CMSC389P: Mastering the PM Interview

Product Management Cheat Sheet

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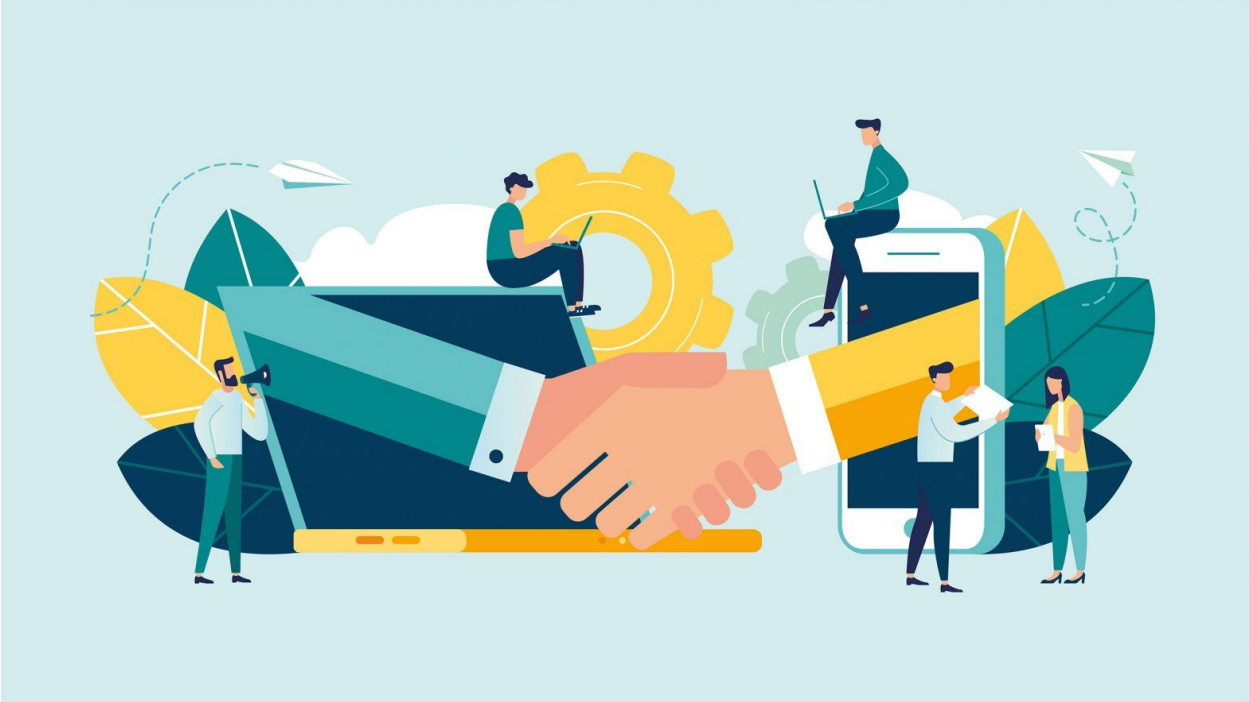

Picture taken from: https://www.csqd.com.au/5-reasons-trusting-your-designer/

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What is Product Management?

According to Carnegie Mellon University, "Product Managers are the people at a tech company who guide the product all the way from inception to completion — including everything from understanding and reconciling engineering tradeoffs to maintaining a firm grasp on how customers will use the product and make decisions about its purchase. The product manager **defines a plan for a product** that contains key choices and constraints, and **sells that plan throughout their organization**." Essentially, a product manager is the **intermediary between the customers, engineers, and designers**. They facilitate product and feature development. Think of a Product Manager as the person behind the ***what and why*** of a product while the Software Engineers are behind the how of a product. They are the voice of the customer, and make both data-driven and customer-driven decisions.

