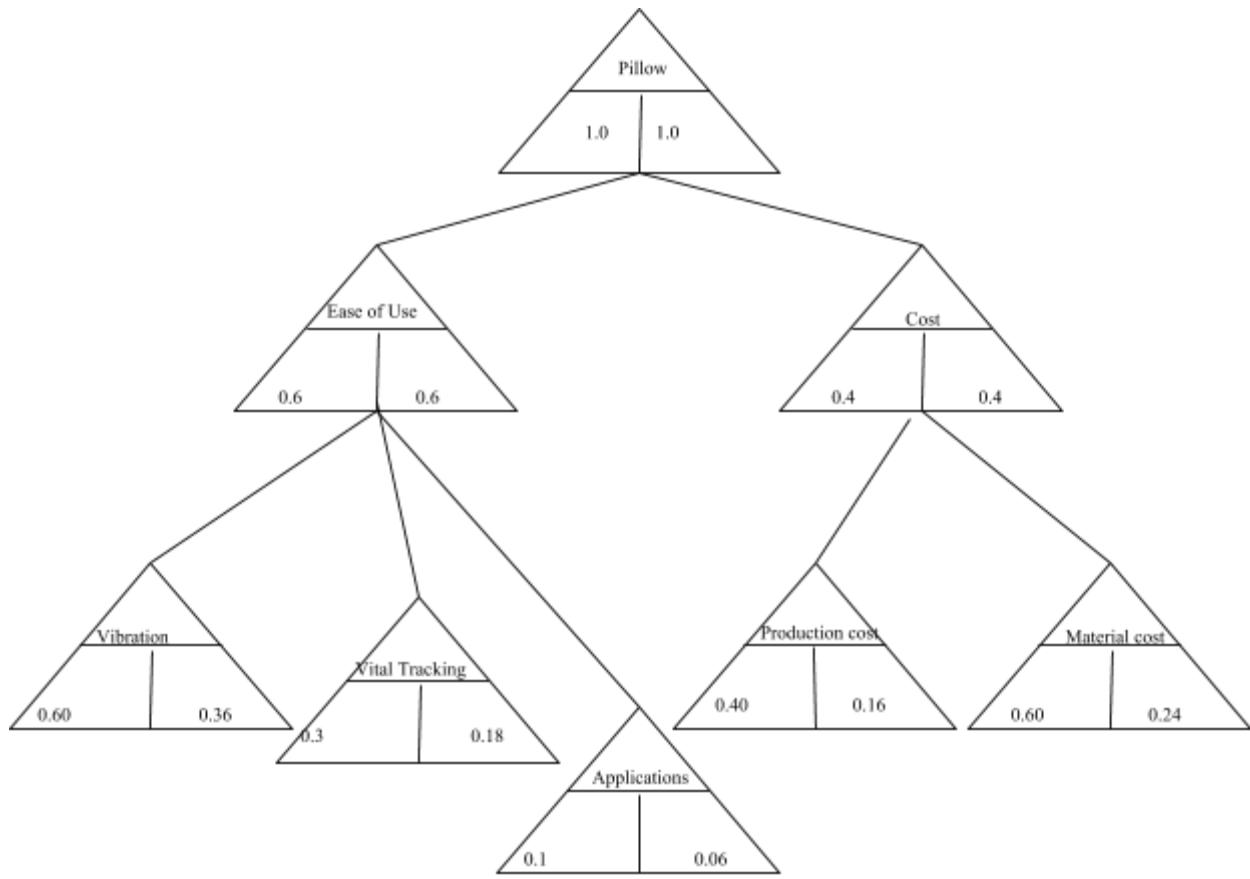
We will use a motor to cause the pillow to vibrate, skin temp monitor, memory foam as the material, and mobile apps to control/monitor yourself. Through a skin temp monitor, this pillow could have a functional temperature control, controlling the temperature of the pillow in order to provide you warm or cool temperatures for your head. This pillow could be mid to high tier.

## Section 9.4: Criteria Chart

Criteria to evaluate how well our design concepts satisfy the user needs (design objectives) and compare:

Criteria	Absolute Weight	PD1		PD2		PD3		PD4		PD5		PD6	
		Rating	Utility	Rating	Utility	Rating	Utility	Rating	Utility	Rating	Utility	Rating	Utility
Vibration	0.36	5	1.8	4	1.44	3	1.08	2	0.72	3	1.08	2	0.72
Vital Tracking	0.18	4	0.72	5	0.9	4	0.72	1	0.18	4	0.72	2	0.36
Applications	0.06	3	0.18	4	0.24	4	0.24	3	0.18	4	0.24	3	0.18
Production Cost	0.16	3	0.45	3	0.48	4	0.64	3	0.48	5	0.8	4	0.64
Material Cost	0.24	2	0.48	3	0.72	3	0.72	4	0.96	4	0.96	5	1.2
Total	1	CU = 3.63		CU = 3.78		CU = 3.4		CU = 2.52		CU = 3.8		CU = 3.1	

## Section 9.5: Utility Function



$$0.36+0.18+0.06+0.16+0.24 = 1$$

Comparison Summary:

Best design concept and develop it into a product:

Potential design 5 seems like it fits our criteria the best with a cumulative utility value of 3.8. Therefore this concept will be our main one. This concept allows us to enter the market with a cheap product instead of entering it with a higher end one. Because the materials we use are easily available, it will be our primary focus to create a great product with what we have decided to use.

Potential design 2 is our second highest with a CU of 3.78. This will be the second concept to pursue. PD 2 is similar to PD5 in the case that the materials used are easily accessible. The switch is that PD 2 uses cotton instead of polyester so the product will have a fluffier texture when rested upon.

Results: The process allows us to understand how similar products work at a functional level and what subsystems and components are needed to perform each function. Function Structure diagrams allow us to understand what functions our product will perform, and how various inputs will be transformed into the products output. We then come up with various solution principles for each sub-function, and create different product design concepts based on the different solution principles. We then developed a utility function and used it to determine the best design concept. The product design we decided on is good enough to act on, as it is technically feasible and uses technologies that are commonly used.

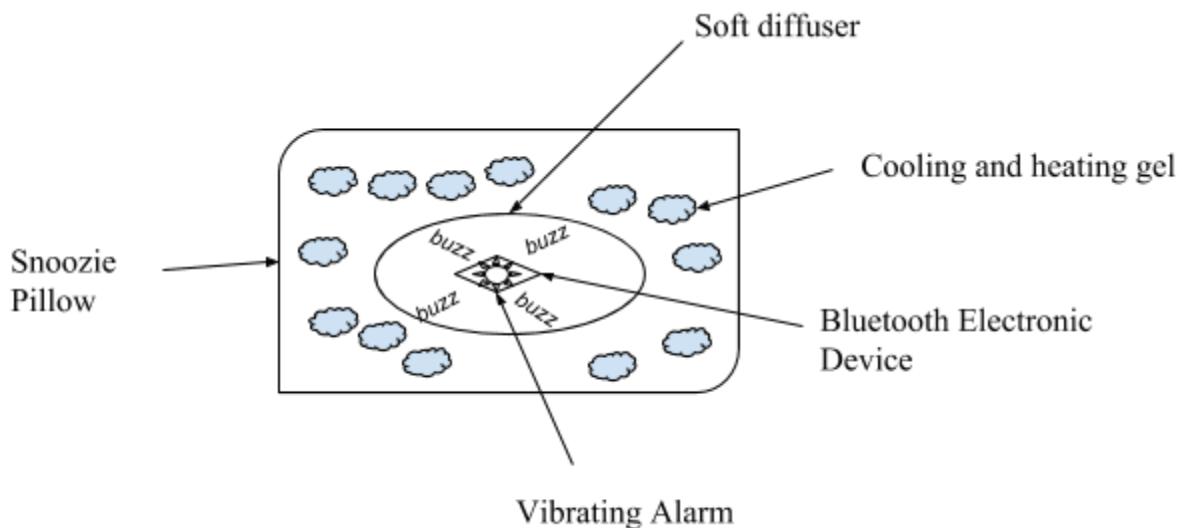
## Section 10: Product Platform Strategy

