FUTURISTIC OUTLOOK TO PRODUCT MANAGEMENT

Industry Review Guide 2020

PREPARED BY

THE PRODMAN CLUB OF IIM AHMEDABAD

The ProdX Club

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ACKNOWLEDGEMENT

There has been a steep increase in the number of firms offering product management roles in the recent past. This is not only maneuvered by an increase in the number of firms visiting the graduate students, but also by expansion in their scope to associate product manager roles for undergrads. In spite of this, there exists a gap in terms of a comprehensive preparation material suited for the Indian audience. Filling this gap was an uphill task, which couldn't have been possible without the stakeholders who were a part of the journey at different points in time..

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INTRODUCTION

Section 1

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Mayank Chauhan, Yuvraj Singh Bawa

WHAT IS PRODUCT MANAGEMENT

Product Management: It Has Always Been There

It is rare to spot tech companies today without a product manager. Though in the contemporary business ecosystem, the definition of product management is by the role of a product manager in the software field. However, if we look at it in hindsight, traditionally, every business has been creating products since the inception of it, long before the advent of technology, computers, and software. The history of business is full of examples of people who have conceptualized ideas to solve a problem. They have built these ideas, tested them, and delivered them to customers for bringing a significant change in their lives. A lot of times, they have failed too. But they reiterated, they pivoted, keeping a single goal in mind creating something to solve a problem and to make sure that the solution is built and shipped in the right way. And this is precisely what a product manager does in organizations today.

So, what is Product Management? The most common explanations look like this one:

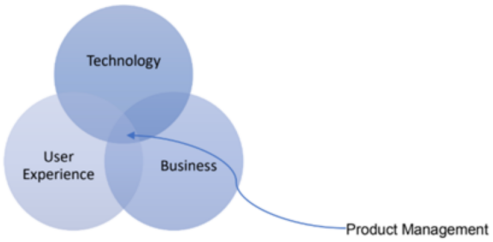

Figure 1.1 What, exactly, is a Product Manager ?

It is like when someone asks, “Where is the Statue of Liberty?” and gets a reply, “It’s between Manhattan, Jersey City, and Governor’s Island.” This kind of information is orienting but incomplete. So, what does a product manager actually do? Do not worry, no one knows!

There are numerous definitions of Product Management around the world, and the internet is full of them. The most popular one is perhaps that " A product manager is the CEO of a product." This makes sense in a way because a product manager indeed possesses almost the entire responsibility of the product. But it may not entirely be true in a lot of cases.

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However, what every product manager does in common is to "guide a team in discovering, developing, and shipping the right product to users and bridge the gaps among different stakeholders of that product."

In contrast to what the name suggests, a product manager may actually not a manager of anybody. A PM is a communicator that puts all the pieces together by getting feedback from all the stakeholders involved. The PM is also a prioritizer, a researcher, a presenter and the most responsible for the ultimate success of a product.

The "Job" of a Product Manager

The words "job" and "product" immediately make us think of Steve Jobs, one of the most significant product visionaries of all time. In the subsequent sections, we will try to draw some learnings from his works. Once he said, "A lot of times, people don't know what they want until you show it to them." This quote became legendary as one of the most popular opinions of a highly opinionated man. Let us look at a few.

To listen or not to listen

The first, foremost, and perhaps the most essential trait of a Product Manager is to listen to your customers. To solve a customer problem, you need to understand the customer's needs, both stated and unstated. It might sound cliché and very obvious, but that's indeed the hardest thing to do, following the unstated needs. To understand the customers' unstated needs, you need to "really listen." When you do not do that, you end up building solutions to problems, which no one wants.

Going back to Steve Jobs's quote, he indeed went ahead and showed the world what they wanted. So does it mean that you are better off by not listening to your customers?

Absolutely not! You should listen to your customers to understand the problem, but not when you are building the solution. Your job is essentially to manage the solution, your way. The quality of the solution, regardless of its acceptability, is what differentiates great product managers from average product managers.

Solutions Prioritization and Decisions

Coming up with multiple ideas/solutions is just the starting step. Prioritizing them comes next. While prioritizing work, PM needs to not only look into internal factors but also look into external factors. Prioritization of work will enable the team to work on the most critical features first, and these features/work will be delivered to the customer as soon as possible.

Here customers' needs play an essential role.
Based on the objective of the deliverable, a Product Manager can use the below metrics to prioritize the work. Based on the impact and feasibility of the work, PM can decide which one to pick from the list. There are other metrics as well, such as based on revenue generation, the effort required, etc. to prioritize work and make informed decisions.

Figure 1.2 Impact vs Feasibility Matrix for a PM

Formal Roles and Responsibilities of a Product Manager

As already discussed, the roles of product managers and their exact responsibilities change across different industries and different companies. It also depends on the product type, size of the product, life stage of the product, and organizational structure of the company. However, the essence of it remains the same. We will talk about the general duties of the product manager.

Market Research: As a PM, you need to understand the customer's requirements and the latest industry trends. Extensive market research will help you to get relevant information that can be used to understand the needs and make decisions. Further, Porter's five forces framework can be used to understand the industry's dynamics.

Vision and Strategy: Product vision is simply the crux of the product - why are we building this product, for whom, and benefit of it. It should have alignment with your company's vision. PM defines the vision and craft a strategy to achieve this vision and translates the strategy into short term and long term product roadmap. This product roadmap should be made known to all the stakeholders involved in the product as well as to the executive management team.

Product Ideation: Once the customer's needs have been identified, the next step for PM is to come up with new and innovative ideas to address the needs. Multiple brainstorming sessions with the team and iterative revision of ideas lead to the final selection.

Product Design & Execution: PM aims to provide a unique customer experience, so the design of the product is customer-centric. PM design the product in an innovative, simple, yet easy to understand way using wireframe or other mock-up tools. Further, PM writes user stories and communicate this information to the engineering team. The product manager continually supports the engineering team throughout the development and testing process.

Marketing Strategy: PM collaborates with the marketing team to create a marketing strategy for the product. PM shares all the required information about the product, customer's needs, and vision to the marketing team to create a unique marketing campaign. PM plans the marketing activities in the roadmap of the product. Based on the product's launch timeline, marketing team starts the campaign and reach out to target customers.

Product Launch: Finally, the day of launching the products to customers arrives. PM plans and coordinates with different stakeholders to launch the product.

PM needs to ensure that there is a customer service team to address and resolve all customer queries. The success of the launch is measured using specific metrics such as customer usage, customer satisfaction, customer retention, and other metrics.

Traits and challenges of being a product manager

A PM should be capable of creating a vision for his/her product(s). A PM needs to have a structured thinking capability regarding the vision, and the ability to lead the collaboration between people involved in the process, guide the execution and courage to take accountability for the product. Five qualities that make a great Product Manager are:

Strategic Thinking: A strategic mind-set is required to create a vision and build a roadmap for the product.

Decisiveness: It is the ability to make a decision. It is a desirable skill to enable drastic prioritization.

Empathy for the Customer: It is to understand the unstated needs of the customer, and their willingness to pay calls for the ability to empathize with the customer.

Lead through Influence: In most cases, no one reports to a Product Manager except for other product managers. The development team in general reports to a Project Manager or a Programme Manager. It is the ability to lead through the influence, which helps to get the work done and delivered by the team.

Excellent Communication Skills: Explaining the same thing to the CEO, to the marketing team, to the Project Manager, to the design team and the development team, calls for different sets of vocabulary and requires the Product Manager to have excellent communication skills directed at the specific requirements of the person.

No matter how exciting that may sound, like all roles, a PM role comes with its own set of challenges. Three such situations that a PM can face are:

1. Multiple, never-ending and different sets of demands and opinions from different teams pulling on the working time of a PM disrupting the personal working plan.
2. The temptation to get too technical or too business-oriented, which results in losing the required balance between both.
3. The feeling of a lack of control that an unruly and unorganized team brings along can dismantle the composure of a PM.

Key Performance Indicators (KPIs) for a Product Manager

You can say it loud that your product is successful, or you have exceeded expectations. But no one is going to believe it until you prove it using data. So, the performance of PM can be measured using activities associated with product success, customers, and the overall process of product design and launch. KPIs help the PM to track the progress and identify risks. The following are examples of some of the metrics used to measure performance.

These KPIs will vary according to different product types and business requirements.

- Monthly Revenue – Month-wise revenue generated by the product
- Delivery-On-Time - Delivery of product or new feature on time
- Product Quality - Number of deviation from standard quality practices
- Customer Counts - Increase in customer over a specified duration
- Stickiness Ratio - Daily active user/ daily monthly user (DAU/DMU)
- Customer Retention - Number of customers stay with the company over a specified period
- Customer Satisfaction Score - Measures overall satisfaction of customers with the product or new features

Product Management Vs Project Management

Product Managers are responsible for the success of a product. Here, success is defined by KPI or metrics. The method by which they reach their goal is not defined. It is up to them or their team. On the other hand, Project Managers are responsible for accomplishing a project, not a goal. A project usually has a timeline and a budget as constraints. A Product Manager needs to have the skill of project management also, in order to manage the execution of the product.

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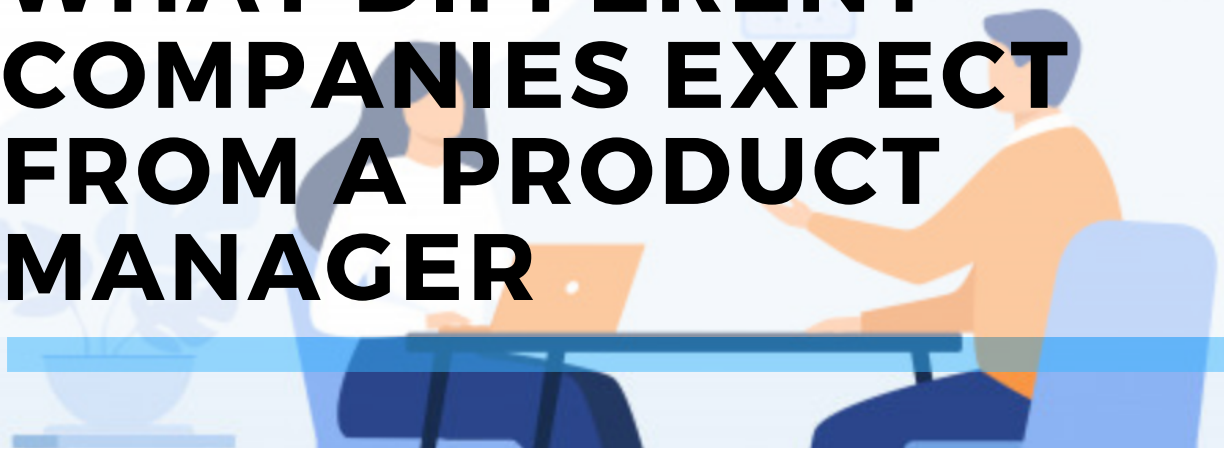
WHAT DIFFERENT COMPANIES EXPECT FROM A PRODUCT MANAGER



In this chapter let's look at the different kinds of PM's there are and what different companies expect from their PM's.

According to an article from Deepak Singh, there are mainly 5 different types of PM.

The Tech Product Manager

These PM's mainly solve the engineering problems, eventually they can end up as engineering managers rather than product managers. In this role one should focus on WHY you are building and WHAT you are building and leave the HOW to engineers.

Some advantages of this role are it's easy to gain trust and respect of engineers and PMs work well with the engineers.

Google and Amazon hire for these roles. Some of the examples for this type are Elon Musk and Marissa Mayer.

What should you focus on: Build good business sense and user empathy to see the big picture and what product to build.

The Designer Product Manager

PM's in these roles should strongly sense the future needs of consumers and focus on design and aesthetics.

Some advantages of this role are PMs empathize well with customers which helps them build much needed and beautifully designed products.PMs can understand the difference between stated and unstated goals design wise. Some challenges that PMs can face are as the design PM would not have much idea about coding it might create troubles when working with the engineering team because they have different styles of working.

Instagram, Facebook, Apple and Tesla hire for these roles. Some of the examples for this type are Steve Jobs, Brian Chesky and Joe Gebbia.

What should you focus on: prioritizing things in this role is really important so developing business sense helps. One should get really good at recognising flows in a product. Prioritisation is the key.

The Business Product Manager
These PM's are well versed with terminologies in business, finance and operations. They communicate really well and understand people around them.

Some advantages are they are able to think through and paint the bigger picture and lead teams. Some challenges can be because the understanding on topics like technology is limited it might create trouble when working with engineers, makes it hard for PMs to build credibility and respect with engineers. Ken Norton is an example for this category.

What should you focus on: One should start by focusing on the technology. Have an eye for detail and rigor.

The Data Product Manager
This is one of the emerging roles with the advancement of AI, ML. They mainly focus on personalisation, recommendation products etc., They make all their decisions based on data, they will gain influence for sound decisions they make over time.

Some advantages are being well versed with data and good analytical skills will help understand business and product, but relying on data so much sometimes is harmful because one loses to see the bigger picture.

Netflix, Amazon and Google would love PMs in this category. Sebastian Thrun is one of the examples in the category.

What should you focus on: PMs should concentrate on WHY, combining WHY with data will work wonders. Concentrating on design aspects along with data will help.

The Growth Product Manager
Growth for different organisations has different meanings. Some may find it hard to generate demand while some may find it hard to supply when they have demand, PMs in this category come up with ideas to solve these problems.

PMs in these roles are strong with data and communication. Some advantages of this role are by solving the problem they make a real impact in the company, clear metrics identification would help them move in the right direction. Some challenges would be though there are a lot of ideas to solve lack of quick experiments and right prioritisation will lead to low impact work. Chamath Palihapitiya falls in this category of growth product managers.

What should you focus on: Prioritization is important. User research and psychology will help you understand what to build and why.

Companies and what they expect

Amazon
Amazon is a American multinational technology company founded in 1994. They work on a wide variety of products. Amazon expects a PM to be excellent planners, have ability to develop long term plans, good analytical skills and good writing and communication skills. Amazon focuses a lot on good customer service, so empathy and understanding what customers need is a must. Amazon has 14 principles that drive their work and lead them to success, aligning your goals to them is really important for a PM.

In summary this is what Amazon wants

- Understanding and utilising analytics
- Launch preparedness
- Customer centricity
- Communicating and collaboration

Microsoft

Microsoft is a American multinational technology company founded in 1975. It is best known for its software products. Microsoft expects its PM to be analytically good, and understand technology. They are mainly interested in the big picture and how it solves customer problems. They want the PM to be able to think clearly, understand business and prioritise the important features to have maximum impact.

PayTM

Paytm is an Indian e-commerce payment system and financial technology company founded in 2010. At PayTM, they mainly focus on product development strategy. Product managers are expected to take control of every minute detail and be obsessed with technology and product innovation.They expect people to be good at communicating not just with the insider team but external customers as well.

Flipkart

Flipkart, founded in 2007, is an eCommerce platform that started by selling books before expanding to various other product categories. It has acquired companies like Myntra, PhonePe over the years. In 2018, US retail giant Walmart acquired a major stake in Flipkart for $15 billion.

5 competencies that Flipkart looks at in a PM candidate:

- Product thinking
- Problem-solving
- Leadership skills
- Domain and Tech
- Execution Excellence

Sprinklr

Sprinklr, founded in 2009, is a Software as a Service company that develops a Customer Experience Management (CXM) platform. It utilizes artificial intelligence, and combines different applications for social media marketing, social advertising, content management, collaboration, employee advocacy, customer care, social media research, and social media monitoring. Sprinklr PMs are expected to be client focused.

Media.net

Media.Net, founded in 2010, is a leading global advertising technology company. It got acquired by Beijing Miteno Communication Co. in 2016 for $900M. They connect advertisers to the websites that want to host the advertisements. They aggregate the ad space supply from different websites and offer it to the potential advertisers.

Media.net expects PMs to be analytically sound. Good understanding of basic algorithms and the ability to build analytical models is usually tested during the interviews. PMs should know how the advertising industry works and where exactly Media.net fits in the value chain.

Adobe

Adobe, founded in 1982, is best known for its media products like Photoshop, Illustrator, etc. They have a wide range of products both in the B2B and B2C segment. PMs in Adobe are expected to be highly creative and have a great story-telling ability.

They look for PMs who care deeply about the customers, mostly in creative fields, and work towards improving their experience. PMs should understand the fundamentals of business, ability to coordinate with multiple functions while working quantitative data.

Product Managers in general:

- should have a good understanding of the industry they are working in. They should be able to identify trends within the industry and use these insights to develop a roadmap for the product.
- act a bridge between various functions (engineering, design, marketing, etc) and therefore communication becomes vital skill in aligning these teams.
- is the voice of the customer. User Empathy, in terms of understanding the user, their needs and pain points, is essential for PMs to succeed. This helps PMs better understand the motivations behind users and 'why'/'how' they use the product.

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CONCEPTS

Section 2

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Shubhangi Singhal

AGILE METHODOLOGY

Waterfall model – Software Development Life Cycle

Waterfall Model is one of the earliest Software Development Lifecycle approach. It represents the linear sequential flow of the software development process. In this model any phase in the development process begins only after the previous phase is complete and the phases do not overlap. This type of model is more suited for small and less complex projects where goals are clear and minimum changes are expected during the course of the project. Shown below are the phases that a typical waterfall software development life cycle follows.

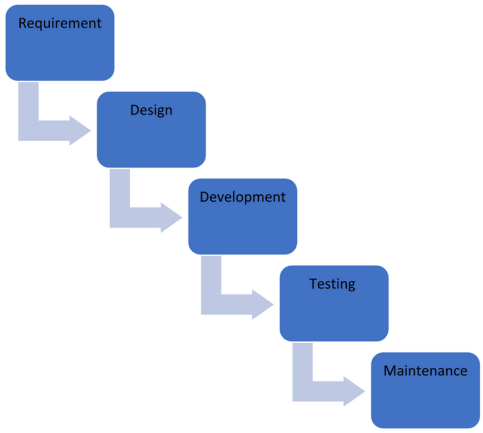

Figure 3.1 Illustration of the waterfall model

The waterfall model poses a number of drawbacks, and is not suitable for projects with unexpected and frequent revision. Few of the shortcomings of this model are mentioned below:

Not adaptable to change
It lacks adaptability at all the stages of development. A design flaw found in the testing phase can lead to a big fall back to the earlier stages of the process and can even lead to serious flaw to the legitimacy of the entire system. The rework and delay due to sequential processes can lead to late delivery of the product and can affect the competitive edge of the client over its competitors.

Risk of defects in the end phase
The testing is done at the end of the process and might result in delays, in case defects are found. The risk that a project might fail is concentrated to the end phase of the cycle.

Absence of Client feedback mechanism
It does not have a mechanism to continuously collaborate with the client and incorporate the feedback of the client in between the development phases.

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Agile

Agile is the ability to respond to change. It is an iterative and time boxed approach to software delivery that builds software in increments from the start to the end of the project,

In Agile methodology, the collaboration between self-organizing cross-functional teams leads to the evolution of requirements and solutions. Agile development helps a cross-functional team to deliver valuable work faster. It also helps in responding quickly to the customer needs. It enhances the quality and predictability of the work done.

Any development process that closely follows the concepts put in the Agile Manifesto is known as Agile development. The Agile Manifesto came into place when a group of fourteen software enthusiasts came together to devise a new way of working.

Agile Manifesto
We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

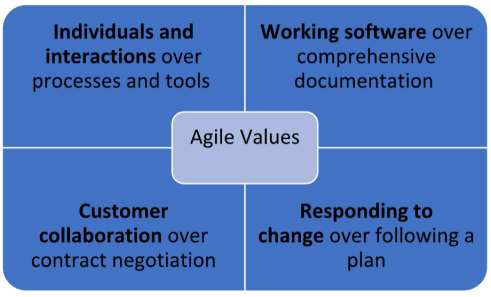

Figure 3.2 Agile Manifestto

Individuals and interactions over processes and tools
Process and tools are time consuming and less responsive to change so Agile gives greater importance to people over process and tools.

Working software over comprehensive documentation
While required documentation is necessary, in the agile mindset, working software is the prime importance.

Customer collaboration over contract negotiation
Agile promotes customer collaboration and feedback throughout the life cycle.

Responding to change over following a plan
Agile works in sprints that are adaptable to change.

Agile acknowledges the value in the items on the right but it seeks to value the items on the left more while working on any project.

Agile Principles

Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
The customer expects fast delivery of the product, and each delivery should add some value for the customer.

Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
The market and businesses are continuously changing and it's almost impossible to predict exact requirements. Agile embraces the changes, even late in the cycle. The latest product gives a competitive edge to the customers over its competitors.

Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
It promotes increment delivery of workable software. Frequent delivery leads to frequent feedbacks from the customers and less defects in the delivered software.

Businesspeople and developers must work together daily throughout the project.
This agile principle encourages organizations to increase the daily collaboration between the developers and the business, increasing the mutual understanding and respect. Communication barriers should be removed and teams should be motivated to interact with business people.

Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
The motivated developers should be enabled with correct coaching, environment, and tools to do their work professionally and contribute to the team.

The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
This principle promotes that team members should have more of face-to-face communication rather than emails, messages and calls.

Working software is the primary measure of progress.
Working software at the end of each cycle is the primary measure of progress and if the working software is not delivered then no progress is considered.

Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
This principle talks about identifying the velocity of the team and making everyone work collectively with a constant pace.

Continuous attention to technical excellence and good design enhances agility.
We should avoid creating technical debts and look for technical excellence and efficient designing of the delivered software.

Simplicity—the art of maximizing the amount of work not done—is essential.
This principle helps us identify the work which is not very important for the end user. Agile says that the work which doesn't add much value to the customers can be postponed or avoided.