Note: Product Management includes both tangible products (products that can be physically held) as well as non-tangible products (products that cannot be physically held)

Common Tasks of a Product Manager

1. Serves the end users
2. Creates product roadmap
3. Creates strategy for product (e.g., includes enhancements and upgrades)
4. Supports product life cycle stages
5. Focuses on what the vision of the product is

Further Characteristics of a Product Manager

1. They must consider:
    a. Where do you want to take the product from?
    b. Where is the product not at?
    c. Where will it be in the future?

    d. What are users looking for in a product?
2. It is vital for a Product Manager to learn who the users are and how they react to your product (e.g., visual appearances and how they may impact the users)
3. Teams that Product Managers work with when following Agile Methodology:
    a. ***UI Designers*** to design how the product should look like
    b. ***Developers*** to take their requirements and bring them to life
    c. **Quality Assurance (QA)** to test every needs/requirements that users are looking to have
    d. ***Scrum Master*** handles tasks when a PM is busy, facilitate with meetings, and help manage any impediments that may occur
    e. *Overall, Product Managers support users, Scrum Masters, Developers, QA Teams, and UI Designers helps them*

Resume Tips for Product Manager Roles

1. Resume Tips

a. Include technical experience/skills
    i. E.g., UX/UI Design, Coding, Digital Marketing, Data Analytics
    ii. Highlight any technical or coding experiences
b. Emphasize when you exemplified soft skills
    i. E.g., Leadership, Collaborated, Organization
c. Highlight your problem-solving expertise and took the lead or initiative on a project
    i. Show your creativity
    ii. Could range from technical projects to personal projects, volunteerism, or even for-fun non-tech passion projects
d. Keep the focus on results and outcomes
    i. Example: “Instead of ‘Designed new products for the advertising team,’ you might say, ‘Partnered with digital advertising team to identify and design six new targeted ad–serving applications, resulting in a 140% increase in client spend.’”

ii. “Contributed to a widget project for x company” -> “led the redesign effort for the widget project”
iii. Bullet point format: action verb + job duty + tangible outcome, number, or metric
    1. Examples include: “Mobilized a team of 2 other interns to study user behavior and needs in order to best reimagine the Widget’s UI”; “Rebuilt the main widget landing page which resulted in x% more form submissions than the previous design”.

2. Resume Keywords

a. Technical Keywords

i. Strategy Keywords
    1. Developed a product vision and strategy
    2. Created product personas
    3. Built a product roadmap
    4. Conducted a strategic review
    5. Recommended strategic initiatives

ii. UX / UI Design Keywords
    1. Designed initial wireframes
    2. Gathered UX feedback from users
    3. Researched competitors' UX
    4. Provided feedback to design team
    5. Contributed to the development of a design system

iii. Coding Keywords
    1. Wrote detailed user stories for engineering team
    2. Made initial tech difficulty assessments for features
    3. Negotiated timelines with Lead Engineer / CTO
    4. Helped make engineering trade-off decisions
    5. Built front-end / back-end features for app XYZ

iv. Digital Marketing Keywords
    1. Created value props with marketing team
    2. Provided feedback on copywriting

3. Coordinated launch with marketing team
4. Tested five acquisition channels
5. Scaled a channel to X number of users

v. Data Analysis Keywords

1. Set key success metrics
2. Measured metrics' improvement
3. Performed analysis on large datasets
4. Generated actionable insights
5. Summarized data findings

b. Soft Skills Keywords

i. Leadership Keywords

1. Lead a team
2. Aligned stakeholders
3. Managed a project
4. Took an initiative
5. Set a vision

ii. Communication Keywords

1. Communicated next steps
2. Summarized a complex situation
3. Ran product meetings / reviews
4. Presented in front of a large audience
5. Wrote product requirement documents

iii. Organization Keywords

1. Delivered a project
2. Ran two-week agile sprints
3. Organized an event
4. Improved shipping cadence
5. Optimized a process

For further information on key words to use in a Product Manager Resume:
https://igotanoffer.com/blogs/product-manager/pm-resume-keywords

Behavioral Interview

1. S.T.A.R. Model

a. **Situation**
    i. "Set the stage for the story by sharing context around the situation or challenge you faced. Share any relevant details."
b. **Task**
    i. "Describe your responsibility or role in the situation or challenge. In other words, explain the task you had to complete."
c. **Action**
    i. "Explain how you handled the situation or overcame the challenge. If the action was carried out by a team, focus on your efforts."
d. **Result**
    i. "What was the outcome you reached through your actions? If possible, quantify your success or provide concrete examples of the effects of your efforts."