### Section 10.1: Core Technology

Defining our core technology:

Snoozie

Defining technology	Vibrating alarm clock
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### Section 10.2: Supporting Technology

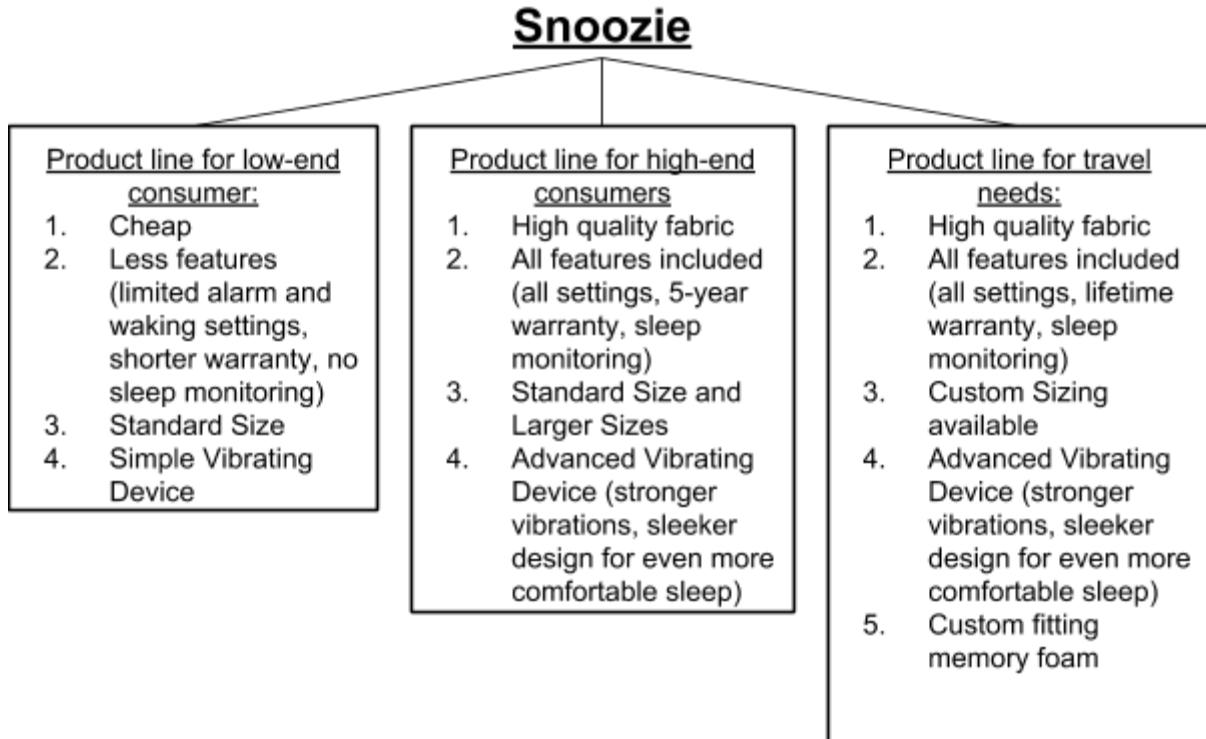
Snoozie Supporting Technology:

<i>Supporting technology</i>	<i>Purpose</i>
Vibrating Device	To vibrate pillow.
Bluetooth Electronics	Connect to temperature monitor, heart rate monitor, and application in order to set up alarm.
Heart Rate Monitoring Electronics	Monitors user's heart rate to help compute optimal sleep schedule and wake times.
Diffuser Pad	Prevent user from feeling Bluetooth Device and Vibrating Attachment unless it is vibrating.

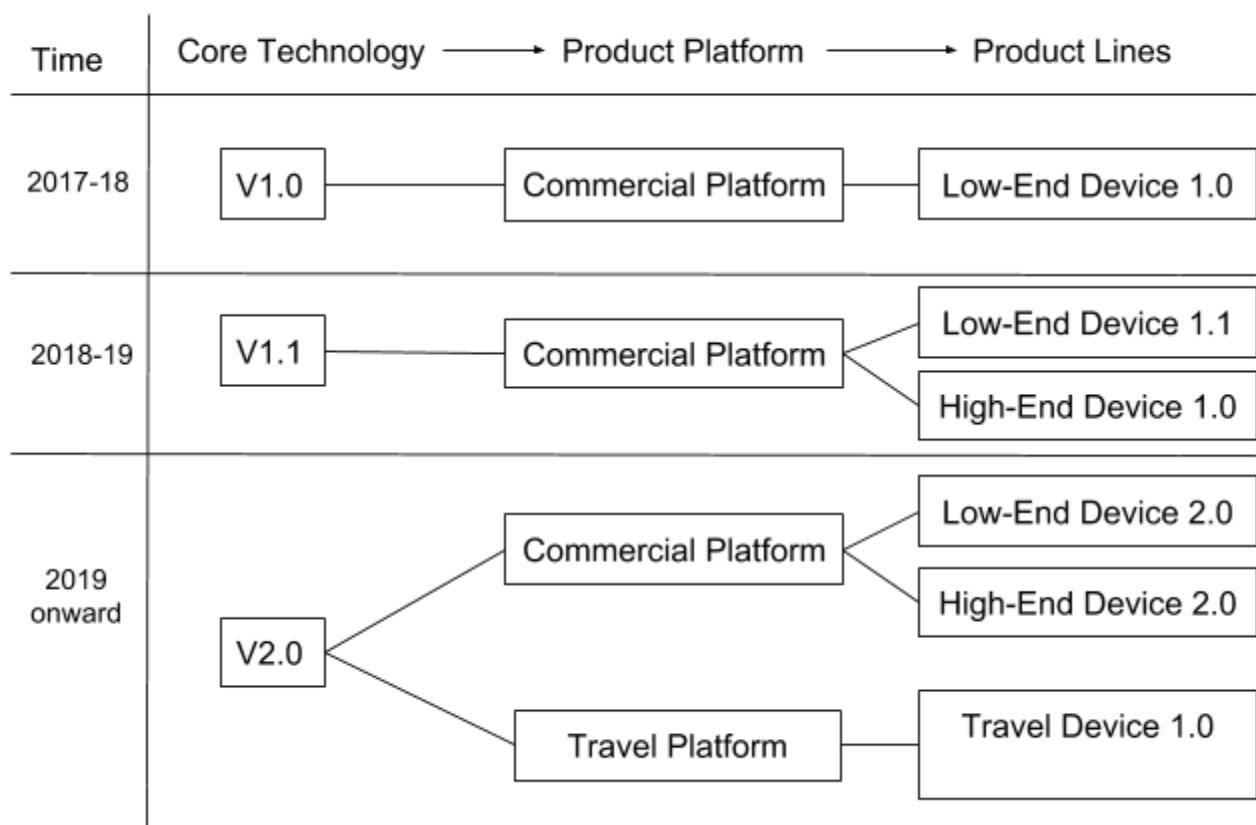
Temperature Monitor	Keeps track of user temperature to regulate temperature based on user settings.
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### Section 10.3: Product Line