The best architectures, requirements, and designs emerge from self-organizing teams.
Agile places a lot of importance in the role of self-organizing teams. It gives power to these teams to make decisions and allows management to trust the teams with the outcomes. It believes that the self-organizing teams are capable of coming up with the best architectures, designs and ideas.

At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.
Self-organized team tune to itself and do the regular retrospective of its processes, behaviors to adapt and

change according to the changing realities. Retrospection helps in course correction.

Agile Best Practices

Iterations - Agile teams pick the right amount of work to be done based on the team's experience, productivity and velocity. Work is done in an iterative manner in order to learn from the mistakes done in the previous iteration.

Customer-oriented approach - Agile team should collaborate with the customer and provide all the information required by them and also keep them updated about the progress of the work. Constant and transparent communication should be a part of team culture.

Product backlog - Product backlogs are ordered depending on the business priorities of the tasks. It includes product features, knowledge acquisition, environment setup, bugs and other technical work.

User stories – The work is logically broken down into smaller chunks or user stories. A user story typically contains a description of the problem from the user's perspective, acceptance criteria for completion, and estimation of the time required to finish it.

Value stream analysis - The methodology talks about defining the product based on user stories and about defining dependencies between the business and technical functionality.

Timeboxing - is required for all the activities of the Sprints. A sprint may last from a week to a month depending upon the nature of work and the delivery schedules. Daily Scrum meetings are timeboxed at about 15 minutes.

Integration - Continuous integration of code is done incrementally. Every increment of code is verified and tested before it is merged with the existing code. It also expedites and simplifies the testing of new user stories.

Test-driven development – All the tasks start with writing programming adaptive tests and unit tests followed by writing of the code specific to the user stories.

Agile Frameworks

Agile is a development methodology and it requires a framework to implement its principles into a project. Agile is implemented through numerous frameworks, some of the most frequently used frameworks are described below:

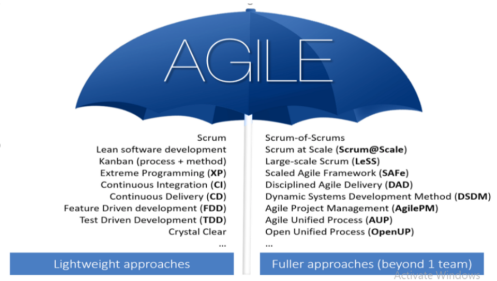

Figure 3.3 Illustration of some popular agile frameworks

Scrum Framework

It is an agile framework used for developing and delivering complex projects. Scrum is lightweight, easy to understand, but difficult to master. Scrum is driven by five values that include Courage, Focus, Commitment, Respect, and Openness. Roles of the scrum team includes product owner, the development team, and a scrum master. Pillars of the scrum framework are transparency, adaptation and inspection.

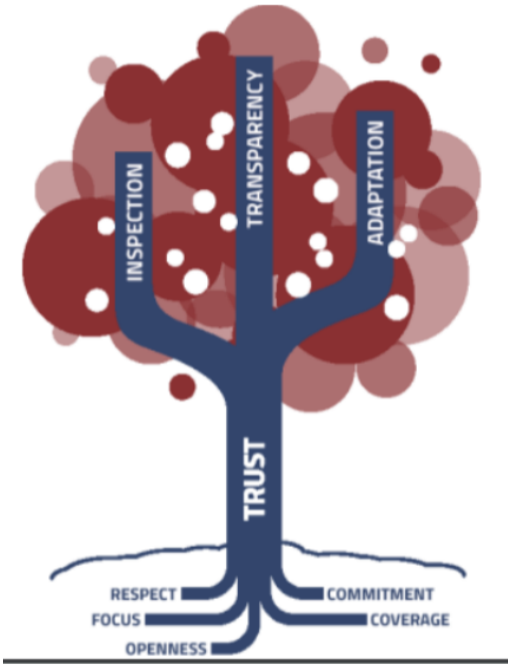

Figure 3.4 Illustrative summary of the scrum framework
Source - agileconference.org

Kanban

In the Kanban framework, the tasks are visually represented on a board called the Kanban Board. The board carries different states such as “to do”, “in progress”, “completed” etc to depict the status of each task. The board helps in avoiding bottlenecks and track the progress of the tasks.

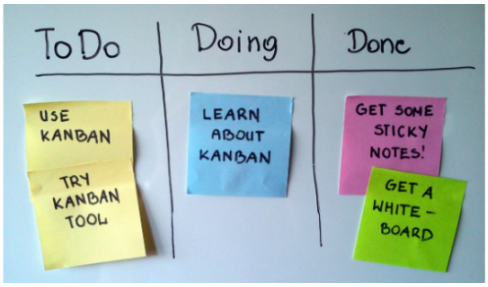

Figure 3.5 Illustration of the kanban framework
Source - Kanbantool.com

XP – Extreme Programming - It is one of the most sophisticated agile frameworks. It is used when the requirements are frequently changing. It comes with a set of engineering practices that should be followed in order to fully experience the capabilities of XP.

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Jayant Jain

USER EXPERIENCE DESIGN FOR DIGITAL PRODUCTS

Design Thinking Process

As defined by the Interaction Design Foundation, User Experience Design is the process of fabricating products that provide purposeful and relevant experiences to users. To achieve this, designers follow the process of design thinking. Design thinking is a problem-solving methodology through an iterative process, in which designers seek to step into the users' shoes, to understand their needs, goals, and frustrations, redefine the problem, and identify alternative approaches to solve the problem. Figure 4.1 illustrates the process of design thinking. The six stages involved will now be discussed in detail.

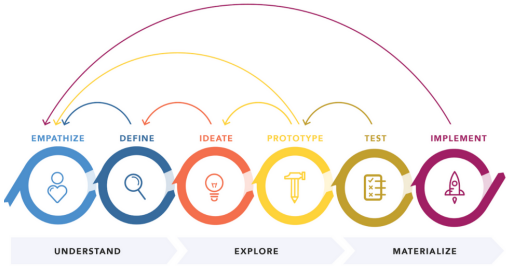

Figure 4.1 The design thinking process

Empathize

In this stage, one should try to get a better understanding of the problem. This will begin with secondary research through databases, books, journals, etc to understand the context and the current state of the art. At this stage, one can also perform a competitive analysis to identify the market gaps. This is followed by primary research. Through primary research, one should try to gather the information that can be used to fulfill the gaps identified in secondary research. Some of the tools that can be used to perform primary research are as follows:

- Ethnography research
- Focus groups
- Diary study
- Cultural probe
- Surveys, interviews and digital questionnaires
- Interviews of subject matter experts

Define

After completing the research, one can use the process of affinity diagramming (also called KJ Method)

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to understand the research data, and to capture insights, gaps, and identify pain points. It is a participatory process, and the whole product team takes part in it. The qualitative data from the research is broken into smaller chunks and is written on cards. The team members collaboratively organize the cards into groups of related information. The process results in identifying the opportunities for future studies, identifying the range of problems, and uncovering similarities among problems from multiple stakeholders.

Then, one moves forward to segment their users and develop user personas. As defined by Alan Cooper, "Personas are archetypal users that represent the needs of larger groups of users, in terms of their goals and personal characteristics." Personas communicate the product's goals and users' behavior patterns to the product team. One starts with identifying behavioral variables like activities, attitudes, skills, aptitudes, and motivations of research subjects. Then, one maps the subjects to these behavioral variables and identifies significant behavior patterns. For each persona, synthesize relevant goals and check for completeness and redundancy. Lastly, expand the description of attributes and behaviors for ease in communication among the product team.

A product team can prepare the following types of personas:

- Primary: Identifies the primary target user for the design.
- Secondary: They are mostly satisfied with the primary persona's design, but have specific additional needs that can be integrated without upsetting the product's ability to serve the primary persona.
- Supplemental: Their needs are completely represented by a combination of primary and secondary persona.
- Customer: They address the needs of customers, who can be different from end-users.
- Served: Though they are not users of the product, they are directly effected by the use of the product.
- Negative: They are used to communicate to stakeholders and product team members that these are the type of users that the product is not being developed to serve.

After defining the users, the product team moves forward to define a problem statement. This helps in defining the purpose of the design initiative, for both the personas and for the business. Following is an example of a problem statement.

"*Company X's customer satisfaction ratings are low and market share has diminished by 10% over the past year because users don't have adequate tools to perform A, B, and C tasks that would help them meet their goal of G.*"

Implement
After prototyping and testing, developers take over the prototype for development. During this stage, it is essential to collaborate with developers to ensure that the workflow of the developed product is as planned, and that the aesthetics of the developed product matches with that of the prototype prepared earlier. A basic knowledge of CSS and Javascript is a plus for this type of collaboration.

Heuristics for User Interface Design

Nielsen and Morich developed 10 general principles for interaction design which can be used as broad rules to test the usability of an online product:

Visibility of system status
The users should be kept informed about what is going on using feedback within appropriate time. Eg: loading indicators.

Match between system and the real world
The phrases used in the system should be familiar to the user and fit their mental model. Eg: using appropriate icons as metaphors and using language which matches the real-world conventions.

User control and freedom
If users get into an unwanted scenario by mistake, they should have an emergency exit option. Eg: undo and redo.

Consistency and standards
A consistent terminology and paradigm should be used throughout the system. Eg: use either 'Add to basket' or 'Add to cart', but they should not be used interchangeably.

Error prevention
The system's flow and design should be such that it eliminates error prone conditions and confirms their inputs before they perform the action. Eg: checking if the password protocols are met before the user presses register.

Recognition rather than recall
The system should decrease the users' cognitive load by making actions and alternatives available. Eg: autocomplete in search.

Flexibility and efficiency of use
The system should cater to the needs of both, novice and experienced users. Eg: use of shortcuts by expert users.

Aesthetic and minimalist design
The system should not be cluttered and show only relevant information upfront. Eg: keeping details hidden under 'view more' hyperlink.

Help users recognize, diagnose, and recover from errors
The error messages should be useful. They should convey the reason for why error has occurred and how to overcome the issue.

Help and documentation
The system should provide documentation in the interface. The documentation section should be easy to search, crisp and focussed on the user's tasks.

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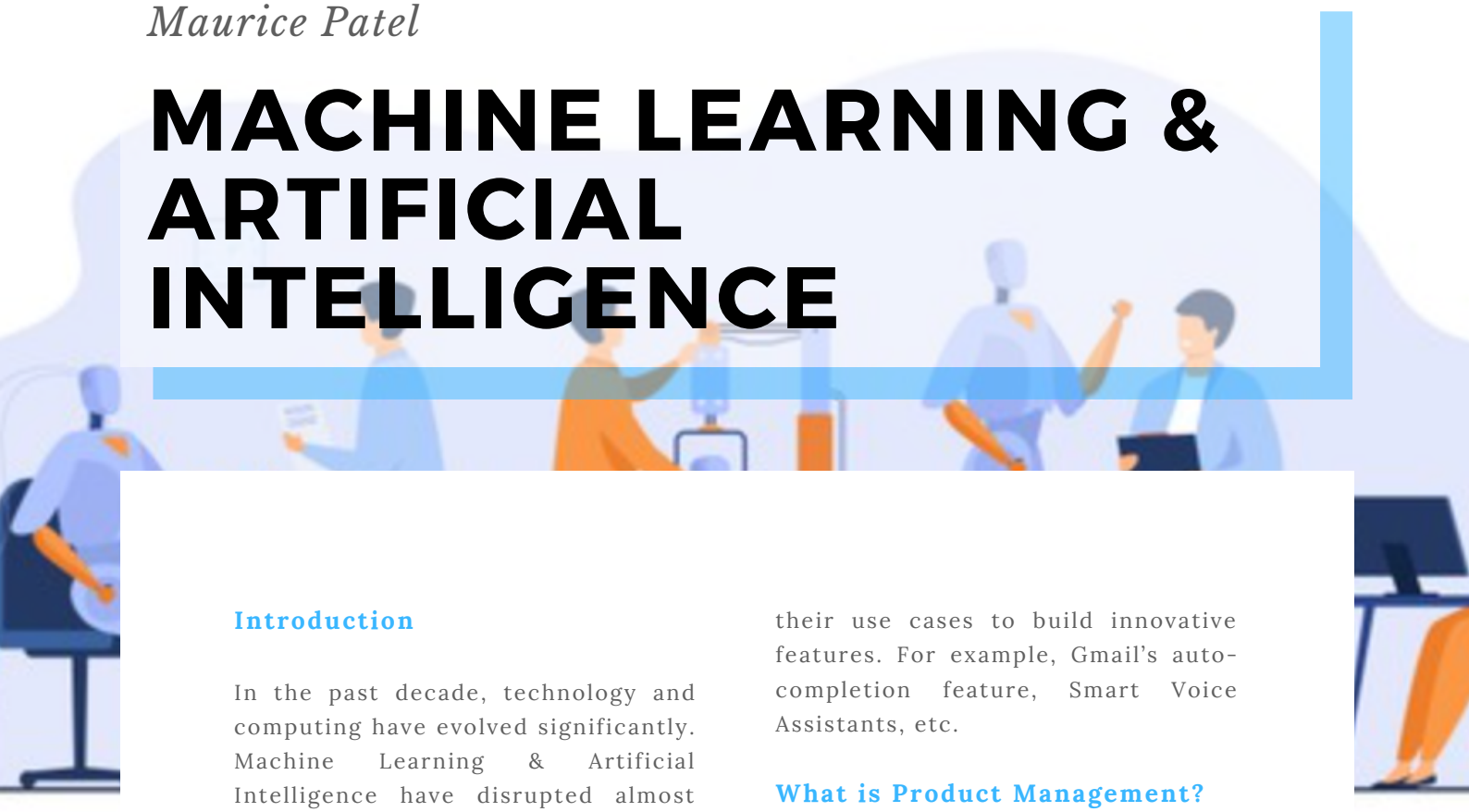
Maurice Patel

MACHINE LEARNING & ARTIFICIAL INTELLIGENCE



Introduction

In the past decade, technology and computing have evolved significantly. Machine Learning & Artificial Intelligence have disrupted almost every industry. Traditional businesses were forced to adapt, change their business model, and develop technological expertise. In 2019, 7 out of the 10 most valuable companies, based on market capitalization were technology firms. They have replaced big oil and natural gas companies, which dominated the market for the last 50 years. Companies like Facebook, Alibaba, WhatsApp, Instagram did not even exist 20 years ago. With an exponential increase in the data being generated every second, utilizing it properly gives any company a competitive advantage. Why is it relevant for a product manager? A product manager's role is defined as 'The CEO of a product', and they are expected to improve upon existing products or develop new products. Hence it is vital to understand the tools available, and their use cases to build innovative features. For example, Gmail's auto-completion feature, Smart Voice Assistants, etc.

What is Product Management?

A product manager connects business strategy, design knowledge, and customer needs to develop a relevant, feasible, and valuable product. They connect three different entities: users (and customers), developers (including designers and engineers) and the business team (sales, marketing). Each team has the following functions:

- The customer/user is the one who suffers from a problem, solving it creates value for the firm.
- The development team - designers and engineers create a product to solve customer problems by utilizing the best practices so that it is easier to develop and maintain in the long term.

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- Business organization on the other hand is solely focused on increasing shareholders' value. The main aim is to generate wealth by selling its services and products by utilizing the firm's resources.

There is an inherent conflict between them; a few examples would be:

- Engineers would want to work on cutting-edge technologies, irrespective of how useful and valuable it is for the users or how expensive it is for the business team. According to the customer, designers wish for an aesthetic design even though it is not the most preferred one.
- Customers want more features at a cheaper cost, and businesses want to extract profits by charging a premium.

Hence a product manager is expected to strike a balance between the payoffs and tradeoffs of each party.

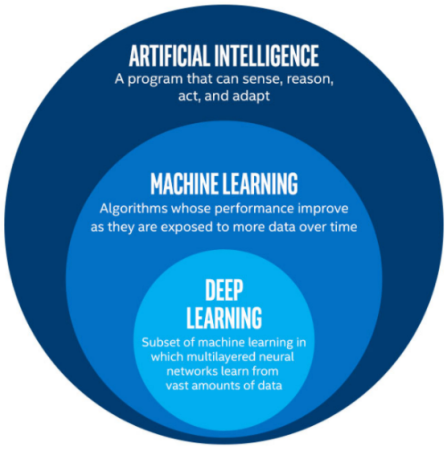

Figure 5.1 Relationship between AI & ML

- Artificial intelligence is a field of computer science developed to give machines the ability to think like humans. It is a broader field that includes areas like Machine Learning, Deep Learning, Natural Language Processing, Computer Vision, Robotics, etc.

Definition of Machine Learning

"A computer program is said to learn from experience (E) to some class of tasks (T) and performance measure (P), if its performance at tasks in T, as measured by P, improves with experience E."- Tom Mitchell

Compared to rule-based systems followed earlier, Machine Learning has the advantage that with more data, the system improves itself and gets rid of underlying biases. For example, in a bank, to sell a deposit product, they decide on potential buyers based on their savings account balance. Thus, if the balance is greater than threshold, then send the advertisement to the buyer. In the machine learning approach, we can look at the characteristics of people who bought the product in the past and match similar customer profiles to reduce the cost of advertisements and improved conversion rates.

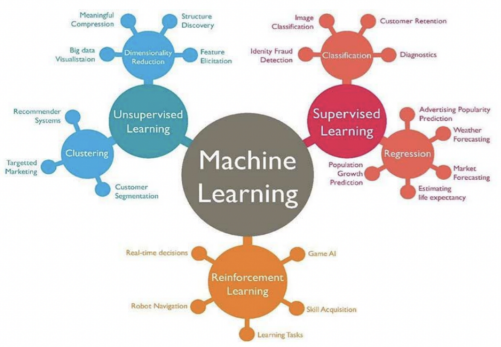

Figure 5.2 Machine learning and related areas

Machine Learning can be divided into three major areas:

Supervised Learning

Making a prediction based on a set where the output is labeled.

- Regression: To predict a continuous variable. For example, weather forecasting, indicating the price of a stock, etc.
- Classification: Classifying input into a set of predefined classes. For example, fraud detection, image classification, spam detection, etc.

Unsupervised Learning

Organizing/describing the structure of unlabeled data.

- Clustering: Finding similar groups between data. For example, customer segmentation, recommender systems, etc.
- Dimensionality Reduction

Reinforcement Learning

To take action to maximize the notion of cumulative reward. For example, game AI is trained for several generations until it learns from its mistakes how it ought to take each step, so that it would lead to victory or survival.

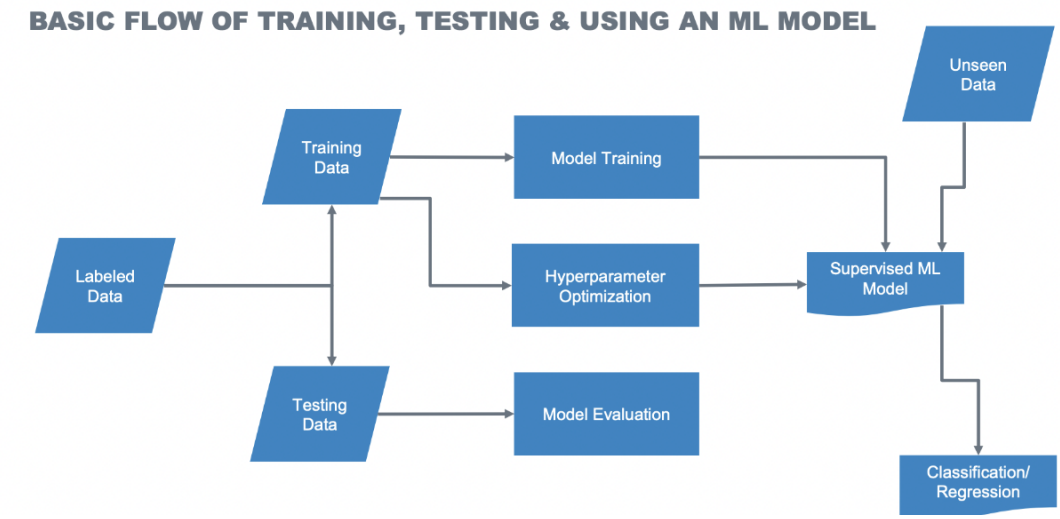

Figure 5.3 Training testing flow of an ML model

In the above diagram, the critical step is to decide which model to use based on each algorithm's limitations. Below are a few of the standard algorithms with their pros and cons.

Algorithm	Used for	Pros	Cons
Linear Regression	Regression	Easy to use and interpret.	Assumption of Linearity.
Logistic Regression	Classification	Convenient probability score for obs., interpretable.	Doesn't perform well if feature space is large.
Decision Tree	Classification	Intuitive Decision rules, handle non-linear features.	Can overfit the model.
Random Forest	Classification, Regression	Reduces overfitting, Robust technique.	Computationally expensive.
SVM	Classification, Regression	Identify Non-Linear patterns in the data, and can handle large feature space.	Difficult to fit the kernel and requires high computational time, resources.
K-Means	Clustering	Simple and efficient and easy to explain the results.	The number of clusters is to be selected in the beginning. The different initial partitions will lead to different clusters.

One of the most important classes of algorithms is recommender systems. Companies like Netflix, Amazon, Facebook, Google, YouTube, Spotify rely on recommender systems for their core product. As Steve Jobs said, “People don't know what they want until you show it to them.” Recommender systems help people identify their needs, which they are not aware of. It can be determined by looking at relationships characterised by ideas like, “people bought X products also bought Y products.”

Types of Recommender Systems

- Content-based: This approach identifies attributes/descriptive keywords from different items and recommends on the basis of similarity between two items. The drawback of this approach is that if there is no common attribute then the users won’t be recommended a particular item.
- Knowledge-based: This approach is used in the initial stages where a user is explicitly asked for his/her preferences and creates a model to recommend the next items. Example: Netflix asks users to select three preferred movie/tv series of their liking.
- Collaborative filtering: This approach utilizes both item attributes and user preferences, including the information obtained from other users’ ratings. Hence it is known as collaborative filtering.