For further information on the S.T.A.R. model:
https://www.indeed.com/career-advice/interviewing/how-to-use-the-star-interview-response-technique

2. Five Key Stories

a. Leadership
b. Teamwork
c. Success
d. Mistakes/Failures
e. Challenges

3. Product Management Terms

a. These are PM terms that will be beneficial to include in elevator pitch or five key stories

i. **Stakeholder Consensus**

1. If you worked for a client

ii. **Customer Empathy**

1. Being close to users in general of a project you worked on

iii. **Cross-Functional Teams**

1. Working alongside different teams

iv. **Requirements & Documentation**

1. Gathering requirements and documenting them

v. **Agile/Scrum**

1. Keeping track of your progress

vi. **Key Performance Indicators (KPIs)**

1. These indicators show how the product is doing. Different products have different KPIs, and you should be able to come up with at least two relevant KPIs for your story.

Technical Concepts

1. Buzzwords

a. Buzzwords are words that are frequently used within the technology industry. They are used throughout many companies and employers typically expect employees to already know the meaning of these terms.

b. Example Buzzwords:

i. The Cloud

ii. Artificial Intelligence and Machine Learning

iii. Blockchain/Cryptocurrency

iv. Fifth-Generation Wireless (5G)

v. Internet of Things (IOT)
vi. Big Data

2. Data Structures

a. “A data structure is a particular way of organizing data in a computer so that it can be used effectively.” - https://www.geeksforgeeks.org/data-structures/

b. Example Data Structures:
   i. Arrays
   ii. Hashmaps
   iii. Graphs and Trees
   iv. Linked Lists
   v. Stacks
   vi. Queues

3. Algorithms

a. Sorting Algorithms
   i. “A sorting algorithm is used to rearrange a given array or list elements according to a comparison operator on the elements.” - https://www.geeksforgeeks.org/data-structures/
      1. Example Sorting Algorithms:
         a. Merge Sort
         b. Quick Sort
         c. Bubble Sort
         d. Insertion Sort

b. Searching Algorithms
   i. “Searching Algorithms are designed to check for an element or retrieve an element from any data structure where it is stored.” - https://www.geeksforgeeks.org/searching-algorithms/
      1. Example Searching Algorithms:
         a. Depth-First Search

b. Breadth-First Search

4. Big O Notation

a. Big O Notation is a way to express the efficiency of an algorithm.

b.

Big O Notation	Name	Example(s)
$O(1)$	Constant	# Odd or Even number, # Look-up table (on average)
$O(\log n)$	Logarithmic	# Finding element on sorted array with **binary search**
$O(n)$	Linear	# Find max element in unsorted array, # Duplicate elements in array with Hash Map
$O(n \log n)$	Linearithmic	# Sorting elements in array with **merge sort**
$O(n^2)$	Quadratic	# Duplicate elements in array **(naïve)**, # Sorting array with **bubble sort**
$O(n^3)$	Cubic	# 3 variables equation solver
$O(2^n)$	Exponential	# Find all subsets
$O(n!)$	Factorial	# Find all permutations of a given set/string

5. System Design

a. "System design is the process of designing the elements of a system such as the architecture, modules and components, the different interfaces of those components and the data that goes through that system." - The Medium

b. Elements of a System

i. "Architecture - This is the conceptual model that defines the structure, behavior and more views of a system. We can use flowcharts to represent and illustrate the architecture."

ii. "Modules - These are components that handle one specific task in a system. A combination of the modules make up the system."

iii. “Components - This provides a particular function or group of related functions. They are made up of modules.”