Product line for Snoozie:



## Snoozie Product Line Strategy



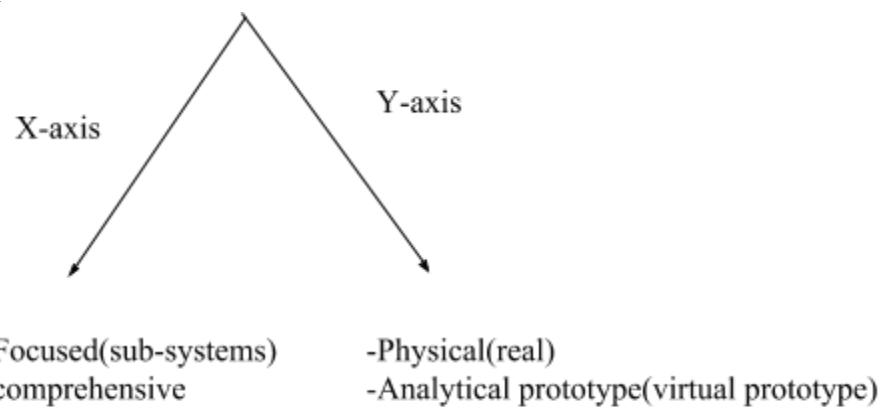
## Section 11: Prototyping Strategy

Prototyping strategy:

Most feasible design concept(s):

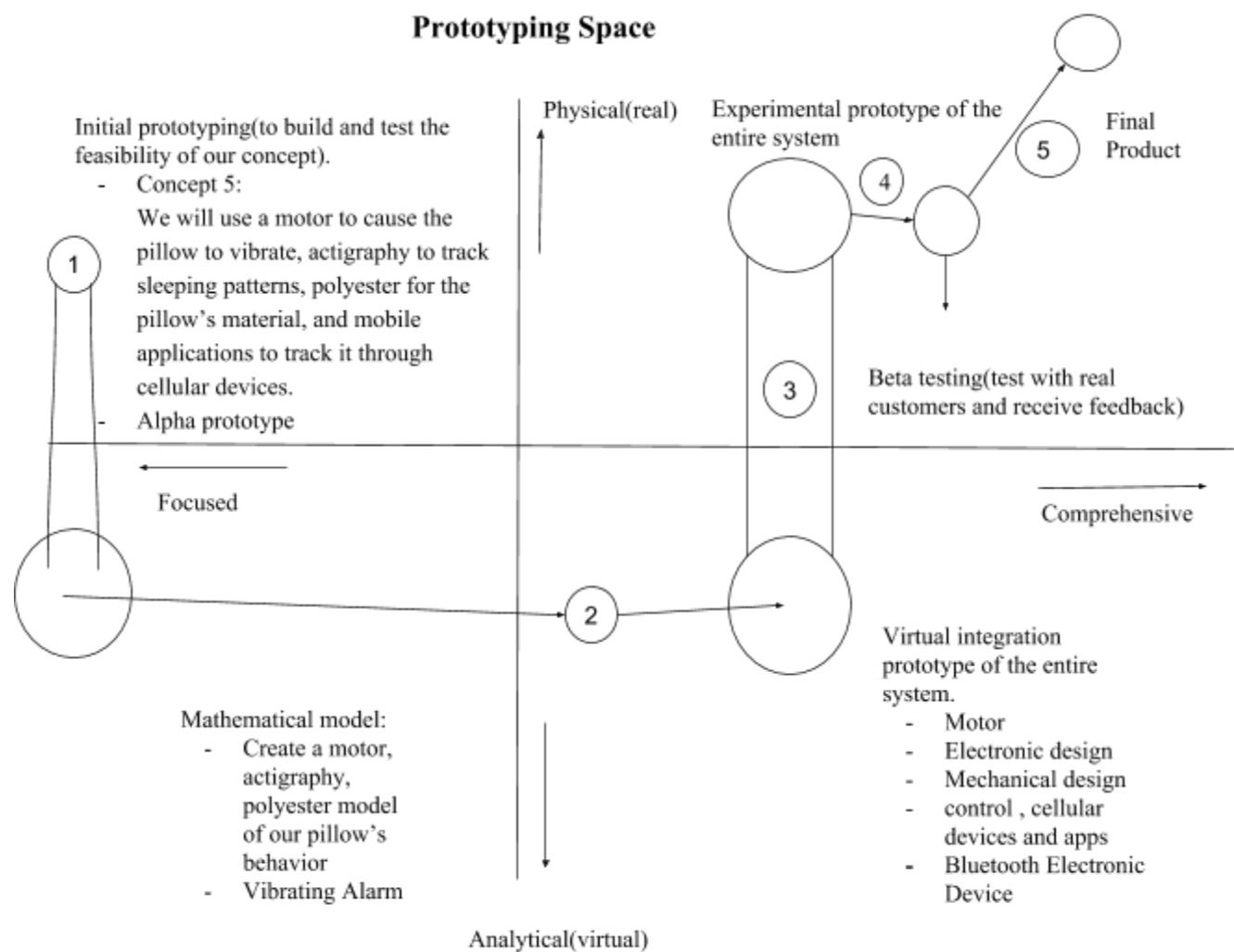
Potential design 5 seems like it fits our criteria the best with a cumulative utility value of 3.8. Therefore this concept will be our main focus. This concept allows us to enter the market with a cheap product instead of entering it with a higher end one. Because the materials we use are easily available, it will be our primary focus to create a great product with what we have decided to use.

In order to build and test our product, we will need to capture a prototyping space or path.



Therefore our path will be 1-2-3-4-5

## Section 11.1: Prototyping Space



## Section 12: Financial Strategy

Here we will put forward the pricing for our as well as other financial predictions.

### Section 12.1: NPV

Assumptions:

Because we have 3 different products we are pushing we have to do 3 different NPV analysis. Because of this we are splitting up the total marketing cost amongst them. We are planning to The ramp of cost among each is separate. The unit prices we found by researching component costs from bulk vendors such as alibaba. The breakdown for this can be found in previous sections such as the product platform.

Basic Model

Basic Model Input Parameters	
Sales and Production Volume (units/year)	500,000
Development Cost (total \$)	5,000,000
Unit Price (\$/unit)	30
Unit Production Cost (\$/unit)	18
Ramp-up cost (total \$)	500,000
Marketing & support cost (\$/year)	666,667
Annual Discount Factor (%)	10

BaseCase		Year 1				Year 2				Year 3				Year 4			
	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	(\$ values in thousands)	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
5 Development Cost		-1,250	-1,250	-1,250	-1,250												
7 Ramp-up cost					-250	-250											
3 Marketing & support cost						-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
9 Production cost							-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	
0 Production volume							125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	
1 Unit Production cost							0	0	0	0	0	0	0	0	0	0	
2 Sales Revenue							3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	
3 Sales volume							125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	
4 Unit price							0	0	0	0	0	0	0	0	0	0	
6 Period Cash Flow		-1,250	-1,250	-1,250	-1,500	-417	1,333	1,333	1,333	1,333	1,333	1,333	1,333	1,333	1,333	1,333	
7 PV Year1, r=10%		-1,250	-1,220	-1,190	-1,393	-377	1,178	1,150	1,122	1,094	1,068	1,042	1,016	991	967	944	921
9 Project NPV, \$		6,063															

We have decided to price this at \$30 to slightly undercut similar products such as the iLove. We are expecting this model to sell relatively well at 500K units, for an NPV of a little over \$6M  
Sensitivity Analysis