We’ll now look as example of the above recommender systems:

Content Based

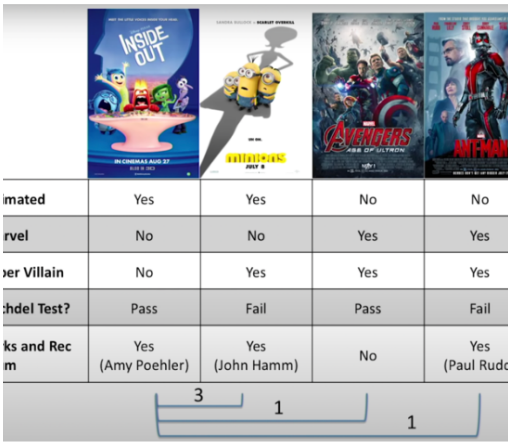

Figure 5.4 Example of content-based recommender systems

The table contains a list of movies and their attributes. It shows that Inside Out is an animated, non-marvel movie without any supervillain, which failed the bechdel test, and includes people from "Parks and Recreation". Based on this information, if somebody had watched Inside Out, we want to know which among the three – Ant-Man, Avengers and Minions we should recommend. We take the similarity between the features of each movie and Inside Out. The highest similarity is with Minions, and hence Minions should be recommended. The drawback is that this approach doesn't consider user preferences and relies solely on the movie's attributes.

Knowledge Based

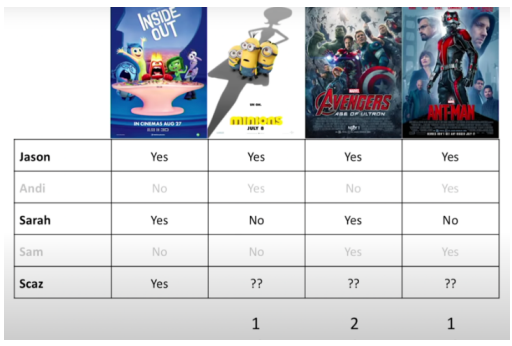

Figure 5.5 Example of knowledge-based recommender systems

The above example contains a list of users and information as to whether they liked a particular movie or not. If Scaz liked the movie Inside Out, we want to know which movie we should recommend that he watch next. We take a weighted average of the opinions of people who have similar reviews as Scaz does for Inside Out, and choose the movie with maximum votes. In this case, Ant-man has the highest votes. This approach's drawback is that it doesn't consider the fact that we have no information about the genre preference. We are not utilizing the movie-attribute information in this scenario.

Collaborative Filtering

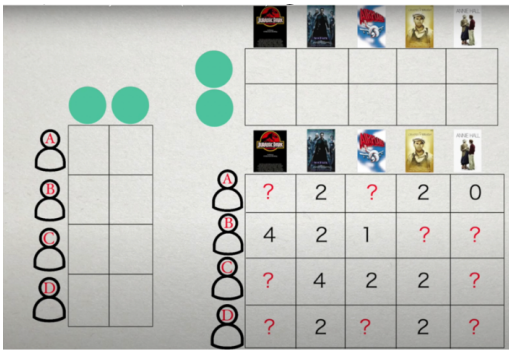

Figure 5.6 Example of collaborative filtering recommender systems - step 1

The matrix contains half-filled information with reviews that users have filled for different movies. The missing values correspond to movies that haven't yet been watched by those users. The aim is to find the missing values. We will try to decompose the matrix into two matrices, known as latent factors.

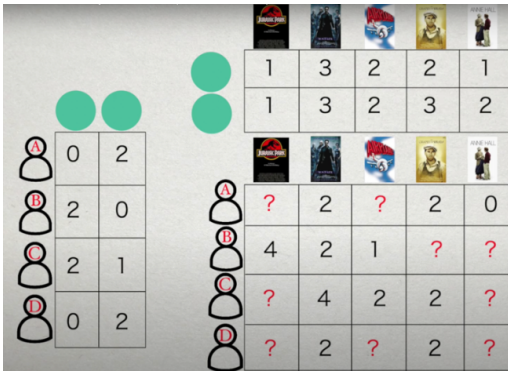

Figure 5.7 Example of collaborative filtering recommender systems - step 2

We start with random values in the two matrices and multiply them to get the information matrix. We calculate the difference between actual and predicted values. Finally, we find the optimal values for both matrices by using gradient descent, which minimizes the error between predicted and given information matrix.

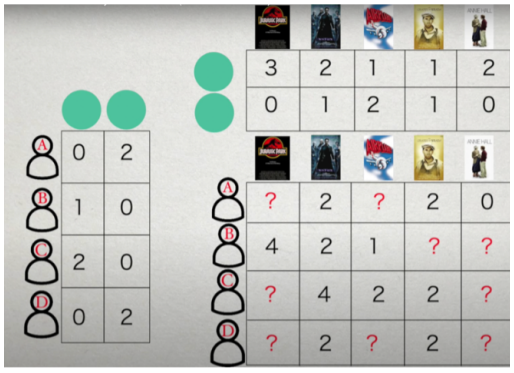

Figure 5.8 Example of collaborative filtering recommender systems - step 3

Using the two matrices, multiply and get the missing question mark values.

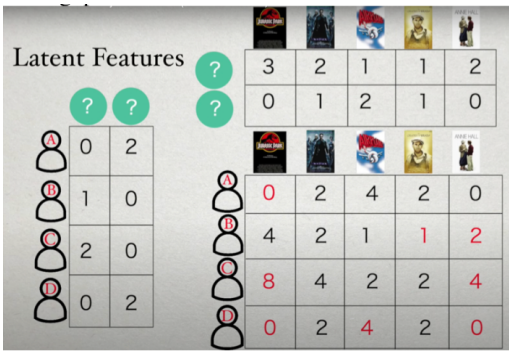

Figure 5.9 Example of collaborative filtering recommender systems - step 4

The predicted values are recommendation scores.

This method takes care of user preferences and object attributes, and is a very powerful and simple recommendation algorithm.

Neural Networks

All the algorithms described earlier worked differently from how humans learn. The goal of machine learning and artificial intelligence was to mimic our way of learning in computers. Neural Networks were developed in the 1960s but gained popularity in the current era, with increased computational capabilities of existing systems. Below is a diagram that compares the working mechanism of a biological neuron and an artificial neuron.

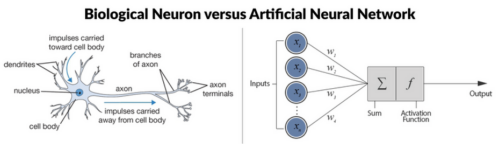

Figure 5.10 Comparison of biological neuron vs artificial neural network

If one puts their hand on a hot stove, the immediate action would be to pull their hand away from the stove. In this process, information that the stove is hot, is taken as input from dendrites to the nucleus, where it decides if it is hotter than some threshold; if yes, the neuron is fired. The axon carries the impulse or signal to take the hand away, till axon terminals. Similarly, in an artificial neural network, inputs are taken from all the xi, and weights are assigned to minimize error. Based on the value of the weighted sum and activation function, the output is predicted.

Each neural network has a different architecture, and is used for different purposes. However, neurons, artificial networks, and hidden layers are common, which extract hidden features.

The more the number of layers, the more capable the ANN of extracting features of a higher dimension.

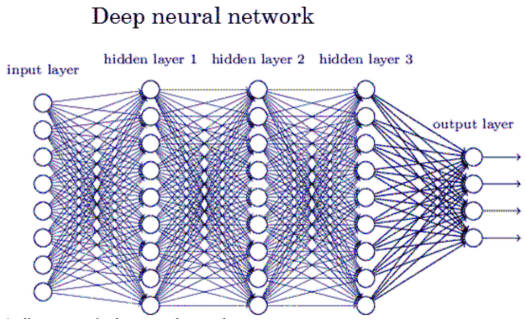

Figure 5.11 Illustration of a deep neural network

The deep neural network has more number of hidden layers, which help in feature extraction. Compared to classical ML models, where users have to derive or specify features from the dataset. In Deep Learning, the model itself selects and creates features. We shall see a specific type of Deep Learning Neural Network, a state of the art network, known for its future potential.

Generative Adversarial Networks

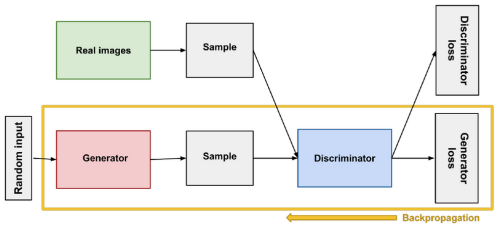

Figure 5.12 Illustrative diagram of a generative adversarial

It is a special type of neural network where we have two optimizing functions instead of one, and both of them compete with one another. We have a generator network and a discriminator network, with their loss functions, and the task is to reduce the loss. Initially, the generator is provided with random input, and hence the discriminator can easily distinguish between real and fake images. The generator loss will be too high. After several iterations, generator loss is minimized, and it creates a more and more realistic image. In a nutshell, both neural networks have achieved state of the art by letting one machine compete with the other. The final output is two networks, one to generate fake images and the other to detect. Both of them can be used independently.

Conclusively, the product manager should understand what different tools they have available, and how to improve the product by applying ML and AI. The following framework provides an idea as to whether you should apply ML to the existing product or not:

- Does it fit the product goal?
- How does the product revolve around the ML?
- How should the product start using ML?
- Benchmark to compare it with?
- How quickly should the product change?
- What interactions, actions, and control do users have?

Several innovative solutions like Tesla self-driving cars, sentiment analysis, and object detection in robotics and the futuristic store – Amazon GO, wouldn't have been possible without an understanding of advanced algorithms and where these tools could be used. The expectation is not to code, but know what requirements to ask of the technical team member!

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Somitra Baldua

AUGMENTED REALITY & VIRTUAL REALITY

Introduction

Augmented Reality and Virtual Reality are two particularly popular buzzwords. They have been a part of popular culture since at least 2012-13, which is quite a long time in the tech-world. However, clarity about their functioning and use cases is still pretty limited and niche. Frequently, these two terms are used interchangeably as well. However, there is a significant difference between both the technologies.

Augmented Reality (AR) refers to observing the real-life environment with a digital augmentation overlaid on it. The fundamental idea here is to enhance real-life experiences with relevant content, information etc. ("What is Augmented Reality", 2019)

In **Augmented Reality (AR)**, we are using a computer to decrypt, or understand the live video stream from camera. By understanding, we mean identifying & recognizing the objects in the video and using the contents of the video to create a context. The computer then renders the relevant 3D graphics and superimpose it on the live camera feed to enhance a user's experience of the real world.

In VR, we are creating a parallel reality itself. We are creating an entire simulated environment for a complete, immersive experience.

A user is placed inside a virtual environment, which in turn tries to trigger and engage (i.e. simulate) as many senses as possible. The ultimate motive is to create an all-round experience with complete self-immersion. The only limits to virtual reality (VR) are the availability of content and cost effective computation power. As is apparent from the definition itself, detailed graphics are an important part of a powerful and convincing virtual reality (VR) experience, and hence the requirement for high computation power. (Bardi, J. 2019)

Popular Products & Brands

AR has a wide range of applications, and hence its product set is also diverse. Examples of AR include multiple app based software products like "Pokémon Go": an AR based smartphone game that became a viral sensation in 2016-17. Similarly, the "IKEA Places" app by IKEA- a furniture retailer has an AR feature

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which allows customers to visualise the selected IKEA product in their homes to confirm product fit. Amongst hardware-based AR products, "smart glasses" is the most popular category, which is led by brands like Google ("Google glass"), Epson ("Moverio"), Toshiba ("dynaEdge") etc. The "smart glasses" category is highly fragmented with no clear winner.

VR products can also be segmented into Hardware and Software. VR headsets, popularly called "Head Mounted Display" (HMD) is the most popular hardware product category in VR. HMDs are further classified into three types:

- **Category 1:** VR headsets to be used in combination with Smartphones.
- **Category 2:** VR headsets to be used in combination with PCs (Personal Computers), or Consoles.
- **Category 3:** Standalone VR headsets.

Each category has a different source of computation power. For example, in category 1, smartphones provide the computation power, while in Category 2 PCs or consoles provide the same. In category 3, the onus of computation is embedded in the headset itself. Generally, category 2 and category 3 HMDs are also accompanied with "hand controllers", which improve motion tracking and therefore, the virtual device experience. The major brands operating in the VR headset space are Sony PlayStation, HTC Vive and Facebook's Oculus.

Pricing and Product Features

AR devices, having varied applications, are meant for long duration use, to the tune of an entire day at a time. As a result, the make or break features include the device being light in weight and having long-lasting batteries. Google Glass, for example weighs around 46 gms and has a battery which is sufficient for a typical day's use. However, it costs the customer around $1500.

VR devices on the other hand are typically used for short durations, in the range of 2-3 hours of continuous use. They weigh more, in the range of 400-600gms and have less battery life, to the tune of 3-4 hours. With lower battery life and heavier weight, however comes the benefit of a lower price tag compared to AR devices. Pricing starts from $120 and touches $600-700. The inefficiency in product design (battery life and weight) are the major bottlenecks in VR and provide immense scope for improvement.

How AR Works

Computer Vision is the most fundamental building block of AR technology. In this section, we will first introduce Computer vision and then further explore the working of AR technology.

Computer Vision Basics: The goal of Computer Vision is "to use observed image data to infer something about the world." (Browlee, J. 2019) Given an image (or video stream – which is again a set of image frames), what can we understand about the scene being portrayed in that image? Does it have an object, what kind of object, how many such objects are there etc. These are the key questions that computer vision focuses on. It is an extremely advanced research field and can be further broken down into

subfields like object detection, object classification, object verification etc. We'll delve a little deeper into object classification, to develop a clearer idea of how computer vision works.

We will try to understand the underlying theory of how object classification works through the character recognition problem.

The problem statement for us is: given a set of images containing only two characters: "c" and "e", how can we develop an automated algorithm to classify each image as either the character "c", or character "e"?

The solution here is broken into two parts: the training phase and the testing phase. The two possible outcomes ("c" or "e") are called classes. Any given image will belong to either class "c", or class "e".

In the training phase, a labelled data set is passed through the "feature extraction algorithm". A labelled data set is a set of images, where each image is labelled as either class "c" or class "e". We always use labelled data sets for the training phase. For example, a user would know beforehand that the image which is being passed to the algorithm for training is of class "c".

In the testing phase, we use an unlabelled dataset. The only information that we have about the unlabelled data set is that each image in the data set will either be of class "c" or of class "e". Unlike the labelled data set, we don't know beforehand whether a given image is of class "c" or class "e". However, we now have a classifier in place. We will pass the unlabelled data through the same feature extraction algorithm used earlier, thus deriving a feature vector Y. We then compare feature vector Y with Xc and Xe, to identify which one it is closer to. If it is closer to Xc, our algorithm will classify the image as Class "c". If it is closer to Xe, our algorithm classifies it as Xe. In this example, since only two classes are used, not belonging to class "c" implies belonging to class "e". But, in case of 3 or more classes, the same would not be possible.

Note: This is a very simplistic model. Advanced algorithms which are used for classification are much more sophisticated.

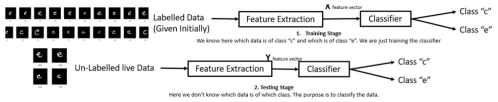

Figure 6.1 Basic character recognition algorithm

AR technology works through the following steps:

- First step is Computer vision, where a computer understands the content of the video streaming from camera feed and generates a basic context for the world around the user.
- Second step is Rendering. Once the computer has understood (in the step 1) what the camera (and hence, the user) is looking at, it searches for the relevant digital content and then super impose it on the camera feed, so that it looks like a part of real world and enhances the experience.

AR is a real time application & hence; both the above steps have to be performed on every frame that the camera captures. iPhone 11 has a camera which capture 4k resolution frames at 60fps, which gives us

around 16-17 millisecond per frame to complete both the above step for a 4k frame. Considering the computational speed of modern processors, 16-17ms is a very long time. This gives developers enough bandwidth to design sophisticated AR algorithms.

How VR Works

In the case of VR, it is a three-step process:

- Step 1: Video is sent from PC (via HDMI cable), or smartphone slotted into headset, or from the graphics controller in headset itself, for a standalone VR headset.
- Step 2: VR headsets either send 2 feeds on a single display, or have two LCD displays: each for one eye.
- Step 3: VR headsets have a lens assembly between the user's eyes and the display, which reshapes the picture appropriately for each eye and create a 3D image.

We are just trying to mimic the way our eyes work. There is a minimum requirement of 60fps from the VR headset for a convincing experience. The modern devices have capabilities which far exceed this limit. Oculus gives 90fps level performance, while Sony's PlayStation VR gives 120fps level performance. Another spec. to focus on for VR headset will be field of view. Ideally, VR headset should provide a 360-degree display to mimic the real life, but that will be too expensive. Most of the VR headsets have 100 to 11o degree field of view which is enough for human capability.

Tracking is an area where VR headsets try to differentiate themselves from each other, in order to justify their premium pricing. VR headsets have sophisticated tracking sensors, which are essential to create a quality experience. Tracking of the user's head is done via internal components like gyroscopes, magnetometers and accelerometers. Many headsets have a set of external sensors like LED lights and cameras to further improve the tracking accuracy. Image data from the headset camera is used to create a 3D model of the room and detect external landmarks like stairs, corners in the room etc. The earlier mentioned computer vision techniques are used here. Rotational and linear acceleration data from sensors in the hand controllers is used to track the user's hand movements.

Latency is an important performance parameter in VR. Head-tracking tech needs low latency to be effective - 50 milliseconds or less or we will detect the lag between our head movement and the VR environment changing. The Oculus Rift has lag of around 30ms.

FOVE VR headset has implemented eye tracking as well, using an internal camera and infrared sensor that monitors the user's eye. Even keeping one's head still, while moving only one's eyeball, will lead to the VR environment changing.

Industrial Application

AR and VR headsets are expanding their market by creating enterprise use cases. There are multiple companies using AR smart glasses in their supply chain to improve their productivity. Ford designers use Oculus Rift to visualise and experience the interior and exterior design of their cars. Lockheed

Martin's engineers use AR glasses to get real time visuals of their aircrafts and overlay images with instructions in a real working environment. The company has realised an annual savings of $10 million in its product line (Source: Statista).

Vital Enterprise has created an AR software which makes instructions available in a hands free and voice-controlled format. Assembly and maintenance engineers can access instructions using AR glasses instead of reading long pdfs of instructions.

"Focus is shifting from talking about technology benefits **to showing real and measurable business outcomes**, including productivity and efficiency gains, knowledge transfer, employee's safety, and more engaging customer experience" – **IDC report**

Industry Status and Product Manager Roles

Figure 2 shows the current industry size and the forecasts for 2020. The industry is expected to go through a high growth period, with a CAGR forecast of 77% for the AR-VR market size over the 20180-2023 period.

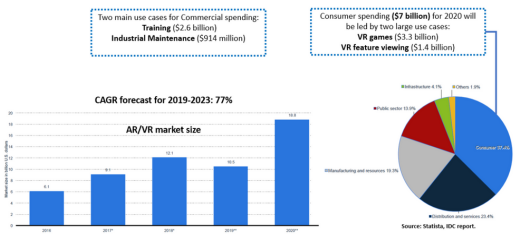

Figure 6.2 AR-VR market size and 2020 forecasts

Note: these forecasts are Pre-COVID figures. The absolute value may carry little value, but trends are useful.

Overall, the industry is moving away from hardware based technological improvements and towards software-based improvement, with a focus on creating enterprise level use cases, while creating more content on play stores. Customer enterprises are also in the process of exploring how to use AR-VR for productivity related improvements in their value chains, such as production supply chains. PM roles in customer enterprises are extremely generic and exploratory, while in AR-VR manufacturing enterprises, PM roles are more software focussed.

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BIG DATA

What is Big Data

Data is the most essential component in decision-making and serves as the raw material for accountability. Big Data refers to data which is so large, generated at such a pace and is so complex that it is difficult to process and use it with traditional methods. Major improvements in processing power, storage density and internet access with cloud have led to a rapid evolution in the field, making Big Data accessible to any company.

Big Data was characterised in the form of three V's by Doug Laney, an industry analyst back in the 2000s:

- **Volume** refers to the large size of the datasets. Data comes from many sources ranging from transactions, IoT sensors and, industrial and manufacturing equipment, audio-visual data, social media mining and more.
- **Velocity** refers to the high speed of data generation. With adoption of IoT, data comes at an unprecedented speed and is handled in real time. Eg. RFID tags, sensors and smart meters.
- **Variety** refers to the diversity of data generation sources and formats. Source can be structured, numeric data to unstructured text documents, emails, videos and financial transactions.

Over the years, many additional dimensions have been added, but majorly there are three more:

- **Variability** refers to change of meaning with context. Also, businesses need manage daily, seasonal and event-triggered peak data loads.
- **Veracity** of data refers to reliability and accuracy aspects of it. As data comes from variety of sources, there are a lot of challenges associated with cleaning, linking, matching and transforming the data to maintain uniformity of operations.
- **Value** refers to using data as a game changer. Leveraging technologies such as Machine learning and Simulation, companies can transform their business model and explore futuristic scenarios.

Big Data can be classified based on the source that it is coming from, or based on the form in which it is coming.

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Internal Data
Data generated within the operations of a business. For example, transactions, inventory, customer data etc.

External Data
Data sourced from external sources.For example, traffic, census, industry data etc.

Structured Data
Data which is highly specific and is stored in a predefined format. For example, geo-locations, employee details, marketing campaigns etc.

Unstructured Data
Data stored in varied forms, which cannot be analysed in a fixed form. For example, social media, blog comments, video/image etc.