iv. “Interfaces - This is the shared boundary across which the components of the system exchange information and relate.”

v. “Data - This the management of the information and data flow.”

c. Concepts

i. Scalability

1. Definition: the ability to handle more input or increased load of the application
2. Vertical Scaling (bigger machine)
3. Horizontal Scaling (more machines)

ii. Load Balancing

1. “The process of distributing network or application traffic efficiently across multiple servers. This ensures no single server bears too much demand. By spreading the work evenly, load balancing improves application responsiveness. It also increases availability of applications and websites for users. Modern applications cannot run without load balancers.”

iii. Resilient

1. If one machine fails, can redirect input to another one.

iv. Network Calls

1. All communication will be through servers for multiple machines which are slow.

v. Inter-Process Communication

1. Inter-process communication inside one machine is fast - data is all in one machine

vi. Data Inconsistency

1. Data is harder to maintain between multiple machines - if one machine sends data to another and to another, lose transactional guarantee

d. **Technical Limitations**
    i. **Memory (RAM)**
        1. Data storage costs
    ii. **Execution Time**
        1. Complexity of implementation

For further information on System Design:
https://medium.com/the-andela-way/system-design-in-software-development-f360ce6fcbb9
https://gist.github.com/vasanthk/485d1c25737e8e72759f

6. Object-Oriented Approach

a. Object-Oriented Design Questions
    i. Vision for big picture
    ii. Show off your technical expertise
    iii. Ability to understand end-user
b. Very similar to product design questions
c. Jukebox Example:
    i. System Components
        1. **Jukebox**
            a. Plays songs and playlists
        2. **CD**
            a. Contains songs and artists
        3. **Playlist**
            a. Can add, delete, or queue songs in playlist
        4. **Song**
            a. Contains song name and artist name
        5. **Artist**
            a. Component of song
d. How-to-Approach
    i. Ask Clarifying Questions
    ii. Describe Use Cases and Analyze Core Objects

iii. Find Relationships Between Objects
iv. Explain User Interactions

7. Framework for General Technical Questions

a. *Source: Cracking the PM Interview Book*
   i. Clarify the Problem
   ii. Go to the Whiteboard (i.e., write the problem down)
   iii. Talk out Loud
   iv. Code, Slowly and Methodically
   v. Test and Fix

Product Design

1. Framework

a. This **CIRCLES** method was coined by Lewis C. Lin *(author of Decode and Conquer)*
   i. **C**omprehend the situation
      1. Clarifying questions
      2. Context
      3. Goals and Metrics
      4. Constraints and Assumptions
   ii. **I**dentify the customer
      1. List potential customer personas
      2. Users and Customers don't have to be the same person
   iii. **R**eport the customer's needs
      1. For each user, capture their needs or use cases
         a. As a <role>, I want <goal/desire> so that <benefit>
   iv. **C**ut by prioritizing
      1. Don't design features for all use cases

2. Need to prioritize, assess trade-offs, and show that you can make decisions
3. Limited by time, money, and labor
    a. **Reach:** how many people will be impacted?
    b. **Impact:** what's the benefit of that use case from low to high?
    c. **Confidence:** what's the probability of success?
    d. **Effort:** how much time will it take?

v. **L**ist solutions
1. Write out a few ideas
    a. **Explicitly tie your feature ideas or solutions back to the use cases or goals**
    b. Customer-focused ideas, not just solutions you want
2. Think big
    a. Try not to do copycat features
3. Have a vision
    a. This is the time to show your creativity!

vi. **E**valuate Trade-offs
1. Discuss pros and cons based on criteria
    a. Customer satisfaction
    b. Implementation difficulty
    c. Revenue potential

vii. **S**ummarize your recommendation
1. Tell your interviewer what feature/product you'd recommend
2. Recap what it is and why it's beneficial to the user
3. Explain why you chose this solution over others
4. Discuss any next steps you'd take to explore this solution further

Product Improvement

1. Framework

a. **Narrow the Scope**
    i. Ask Clarifying Questions
        1. What part of the product am I focusing on?
        2. Who is it for?
            a. Find user base
        3. Where is it available?