Travel model

<b>Tavel model Input Parameters</b>													
Sales and Poduction Volume (units/year)													300,000
Development Cost (total \$)													5,000,000
Unit Price (\$/unit)													35
Unit Productions Cost (\$/unit)													18
Ramp-up cost (total \$)													500,000
Marketing & support cost (\$/year)													666,667
Annual Discount Factor (%)													10

BaseCase	Year 1				Year 2				Year 3				Year 4				
	period (\$ values in thousands)	1 Q1	2 Q2	3 Q3	4 Q4	5 Q1	6 Q2	7 Q3	8 Q4	9 Q1	10 Q2	11 Q3	12 Q4	13 Q1	14 Q2	15 Q3	16 Q4
Development Cost	-1,250	-1,250	-1,250	-1,250													
Ramp-up cost					-250												
Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
Production cost						-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	
Production volume						75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	
Unit Production cost						0	0	0	0	0	0	0	0	0	0	0	
Sales Revenue						2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	
Sales volume						75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	
Unit price						0	0	0	0	0	0	0	0	0	0	0	
Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	
PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	980	956	932	910	887	866	845	824	804	784	765	
Project NPV, \$	4,124																

The travel model would be popular but maybe not as much as the basic model. It has similar cost and development cost as the basic model and yields an NPV of \$4.1M.

High end model

<b>High end Input Parameters</b>	
Sales and Poduction Volume (units/year)	50,000
Development Cost (total \$)	5,000,000
Unit Price (\$/unit)	300
Unit Productions Cost (\$/unit)	70
Ramp-up cost (total \$)	500,000
Marketing & support cost (\$/year)	666,667
Annual Discount Factor (%)	10

BaseCase																	
period (\$ values in thousands)	Year 1				Year 2				Year 3				Year 4				
	1 Q1	2 Q2	3 Q3	4 Q4	5 Q1	6 Q2	7 Q3	8 Q4	9 Q1	10 Q2	11 Q3	12 Q4	13 Q1	14 Q2	15 Q3	16 Q4	
	Development Cost	-1,250	-1,250	-1,250	-1,250												
Ramp-up cost					-250	-250											
Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
Production cost						-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	
Production volume						12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
Unit Production cost						0	0	0	0	0	0	0	0	0	0	0	
Sales Revenue						3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	
Sales volume						12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
Unit price						0	0	0	0	0	0	0	0	0	0	0	
Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	2,708	2,708	2,708	2,708	2,708	2,708	2,708	2,708	2,708	2,708	2,708	
PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	2,394	2,335	2,278	2,223	2,169	2,116	2,064	2,014	1,965	1,917	1,870	
Project NPV, \$	17,915																

We are not expecting to sell as many units, however because similar products sell for hundreds, our high yet reasonable sales price yields the highest NPV, \$17.9M.

## Section 12.2

### Travel Model

Sales Volume for the Basic Model: +10 %

BaseCase																	
period (\$ values in thousands)	Year 1				Year 2				Year 3				Year 4				
	1 Q1	2 Q2	3 Q3	4 Q4	5 Q1	6 Q2	7 Q3	8 Q4	9 Q1	10 Q2	11 Q3	12 Q4	13 Q1	14 Q2	15 Q3	16 Q4	
	Development Cost	-1,250	-1,250	-1,250	-1,250												
Ramp-up cost					-250	-250											
Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
Production cost					-2,475	-2,475	-2,475	-2,475	-2,475	-2,475	-2,475	-2,475	-2,475	-2,475	-2,475	-2,475	
Production volume					137,500	137,500	137,500	137,500	137,500	137,500	137,500	137,500	137,500	137,500	137,500	137,500	
Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0	
Sales Revenue					4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	
Sales volume					137,500	137,500	137,500	137,500	137,500	137,500	137,500	137,500	137,500	137,500	137,500	137,500	
Unit price					0	0	0	0	0	0	0	0	0	0	0	0	
Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,483	1,483	1,483	1,483	1,483	1,483	1,483	1,483	1,483	1,483	1,483	
PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,311	1,279	1,248	1,217	1,188	1,159	1,131	1,103	1,076	1,050	1,024	
Project NPV, \$	7,356																

Sales Volume for the Basic Model: -10 %

BaseCase																	
period (\$ values in thousands)	Year 1				Year 2				Year 3				Year 4				
	1 Q1	2 Q2	3 Q3	4 Q4	5 Q1	6 Q2	7 Q3	8 Q4	9 Q1	10 Q2	11 Q3	12 Q4	13 Q1	14 Q2	15 Q3	16 Q4	
	Development Cost	-1,250	-1,250	-1,250	-1,250												
Ramp-up cost					-250	-250											
Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
Production cost					-2,025	-2,025	-2,025	-2,025	-2,025	-2,025	-2,025	-2,025	-2,025	-2,025	-2,025	-2,025	
Production volume					112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	
Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0	
Sales Revenue					3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	
Sales volume					112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	
Unit price					0	0	0	0	0	0	0	0	0	0	0	0	
Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,183	1,183	1,183	1,183	1,183	1,183	1,183	1,183	1,183	1,183	1,183	
PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,046	1,020	995	971	948	924	902	880	858	837	817	
Project NPV, \$	4,770																

## Sales Volume for the Basic Model: +20 %

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1				Year 2				Year 3				Year 4			
3	period	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	Q3	Q4	Q1	Q2	Q3	Q4
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-2,700	-2,700	-2,700	-2,700	-2,700	-2,700	-2,700	-2,700	-2,700	-2,700	-2,700	-2,700
10	Production volume					150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500
13	Sales volume					150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15																	
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,633	1,633	1,633	1,633	1,633	1,633	1,633	1,633	1,633	1,633	1,633
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,444	1,408	1,374	1,341	1,308	1,276	1,245	1,214	1,185	1,156	1,128
18																	
19	Project NPV, \$																

## Sales Volume for the Basic Model: -20 %

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1				Year 2				Year 3				Year 4			
3	period	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	Q3	Q4	Q1	Q2	Q3	Q4
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-1,800	-1,800	-1,800	-1,800	-1,800	-1,800	-1,800	-1,800	-1,800	-1,800	-1,800	-1,800
10	Production volume					100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
13	Sales volume					100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15																	
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	913	891	869	848	827	807	788	768	750	731	713
18																	
19	Project NPV, \$																

## Sales Volume for the Basic Model: +30 %

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1				Year 2				Year 3				Year 4			
3	period	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	Q3	Q4	Q1	Q2	Q3	Q4
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-2,925	-2,925	-2,925	-2,925	-2,925	-2,925	-2,925	-2,925	-2,925	-2,925	-2,925	-2,925
10	Production volume					162,500	162,500	162,500	162,500	162,500	162,500	162,500	162,500	162,500	162,500	162,500	162,500
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875
13	Sales volume					162,500	162,500	162,500	162,500	162,500	162,500	162,500	162,500	162,500	162,500	162,500	162,500
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15																	
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,576	1,538	1,500	1,464	1,428	1,393	1,359	1,326	1,294	1,262	1,231
18																	
19	Project NPV, \$																

## Sales Volume for the Basic Model: -30 %

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1				Year 2				Year 3				Year 4			
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	(\$ values in thousands)	Q1	Q2	Q3	Q4												
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-1,575	-1,575	-1,575	-1,575	-1,575	-1,575	-1,575	-1,575	-1,575	-1,575	-1,575	-1,575
10	Production volume					87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625
13	Sales volume					87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15																	
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	883	883	883	883	883	883	883	883	883	883	883
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	781</										