Nowadays, the concept of horizontal scaling (more machines working parallelly) is used for intense data storage or processing. However, this strategy incurs an additional penalty of complexity. Most cloud applications are on distributed systems (network that stores and shares data on more than one node at the same time). The CAP theorem states that while designing a management system we can only choose 2 out of the following 3 characteristics – Consistency (all clients see the same data across nodes at the same time), Availability (any client making a request gets a valid response all the time) and Partition Tolerance (cluster continues to work despite any number of communication breakdowns between the nodes in a system).

Big Data Architecture

The architecture components of a big data system typically consist of four layers:

1. **Sources Layer** – This is the layer where we source the data from. This is different from where data is originated, as the Sources layer refers to data which has already been recorded and stored in the form of data warehouses, Database management systems (SQL or NoSQL) etc.
2. **Storage Layer** – Here, the data is taken from the source layer and stored in a suitable format to proceed with analysis. The format is decided based on the requirements of the data analytics tool.
3. **Analysis Layer** – In this layer, there are various analytics and business intelligence tools which extract insights from the stored data.
4. **Consumption Layer** – This is the final layer of the architecture which interfaces with the end user. The output of the analysis later is presented in visual or dashboard type of formats.

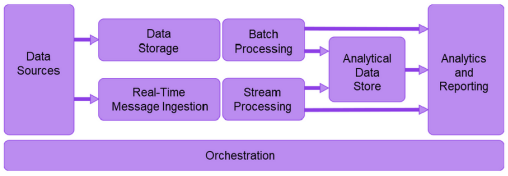

Figure 7.1 Big Data Architecture

Big Data Technologies

The platform of Big Data is like an ecosystem. There are three broad components associated – Data Management, Data Analysis and the Infrastructure side.

Data Management – Within data management, there are ingestion platforms like Flume and Sqoop, through which data is transported from various sources to a storage medium. Then there are storage technologies like Hadoop and NoSQL. They help in storing the data in the form of clusters, with a node assigned, that can be accessed from any part of the system. There are also cluster administration technologies like Ambari and Chukwa, which help in managing and monitoring clusters. Finally, we have data governance technologies like Eagle and Falcon, which help in controlling the quality and security aspects of data.

Data Analysis – For data analysis, there are query technologies like Hive, Impala and Drill, which provide interactive query support for the stored data. There are batch processing engines like ETL, Pig and Oozie, which help in scaling out computations, in order to handle a large volume of data. Unlike real-time processing, however, batch processing is expected to have latencies (the time between data ingestion and computing a result), that measure in minutes to hours. There are also data stream engines, which are an improvement over batch processing. They process data over rolling windows or most recent records, removing the latency. Examples of such technologies are Kafka and Spark. Finally, there are Advanced analytics technologies like Mahout and Spark which apply Machine learning to Big Data to perform more advanced computations.

Infrastructure – Infrastructure refers to the medium through which these technologies are stored, provided and accessed. These are mainly cloud services like AWS, Azure, GCP, Whirr etc. Figure 2 shows Microsoft's Big Data ecosystem.

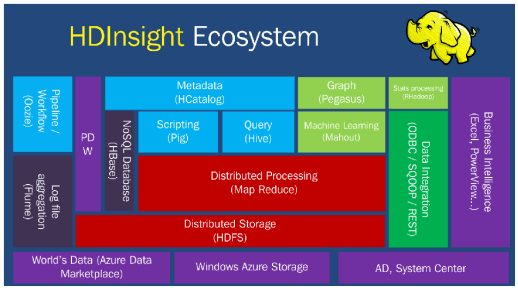

Figure 7.2 Microsoft HDInsight ecosystem

B2C Applications

Major companies using Big Data in their operations can be classified based on their industries.

- BFS – Banking and financial service industry includes insurance providers, banks, credit card providers, etc. Big Data is used in insurance and trading operations, identifying and detecting fraud, analysing portfolio and valuations. Data security and governance is critical in this industry.
- Retail – This includes sales of goods and services and use cases across supply chain, vendor management, analysing shopping baskets, and other service based categories.
- Healthcare & Life Sciences –This includes biotech companies, research institutes, health insurance providers, who use big data for pharma R&D, disease management, drug efficacy etc.

- ICT – This includes companies that work on software and information systems, and other technology based companies. Use cases include data analysis.
- Media & Entertainment – This includes companies working in print media, television, radio, gaming, and online advertising. Most commonly big data is used in delivering content and optimizing workflows.
- Telecommunications – Telecom service providers and operators use big data to improve customer service, churn management and for optimizing their network.
- Government – This includes all government affiliated entities such as intelligence agencies, defence & military. Some of the most common use cases are Cybersecurity, defence, legal intelligence, disaster preparedness, & law enforcement.

B2B Applications

Big data analytics can address and improve many issues in B2B industries – operational, strategic, financial, etc. Consider the example of the power sector. The industry infrastructure is becoming smart, with built-in processing, connectivity, and sensing capabilities. Technology systems like electric vehicles (EVs), internet of things (IoT), smart homes, grid management systems, and others are likely to interface with utilities and provide them with potentially valuable data. Currently, there are few players in the world who have actively adopted big data analytics.

Big Data analytics help **power companies** avert turbine failures – By utilizing predictive models, companies can study various factors causing equipment failure and then perform maintenance activities in time, leading to maintenance cost savings. Some examples include:

- Schneider Electric's PRiSM, a big data software solution, diagnoses equipment issues in advance and provides early warnings. Southern Company in the U.S currently uses the system.
- GE's Predix platform uses advanced predictive analytics to identify patterns from datasets. Enel, an Italian MNC, active in electricity generation and distribution sectors, uses Predix platform to achieve the following 4 goals – increased performance, increased reliability, optimized output, and reduced costs.

Big data plays a large role in **utilities consumption management** – Utilities companies use a demand response strategy to spread the energy consumption from the peak hours of the day to other parts of the day when demand is lower.

- The national grid in the U.K has partnered with Open Energi to explore the use of automated demand response in stabilizing the grid. The focus was on frequency control which requires fast response from the system.

Big data to be used to optimize **electric vehicle** charging – EVs generate datasets of various parameters and from various sources which can be collected via vehicle-to-grid (V2G) charging systems. This data can then be analysed to develop new effective charging station policies, develop smart charging algorithms, solve the issues of energy efficiency, and even calculate the required capacity of electrical distribution systems to manage the future load.

PM & Big data

Organisations usually have data scientists leading a team of data analysts for all the big data operations. By creating a separate team, businesses sometimes create yet another 'silo', which is isolated from the rest of the functional groups. For a product manager, big data can be an important tool in a typical product development cycle. We explain it through the Design Thinking method:

Empathize – This phase is all about understanding the customer - who they are, their pains, problems, attitudes, and what their emotional goals are. PMs can look at website or app analytics, observe the user journeys, understand the heat maps and where users end up, to gain insights.

Define – In this phase, a PM defines the problem that they are going to solve. Data visualization tools allow PMs to isolate pain points and attach root causes to them. It is also important to chart out different user personas, where the product positions itself vis-à-vis competitors to segment users.

Ideate – Here, PMs come up with a bunch of different ways to solve the problem. It is necessary to evaluate different ideas. Large amounts of historical data (internal + external), along with the data from the empathize phase can be used to assign weights to different parameters and shortlist the most relevant ideas.

Prototype – The ideas are turned into an MVP in this stage. As they build these MVPs, Product analytics can inform PMs about the features that are working and those which are not. Analytics help in creating a product roadmap, which can tell where the product is currently, where they want it to go and how to get it there.

Test – Prototypes are tested in front of users at this stage. Usually products are released into apps or websites for A/B testing, hence app/web Analytics data gives a broad user feedback. Nowadays, social media mining helps perform sentiment analysis, and gauge the perception of users as well.

Things To Look Out For

Personas – Understand the end user of the product. Different groups will be at different levels of data literacy. So, possible groupings could be: data producers, data consumers, data maintainers etc. These could be further divided into different functional roles and use case scenarios. For example, data producers could be divided into engineers, executives (web based use or phone based), etc.

Analytics – This involves the application part of the data and extracting insights from it. One must be cognizant of all the steps involved between storing data and retrieving it to perform analysis. One must consider how the data will be retrieved and processed, and consequently what the requirements of it are. There are multiple companies offering ready to use solutions, and some of these can be outsourced as well.

Visualization – To make the best use of the data present it in an intuitive and user-friendly way. A PM must understand the user personas and demographics, their mindset when using data and the accompanying form factor.

Storage – While a PM does not define the technical requirements, he/she is responsible for defining the use cases and business model. The data type used will impact the kind of database to use. For example, for a structured database a relational database like an SQL Server would work, but for unstructured data, one would use a schema less database such as MongoDB or Hadoop. A PM's job is to define clearly the use cases and then convey those to the engineering team. Similarly, on deciding where to store data, on cloud or on-premise, a PM must analyse the ROI for each approach.

Multiple Access Points – There are multiple products that different people prefer, and it is difficult to make a one-stop tool. Hence include import and export capabilities and other migration features that allow the user to transfer data between systems through various methods, and not restricted just through the user interfaces (UIs). Creating an open API is one way to do so.

Security – Security is a big concern for various stakeholders, since we are dealing with private and sensitive data. As a PM one must ensure that security is kept a priority since the beginning of the development process and is incorporated in all features of the product, across the full stack, right from the database to the UI and APIs. Correct quality control measures should be in place and bugs removed in frequent tests.

Practice Case Study

Sample – B2B social media data analytics process in a firm like Sprinklr

The steps involved in this process would be – Identifying data sources, Capturing data, Processing data, Presenting findings, and finally Generating Insights.

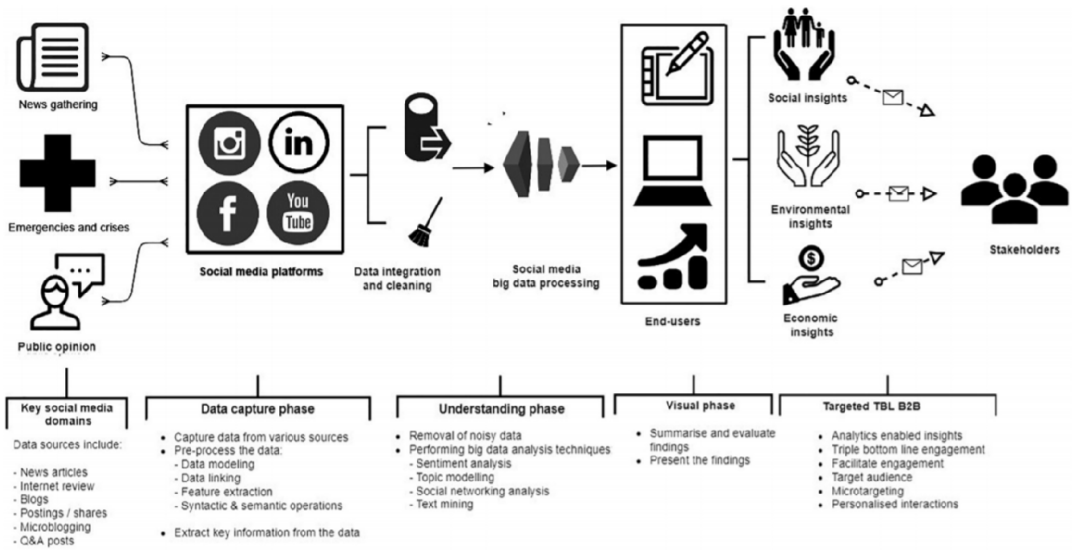

Figure 7.3 Social Media Data Analytics

Exercise – Can Big Data and Design thinking be used to help combat COVID 19?

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Prakhar Gupta, Seema

INTERNET OF THINGS

What is IoT

The Internet of Things is essentially a bunch of devices connected together. IoT doesn't require that the network connecting the devices be the internet. However, given that the Internet is the network connecting most systems, the terminology holds.

IoT is widely regarded as the fourth stage of the industrial revolution and is touted to be as impactful as the steam engine, assembly line, or personal computer. The rapid development in artificial intelligence, big data analytics, and internet connectivity, are the key drivers in the adoption of Internet of Things based technologies.

The IoT Tech Stack

The IoT Tech stack consists of 5 layers. These are the device hardware, device software, communication, data & analytics, and the application layer.

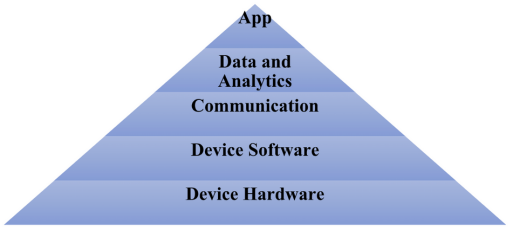

Figure 8.1 The IoT stack

Device Hardware

The device hardware forms the bottom-most layer of the IoT Tech stack. The two primary components of the device hardware are the sensors and the processors.

The sensors collect raw data from the surroundings, which is processed further to generate an output that can influence some other system. A typical IoT system can have anywhere between tens and millions of sensors depending on its complexity.

The microprocessors form an integral part of the device hardware, and a lot of them put together, form the basis for crunching the high-velocity data that are generated by the sensors and use it for processing in other stages.

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Device Software
The device software is primarily the operating system and the applications built on top of the operating system, to connect to the upper layers in the tech stack.

The operating system to be used is determined on the basis of the complexity of the system, along dimensions such as whether it has to be real-time, and the amount of data that needs to be processed. Another critical factor in deciding on the OS is the kind of interface available in the layers above. Linux is one operating system that is widely used in IoT design.

Communication Layer
The communication layer forms the backbone of any IoT system and connects the different devices that comprise the system.

There are five broad types of connectivity: bluetooth, radio, wi-fi, cellular, and satellite. These differ mainly in their operating frequency and the range (distance) that they support. The trade-off between the type of connectivity is often in terms of cost and the kind of hardware and software that has been used in the lower layers.

There are also communication protocols that define how these devices interact with each other. Some examples include IPV4/V6, JSON -Ld. and WebSocket.

Data and Analytics
There is a lot of data that is generated in an IoT system. The data can be either in a structured or an unstructured format (which needs to be interpreted before being processed for further use) depending on the kind of system.

The most important thing to consider when designing an IoT system is to understand the nature and volume of data you will receive, and see which of it is relevant and needs to be extracted. Using this information, one can then design the system to have the ability to process such data.

There are a lot of cloud APIs that can help generate insights using sophisticated data analytics techniques and can help make sense of the data collected and processed so far.

Applications
The last layer in the tech stack is the applications layer. These can take different forms like web-based or app-based depending on the requirement. The applications layer is typically the layer that the end-user interacts with and sees.

There are multiple examples of areas in both B2B and B2C segments of IoT applications. Some examples in the B2C space are Pawscout (A dog tracking app), or Amazon go.

One Example in the B2B space is South East Water, which made an app to improve its clients' service delivery and CRM scores. Another company CSG has made IoT solutions specifically for the telecommunications sector.

Figure 8.2 Images of pawscout and amazon go

Growth Potential

The Internet Of Things is taking over mainstream business use cases, and provides opportunities to create disruptive solutions for different use cases across industries. The number of IoT connected devices is estimated to increase from 9.9 billion in 2020 to 21.5 billion in 2025. As per the growing demand IoT market will grow globally at a 26.9% CAGR, from $ 170.57 billion in 2017 to $561.04 billion by 2022. The adoption of the cloud platform, digital transformation, 5G, and reduction in the cost of sensors are other attributes that have contributed to the fast growth of the Internet of Things.

Important Use Cases

Amazon is reinventing warehousing and uses "armies" of wi-fi connected robots to locate and dispatch products at its warehouses.

Power and Robotics Major ABB has used connected sensors to monitor the performance of its robots and maintain them.

Airbus is building the factory of the future to improve operational efficiencies and have incorporated features like the smart glasses to minimize errors.

These are just glimpses of a few use cases of the way IoT has seen adoption.

- Smart Cities - One of the most important and promising use cases of IoT is in developing smart cities. IoT systems can sync up different traffic lights across cities as per real-time data, which will help redirect and synchronize traffic as and when needed. The sensors in buildings like CO2 sensors, smoke detectors, cameras etc. can optimize buildings' energy usage. Power energy grids can be synced further to predict energy surges and then redistribute energy as per requirement. Numerous other functions can be integrated using IoT devices to make cities more efficient.
- Healthcare - Health trackers and wearables are already used heavily in urban areas. However, IoT provides a much bigger opportunity to revolutionize medicine completely. IoT devices are being used to collect critical patient information and send it to some other location. They are also used to continuously monitor heart rate, blood pressure, and glucose for patients like diabetics who need regular attention. Apart from remote monitoring, caregivers can use IoT devices to monitor and administer medicine remotely.
- Industry 4.0 - IoT has only accelerated all use cases related to Industry 4.0. Real time data are collected through sensors, RFID tags, and various electronics and then integrated with industrial machines and various systems. From asset management in real time and tracking to predictive maintenance, all have the useful application of IoT.

- Autonomous and Connected Vehicles - Cameras, LIDAR, and other onboard sensors can get data about road conditions and inform appropriate driving actions to prevent. IoT is playing a part in making "vehicle-to-everything" or "V2X" technology a reality.

IoT Product Management

An IoT product combines hardware(s) and software(s), measures real-world data, and connects to the internet to create value for the user.

An IoT product manager would be different from others because of the complexity of multiple layers in the IoT stack, and the need to keep all layers and various interfaces in mind while designing. One does not need to be an expert in all layers, but it is vital to have a fundamental understanding of them. It's essential to adopt a system thinking approach for the success of the IoT product.

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Shiwani Jaiswal

CLOUD COMPUTING

What is Cloud Computing?

Cloud computing can be defined as the collection of computing services that are delivered such as servers, databases, networking, storage, analytics and even intelligence over the internet, aka “the cloud”. This helps in achieving not just faster innovation but flexibility as well and one of the reasons for very fast adoption had been lowering overall operating costs, no or low management of infrastructure and option of quick scaling up as and when needed.

Market Size and Key Characteristics

1. By 2023, the global cloud computing market is expected to reach 623.3 billion USD and by 2027 it would be 927.51 billion USD (Source: Report Linker).
2. As per the cloud computing growth stats, this industry is expected to grow at a CAGR of 16.4% from 2020 to 2027..

Major Players

- Amazon Web Services (AWS)
- Microsoft (Azure)
- Google Cloud (GCP)
- Alibaba Cloud
- IBM Cloud
- Oracle Cloud Infrastructure
- SAP Cloud

Types of Cloud

Public Cloud: Amazon Web Service or Microsoft Azure are example of third party cloud vendors who deliver their computing resources like storage and server over the internet. All Software, hardware and other supporting infrastructure management is done by the cloud vendors. The resource model can be shared and dedicated, hence helps to leverage economies of scale.

Private Cloud: It can be defined as a cloud computing offering that can be described as a proprietary environment of resources used dedicatedly by a single organization or many a times the cloud environment given by public vendor itself but the environment is completely isolated. This option results in less cost saving but ensures high security. The resource model is dedicated, hence it is capital intensive.

Hybrid Cloud: Hybrid clouds combines flavor of both public and private clouds. Hybrid Cloud allows both application and data to be

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shared between. This easy sharing model allows business to have a greater flexibility as well as many more deployment options which helps in optimizing existing infrastructure, compliance and security.

Types of Cloud Services

IaaS [Infrastructure as a Service]: Iaas is the basic offering of cloud computing services with no frills. With IaaS, IT infrastructures like virtual machines (VMs), servers, storage, networks, operating systems can be rented. It is a pay-as-you-go based on the usage. Users manage their own infrastructure. In simple terms it can be understood as an on-premise machine that you buy on cloud at a very low cost. For example, AWS EC2, Rackspace, Google Computer Engine.

PaaS [Platform as a Service]: Very similar to IaaS, PaaS provides a framework around the offerings. Here the barebone infrastructure is hidden from the end users. It provides the developer with various tools and services. PaaS is more focused on providing an environment for developers to start working instantly. For example, AWS Elastic Beanstalk, Windows Azure.

SaaS [Software as a Service]: The most opted offering where applications is provided over the Internet to the end-user on demand and typically on a subscription basis. For example, Google Workspace, Dropbox, Salesforce.

Serverless Computing: Intersecting with PaaS offering, serverless computing intrinsically focuses on building app functionality and scaling up-down. The developer does not have fine grain control in the environment, as they would have had on PaaS. Here the cloud provider handles the setup, capacity planning and server management for you. The use case can be for developing any event-driven programming.

FaaS [Function as a service]: Function as a service (FaaS) is a very new model which is becoming increasingly famous . The design of Faas is based on the premise of serverless architecture. It provides environment to develop, run and deploy the code unit on the fly and gets executed in response to any event. For example, Lambda functions from AWS, Microsoft Azure functions, Oracle Cloud Fn etc.

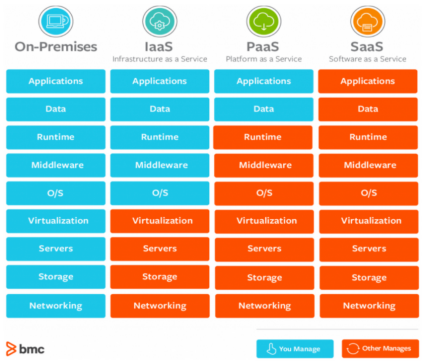

Figure 9.1 Types of Cloud Services

Benefits

It is estimated that in the USA, 69% of businesses are using cloud in one or the other form, and 18% are considering adopting it. So let's look at what makes the cloud so appealing.

Cost Savings – Adopting Cloud Services can help to drastically reduce the huge capex incurred while setting up computing infrastructures like machines or even large-scale data centers. Most cloud services give you the flexibility to choose what you want to do and pay only for how much you use. For example, for storage, the pay-as-you-

go model ensures that the organization/individual is paid exactly for the space one is currently using. Taken together, such factors lead to huge cost savings, and organizations need not worry about scalability at all. In one word it reduces the total cost of ownership (TCO).