b. **Goal of the Product**
    i. Summarize goal of product
        1. Make sure you know what the product does
    ii. Connect goal back to user
        1. What problems does it solve?
        2. Different from use cases
    iii. Identify product users here

c. **Areas to Improve**
    i. Define Metrics
        1. Customer Base
            a. Too low? Why? What could the product do better?
        2. Revenue
            a. Per customer or total number of paying users?
        3. User Engagement
            a. How long are customers spending time on the product? Too little?
        4. Retention
            a. Are customers leaving and not coming back?
        5. Conversion
            a. Is there a need to increase unpaid to paid users?

d. **Current Pain Points**

i. Pain-Point
    1. Specific problem that your user is facing
ii. How to find?
    1. Go through key user journey
    2. Identify important interactions or pain-points along the journey
iii. Prioritize pain-points
    1. Impact - severity of issue and its effect on customers
    2. Reach - scope of affected users, ranging from a few outliers to entire population

e. Implement Solution

i. Describe approach
    1. Structure answer
ii. List solutions
    1. Always tie solutions back to goal
iii. Sketch out mockups
    1. To communicate effectively with engineers and designers
    2. To facilitate more detailed critiques of visual elements and functionality so changes can be made

f. Evaluate Tradeoffs

i. Discuss technical challenges
    1. Data storage
    2. Back-end functionality
ii. Discuss pros/cons
    1. Feasible for engineers to build or designers to create?
iii. Reduce costs/risks

Estimation

1. Definition

a. Estimation questions are often hidden within other interview questions, but test your ability to break down problems in a data-driven, logical manner. These

questions are centered around computing a value using pre-existing knowledge and applying intuition.

b. What your interviewer is looking for:
    i. Ability to break down a problem into logical components
    ii. An ounce of intuition somewhere
    iii. Ability to clearly explain your logic
c. Why is my interviewer looking for this?
    i. As a PM, you'll often need to:
        1. Explain your thoughts in a clear and structured manner
        2. Evaluate and challenge assumptions
        3. Drive decision-making using data

2. Approach

a. As always, ask your clarifying questions
b. Start with a formula
c. Break down each variable
d. Calculate the numbers
e. Conduct a sanity check

3. Numbers Cheat Sheet

US Population	**300 million**
Avg. people per US household	**3**
World Population	**7 billion**
Area of US	**3 million square miles**
Life Expectancy in US	**80 years**
Life Expectancy in World	**65-70 years**

Analytical

1. Definition

a. Analytical Questions usually involve a problem occuring with the product/feature and require further investigation to determine what the cause might be.
b. What your interviewer is looking for:
    i. Ability to ask questions in a structured manner
    ii. Ability to filter only questions relevant to answering the question
    iii. Ability to identify and eliminate potential causes
c. Why is my interviewer looking for this:
    i. As a PM, you'll often need to:
        1. Problem-solve by discovering root causes for unexpected situations
        2. Mitigate risks/loss for the company/product by identifying the cause
        3. Understand the factors that might affect a product beyond the product itself

2. Approach

a. Ask clarifying questions
b. Tackle by category of cause
c. Internal
    i. Product changes
        1. Example:
            a. Bug/outage
            b. Privacy Breach
            c. New campaigns for the product
    ii. Historical trends
        1. Any trends reported before

d. External
    i. Market analysis
        1. New competitors
        2. Legal/compliance changes
    ii. Current events/social media
        1. Headlines in newspapers

Product Launch + KPIs

1. Definition

a. These are interview questions that revolve around the initial launch of a product/feature.
b. These questions may range from the interviewer asking whether a company should or should not launch a certain feature, to how the company should go about launching the product, all the way to how to measure and monitor the success of the product.