## Unit Price for the Basic Mode: +10%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1			Year 2			Year 3			Year 4						
3	period	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	Q3	Q4	Q1	Q2	Q3	Q4
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250
10	Production volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125
13	Sales volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,708	1,708	1,708	1,708	1,708	1,708	1,708	1,708	1,708	1,708	1,708
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,510	1,473	1,437	1,402	1,368	1,335	1,302	1,270	1,239	1,209	1,180
19	Project NPV, \$					9,295											

## Unit Price for the Basic Mode: -10%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1			Year 2			Year 3			Year 4						
3	period	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	Q3	Q4	Q1	Q2	Q3	Q4
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250
10	Production volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375
13	Sales volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	958	958	958	958	958	958	958	958	958	958	958
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	847	826	806	787	767	749	730	713	695	678	662
19	Project NPV, \$					2,831											

## Unit Price for the Basic Mode: +20%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1			Year 2			Year 3			Year 4						
3	period	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	Q3	Q4	Q1	Q2	Q3	Q4
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250
10	Production volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500
13	Sales volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,841	1,796	1,753	1,710	1,668	1,627	1,588	1,549	1,511	1,474	1,438
19	Project NPV, \$					12,527											

## Unit Price for the Basic Mode: -20%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1			Year 2			Year 3			Year 4						
3	period	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	Q3	Q4	Q1	Q2	Q3	Q4
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250
10	Production volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
13	Sales volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	583	583	583	583	583	583	583	583	583	583	583
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	516	503	491	479	467	456	445	434	423	413	403
19	Project NPV, \$					-402											

## Unit Price for the Basic Mode: +30%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1			Year 2				Year 3				Year 4				
3	period	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	Q3	Q4	Q1	Q2	Q3	Q4
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250
10	Production volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875
13	Sales volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	2,458	2,458	2,458	2,458	2,458	2,458	2,458	2,458	2,458	2,458	2,458
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	2,173	2,120	2,068	2,018	1,968	1,920	1,874	1,828	1,783	1,740	1,697
19	Project NPV, \$					15,760											

## Unit Price for the Basic Mode: -30%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1			Year 2				Year 3				Year 4				
3	period	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	Q3	Q4	Q1	Q2	Q3	Q4
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250	-2,250
10	Production volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625
13	Sales volume					125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	208	208	208	208	208	208	208	208	208	208	208
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	184	180	175	171	167	163	159	155	151	147	144
19	Project NPV, \$					-3,634											

## Travel Model

### Sales Volume for the Travel Model: +10 %

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1			Year 2				Year 3				Year 4				
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	(\$ values in thousands)	Q1	Q2	Q3	Q4												
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-1,485	-1,485	-1,485	-1,485	-1,485	-1,485	-1,485	-1,485	-1,485	-1,485	-1,485	-1,485
10	Production volume					82,500	82,500	82,500	82,500	82,500	82,500	82,500	82,500	82,500	82,500	82,500	82,500
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					2,888	2,888	2,888	2,888	2,888	2,888	2,888	2,888	2,888	2,888	2,888	2,888
13	Sales volume					82,500	82,500	82,500	82,500	82,500	82,500	82,500	82,500	82,500	82,500	82,500	82,500
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,236	1,236	1,236	1,236	1,236	1,236	1,236	1,236	1,236	1,236	1,236
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,092	1,066	1,040	1,014	990	965	942	919	896	875	853
19	Project NPV, \$					5,222											

### Sales Volume for the Travel Model: - 10%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1			Year 2				Year 3				Year 4				
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	(\$ values in thousands)	Q1	Q2	Q3	Q4												
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-1,215	-1,215	-1,215	-1,215	-1,215	-1,215	-1,215	-1,215	-1,215	-1,215	-1,215	-1,215
10	Production volume					67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					2,363	2,363	2,363	2,363	2,363	2,363	2,363	2,363	2,363	2,363	2,363	2,363
13	Sales volume					67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	981	981	981	981	981	981	981	981	981	981	981
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	867	846	825	805	785	766	748	729	712	694	677
19	Project NPV, \$					3,025											

## Sales Volume for the Travel Model: +20%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1				Year 2				Year 3				Year 4			
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	(\$ values in thousands)	Q1	Q2	Q3	Q4												
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-1,620	-1,620	-1,620	-1,620	-1,620	-1,620	-1,620	-1,620	-1,620	-1,620	-1,620	-1,620
10	Production volume					90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					3,150	3,150	3,150	3,150	3,150	3,150	3,150	3,150	3,150	3,150	3,150	3,150
13	Sales volume					90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15																	
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,363	1,363	1,363	1,363	1,363	1,363	1,363	1,363	1,363	1,363	1,363
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,205	1,176	1,147	1,119	1,092	1,065	1,039	1,014	989	965	941
18																	
19	Project NPV, \$																

## Sales Volume for the Travel Model: -20%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1				Year 2				Year 3				Year 4			
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	(\$ values in thousands)	Q1	Q2	Q3	Q4												
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-1,080	-1,080	-1,080	-1,080	-1,080	-1,080	-1,080	-1,080	-1,080	-1,080	-1,080	-1,080
10	Production volume					60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100
13	Sales volume					60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15																	
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	853	853	853	853	853	853	853	853	853	853	853
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	754	736	718	700	683	667	650	635	619	604	589
18																	
19	Project NPV, \$																

## Sales Volume for the Travel Model: +30%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1				Year 2				Year 3				Year 4			
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	(\$ values in thousands)	Q1	Q2	Q3	Q4												
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-1,755	-1,755	-1,755	-1,755	-1,755	-1,755	-1,755	-1,755	-1,755	-1,755	-1,755	-1,755
10	Production volume					97,500	97,500	97,500	97,500	97,500	97,500	97,500	97,500	97,500	97,500	97,500	97,500
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413
13	Sales volume					97,500	97,500	97,500	97,500	97,500	97,500	97,500	97,500	97,500	97,500	97,500	97,500
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15																	
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,491	1,491	1,491	1,491	1,491	1,491	1,491	1,491	1,491	1,491	1,491
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,318	1,286	1,254	1,224	1,194	1,165	1,136	1,109	1,081	1,055	1,029
18																	
19	Project NPV, \$																

## Sales Volume for the Travel Model: -30%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1				Year 2				Year 3				Year 4			
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	(\$ values in thousands)	Q1	Q2	Q3	Q4												
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-945	-945	-945	-945	-945	-945	-945	-945	-945	-945	-945	-945
10	Production volume					52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838
13	Sales volume					52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15																	
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	726	726	726	726	726	726	726	726	726	726	726
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	642	626	611	596	581	567	553	540	527	514	501
18																	
19	Project NPV, \$																

## Unit Price for the Travel Model: +10%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	BaseCase																	
2							Year 1											
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
4	(\$ values in thousands)	Q1	Q2	Q3	Q4													
6	Development Cost	-1,250	-1,250	-1,250	-1,250													
7	Ramp-up cost					-250	-250											
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
9	Production cost					-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	
10	Production volume					75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0	
12	Sales Revenue					2,888	2,888	2,888	2,888	2,888	2,888	2,888	2,888	2,888	2,888	2,888	2,888	
13	Sales volume					75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0	
15																		
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,371	1,371	1,371	1,371	1,371	1,371	1,371	1,371	1,371	1,371	1,371	
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,212	1,182	1,153	1,125	1,098	1,071	1,045	1,019	994	970		
18																		
19	Project NPV, \$					6,386												