Mobility and collaboration - As resources are over the internet, cloud ensures that resources can be accessed from anywhere, anytime 24X7, and on any device. This makes collaboration a simple process by empowering employees to connect and share information seamlessly and securely.

Reliability – Backup and disaster recovery is an intrinsic feature. Even the backups are geographically distributed, to add a layer to reliability. For example, loss prevention of data that would not have been possible in case of hardware failure in a local computer.

Security - Cloud host's full-time job to carefully monitor security, which is significantly more efficient than a conventional in-house system. Cloud storage providers implement baseline protections for their platforms and the data they process, such authentication, access control, and encryption. Many enterprises supplement these protections with added security measures of their own to bolster cloud data protection and tighten access to sensitive information in the cloud.

Revenue Models

The revenue model for cloud resources are under the following buckets:

Freemium – In this model, the company offers their product for free, with limited features based on users, bandwidth, and other criteria. When you cross that threshold, you might need to upgrade to a paid account.

Tiered pricing - Some services have volume pricing tiers across certain usage dimensions that lowers price rates when usage increases. With consolidated billing, the system determines which volume pricing tiers to apply, giving a lower overall price whenever possible.

Pay-as-you-go/Usage based - PAYG cloud computing is a payment method that charges the user exactly on the amount of usage. For example: The electricity bill is charged on the entity based on the usage.

Reserved capacity – For certain resources flat monthly or yearly rates are charged.

Challenges in Cloud Computing

- No control over infrastructure:
  - Backend infrastructure governance and control is with the cloud vendors.
  - Policies are decided by vendors only.
  - Limited control over backend, system metrics, telemetry information etc.
- Monitoring and maintenance tools' shortcomings – The tools for maintenance are not very mature in the market. The data monitored at the infrastructure level is very generic, and might not be helpful for predicting performance issues.

- Privacy of data – This is the biggest blocker for non-adoption of cloud in many organizations and specially in data sensitive domains like healthcare, military and government. There have been reports around data breaches, insecure access of data etc. Another reason is the secondary usage of data by cloud companies resulting in loss of privacy , targeted advertisement.
- Service levels – Although most cloud vendors guarantee 99.x% SLA's (service level agreements), for mission critical application this is still a no go.
- Cloud migration and integration – Although creating a new application in the cloud is very easy, migrating existing applications to the cloud is not so straightforward. It might even require an architecture change. Many times, the application might have a dependency on other applications, or tools that in turn might be on-premise. Such issues lead to a lot of interoperability issues.
- Compliance - Transferring data on the cloud can involve compliance clearings. For multinational companies, it can be very difficult to remain in compliance with regulations of all countries. GDPR, Canada's privacy act or health laws and the U.S patriot act are trying to force stop exposure of data to third parties. Many a times companies need to do due diligence or consult data security professional to ensure they comply with the law.

Use Cases

Cloud strategy - This is used by companies for the business transformation strategy. It helps the organization to understand the best way to use cloud services. For example, which apps are right for the cloud, what are the prerequisites for cloud application, migration , cost benefit analysis, ROI etc.

Cloud first application development - E2E services – Projects to build progressive, scalable, value driven cloud applications to match the business needs.

Cloud migration - Designing (or re-designing) your software to fully leverage cloud deployment and to gain access to scalable infrastructure, as business needs require it.

High Potential in SME's - With rise of growth stage Startups as well as existing SMEs moving towards digital transformation ,the cloud service market forecasts a huge growth. Major reason being cost saving and flexibility.

Design Considerations - To design cloud applications following consideration can be useful:

1. Scalability
2. Resilience
3. Loose coupling between interacting modules
4. Take advantage of multi tenancy to optimize resources and cost.
5. Performance Monitoring

To conclude : Till recently IT was considered as a cost center, but now with advent of cloud, IT is considered as a business enabler, helping tremendously in organizational transformations.

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Akash Padmane, Kunal Jain

BLOCKCHAIN

Introduction

A blockchain is a form of a mathematical data structure and is programmed such that it is very difficult or even impossible to manipulate it. A blockchain consists of a list of records called blocks that keeps on growing as more information is added. These records (blocks) are linked with one another using cryptographic functions. There are three elements in each block-

1. A cryptographic hash function pointing to the previous block in the chain.
2. Transaction data of the current block + Timestamp, corresponding to the current block.
3. A cryptographic hash of the current block.

Some of the properties that make blockchain very interesting are listed below-

- **Distributed**: All network participants possess a copy of the ledger, and any addition to the records will reflect for participants in real-time.
- **Immutable**: Any record once validated and added to the ledger cannot be changed and is irreversible. In order to change any block, every block preceding it must be changed, which is computationally impossible.
- **Time-stamped**: Each transaction/block has an immutable timestamp associated with it. Having a timestamp for each entity not only helps in its unique identification but also ensures easy tracing of the chronology of events at any subsequent stage.
- **Programmable**: Blockchain transactions could be automated using programmed codes called smart contracts. Smart contracts are stored on the blockchain as lines of codes and give blockchains the ability to automatically complete transactions when certain predefined terms and conditions written on the contract are met.

Types of Blockchain

Traditional enterprise applications are built on a client-server-database architecture, where a centralized server services requests from clients. The database acts as an information storage device that communicates with the server. In the blockchain environment, there is no centralized server or database; each node in the network owns their copy of the shared ledger. The following diagram gives a brief note on possible architectures in a blockchain environment, based on different

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nodes' ability to access and edit the shared ledger.

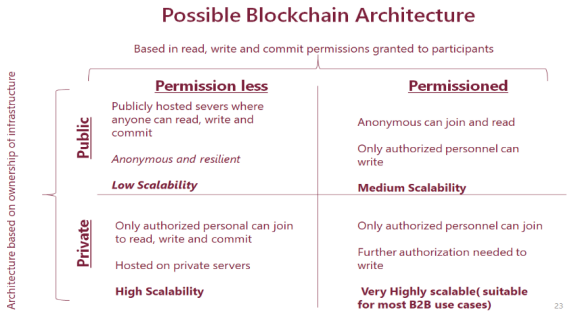

Figure 10.1 Types of blockchain

Technical Details

A blockchain is technically defined as a collection of blocks that contain data or information linked together in an immutable and decentralized structure. The following two components are useful to understand how blockchains function at its core.

Cryptographic Hash Function - A special type of function named the cryptographic hash function is pivotal to the functioning of the blockchain protocol. It can be imagined as a BlackBox, that takes some random input (images, text, etc.) and will convert it into a unique output of a fixed size. There is no mapping possible between the input and the output of the hash functions, and the only way to inverse this function is by brute force checking.

Digital Signatures – Digital signatures are pivotal to allow secure messaging in any network. Each identity consists of two unique components – public key and private key. These keys are generated in pairs by a mathematical function. The public key of a user is visible to everyone in the network, whereas the private key is only visible to the user. Each message that is sent over this network is converted into a signature by using a private key. The receiver of the message and signature will use the sender's public key to verify the message's authenticity. This allows secure and anonymous messaging within a network.

Broadly, each block in a blockchain consists of three major parts - the hash of the previous block, the contract specific data along with a timestamp, and also the hash of the current block. Since each block refers to the previous block, the chain essentially is an immutable structure. If someone tampers with an intermediate block's data, they will also have to change every subsequent block to make the blockchain consistent again.

Example: Transactions Ledger - This section will cover the working of a sample transaction ledger that records every transaction on a decentralized and immutable database. The network consists of five nodes, all of which have a copy of the blockchain with records of every transaction since the inception of the chain. This record of transactions is depicted into a simplified ledger, which stores the account balance of each node. In this network, every node also acts as a verifying node. Consider a case where the Node "A" wishes to transfer two units to node "B." In this scenario, "A" will transmit the message "A pays 2 units to B" in a protocol that is fixed by the blockchain. This message's validity is established as soon as it reaches the rest of these nodes using a digital signature. Once the message sender is verified, each node will then separately validate the transaction in two significant steps. In its first step, every node would check if "A" has the

required amount of balance to complete the transaction (greater than 2 units in this case). Blockchains have underlying protocols that determine how transactions get verified. One common protocol is termed as “Proof of Work,” which is a consensus mechanism that crudely states that the node in the network that has the highest available computing power will validate a transaction, create an updated ledger and send the updated ledger across the network. The process of finding the node with the highest computing power differs across each blockchain, but all have the same goal – to validate a transaction. The node that achieves this gets a reward, essentially the transaction fees. Finally, the transaction is completed as all the network players receive an updated ledger from the verifying node.

Blockchain Business Value

The discussed properties of blockchain infrastructure make it suitable for a variety of business sectors due to the following advantages-

Greater Transparency - Transparency due to the distributed ledger technology. It increases accountability for each stakeholder and motivates them to act in the best interest of the firm.

Increased Efficiency - Peer-to-peer transactions remove the need for a middleman even while doing cross-border transactions. Programmable contracts or smart contracts automate many manual processes based on some predefined conditions further improving efficiency.

Improved Traceability - On a blockchain ledger, each transaction/exchange of goods is recorded in a timely manner. This time sorted information helps in tracking the movement of the goods as a single point of the proof trail is present. This helps in improving security and prevent counterfeit related frauds. This has become especially important in the current pandemic context where consumers need and demand the ability to track their product's origin.

Better security - Blockchain is highly secure as each transaction is encrypted and linked to the network's previous transaction. This makes tampering with any past transaction practically impossible. This immutable and incorruptible nature of Blockchain makes it safe from falsified information and hacks.

Business Applications of Blockchain

The uses of Blockchain can be categorized two fundamental functions-

Record Keeping - The feature of immutability and easy accessibility makes Blockchain a powerful candidate that could be used for storing static information, which has potential uses in keeping records for land titles, patents, government databases like IDs and social security numbers. Storing of voter information on blockchain could potentially be the first step towards secure and trusted digital voting.

Dynamic transactions Registry - As the transactions of a blockchain network are time stamped and programmable (via smart contracts), they could be used for storing and

real-time updating of tradable information. Widespread use of this is the Bitcoin network, where transaction information is dynamically stored and acts as a single point of truth for everyone. Other use cases include monitoring supply chains in real-time, information of drug trials, cross-border peer-to-peer transactions, insurance, and medical claims, etc.

The following segment highlights a few industry use-cases where blockchain can be used to drive business value

Blockchain Augmented Supply-Chain – As businesses grow complex, the network that allows firms to deliver manufactured products to market also grows complex. In this scenario, a trust-based method to transfer information is crucial to ensure operational efficiency. Along with operational efficiency, such a mechanism would allow players in a supply chain to trust the nodal firm. Currently, only limited information about products is recorded, with none of the players having complete visibility or access to a product's origin or path. Providing a centralized database to track products in a supply chain would not be appreciated by other players, as trust is not reinforced. A private permissioned blockchain-based solution can be used in this scenario, where only supply chain partners can access and edit product quality and transaction data. This has multiple use-cases such as flagging counterfeit products/raw materials, tracking provenance of damaged goods, etc. A blockchain based supply chain solution will thus add business value by allowing businesses to avoid risk and ensure better planning.

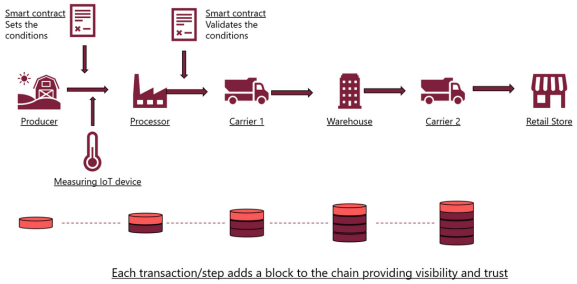

Figure 10.2 Blockchain augmented Supply-Chain

Government/Civic Tech Applications - As governments push their digital initiatives, ensuring that the government's record-keeping facilities are tamper-free and transparent is essential. Blockchain's trust-based record-keeping and transaction mechanisms can be used to solve this issue, especially by enabling services such as Digital Voting. Since blockchains are immutable, secure and anonymous, they can be used to create digital voting alternatives to existing systems.

Banking and Finance – The banking and finance sector has been one of the earliest adopters of blockchain technology. Bitcoins and other cryptocurrencies function on the infrastructure of Blockchain. The primary need for blockchain technology arises from the need for peer-to-peer transactions to facilitate cross-border payments and trade. Currently, many intermediary banks and financial institutions that facilitate cross border transactions. Nevertheless, due to the presence of intermediaries, the process is both time-consuming and costly. Utilizing the framework used for Bitcoins, blockchain infrastructure could eliminate the need for intermediaries for any transaction. The blockchain protocols also eliminate the problem of double-spending, which is prevalent in other digital currencies.

Healthcare – Healthcare industry needs the functionality of immutability and a distributed database of blockchains. The primary need arises due to the need for accessibility of medical records to accelerate clinical and biomedical research. Currently, centralized data stored with medical institutes, which is shared according to their will, and generally, time-consuming processes are involved in obtaining these records. Using blockchain technology and the ability of distributed storage with correct access permissions, medical data could be democratized. This will allow medical institutions other than hospitals to leverage this data for further development.

Blockchain and Product Management

Deciding whether to adopt a blockchain infrastructure for your organization could be a highly challenging task, as there are trade-offs between speed and security/reliability. While the traditional database system would work better in specific industries, blockchain would provide unparalleled advantages in others. The below framework could be really helpful in choosing between various options of data storage infrastructures.

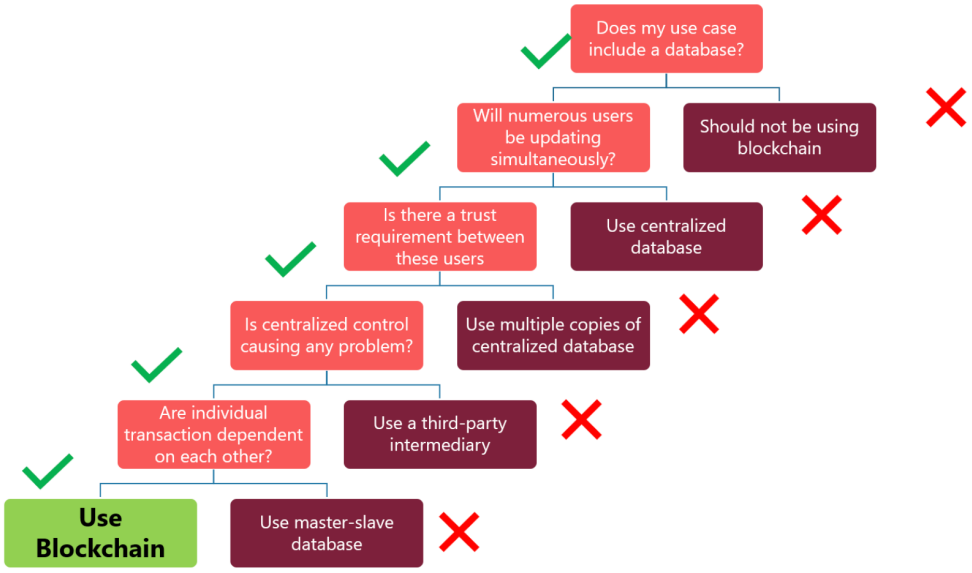

Figure 10.3 Assessing need for blockchain solution

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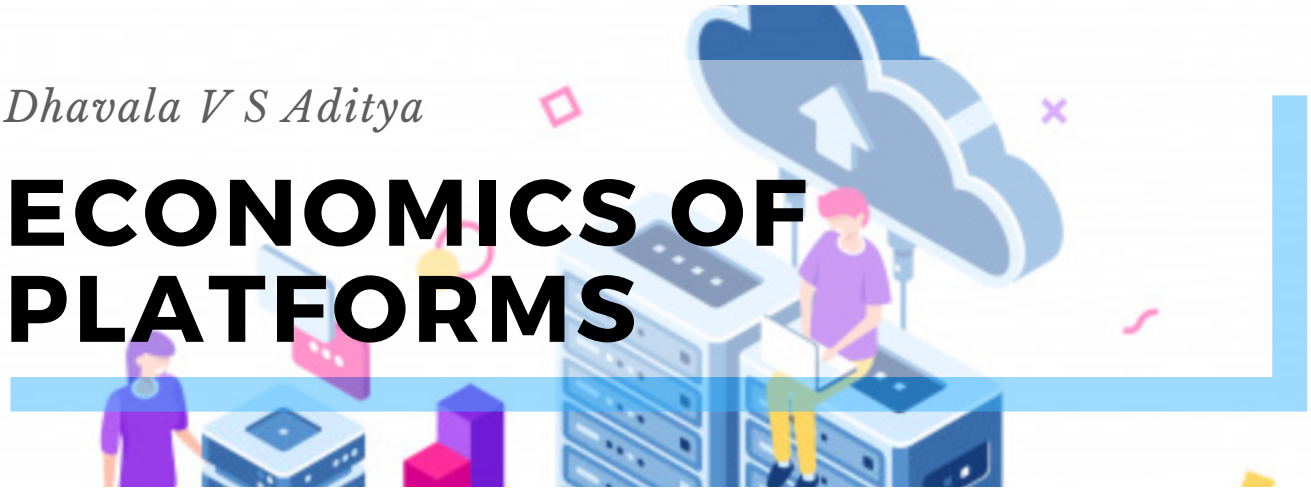
Dhavala V S Aditya

ECONOMICS OF PLATFORMS



Understanding the microeconomics of an industry indeed lends one an excellent theoretical understanding of the business, even as a complete outsider. Microeconomics forms the backbone of management education and is most critical to understand various subjects. Naturally, it also lends insights to product managers, and it is fitting to start the book by looking at the technology industry through the lens of microeconomics.

This chapter will help PMs and aspiring PMs to understand what type of features are essential, how to compete with companies, and to align personal goals with the strategy of the organization to move into a strategy role eventually.

The chapter has been structured into three parts. The first part introduces a framework to understand various elements to understand platforms. The second part has exercises which help drive the concepts further. Finally, we have three cases (Google, Amazon & Uber) where we apply the above framework and draw insights about the strategies that the company should choose.

Introduction to the Framework

The definition of platforms for this chapter is going to be very broad. Platform businesses are essentially any business which creates value by facilitating an exchange between one or more "sides" or "segments of users," e.g. in the case of Uber, drivers and riders are the two sides of the platform. Various examples of platform businesses include Uber, Google, Amazon, Facebook and even Windows OS.

There are the following three factors comprising the framework:

Economies of Scale: When looking at economies of scale, we try to ask the question “how much does it cost the company to produce one extra unit/to service one extra user/to produce one extra minute of streaming etc.?” We will only look at economies of scale from the point of view of costs.

Network Effects: Network effects are about customer value. Network effects are said to exist when the value of the product/platform increases by increasing one extra

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customer or user on the platform. The question that we ask here is "What type of network effects does the company have if it does have network effects?"

Differentiability: Differentiability helps us understand competitive evolution. Differentiation is created when there is a unique space in the customer's mind about the company's product. It is about the perception of the customer and is not internal.

Economies of Scale

Economies of scale are said to exist when the cost of producing one extra unit or servicing one extra user reduces. Usually, when there are fixed costs like a factory which can produce multiple units or serve multiple users, the costs get distributed. Therefore, once a company has invested in a factory with a capacity of 100 users and current demand is 50, the extra cost incurred to produce one extra unit, i.e. the 51st unit is minimal.

The extra cost associated with producing one unit is called the **marginal cost**. On the right side, we see the standard Demand-Supply curve. The y-axis represents the price, while the x-axis represents the number of units. The demand curve represents the customers, i.e. what the customer is willing to buy at that price. The supply curve represents what the suppliers are willing to serve when they are getting the price. **Therefore, the supply curve is nothing but the marginal cost curve of the suppliers,** because the supplier would be willing to supply a particular unit only when he gets a price higher than its marginal cost.

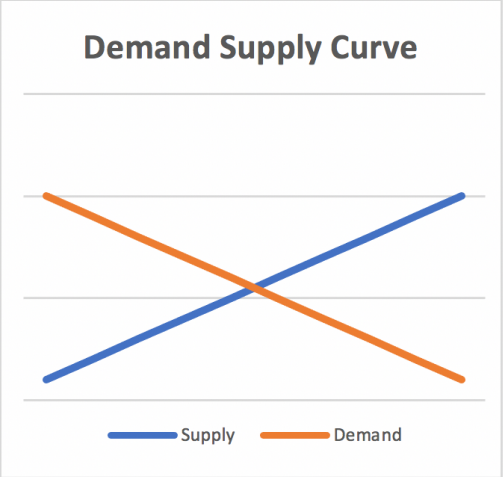

Figure 11.1 Demand Supply Curve

That begs the question if the supply curve is just the marginal costs curve, why is the supply curve (marginal cost curve) increasing? What happened to economies of scale? Shouldn't the cost be reducing?

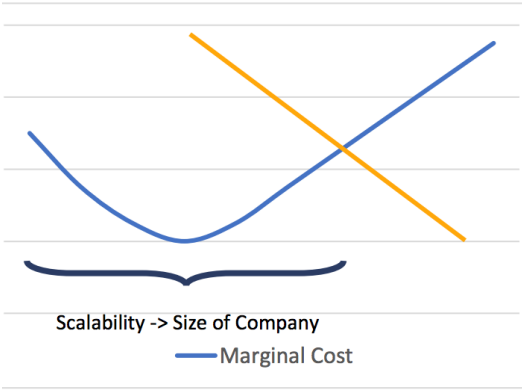

Figure 11.2 Marginal Cost

Well, economies of scale do exist. The actual cost curve (supply curve) looks like the one in the figure below. So, the economies of scale do exist for the first few units, but then the marginal cost curve goes upward, and diseconomies of scale set in. This starts to happen because after a certain point several costs begin to increase, e.g. managerial costs, costs of raw materials, cost of capital etc. In the above example of a factory, to produce the 101st unit, the cost

incurred will be to set-up an entirely new factory which is going to be much higher than the marginal costs for the previous units.