2. Approach

a. Ask clarifying questions
b. Determine the key goals
    i. Ask yourself, why are we launching this product?
    ii. Do we want to:
        1. Accelerate customer acquisition? Retention? Visit duration?
        2. Improve brand awareness?
        3. Increase profits?
        4. Optimize for future scaling?
        5. Be first-to-market?
c. Develop a launch strategy
    i. Who should we target?
    ii. Some options:

1. A/B testing
    a. This is when there are two versions of a product. They are compared against each other and both analyzed to see which version performed the best and is most effective.
2. Staged rollout
    a. A way for your update to reach only a percentage of your users, which you can increase over time.
    b. This lets us release an update only to a small subset of the user base, monitor its stability or any other metric of interest, and decide whether to roll out the update to more users, to wait for more data to come in, or to halt the rollout altogether.
3. Geographic rollout
    a. A way for your update to reach only a percentage of your users, which you can increase over time.
    b. This applies to geographic location as you may want to start at one location and then expand the user base to a separate location.

d. Who will you target?
    i. Identify exactly who your customers are
        1. Create a character profile
        2. Identify market segments
    ii. Bigger the pain point, the bigger the value proposition
        1. Understanding the customer's perspective
    iii. Once you find target users, find potential market
        1. Address alternatives/competitors in market
e. How will you target the demographic you've identified? Why are you choosing this method?
    i. Essentially, what marketing tools will you use?
        1. Tie the marketing message to the product features and differentiate the product from your competitors
    ii. Examples to spread the word:

1. Social media campaigns, PR campaigns, brand awareness
2. Partner with local services (TV channels, streaming services, stores) to create excitement about your product

iii. Advertise product to target demographic

1. Highlight use cases

f. Propose an implementation plan

3. Pre-Launch

a. Assessing Resources

i. Examples:

1. What does the engineering effort or business resource requirement look like?
2. Can we reduce the cost of launch with a partnership (outsourcing or sharing internal resources)?
3. Is there anything outside the scope of the company's current efforts and abilities?

b. Mitigating Risk

i. How can we predict success or failure before we even start?

1. Customer Surveys
2. Pre-orders
    a. Pre-order quantity is a good early indicator of a product's success, and can lead to increasing orders if the product is successful or deciding to scrap the product all together if a product is performing poorly during the pre order
3. Marketing Response
    a. Are people reacting positively to the product? What is the general response to this product in the market?
4. SEO/SEM Trends
    a. Ways to prevent failure
    b. Search Engine Optimization (SEO)

i. Is to increase the number of website visitors by elevating the site's position within results returned by a search engine

c. Search Engine Marketing (SEM)

i. Involves gaining website traffic by using paid ads to increase a website's visibility on search engines.

d. https://www.weidert.com/blog/seo-vs-sem

5. Product Beta Testing

a. Have people test out the beta version of a product to determine risk before distributing to a larger population

b. A type of user acceptance testing where the product team gives a nearly finished product to a group of target users to evaluate product performance in the real world

c. https://xd.adobe.com/ideas/process/user-testing/everything-you-need-to-know-about-beta-testing/#:~:text=Beta%20testing%20is%20a%20type,performance%20in%20the%20real%20world.&text=The%20product%20should%20be%20in,planned%20for%20the%20release%20version)

c. Defining KPIs

i. How do we measure the success of the product?

1. What will product interaction look like?

a. Direct-to-Consumer, B2B, P2P

b. Note: Try walking through these user flows

2. What are appropriate metrics/KPIs to track?

a. Ex. churn rate, retention rate, click-through-rate (CTR), cost-per-click (CPC), customer acquisition cost (CAC), conversion rate, time per visit, etc.