## Unit Price for the Travel Model: -10%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	BaseCase																	
2							Year 1											
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
4	(\$ values in thousands)	Q1	Q2	Q3	Q4													
6	Development Cost	-1,250	-1,250	-1,250	-1,250													
7	Ramp-up cost					-250	-250											
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
9	Production cost					-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	
10	Production volume					75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0	
12	Sales Revenue					2,363	2,363	2,363	2,363	2,363	2,363	2,363	2,363	2,363	2,363	2,363	2,363	
13	Sales volume					75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0	
15																		
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	846	846	846	846	846	846	846	846	846	846	846	
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	748	729	712	694	677	661	645	629	614	599	584	
18																		
19	Project NPV, \$					1,861												

## Unit Price for the Travel Model: +20%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	BaseCase																	
2							Year 1											
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
4	(\$ values in thousands)	Q1	Q2	Q3	Q4													
6	Development Cost	-1,250	-1,250	-1,250	-1,250													
7	Ramp-up cost					-250	-250											
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
9	Production cost					-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	
10	Production volume					75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0	
12	Sales Revenue					3,150	3,150	3,150	3,150	3,150	3,150	3,150	3,150	3,150	3,150	3,150	3,150	
13	Sales volume					75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0	
15																		
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,633	1,633	1,633	1,633	1,633	1,633	1,633	1,633	1,633	1,633	1,633	
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,444	1,408	1,374	1,341	1,308	1,276	1,245	1,214	1,185	1,156	1,128	
18																		
19	Project NPV, \$					8,649												

## Unit Price for the Travel Model: -20%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	BaseCase																	
2							Year 1											
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
4	(\$ values in thousands)	Q1	Q2	Q3	Q4													
6	Development Cost	-1,250	-1,250	-1,250	-1,250													
7	Ramp-up cost					-250	-250											
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
9	Production cost					-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	-1,350	
10	Production volume					75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0	
12	Sales Revenue					2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	
13	Sales volume					75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0	
15																		
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	583	583	583	583	583	583	583	583	583	583	583	
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	516	503	491	479	467	456	445	434	423	413	403	
18																		
19	Project NPV, \$					-402												

Unit Price for the Travel Model: +30%

Unit Price for the Travel Model: -30%

## High-End Model

Sales Volume for the High-End: +10%

Sales Volume for the High-End: -10%

## Sales Volume for the High-End: +20%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2	Year 1																
3	Year 2																
4	(\$ values in thousands)																
5	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost							-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost							-1,050	-1,050	-1,050	-1,050	-1,050	-1,050	-1,050	-1,050	-1,050	-1,050
10	Production volume							15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
11	Unit Production cost							0	0	0	0	0	0	0	0	0	0
12	Sales Revenue							4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500
13	Sales volume							15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
14	Unit price							0	0	0	0	0	0	0	0	0	0
15	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	3,283	3,283	3,283	3,283	3,283	3,283	3,283	3,283	3,283	3,283	3,283
16	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	2,902	2,831	2,762	2,695	2,629	2,565	2,502	2,441	2,382	2,324	2,267
17	Project NPV, \$																
18		22,871															

## Sales Volume for the High-End: -20%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2	Year 1																
3	Year 2																
4	(\$ values in thousands)																
5	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost							-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost							-700	-700	-700	-700	-700	-700	-700	-700	-700	-700
10	Production volume							10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
11	Unit Production cost							0	0	0	0	0	0	0	0	0	0
12	Sales Revenue							3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
13	Sales volume							10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
14	Unit price							0	0	0	0	0	0	0	0	0	0
15	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	2,133	2,133	2,133	2,133	2,133	2,133	2,133	2,133	2,133	2,133	2,133
16	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,886	1,840	1,795	1,751	1,708	1,667	1,626	1,586	1,548	1,510	1,473
17	Project NPV, \$																
18		12,958															

## Sales Volume for the High-End: +30%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2	Year 1																
3	Year 2																
4	(\$ values in thousands)																
5	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost							-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost							-1,138	-1,138	-1,138	-1,138	-1,138	-1,138	-1,138	-1,138	-1,138	-1,138
10	Production volume							16,250	16,250	16,250	16,250	16,250	16,250	16,250	16,250	16,250	16,250
11	Unit Production cost							0	0	0	0	0	0	0	0	0	0
12	Sales Revenue							4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875
13	Sales volume							16,250	16,250	16,250	16,250	16,250	16,250	16,250	16,250	16,250	16,250
14	Unit price							0	0	0	0	0	0	0	0	0	0
15	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	3,571	3,571	3,571	3,571	3,571	3,571	3,571	3,571	3,571	3,571	3,571
16	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	3,156	3,079	3,004	2,931	2,859	2,790	2,721	2,655	2,590	2,527	2,466
17	Project NPV, \$																
18		25,349															

## Sales Volume for the High-End: -30%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2	Year 1																
3	Year 2																
4	(\$ values in thousands)																
5	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost							-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost							-613	-613	-613	-613	-613	-613	-613	-613	-613	-613
10	Production volume							8,750	8,750	8,750	8,750	8,750	8,750	8,750	8,750	8,750	8,750
11	Unit Production cost							0	0	0	0	0	0	0	0	0	0
12	Sales Revenue							2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625
13	Sales volume							8,750	8,750	8,750	8,750	8,750	8,750	8,750	8,750	8,750	8,750
14	Unit price							0	0	0	0	0	0	0	0	0	0
15	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,846	1,846	1,846	1,846	1,846	1,846	1,846	1,846	1,846	1,846	1,846
16	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,631	1,592	1,553	1,515	1,478	1,442	1,407	1,372	1,339	1,306	

## Unit Price for the High-End Model: +10%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	BaseCase																	
2		Year 1			Year 2				Year 3				Year 4					
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
4	(\$ values in thousands)	Q1	Q2	Q3	Q4													
6	Development Cost	-1,250	-1,250	-1,250	-1,250													
7	Ramp-up cost					-250	-250											
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
9	Production cost					-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875
10	Production volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125
13	Sales volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0	0
15																		
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	3,083	3,083	3,083	3,083	3,083	3,083	3,083	3,083	3,083	3,083	3,083	3,083
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	2,725	2,659	2,594	2,531	2,469	2,409	2,350	2,293	2,237	2,182	2,129	
18																		
19	Project NPV, \$																	
		21,147																

## Unit Price for the High-End Model: -10%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	BaseCase																	
2		Year 1			Year 2				Year 3				Year 4					
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
4	(\$ values in thousands)	Q1	Q2	Q3	Q4													
6	Development Cost	-1,250	-1,250	-1,250	-1,250													
7	Ramp-up cost					-250	-250											
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
9	Production cost					-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	
10	Production volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0	
12	Sales Revenue					3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	
13	Sales volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0	
15																		
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	2,333	2,333	2,333	2,333	2,333	2,333	2,333	2,333	2,333	2,333	2,333	
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	2,062	2,012	1,963	1,915	1,868	1,823	1,778	1,735	1,693	1,651	1,611	
18																		
19	Project NPV, \$																	
		14,682																

## Unit Price for the High-End Model: +20%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	BaseCase																	
2		Year 1			Year 2				Year 3				Year 4					
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
4	(\$ values in thousands)	Q1	Q2	Q3	Q4													
6	Development Cost	-1,250	-1,250	-1,250	-1,250													
7	Ramp-up cost					-250	-250											
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
9	Production cost					-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	
10	Production volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0	
12	Sales Revenue					4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	
13	Sales volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0	
15																		
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	3,458	3,458	3,458	3,458	3,458	3,458	3,458	3,458	3,458	3,458	3,458	
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	3,057	2,982	2,909	2,838	2,769	2,702	2,636	2,571	2,509	2,448	2,388	
18																		
19	Project NPV, \$																	
		24,379																