We can also see that the size of the company is limited by the upward curving supply curve, which leaves space for competitors to carve out the remaining customers and compete with the company. We can also see from here that highly scalable companies delay the upward curving of the marginal cost curve, which automatically results in a bigger sized company.

Hence, there are also **natural monopolies** which exist, whose marginal cost curve is like that shown in the figure on the left. The curve suggests that the companies are infinitely scalable, which means that there is no space left in the market for another competitor – hence the name natural monopolies. Some examples of natural monopolies are railways, pipelines etc.

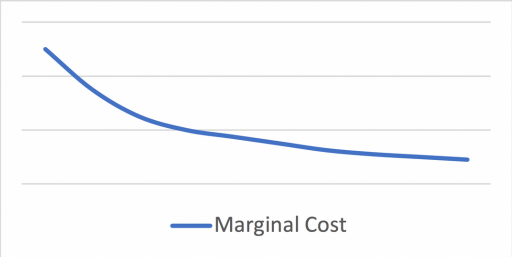

Figure 11.3 Marginal Cost

The cost curves of most technology companies are similar to that of a natural monopoly, i.e. highly scalable.

Network Effects

The second element of the framework is Network effects. Network effects are said to exist when the value of the product or platform increases when one additional user is using the product. The simplest example of network effects is messaging services. The service holds zero value to a person when they are the only person on the platform. Add 1,000 more people, and you have probably got some people who know each other. Keep adding more people on the platform, and there will be a point where the platform reaches a critical mass where the value addition for every customer snowballs. Eventually, there is a point reached where the value that is created by adding more people to the platform diminishes and the network effects begin vanishing.

There are two different categories of network effects:

- Side Network Effects: Cross side network effects vs Same side network effects.
- Scale Network Effects: Global vs Local Network Effects.

Side Network Effects

For side network effects, we can have either cross-side or same-side network effects.

Cross Side Network Effects

When the value of the platform increases when users get added to the other side.In case of Uber, if there are more drivers on the platform, it is more attractive for the riders because the waiting times will be lower because of higher availability and lower surge prices. Similarly, the more the number of riders, the more attractive it becomes for drivers to join the platform, and take advantage of the high capacity utilization and higher prices.

Same Side Network Effects

When the value of the platform increases when more users get added to the same side. Messaging service that we discussed above, has same-side network effects. The more the number of people using the service, the higher value it holds for everyone.

Same side network effects are more potent than cross-side network effects because of the existence of a flywheel. More people keep increasing the value for customers because of which even more people join because of which value increases even further. It is no coincidence that the apps and companies with the most massive scale have same-side network effects (WhatsApp, Google, Facebook).

In cross-side network effects, however, there is always an equilibrium which is reached. In the case of Uber, adding more drivers makes more customers join in, and the cycle ends there creating an equilibrium. One side needs to be consistently incentivized to keep joining the platform to make the other side join. There is no flywheel effect in place, and hence it is more challenging to grow in this case.

Scale Network Effects

For scale network effects, again, we have two types, i.e. local and global network effects.

Local Network Effects

When the network effects are restricted to local geographical regions or a particular segment of customer, the network effects are called local network effects.In the case of Uber, the network effects which exist are local. Having an additional driver in Mumbai does not help a rider in Delhi.

Global Network Effects

When the network effects are spread across global geographical regions or several segments of customers, the network effects are global. In the case of Airbnb, where having an additional room in New York provides value to a customer travelling from Mumbai.

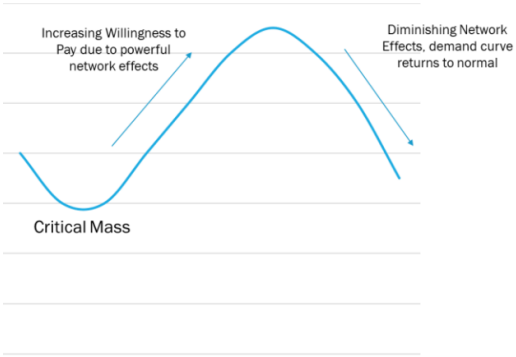

Figure 11.4 Demand Curve

Global network effects are more powerful because it helps companies scale over a broader market much faster, while for companies which have local network effects it requires much more investment to reach a similar scale. Since network effects are a demand-side effect, let us examine how the shape of the demand curve changes due to the existence of network effects. The demand curve is the cumulative willingness to pay of all the customers, and we can see the resulting curve on the image on the right.

Initially, the value added by the network effects is minimal, and hence the demand curve keeps falling. However, when critical mass is reached, the value increases due to powerful network effects. At some point, the marginal value provided by network effects goes to zero, after

which the demand curve returns to normal.

The demand curves of most technology companies are characterized by the above curve where the network effects are strong and pervasive.

Differentiability

The third element of the framework is differentiability. Differentiability is when one creates a unique space in the customer's mind about the product. It is strictly external and not related to internal processes. If Uber creates a new algorithm which increases cab availability for customers, but the customers do not perceive any significant difference over Ola, then Uber has not differentiated itself. A difference in the internal processes of the company should change into a tangible, customer value to be considered differentiation.

Cost of Convergence: Differentiation requires a unique value proposition. A unique value proposition in the context of technology platforms is provided through unique features. However, maintaining the uniqueness of features in technology products is not easy. As soon as company A launches a new feature, product managers in company B and company C immediately start reverse-engineering the feature to add it to their products. This is because the cost of them copying the feature is quite low, i.e. the cost of convergence is quite low.

Customer Switching Costs: The second aspect we should take a look at are customer switching costs. If the customer switching costs are high, then the first mover in the market has a significant advantage. Having high customer switching costs can lead to differentiation since the platforms do not have an incentive to converge features.

Putting it All Together

Initially, let us assume that there is no competition and consider the effect of economies of scale & network effects on the demand curve and the supply curve in conjunction. Before we do that, let us look at the company and customer surplus in case of a standard demand-supply curve and the natural monopoly.

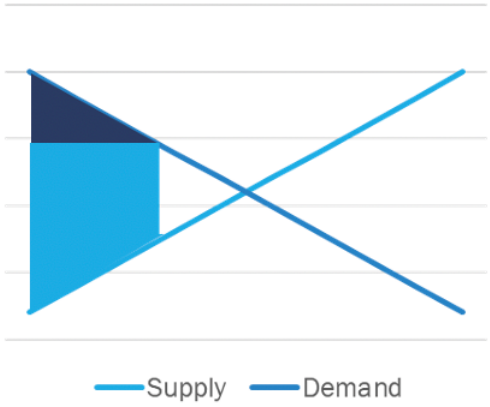

Figure 11.5 Supply Demand Curve

For a standard demand-supply curve shown on the right, the darker area represents the consumer surplus, while the entire light blue area represents the surplus of a monopoly firm. For a technology platform, we juxtapose the demand curve and the supply curve we discussed previously as is shown in the figure above on the left. Since technology platforms can also price discriminate, the entire surplus is captured by the company. Even a very preliminary comparison reveals that technology companies can capture a vast amount of supernormal profits.Now let us try and introduce competition and understand how the market evolves.

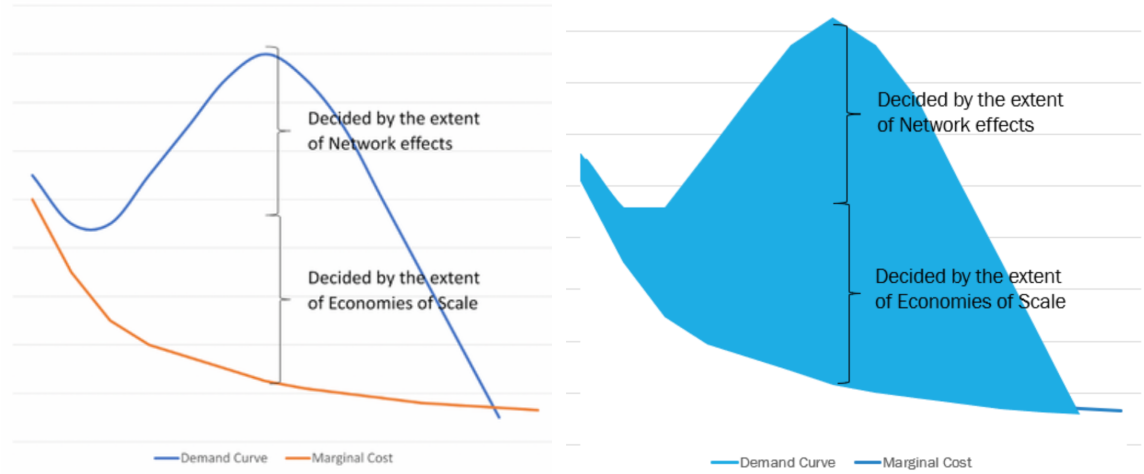

Figure 11.6 Marginal Cost

If there are powerful economies of scale, powerful network effects and low differentiability (low customer switching costs and high convergence costs), the industry will undoubtedly end up as a monopoly.

Because there are scale economies, the bigger player can price lower because of which the bigger player grows faster. If there are strong network effects, the bigger player adds customers faster, because of which the bigger player grows faster. The bigger player would also find it attractive to acquire smaller players and increase its scale. Hence, whichever company (typically the first mover) reaches the critical mass of users faster will become the dominant player. Infinite economies of scale leave no space for competitors, and robust network effects mean the company grows to occupy the space faster than any other company.

As a late mover, the only way to compete is by creating differentiation. To create the differentiation, the company needs features which can increase the cost of convergence or increase the customer switching costs.

As a result, we can draw three important implications from the entire discussion about the framework that was introduced.

1. New companies burn cash to reach the critical mass point. The companies ramp up fast because they are likely to get eliminated from the market if they do not reach the point first.
2. A company needs to ask itself whether it inherently has vast economies of scale. If it has 100 users today, it needs to understand whether it can handle 5,000 users tomorrow and a million users in a year, if it does business the same way it has been doing until now.
3. As a smaller player in the market, the only way to compete is by differentiating. Increasing switching costs and introducing features that make it difficult for the bigger player to copy, will create differentiation.

Exercises

Which company amongst Uber and Airbnb would find it easier to expand overseas?

AirBnB has global network effects, whereas Uber primarily has local

network effects. Hence, AirBnB would find it much easier to expand overseas, while for Uber to expand, it will need cabs operating in several local regions.

You are examining a start-up company you want to join. In its chosen market, a bigger player already exists. The switching costs are low, and convergence costs are high. Do you think the start-up will do well?
Since the customer switching costs are low, there is scope for the company to attract a segment of the customers of the bigger company with some new features. The bigger company cannot also copy the features to win back their original customers.

You are examining a start-up company you can invest in. In its chosen market, the switching costs are low, and convergence costs are low. There are no other players in the market, will you invest?
Since the customer switching costs are low, this company might quickly lose customers to new players. However, since the convergence costs are low, the start-up can easily copy any new features the other player comes up with.

When should you go for a cloud service provider and when should you own your infrastructure?
Having your own infrastructure ensures vast economies of scale and scalability. However, having your own infrastructure also undermines flexibility. Having a cloud service provider significantly increases flexibility. However, since the marginal costs increase with scale, it undermines scalability. Hence, for smaller companies or for very early-stage companies, where flexibility is essential, cloud service providers would be best. However, when the scale increases, and the company starts getting bigger, owning infrastructure is more critical.

You are a PM in Flipkart. Amazon has approached you with a potential collaboration. They want to partner to create a tool which lets suppliers manage their inventory and pages through a common portal for all e-commerce platforms. Should you accept?
Flipkart is the first mover in India while Amazon is the second mover. Both companies have similar scale. This would result in reducing the customer switching costs by way of which differentiability would be reduced. Since you need to maintain your own space in the market, it is best not to go ahead with the proposal.

Case Studies

Google & the Search Market
Economies of Scale: Google has considerable economies of scale. Google's file system is highly scalable. In fact, there is an interesting story associated with Google and Yahoo. Even though Yahoo was the first mover, Google won the search market. Why? This is because Google built its file system to be highly scalable while Yahoo's story is captured in the following sentence extracted from a Techcrunch article. Yahoo was "unable to keep up with increasing demand due to complex & inefficient infrastructure and rising vendor costs."

Network Effects: Google's search algorithm improves with every new search. Google also has global network effects. Google has been further strengthening its global network effects by expanding the languages it supports. Google primarily has same-side network effects. Cross side network effects exist for businesses that want to advertise on Google Search. More the search market share, more businesses are interested in Google.

Differentiability: This is a classic example of a market where a smaller company needs differentiability to create space for itself. This can be done either by decreasing switching costs or by increasing convergence costs. Google has so much of our data stored with it, including passwords and search history, which makes browsing the internet much more comfortable, hence the switching costs are relatively high. Hence, a feasible way to increase differentiability is by increasing convergence costs. DuckDuckGo exploits precisely that characteristic of the industry. Since Google will find it extremely costly to provide privacy to people, DuckDuckGo positioned itself as a company which provides privacy.

Hence, this way, we can draw insights about how Google came to dominate the search market, overtook Yahoo and how some niche players are still competing with the giant.

Amazon & the E-Commerce Market

Economies of Scale: Amazon does not necessarily have high economies of scale. To ensure delivery, it needs to build and maintain a long supply chain. However, the alternative, i.e. physical retail stores have much higher overheads than Amazon. Hence, the economies of scale of Amazon are more significant than standard retail chains.

Network Effects: Amazon has countrywide network effects as its international supply chains are still not very well developed. Amazon also has strong cross-side network effects which means that one side needs to be continuously incentivized.

Differentiability: In terms of differentiability, the convergence costs are low, but the customer switching costs of its customers are very high.

Anyone who has taken a look at Amazon's business model flywheel will realize that Amazon understood the economics of its business well. Amazon understood that the scale of its retail business is limited and knew that competitors would soon be able to create space for themselves. Hence, they created high customer switching costs in the form of Amazon Prime. Amazon did not focus on features because it knew that the convergence costs are low. Instead, once they created a good website, they have hardly made any significant changes to it over the past few years and moved on to newer, more attractive businesses like cloud service.

Amazon can improve by creating more network effects as its current ones are underwhelming. Hence, Amazon has taken a few measures recently, which, when put in the context of this, makes more sense. Amazon has introduced vernacular languages to make the countrywide network effects more powerful. It introduced a social network for

customers to talk about what they shopped. It is also introducing advertisements for sellers and third parties to strengthen the cross side effects further.

Uber and the Ride-hailing market

Economies of Scale: Uber's software developed anywhere can be deployed across the world. Uber also owns some of the cars in some markets; hence higher capacity utilization drives its economies of scale.

Network Effects: Uber has strong cross-side network effects but is restricted locally to cities. One side needs to be continuously incentivized to join; hence it undermines the economies of scale.

Differentiability: Uber's model has been copied across the globe because it could not expand fast enough owing to its local network effects. The ride-hailing market currently also has very low switching costs, and the customer goes to the player with lower costs and higher availability.

Though the market has not completely evolved yet, we can predict that the market will end up in local monopolies or duopolies. Since the economies of scale are not pervasive, and the network effects are local, other companies can create space for themselves.

What can Uber do today to improve value? One, since it has economies of scale, it should look for mergers and acquisitions in all key markets. Two, Uber should take measures to increase customer switching costs by instituting highly attractive loyalty programs. Three, the company can instantly create value by getting into the transportation business and not just a ride-hailing business because that creates global network effects.

APP CRITIQUES

Section 3

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Ravi Koshal

ECOMMERCE

Understanding e-commerce

E-commerce (electronic commerce) is the activity of electronically buying or selling of products on online services or over the internet. The industry can be classified into following categories based on the business application.

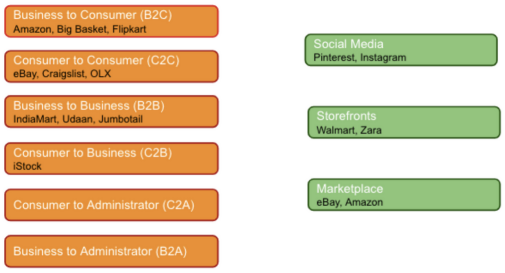

Figure 12.1 Industry categories

User Personas

Building any product or service requires a key understanding of the various user personas that will interact with the platform. In case of e-commerce the various user personas involved are as in the figure. (Note- depending on the platform, the user personas may be a subset of the listed).

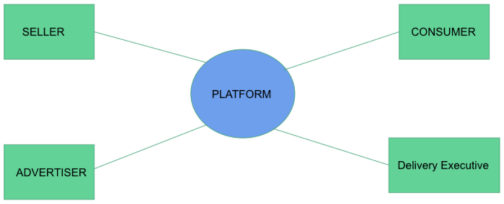

Figure 12.2 E-commerce user persona

Typical User Journey

A typical user journey on an e-commerce platform starts off with first acquiring a user from any of the channels available on the internet. The channels may be paid, organic, direct or referral.

Paid: Paid channel is a channel where a platform has to pay directly to the acquiring channel to acquire users. For example, Google SEM, facebook ads, retargeting on websites, app store advertisements, etc.

Organic: Organic channel comprises channels, where the user(s)/traffic is not paid for directly to the acquiring channel. For example, Google SEO, etc.

Direct: Direct traffic is traffic that directly lands on your app/traffic and not through any other channel. The rate of change of this traffic segment is a good way to gauge brand

recall of your platform. For example, direct app traffic, users typing in website URLs in the browser directly rather than searching on google and then clicking on a link to arrive at a platform.

There on, the platform journey can be classified into key buckets of research, select, schedule order, pay for order and place order. The steps mentioned above are the typical set of steps involved. The steps may vary depending on the landing page/screen of the user. For instance, if a user searches for a product on google and clicks on a link that directs them to the PDP (product description page) of the product on the ecommerce platform, via a deep link, then the research part has happened off the ecommerce platform. However, if the user fires up the app directly, they will be taken to the home screen and then have to research/search the product and continue there on. Various steps in the user journey funnel and what they constitute are:

- Research: Search for a product on the platform. The search can happen through various avenues, depending on availability on the platform. The typical search avenues include, but not limited to, free-text search, menu navigation using category listing, in-app promotions and banners, etc.
- Select: Here a user selects the product they are interested to buy and adds the same to the cart.
- Schedule Order: This includes scheduling when and where the product is to be delivered. Few e-commerce platforms like BigBasket, as on date, ask for the time of delivery. This is followed by the location or the address where the product(s) is/are to be delivered.
- Pay For Order: This step provides various payment methods available for selection for a user on the platform. The payment methods may vary depending on the product and platform.
- Place Order: Here is where the user is asked to confirm the order and the order is placed with the platform.

Once placed, the order fulfillment in almost all cases happens offline by a delivery executive. The fulfillment on platforms like BookMyShow does not need an executive as the ticket is made available online in the form of a QR code.

Once done, there is a need for platforms to get the users back and increase the overall LTV (lifetime value)of a user. This is achieved by use of notifications and pixel retargeting on other platforms.

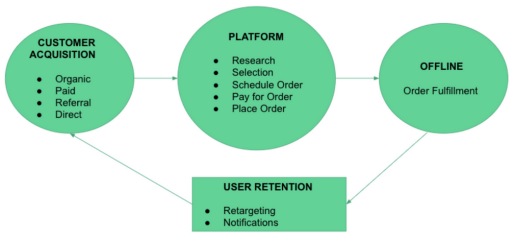

Figure 12.3 Illustration of the user journey

Platform Structure

A platform typically has 3 sections.

Section I

This comprises the research and selection phase. The screens/pages that constitute are:

- Landing Page: The landing page is the page/screen that the user enters the platform on or starts their journey from. It will be the home screen in case the user lands by directly firing up the app from the mobile screen or landing on the homepage directly or through SEO or SEM. In some cases it could also be a specific page. For instance a marketing campaign or notification may lead a user to a landing page that is not necessarily the home page but a targeted landing page/screen.
- Product Listing Page (PLP): This is the category page where all the constituent products are listed. This page is laden with filter(s) and sorting options for a user to ease the research and selection process. The key elements to take care on this page is how to sort the various products by default. Should it be price, relevance, ratings etc. The choice of default sort is very platform and goal dependent.
- Product Description Page (PDP): This is the page/screen that provides in depth details about the product. The elemental details usually include the price, media (photos/videos), user ratings and reviews, similar product recommendations, complementary product recommendations, etc.

Section II

- Cart Page: The cart page/screen lists all the products in the cart with quantity of each. A few platforms allow a user to modify quantity to order from the cart page.
- Confirm Delivery Schedule: This is where the user enters the scheduling and customer contact details. The details to be captured depend on the platform, but typically include the time slot of delivery, the address, contact information of the customer, etc.
- Make Payment: This block takes care of payment methods available to the customer.

Figure 12.4 Illustration of detailed the user journey

Section III

- All orders page/Order Tracking: This page/screen lists all the previous orders with the invoice and status. It also lists the order(s) that have not yet been fulfilled along with estimated date/time of delivery and current status.
- Give Review: Once the order has been placed, it's important for an e-commerce platform to know the quality or product and seller. This user driven feedback mechanism helps the platform keep checks on fraudulent sellers and also help on platform potential buyers make a more informed decision.

Based on the framework provided above let's now look at the flow of amazon.