4. Post-Launch

a. Assessing Resources

b. Mitigating Risk

c. Defining KPIs
d. Monitoring the Product
    i. Success Metrics - Ways to measure the success of a your product
        1. Get User Feedback
            a. Ex: customer satisfaction surveys, customer reviews posted online
        2. Track KPIs
            a. Ex: Measure number of units sold, DAU (daily active users), user retention rate
        3. Revenue (if this was your main goal; if not, this is secondary)
e. Difference between Pre-Launch and Post-Launch
    i. Post-Launch follows the same format as Pre-Launch
    ii. The only difference between the two is that with Post-Launch, it is necessary to continuously monitor the progress of the product to ensure that it is still satisfying customer needs

Case Studies

1. Definition

a. "The case study interview typically consists of a single session, in which the candidate is presented with an authentic business scenario related to the company they are interviewing with. The candidate is asked to study the problem, perform analysis, and render advice on how to handle the scenario."

b. What interviewers are looking for:
    i. Structure a problem
        1. Break it down into smaller components.
    ii. Show strong instincts
        1. Should be able to make good business decisions, even with limited data.
    iii. Drive, Not Ride

1. Drive the interview forward. Be exhaustive in your response to a question (e.g., consider all factors of a question).

c. https://www.wikijob.co.uk/content/interview-advice/interview-questions/case-study#what-is-a-case-study-interview-and-why-do-consultancies-like-to-use-them

2. Approach

a. Ask clarifying questions
b. Determine the user group
c. Identify value of product to business and users
d. Propose an implementation plan to address the scenario
    i. Example:
        1. How would you fix the problem identified?
        2. How would you update the product?
e. Define metrics
    i. How would you measure the success of the product?
f. ***Note:*** *Case Studies can tie in all the elements of PM interviews learned in this class (Product Design, Product Improvement, Analytical, etc.), applied to a real life business scenario.*

3. Useful Frameworks

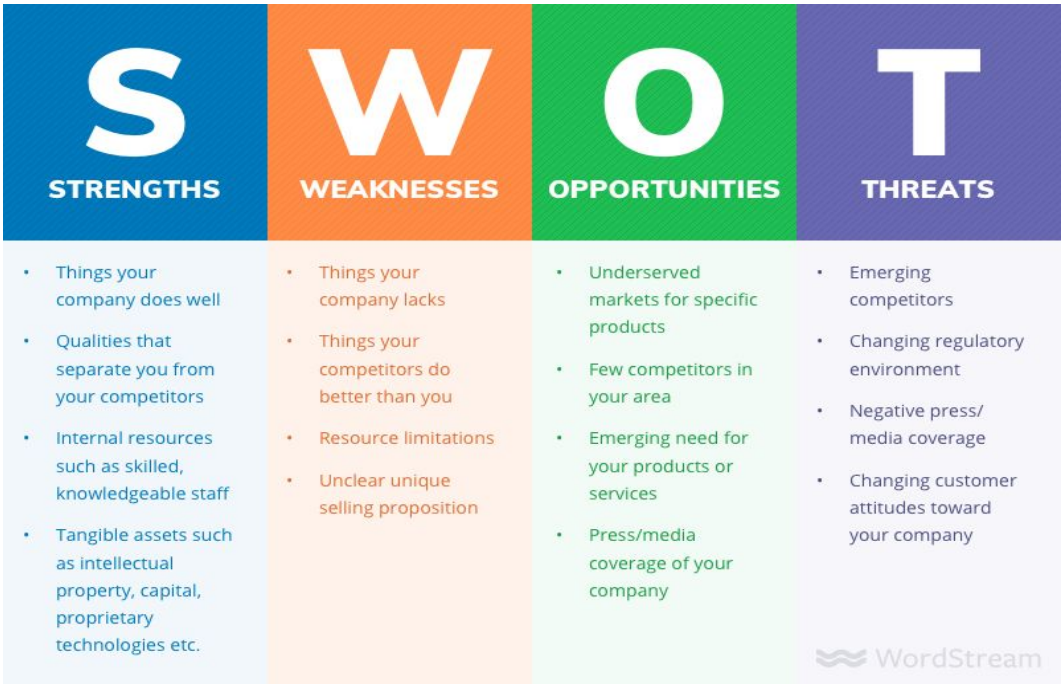
a. Customers Purchase Decision Making Process
    i. AIDA
        1. **Attention or Awareness**
            a. Need to catch the attention of the audience.
        2. **Interest**
            a. With the customer's attention, you need to get them interested in the offering. What are the advantages and disadvantages?
        3. **Desire**

        a. Need to convince the customer that they want your product.
    4. **Action**
        a. After all of these steps, then customers take action to purchase the product.
ii. REAN
    1. **Reach**
        a. The customer is aware of your product.
    2. **Engage**
        a. The customer is engaged and considering your product.
    3. **Activate**
        a. The customer takes action to purchase the product.
    4. **Nurture**
        a. The customer has purchased the product, and it's now your responsibility to nurture this relationship.