## Unit Price for the High-End Model: -20%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1			Year 2				Year 3				Year 4				
3	period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	(\$ values in thousands)	Q1	Q2	Q3	Q4												
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250	-250										
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167
9	Production cost					-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875
10	Production volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	0
12	Sales Revenue					3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
13	Sales volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	0
15																	
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,958	1,958	1,958	1,958	1,958	1,958	1,958	1,958	1,958	1,958	1,958
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-3											

## Unit Price for the High-End Model: +30%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1			Year 2				Year 3				Year 4				
3	period	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	Q3	Q4	Q1	Q2	Q3	Q4
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250											
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
9	Production cost					-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	
10	Production volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	
12	Sales Revenue					4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	
13	Sales volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	
15																	
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	3,833	3,833	3,833	3,833	3,833	3,833	3,833	3,833	3,833	3,833	
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	3,388	3,305	3,225	3,146	3,069	2,995	2,922	2,850	2,781	2,713	2,647
18																	
19	Project NPV, \$																

## Unit Price for the High-End Model: -30%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	BaseCase																
2		Year 1			Year 2				Year 3				Year 4				
3	period	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	Q3	Q4	Q1	Q2	Q3	Q4
6	Development Cost	-1,250	-1,250	-1,250	-1,250												
7	Ramp-up cost					-250											
8	Marketing & support cost					-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	-167	
9	Production cost					-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	-875	
10	Production volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
11	Unit Production cost					0	0	0	0	0	0	0	0	0	0	0	
12	Sales Revenue					2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	
13	Sales volume					12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
14	Unit price					0	0	0	0	0	0	0	0	0	0	0	
15																	
16	Period Cash Flow	-1,250	-1,250	-1,250	-1,500	-417	1,583	1,583	1,583	1,583	1,583	1,583	1,583	1,583	1,583	1,583	
17	PV Year1, r=10%	-1,250	-1,220	-1,190	-1,393	-377	1,399	1,365	1,332	1,300	1,268	1,237	1,207	1,177	1,149	1,121	1,093
18																	
19	Project NPV, \$																

## Section 12.3: Expected Profit

According to the NPV analysis, if all projects are invested in, we could expect \$17.9M for the high end model, \$4.1M for the travel model, and \$6M for the basic model. This puts expected profit at the end of four years at \$28M.

### Financial Modeling

Step 1: Create a base case financial model in Excel.

- Estimate the timing and magnitude of all relevant cash flows.
- For each quarter estimate the relevant cash flow.
- Compute the present value of the net cash flow for each quarter.
- Add up the present value for each quarter to get the Net Present Value.

Step 2: Perform a sensitivity analysis on the nominal (base case) model to understand the effect of changing input parameters in the financial model.

Step 3: Use the sensitivity analysis to understand and quantify the tradeoffs between development time, development and manufacturing costs, and price.

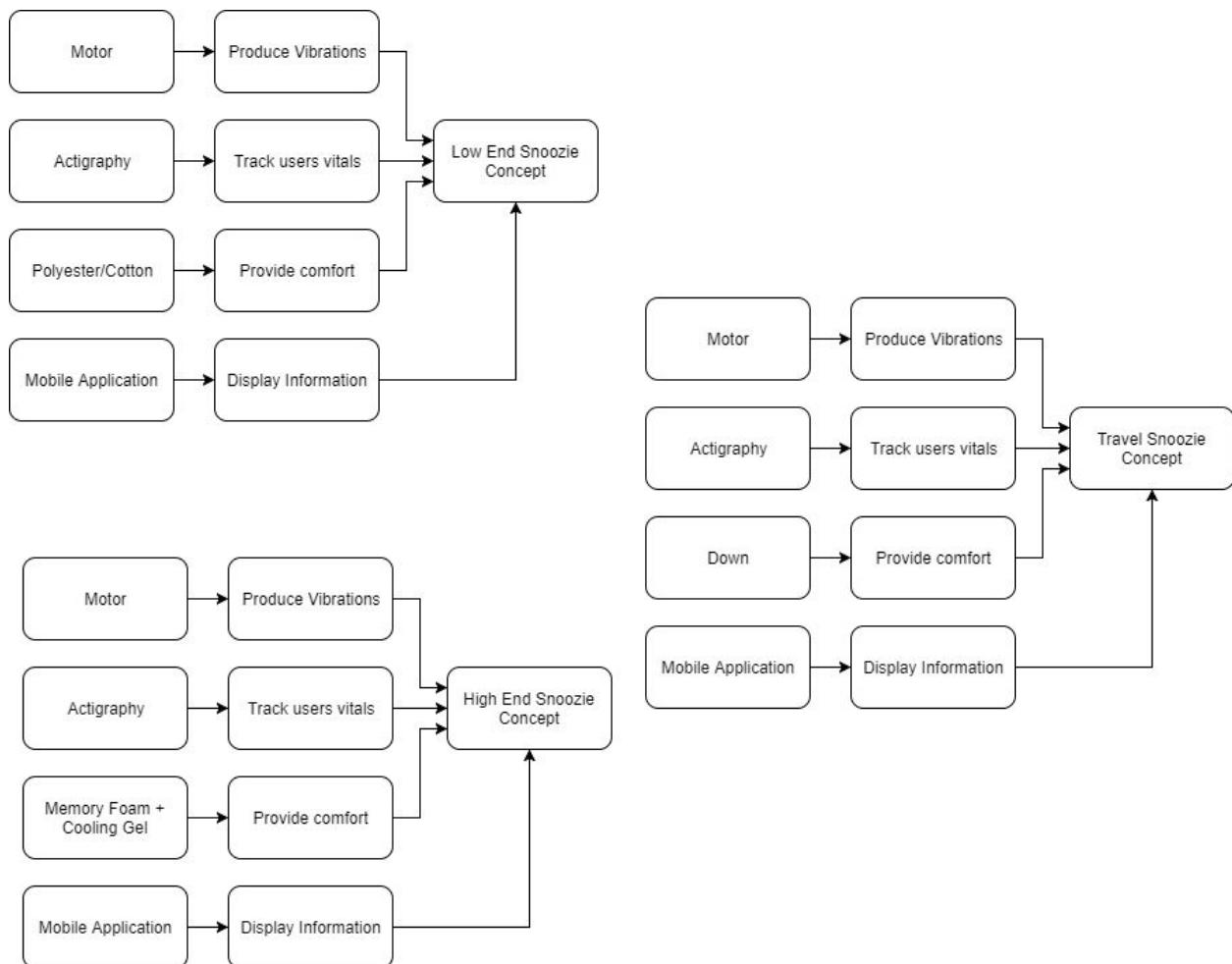
Step 4: Consider the effect of changing more qualitative factors in the micro-economy.

## Section 13: FMEA Analysis of Failure Modes

### FMEA Analysis

Purpose: To improve the quality of the product by anticipating ways in which the product could fail & then either prevent or minimize the effect of these failure modes before selling the product.

Snoozie Fast Diagram:



### Section 13.1: Potential Failure Modes with RPNs

Function	Potential Failure Mode	Potential Effect of Failure	Severity	Potential Cause of Failure	Occurrence	How will it be detected?	Detection	RPN
Provide comfort	Easily torn	Customers won't buy again	5	Not sewn properly	1	Inspection after manufacturing	1	5
Track users vitals	Inaccurate readings	Inaccurate alarm calibration	4	Damage during production	2	Beta-tester feedback	3	24
	Does not read at all	Customer refund product	1	Damage during production	2	Beta-tester feedback	3	6
Produce Vibration	Fails to produce vibration	Will not be woken up	3	Motor malfunction	3	Inspection after manufacturing	1	9
	Vibrations too strong	Wake up with a headache	3	Motor too powerful	2	Customer feedback	1	6
Display Information	Connectivity issues with apps	Information won't be displayed	1	Apps not optimized properly	3	Customer feedback	2	6

One of our RPN's has a value of 24 therefore we need to take action to fix the problem. If the product was damaged during production, we will need to inspect all products after production before releasing it to beta-testers or customers.