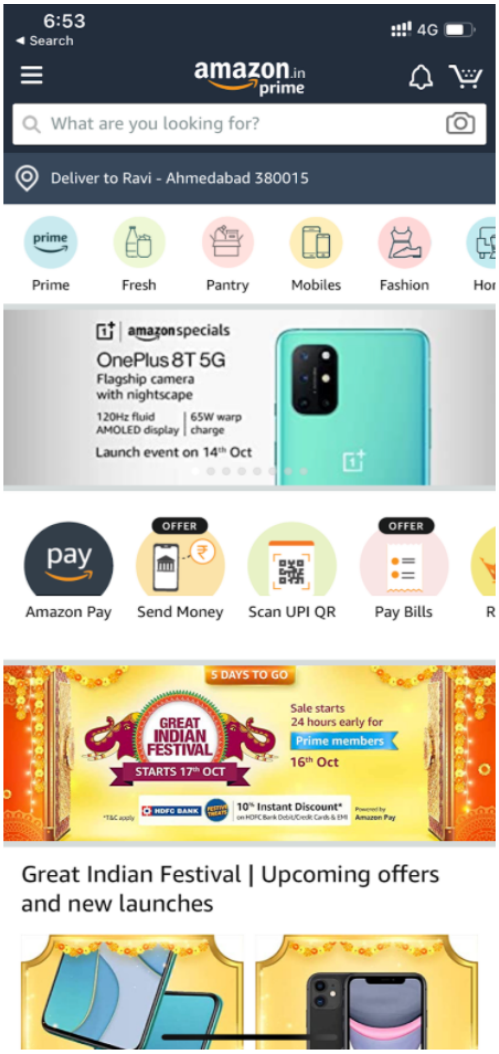

Figure 12.5 Home Page

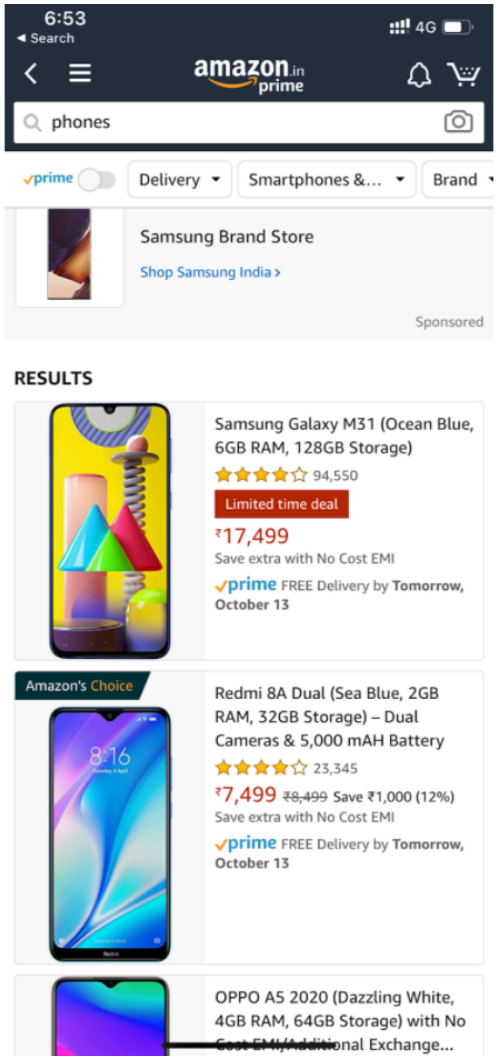

Figure 12.6 Product listing page

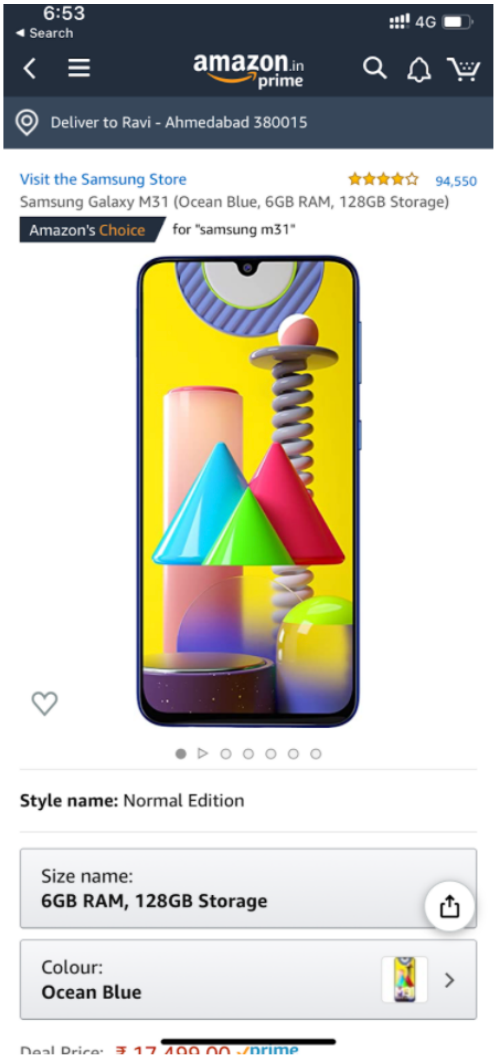

Figure 12.7 Product description page

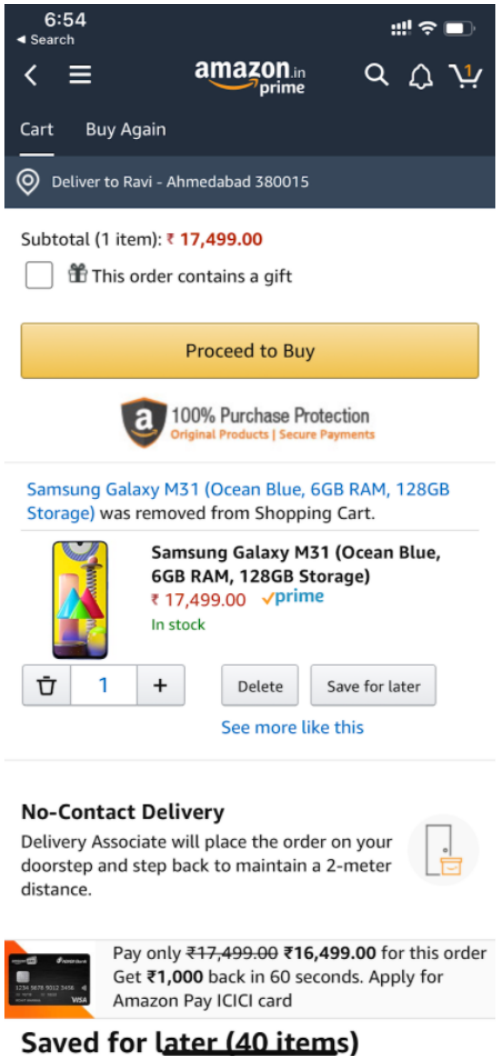

Figure 12.8 Cart page

Risks and Challenges

The various challenges and risks for e-commerce players are as below:

- Brick and mortar retail stores - Instant gratification is something that brick and mortar retail stores have an upper hand over ecommerce platforms.
- Data Security - With saving customer contact information, customer card details on platform, the onus is on the e commerce platform to make sure the details are secure.
- Customer loyalty and retention - With multiple players in the space, increasing LTV of a user at a low retention cost is a big problem for ecommerce platforms.
- New stringent consumer protection guidelines - Antitrust laws across geographies are getting stringent with the discounting model on ecommerce platforms and inturn hurting small businesses.
- Foreign Direct Investment (FDI) rules in e-commerce - Changing government regulations on FDI in ecommerce is a constant challenge of the platforms.

- Rural area reach and last mile delivery constraints - With very low penetration in rural areas, high cost of customer education, poor infrastructure, ecommerce platforms are finding it hard to get the next billion users on their platforms. Furthermore, high cost and uncertainty in last mile delivery is a problem all players are fraught with.
- Reverse logistics - Easing and reducing reverse logistics is important for the seller and the platform to function at lower costs, especially in the apparel domain.
- SEO - With voice as the new upcoming way of searching and placing orders, SEO evolution is something that these platforms are wary of.

Entrepreneurial Opportunities

Various entrepreneurial opportunities available in the Ecommerce space are as below.

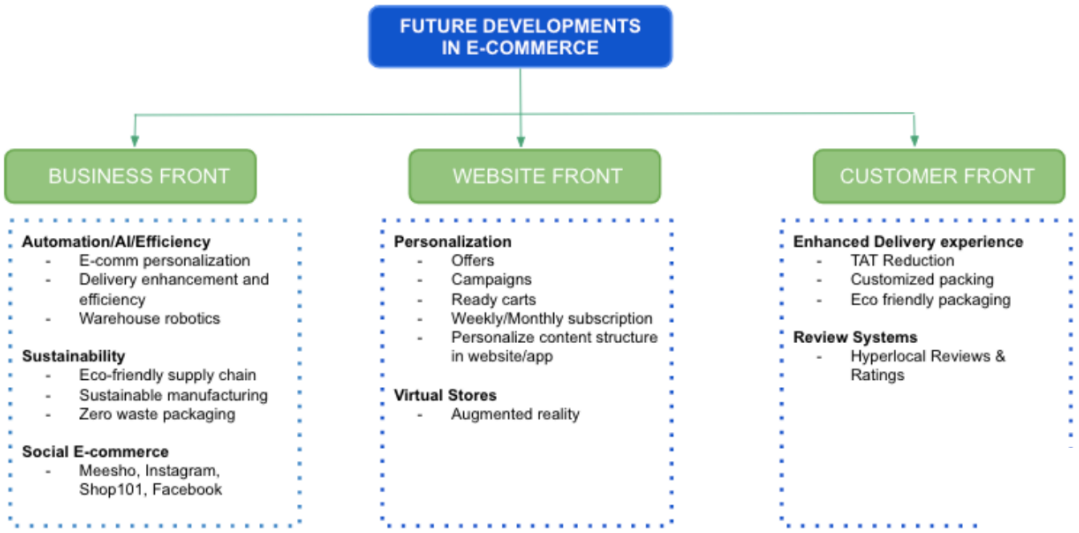

Figure 12.9 Illustration of future developments

Tech Stack

The tech stack of Amazon is as on date of this document, is as below:

Application and Data	Utilities	DevOps
Java	Amazon Route S3	Amazon EC2 Container Service
MySQL	Amazon SES	Amazon CloudWatch
AngularJS	Amazon SNS	
Amazon EC2	Amazon API Gateway	
Amazon S3 Amazon CloudFront Amazon RDS Amazon DynamoDB Amazon SQS Perl Amazon PVC Amazon ElastiCache Amazon Redshift Amazon EBS Amazon RDS for PostgreSQL Amazon EMR Amazon Elastic Transcoder Amazon SimpleDB	Amazon Kinesis Amazon Glacier Amazon CloudSearch Amazon A/B Testing Amazon SWF Amazon FPS Amazon Mobile Analytics Amazon Mechanical Turk	

Figure 12.10 Tech Stack of Amazon

Abhishek Kikani

FINTECH

Fintech Space in India and Fintech Business Models

Fintech is one of the fastest growing sectors in India, and India is amongst the fastest growing fintech markets globally. The overall transaction value in the fintech space is expected to jump from $65Bn in 2019 to $140Bn in 2023. Digital payments are expected to grow at a CAGR of 20% till 2023. NEFT, RTGS, IMPS and digital wallets have played a big role in this development along with the demonetization drive in November 2016 by GoI. There has been continuous government support and innovation in the banking and finance industry which has also led to the adoption of new business models in this domain. The following is the number of startups across different fintech models in India as of 2019.

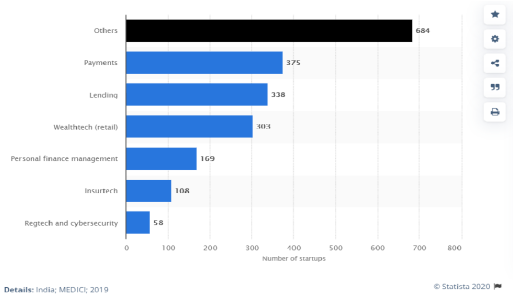

Figure 13.1 Number of startups by fintech model

Fintech Business Models in India

There are a few fintech business models which are already popular among consumers, banks, SMEs, and corporates among others. The list includes:

- Payment Gateways
- Digital Wallets
- Digital Insurance/ InsurTech
- Digital lending
- PoS
- Neo banking
- Wealthtech

Payment Gateways and Digital Wallets

Ever since demonetization happened in India, the emergence of payments has been phenomenal. With 375 payment start-ups in the country, the digital payments market in India is expected to grow exponentially till 2023. A proactive government, and deep mobile penetration are the driving forces for this industry. Some emerging companies in this space are PayTM, MobiKwik and FreeCharge and RazorPay.

Digital Lending

Digital lending FinTechs are mainly targeting the unmet demand of MSMEs as well as consumers, for credit. The emergence of technology,

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easy access to data has led to the popularity of digital lending based on credit scores for loans, mortgages, and small businesses. Some promising start-ups in this space are LendingKart, Capital Float, RupeePower and Rupeek.

Point of Sale (PoS)

The point of sale (POS) or point of purchase (POP) is the time and place where a retail transaction is completed. A digital retail point of sale system typically includes a POS terminal that can read debit/credit cards and enable payments through a swipe. Service providers that provide both POS hardware and software solutions are called POS companies.

Some of the notable POS terminal providers here are Ezetap, Mswipe, Pine Labs, Innoviti, Mosambee, Payswiff (earlier known as Paynear), among others.

NEO Banking

Neobanking is a relatively new concept in India. Being a digital-only platform, neobanks are fast, efficient, straightforward, adaptable and highly cost-effective. Different neobanks have different focuses – some help with managing online bank accounts, and with budgeting and saving tools. SBI Yono, Open, Kotak 811 are some of the examples of neobanks in India.

Wealth Management

WealthTech describes a new class of financial technology companies which are creating digital solutions to transform the investment management process. This includes both end investors and firms that service them. Some of the profiting companies in this space are Zerodha, PayTM Money and Groww.

Zerodha

Zerodha pioneered the online discount brokerage model in India. Kite is the flagship trading platform which offers RT market data, advanced charts, and an elegant UI. Coin is the platform to buy commission free direct mutual funds. Zerodha accounts for about 15% of the retail trading volume with a customer base of 2.8 million. The average age of the customer is between 25 to 35 years. Zerodha has been able to sustain organic growth, and it recently decided to buy back the company's shares given to its employees which took its valuation to $1Billion. Below is the comparison between ICICI securities and Zerodha.

Financial Metric	ICICI Securities	Zerodha
FY20 Revenue	INR 1725Cr	INR 950 Cr
Market Valuation	INR 16500 Cr	INR 7000 Cr
Valuation/ Revenue Multiple	9.5x	7.4x

Figure 13.2 FinTech Financials

Zerodha follows the discount broking model and banks on higher usage to generate revenue. Since it only has a presence online, compared to other traditional brokers it also has relatively lower operating costs compared to traditional brokerage houses.

Business Model Analysis

The Osterwalder's business model framework has been used to compare and analyze Zerodha with its peers.

Figure 13.3 Zerodha business model canvas

Zerodha Tech Stack

C++, Java, VueJS, Flutter, Kafka, Sentry, Grafana, Prometheus

Zerodha App Critique

Login Page
The login page is designed in a minimalistic manner, and does not ask for any additional information. However, the page takes time to load, once you open the app and this is something Zerodha can work on in the future. Other relevant apps open relatively faster while Zerodha takes about 3-5 secs to open the credential page.

Stock Trend View
The mobile app has been created such that it's a copy of the website. As a result, for reviewing the stock trends the information looks very cluttered on the phone screen. This portion of the app can be modified to reflect the most important features that users would need, and the other options can be disabled to have a better user experience.

Watchlist
The watchlist feature is very user friendly. The user can create multiple lists and can look for the stocks across all the lists in a seamless and efficient manner.

Feature Enhancement

Stock History
Zerodha does not provide any information apart from price and trends on the stocks. The user engagement will increase if it can provide relevant news information, stock analysis and recent EPS so that users can access that information instantly. This will also increase user engagement and lead to better user experience.

Home Page
There is no dedicated homepage. The home page shows the portfolio value and the stocks that the user holds. The design can be improved to just show the portfolio value, and then show daily news updates, and have pre-selected filters of stocks like Nifty 50, Nifty Small Cap etc. This allows users to click on those filters and look up stocks that they can invest in.

News and Partner Apps
Zerodha has a separate tab for its partner apps and the user needs to

download them as separate apps. From a user experience POV it will be helpful if these can be incorporated into the Kite app to improve engagement.

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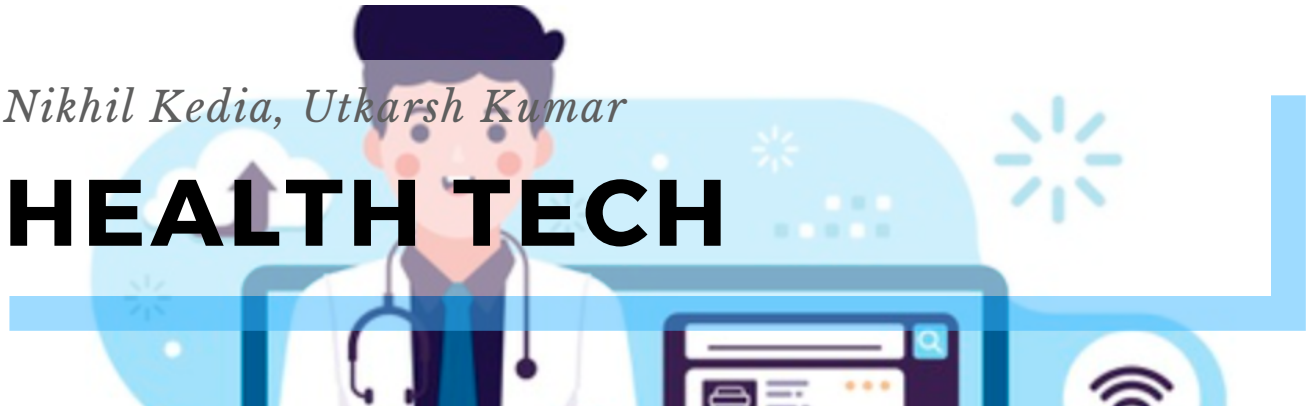
Nikhil Kedia, Utkarsh Kumar

HEALTH TECH



Industry Overview

Healthcare Technology, also popularly known as Healthtech, alludes to the usage of technologies created to improve all aspects of the medical care system. From telehealth to robotic-assisted medical procedures, from sports apps to calories counters, all domains of health assistance leveraging technology can be termed as healthtech.

Drivers of HealthTech – A big opportunity for the future

1. A growing landscape - Increase in health tech firms.
2. Growing market opportunity for Indian Health Tech providers - Increase in market size.
3. Acceleration in funding - Birth of new health tech focused startups.
4. Increase in consumer awareness - Proliferation of B2C segments.

Healthcare Apps

Figure 14.1 Healthtech apps in different spaces

The healthtech industry is growing at a very fast rate, and is attracting a lot of VC funding, which has bolstered startups building apps to create specific solutions in the space. The global health market is expected to reach $111.8 billion by 2025, growing at a CAGR of 44.2%. As can be seen from the above figure, healthtech is a very broad segment with several different categories of apps - from building up habit and productivity, to healthcare checkups, from meditation and fitness to medicine deliveries and reminders. In this chapter, we have taken up the Indian startup - Practo to dive into details from a Product Management perspective.

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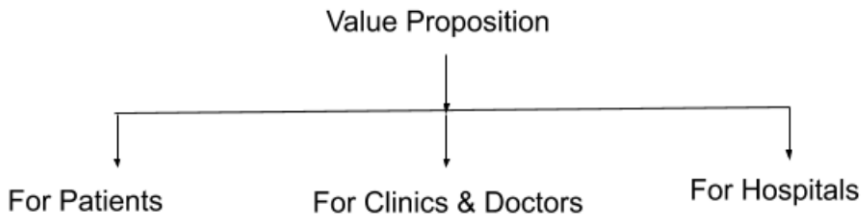
Practo's Business - Overview



Online Healthcare search	Practo Consult	ERP solution for fin/op
Medicine Info and Ordering	Practo Health Feed	Patient relationship mgmt
Online Doctor consultation	Practo profile	AI-driven analytics tool
Storing information, reminders	Quick online booking	
Accessing health tips		

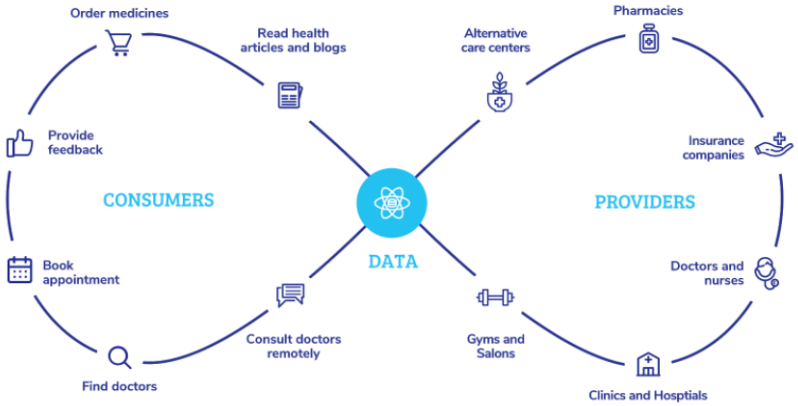


Figure 14.2 Practo data flow

- Key activities: Software development, Networking with multiple stakeholders, Promotions.
- Consumer/Partner segments: Patients, Clinics, Hospitals, Pathology Labs, Pharmacies, Insurance companies, Doctors, Delivery partners.
- Key resources: Website, Practo app, Manpower skills, IT.