b. 4 P's of Marketing Mix
i. Purpose: Way to understand the different aspects of a product's approach to marketing.
    1. **Product**
        a. The actual item being offered that should cater to a customer's wants or needs.
    2. **Price**
        a. The price will determine how many and what type of customers purchase the product.
    3. **Promotion**
        a. Encompasses all forms of advertising, PR, word of mouth, sales staff.
    4. **Place**
        a. The customer has purchased the product, and it's now your responsibility to nurture this relationship.

c. SWOT Analysis
i. Purpose: Structure to analyze companies and products

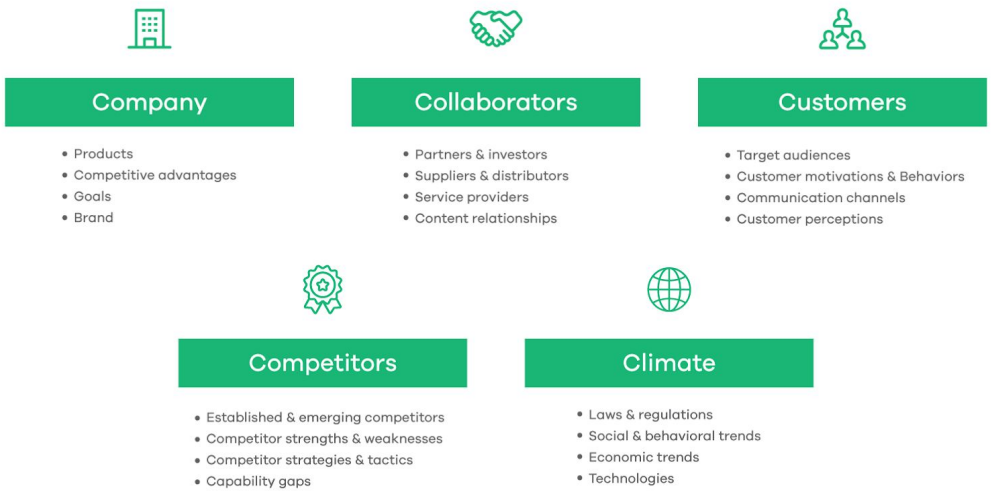
ii.



iii. https://www.wordstream.com/blog/ws/2017/12/20/swot-analysis

d. The Five C's

i. Purpose: Provide an overview of the environment for a product or decision



ii.

iii. https://www.pinterest.com/pin/758082549764114503/

e. Porter's Five Forces

i. Purpose: Framework for Industry Analysis. It is useful for understanding a company's decision

1. **Rivalry**
    a. More competitors generally leads to more heated competition, as does more direct competition.
2. **Customer Bargaining Power**
    a. If a company or industry has relatively few buyers or some buyers have a very disproportionate share of revenue, these buyers will wield considerable power.
3. **Supplier Bargaining Power**
    a. Like buyers, suppliers gain influence over a company if the company is heavily dependent on them.
4. **Threat of Substitutes**
    a. Competition exists not just from direct competitors, but also from substitute products.
5. **Threat of New Entrants**
    a. With few barriers to entry in an industry, companies are constantly vulnerable to competition. If they price their goods too high, another company will enter the market and capture market share.

This resource is a summation of information collected from a variety of sources. These sources include *Cracking the PM Interview* by Gayle Laakmann McDowell, *Decode and Conquer* by Lewis C. Lin, as well as the sources linked in various sections of the document.