## **Section 14: Conclusion and Future Work**

Throughout this project we learned a lot about managing technology as well as teamwork. It has been difficult to coordinate with such a large group with various different schedules. However, we managed to turn our simple smart pillow idea into a structured plan of action for introducing it into the market.

We developed a product that is ideal for college students, the deaf community and individuals who want to track their sleeping patterns. In turn, this grabs a large section of the alarm clock market. With the use of Porter's Five Forces, Competitive Strategy and The House of Quality and The Criteria Chart we narrowed our conceptual designs down to the ideal alarm clock pillow. The Snooze has the best attributes of both alarm clocks and pillows which ties into our product differentiation strategy.

In our next stage, we collaborated in order to define the core technology and create three product lines targeted at basic, high-end and travelling customers. We have three different NPVs, \$6 million, \$17 million, \$4.1 million for the low-end, high-end and travelling customers respectively. Our total projected profit is \$28 million for all of our product lines. We used the Failure Modes Analysis to project how our product could fail and how severe the effects of failure would be.

We managed to collaborate with one another, respect opposing opinions, make executive decisions and choose the best options to create the most successful product. We developed a plan to work with one another over the past 10 weeks. Seeing our completed project makes the late night meetings, team coffee runs and google drive meetings during the holidays worth it. The skills learned from creating Snooze can be taken and applied to the future endeavors of every team member.

Snooze is a successful product that has high potential to take over the pillow market. It has low chance of failing and appeals to the customer needs of the masses. It is very possible to see it on shelves on Targets and Walmarts across North America, as well as the front page of Amazon.

## Section 15: Individual Contributions

<b>Members</b>	<b>Primary Project Contributions</b>	<b>Secondary Project Contributions</b>
Diego Garcia	<ul style="list-style-type: none"> <li>- Aggregate project plan</li> <li>- HOQ</li> <li>- Sub functions analysis</li> <li>- Basic model decision tree</li> <li>- NPV analysis</li> </ul>	<ul style="list-style-type: none"> <li>- Cost research</li> <li>- Different tier research</li> <li>- Planned all group meeting times</li> <li>- Reserved rooms for group work</li> <li>- Conclusions</li> </ul>
Manzanita Griffin	<ul style="list-style-type: none"> <li>- Structured each phase using SPSP</li> <li>- Printed every phase for our meetings</li> <li>- Developed the table of contacts and organized the final report into sections</li> <li>- EMV analysis</li> <li>- Prototyping strategy</li> <li>- Decision tree for our travel pillow</li> </ul>	<ul style="list-style-type: none"> <li>- Conceptual design(morphological matrix)</li> <li>- Mission and Vision</li> <li>- Business goals and developmental goals</li> <li>- Criteria chart</li> </ul>
Kevin Chen	<ul style="list-style-type: none"> <li>- Conceptual Design</li> <li>- Reverse Engineering Similar products</li> <li>- Decision Tree Analysis</li> <li>- Sensitivity Analysis</li> <li>- Market Need Analysis</li> <li>- Competitive Strategy</li> <li>- Functional Map</li> <li>- Technology Strategy</li> </ul>	<ul style="list-style-type: none"> <li>- Target Need Analysis</li> <li>- NPV Analysis</li> <li>- Product Lines</li> </ul>
Dan Vo	<ul style="list-style-type: none"> <li>- Conceptual Design</li> <li>- Utility Function</li> <li>- Failure Modes and Effects Analysis</li> </ul>	<ul style="list-style-type: none"> <li>- Technology Strategy</li> <li>- Product/Market Strategy</li> <li>- Porter's five forces analysis</li> <li>- Product Platform / Product Line</li> <li>- Decision Analysis</li> </ul>
Kaitlyn Martinez	<ul style="list-style-type: none"> <li>- Product Platform Strategy</li> <li>- Product Line</li> </ul>	<ul style="list-style-type: none"> <li>- Core Technology</li> <li>- Customer Needs and</li> </ul>

	<ul style="list-style-type: none"> <li>- Conclusion</li> </ul>	<ul style="list-style-type: none"> <li>- Technical Metrics</li> <li>- Challenges That Our Product Will Help Customers Overcome</li> <li>- Morphological Matrix revision</li> </ul>
Austin Wisherop	<ul style="list-style-type: none"> <li>- Target Market Analysis</li> <li>- Influence Diagram and Building Blocks</li> <li>- Decision Trees and Foldbacks</li> <li>- Reverse Engineer Competing Products</li> <li>- Product Line Strategy</li> </ul>	<ul style="list-style-type: none"> <li>- HOQ additions and adjustments</li> <li>- Product Lines</li> <li>- Grammar and Error Revisions</li> </ul>
Vinshaan Nguyen	<ul style="list-style-type: none"> <li>- Generated consumer responses using Google Forms</li> <li>- Determined customer needs</li> <li>- Helped out teammates on their parts when needed</li> </ul>	<ul style="list-style-type: none"> <li>- Executive Summary</li> <li>- Porter's five forces analysis</li> <li>- Market needs analysis</li> <li>- Effects analysis</li> <li>- Worked on FAST diagram for HOQ</li> </ul>
Ethan Cox	<ul style="list-style-type: none"> <li>- Conceptual design</li> <li>- Functional maps about related products</li> <li>- FAST dissection of other related products</li> </ul>	<ul style="list-style-type: none"> <li>- Porter's 5 forces</li> <li>- Decision trees for each project</li> <li>- Product platform/product line</li> <li>- Financial modeling</li> <li>- Business/Development Goals</li> </ul>

## **Section 16: Appendix**

[https://www.alibaba.com/product-detail/Factory-Directly-Sale-Soft-King-and\\_60708052486.html  
?spm=a2700.7724857.main07.1.5f0559b2J2eCob](https://www.alibaba.com/product-detail/Factory-Directly-Sale-Soft-King-and_60708052486.html?spm=a2700.7724857.main07.1.5f0559b2J2eCob)

[https://www.alibaba.com/product-detail/1-5v-3v-mini-dc-motor\\_60439598262.html?spm=a2700.7724838.2017115.55.6f902ff4ZsWIQi](https://www.alibaba.com/product-detail/1-5v-3v-mini-dc-motor_60439598262.html?spm=a2700.7724838.2017115.55.6f902ff4ZsWIQi)

[https://www.alibaba.com/product-detail/Super-Soft-Memory-Foam-Neck-Support\\_60595314277.html?spm=a2700.7724857.main07.12.5f0559b2J2eCob&s=p](https://www.alibaba.com/product-detail/Super-Soft-Memory-Foam-Neck-Support_60595314277.html?spm=a2700.7724857.main07.12.5f0559b2J2eCob&s=p)

[https://www.alibaba.com/product-detail/1-5v-3v-mini-dc-motor\\_60439598262.html?spm=a2700.7724838.2017115.55.6f902ff4ZsWIQi](https://www.alibaba.com/product-detail/1-5v-3v-mini-dc-motor_60439598262.html?spm=a2700.7724838.2017115.55.6f902ff4ZsWIQi)

<http://blog.marketresearch.com/4-tips-for-determining-your-market-research-budget>

<https://www.investopedia.com/terms/r/research-and-development-expenses.asp>