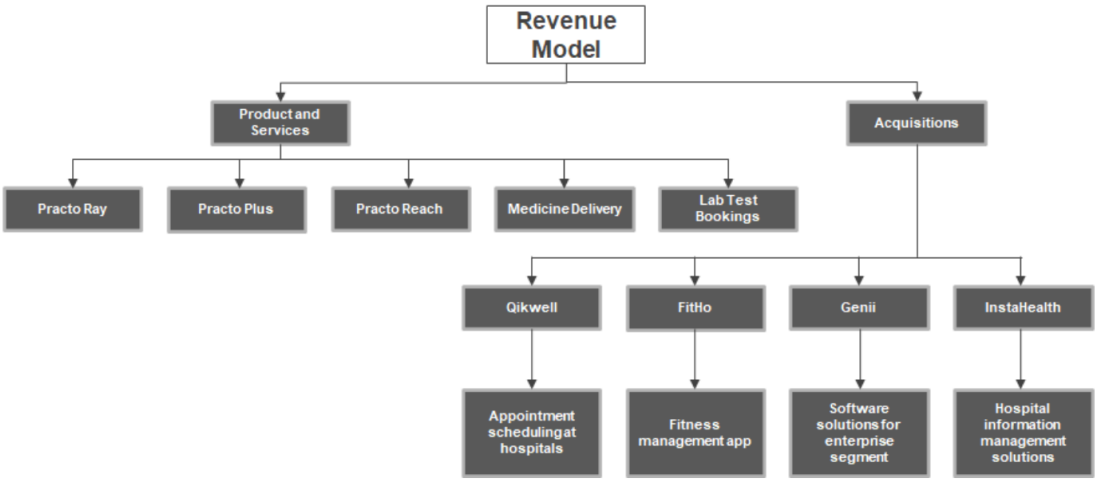


Figure 14.3 Practo revenue model

How Practo crossed the 'chasm'

Crossing the chasm is a theory by Geoffrey Moore built around the technology lifecycle for tech products. As we can see in the graph below, there is a chasm between the early market and mainstream market, crossing which can only help make any company leverage gains and a sizable market chunk for the product. To cross the chasm, companies need to provide products that add value to consumers and are easy enough to use.

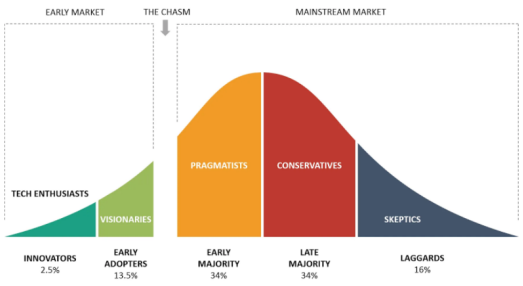


Figure 14.4 Crossing the chasm

What problem did they start with: To make clinic visits cashless, paperless, and painless.

MVP - Building the multi-sided platform: Practo was, in a way designed to help the patient find and book doctors seamlessly, avoiding unnecessary existing hassle. This made Practo a multi-side platform with several other stakeholders like clinics/hospitals, even for the MVP.

Most successful multi-sided platforms first need to set up the supply side, and only then can they expect the demand side. This meant doctor onboarding was a very important step. The pain point for doctors, clinics and hospitals at the time was maintaining patient information, records and maintaining billing details. So, Practo furnished them with a complete end-to-end practice management electronic tool that managed their consultations, prescriptions, bills, and medical records. Within 2 years, had onboarded 500 doctors and 500,000 patients.

Crossing the chasm: Now they needed to onboard large and popular doctors, as only that could pull in more patients, and thereby create network effects to pull in further more doctors and more patients. They came up with several features for the doctors, to assist them and had a 3-tier pricing plan and a free

version with limited features. Free service for patients and minimal monthly charge for listing doctors, once the number started growing. In this next year, the number of doctors jumped from 500 to 8000 doctors and 3 million patients.

For marketing, they went ahead with the 'Fleet on street model'. This same model has been used by Byju's, to grow. This model was to bring doctors onboard as we already discussed, this was the key in growing the app. They also initiated developing for B2C features – discovering the doctors and booking the appointments comprehensively. 'Practo Ray' got doctors on board and 'Practo Search' got patients onboard. They began a spree to map every doctor and clinic to ensure genuine doctors. By 2013, they had 10,000+ registered doctors and 7.5mn+ unique visitors. Once doctors were on board, they became habituated, so even though the cost of acquisition was high, LTV was higher. It was the two-sided marketplace which began showing network effects and helped them cross the chasm.

Entering the Tornado: This is the phase right after crossing the chasm, surviving which, the company becomes able to reap the benefits of the mainstream market. They introduced several features including Practo software and ads. They started with multiple acquisitions in 2015. They also expanded their product portfolio - medicine delivery, chat with doctors and even undertook geographic expansion.

User Profiling and Jobs To Be Done

The most important step in designing any product or solution is to understand the WHY and WHOM. It begins by trying to understand the user and create a user profile, which is more than just demographic information. A good user profile should illustrate the behavior, tendencies and pain points of the user. From the JTBD primary statement, we create a job map. This is a step by step, what a customer is trying to do. It gives a 'needs view', rather than a 'solution view'.

User Profile	Riya 45, married, chronic thyroid issue, working woman, on the lookout for solutions that make her healthcare easy.	Bhushan, 28, married. Tech savvy, stays away from parents and wants to take the best care of them. Is always worried for them.	Shobhna, 22, single. Works in Bangalore, is new to the town. Wants to keep her minor health issues away without losing on time.
JTBD Statement	**"My Thyroid drains me physically and psychologically. I want the pain of managing my health reduced".**	**"My parents are getting old and I am always scared about their health".**	**"I need an easy way to look out for the most trustable doctors nearby".**

Pain Points	- Medicines prescribed by doctors are not easily available. - Forgets to take medicines sometimes due to schedule. - Not too many good doctors in the city. - Managing a huge health file. - Long waiting lines in hospitals.	- Forgets to remind parents. - Remote consulting not possible. - Constant fear of parents falling ill. - Finding new and better doctors is cumbersome. - Managing parent's profile.	- Limited knowledge of locality. - Don't know how to judge if a doctor is good or not. - Long waiting lines in clinics. - No reliable source for great health tips.
Jobs to be done	- Give me an easy way to manage health records. - Help me in planning doctor and lab visits. - Provide an easy way to order medicines. - Keep me updated with knowledge on thyroid patients' life.	- Give me easy accessibility to info on parents' well-being. - Give me ways to reduce the burden from my parents. - Provide an easy way to consult a doctor remotely. - Help remind parents to take medicines.	- Help me find a relevant and good doctor easily. - Give me a hassle-free and fast booking experience Trusted source of information on health. - Provide an easy way to manage bills. - Give me important healthcare tips.
Solution by Practo	Profile, doctor booking, medicine orders, personalized articles.	Practo Plus, reminders, medical history, profile, online consultation.	Test bookings, appointments, Health readings, Online payments.

App Critique - Customer Journey Snapshot

In general, a patient or a potential patient or their relative/well-wisher follow these steps in case of medical issues. These steps have a lot of detailing within as you can imagine, when you recall a time you were not doing great health-wise.

Steps in general:

1. Identification of symptom
2. Quick research and self-treatment
3. Doctor selection
4. Appointment
5. Post appointment

How is it facilitated on the app - A Critique:

- Identification of symptom - Symptom to issue mapping is still relatively weak, and doesn't come out in the UI, though there is a provision for the same.
- Quick research and self-treatment - The app provides articles on issues and free expert answers. However, it does not seem to promote this idea, as the home screen should have had a search button to really make this a part of their offering.

- Doctor selection - The process of selecting doctors is seamless and even personalized, as the doctors previously consulted, show up on the home screen. This has been the core offering of the app for a long time. Also provides reviews of doctors.
- Appointment - Seamless appointment booking process, where after selecting the doctor, you can easily select the required date and time from the simple UI.
- Post appointment - This is a new segment that they have entered and have been adding feature after feature with flavor of personalization. Be it ordering medicines, or lab tests and checkups, or reminders - the UI/UX is seamless.

A user's journey begins with the signup and onboarding. Then they can directly book an appointment or add more profile details. The app has a lot of other features, like setting reminders, adding medical history, viewing personalized articles, ordering medicines etc.

Here, we will only look at the snapshots of only some of the processes:

Home page:

Pros: To begin with, has a very good looking, familiar UI. Major offerings in the home screen and other offerings can be easily accessed from the menu bar in the home. Has a very effective nudge to the "Practo Plus" feature, which is a paid subscription. Has major features listed on the top of the home screen. Also, has a personalized home screen with info on doctors consulted.

Cons: It's all well and good until 'Not feeling too well', which provides a simple way to choose between options. At this stage usage starts getting overwhelming. A very lengthy home page (mostly seem to be ads). The app should have followed the maximum 3-scroll screen rule. People will just scroll through without reading. Has to be some bifurcation. Additionally, the plus feature only supports debit and credit card payments.

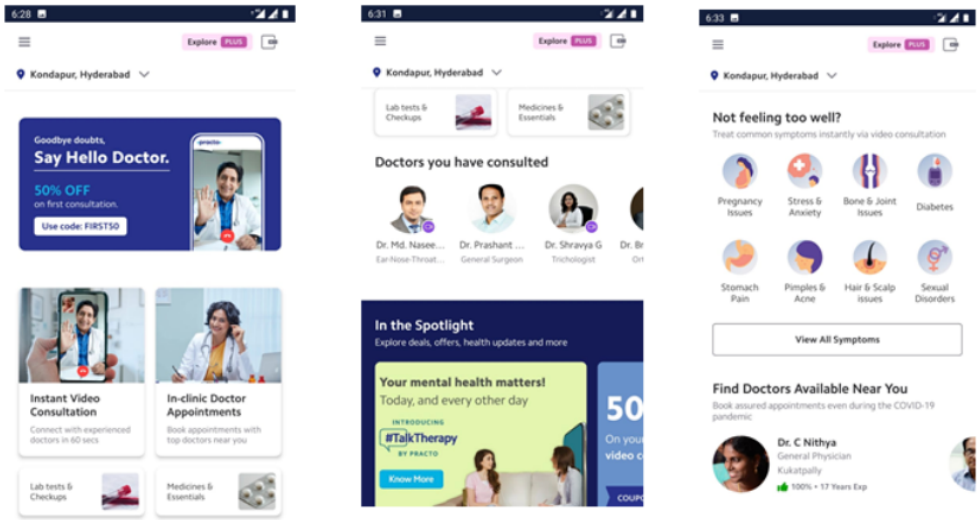


Figure 14.5 Practo home page

Menu bar

Pros: A very well made menu bar with standard icons that are intuitive, and with feature names that are easy to understand. Option to add medical records, add reminders. Very personalized. Also, the features are very simple and easy to use. The design is intuitive.

Cons: Your profile option is comprehensive which is a good thing. But people may not want to fill in so much detail manually without any incentive. Either the process could be made more seamless or it could be incentivized.

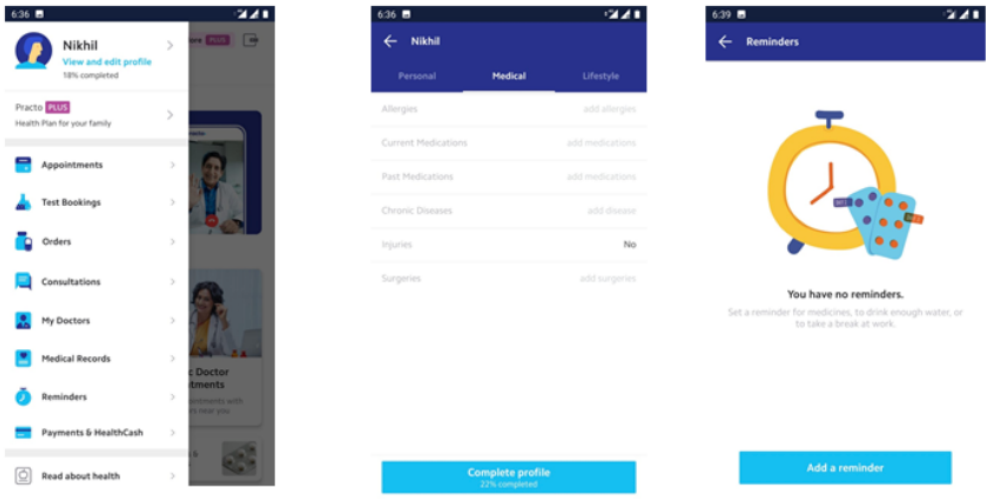


Figure 14.6 Practo menu bar

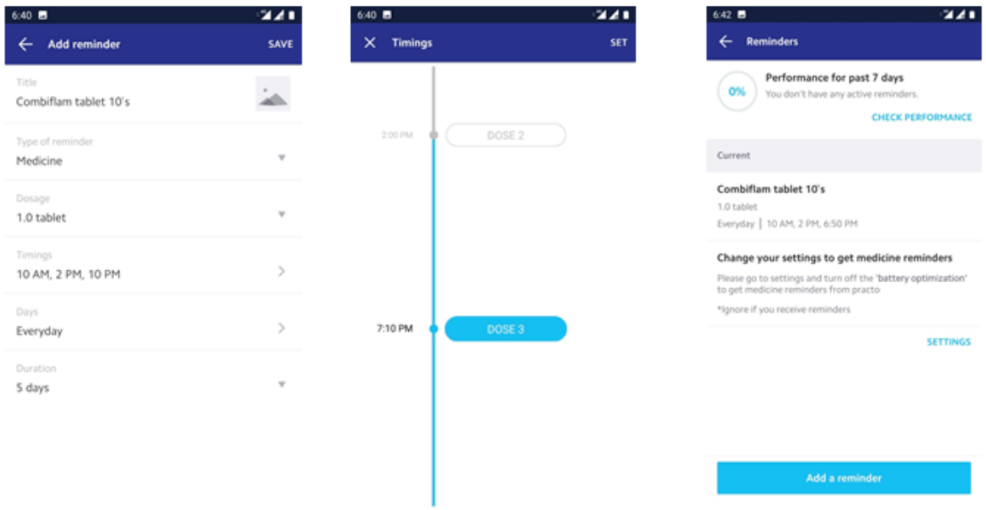


Figure 14.7 Practo reminder feature

App critique - Parametric Review

The app has over 5 million downloads on the PlayStore and a rating of 4.2. However, the rating in the iOS version is 4.6, clearly showing the upside potential of improvement in Android. We will analyse the app based on several standard parameters of app critique:

Parameter	Comment	Verdict
Onboarding	The 20 sec onboarding video on playstore is too small to educate consumers. Features are easy enough though for self-onboarding for tech-savvy users .	Neutral
UI Design	Great colors, visible text. Easy access to features through the menu and easy to understand. Home screen is too lengthy.	Positive
Inclusivity	Despite being a healthcare app, it does not really cater to the specially abled users. No voice support, or easy motor assistance or haptic touch, or easy zoom in.	Negative
Ease of Use	For the literate English speaking tech savvy user, using the app is a cakewalk and extremely intuitive and familiar.	Positive
Diversity	Despite targeting an industry as huge as healthcare in a diverse country like India, no multi-language support could be easily found on the app while sign or even later on.	Negative
Innovation	Makes full use of technology today with added personalization and online consultation.	Positive
Addressing user pain points	As we had seen in the user profiling and JTBD, a lot of the user pain points are resolved by the app.	Positive
Compliance with Fitts's laws	The UI touch points on the app are large enough and have sufficient space between them for an ordinary user.	Positive
Nielsen Heuristic	Medicine order tracking, booking status visible. Gives control to users for canceling orders, changing locations. Has a help section. Design is minimalist but not throughout all screens.	Positive-Neutral

Product Management and Healthtech

Future Trends

Forefront versatile healthcare innovations are going to be founded on the following layers:

- Open Marketplace - A great multi-sided platform that seamlessly integrates the entire healthcare ecosystem.
- Mobile Application - Has to be mobile, always on always connected.
- Blockchain Back-end - Blockchain is revolutionizing security and supply chain. Healthtech already has data privacy concerns and a growing number of stakeholders.
- AI & Big Data Analysis - Personalization, optimized recommendations, self diagnosis, the entire doctor, clinic and hospital ecosystem will be available on the phone.

Things to keep in mind when designing an app:

1. User Empathy: The most important thing to keep in mind when designing a solution is the user. What does the user want, what are her pain points and behavioral traits. Define your target segment and build MVP features for it before expanding further.
2. Personalization: Health is a personal thing. Any user would only want an app that caters to their needs and that understands their issues.
3. Having deep multi-level architecture in the app can lead to users missing out on important features of the app.
4. Visual design should be consistent with the intended communication. For example, a notification icon should be used for notifications only. Using it to say 'book an appointment' is non-empathic design.

Exercise to solve

Design a healthcare app (MVP) similar to Practo with improvements or features that are required but not present currently, In the process, you will have to do the following as a part of the exercise:

- Present a summary upfront using CIRCLES method to show the complete process.
- Very distinctive user profiling and jobs to be done.
- Identify the platform and business strategy. Which module will you make first and what features will you add:
  - Patient Panel Module
  - Doctor Panel Module
  - Admin Panel Module
  - Clinic Panel Module
  - Diagnostic Panel Module
  - Delivery Panel Module
- Create a plan for user orientation and onboarding.
- Make UI Mockups for two of the modules, showing interaction between them.
- Show the steps for A/B testing.
- Define the KPIs you will measure and show how they will help you in improving your app from a PM PoV.
- Create a business plan for the MVP to cross the chasm.

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RIDE HAILING TECH

Industry Overview

The taxi-booking market was highly fragmented, and there was no transparency in the entire process (from booking to payment). Earlier, there were some regional players, but they were not established players, and the value proposition they offered were not significantly different from the traditional taxi-booking services.

Uber and Ola brought transparency to the entire process, and have also improved the reliability of cab services significantly. Lower search cost is also one of the additional value-adds that a customer/user enjoys through these services. Currently, the ride-hailing market in India is estimated to be ₹20000-25000 cr. (Philip, 2020).

Business Model Canvas

The following must be kept in mind when you address the question. It gives us an exhaustive list of the business dependencies.

Value Proposition - What is the problem/need addressed by the product to the different customer segments? Also, talk about the competitive advantage of the product.

Customer Segment - Understand the user who will interact with the product and how they will use it.

Channels - The ways the product reaches the customer.

Customer Relationships - Relationships that the customer expects from the company, and the cost required to provide that.

Key Activities - Activities required to provide the value proposition, and to maintain the channel, customer relationships and revenue source.

Key Resources - Resources required to provide the value proposition and to maintain the channel, customer relationships and revenue source.

Key Partners - Mention the partners and suppliers, and keep in mind the resources that they provide.

The business model canvas in the ride-railing business is as follows:

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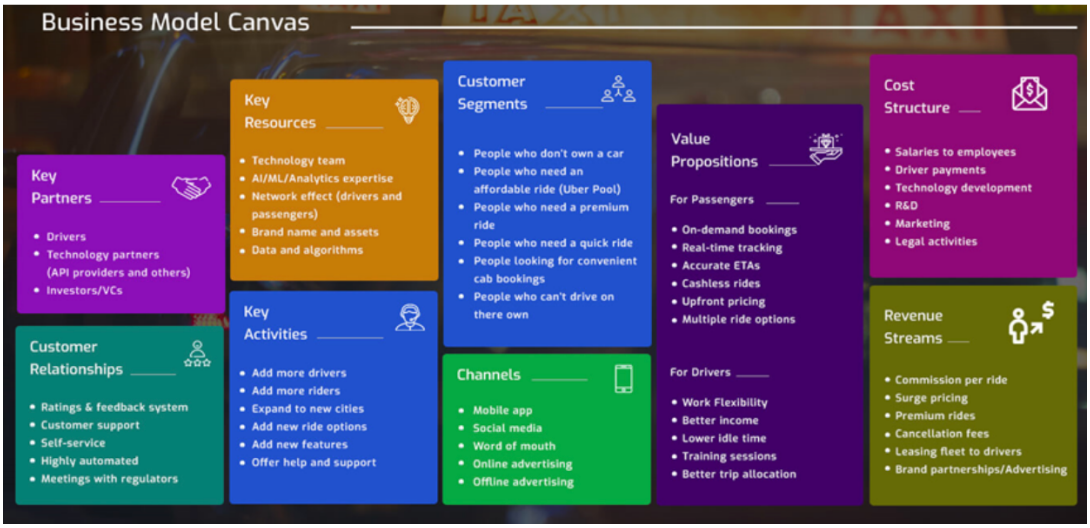


Figure 15.1 Business model canvas for ride hailing

When analysing platform apps, it is imperative to consult the interviewer regarding the side to be explored and the metric to be focused on. For example, in Uber and Ola, they will have different apps for the passenger and the driver. Also, keep in mind the 10 heuristics of user interface design that were developed by Nielsen and Morich and are mentioned in the chapter, "User Experience Design for Digital Products". The product can be assessed from the following point of view:

- UI/UX
- Current features
- Metrics used
- Near future improvements
- Long term product roadmap

The metrics that can be focused on are:

- Awareness
- Acquisition
- Activation
- Engagement
- Retention
- Monetisation
- Referral

Tech Stack

Follow a bottom-up approach, i.e. from the backend to the UI/UX, to ensure we don't miss any part of the technology stack.

Infrastructure and Storage - A hybrid cloud model is used, that is a mix of cloud data centres and physical data centres. This ensures that while handling big data, the compromise between availability, consistency and partition tolerance is minimised. Currently data is handled using Schemaless along with SQL, for long term storage and Riak and Cassandra for high availability and low latency. Uber is also working towards building a real-time data platform.

Logging - It refers to the interaction between the profiles. In case of a ride-sharing app, driver-rider is the only interaction possible. This interaction is established through clustering, using a distributed file system in Hadoop. The clustering helps in dynamic pricing. Clustering is done to ensure short term (using Kafka) and long term availability

(using Hadoop). Data is also ingested in real time and indexed into an ELK stack for searching and visualizations.

App Provisioning - Checking the scalability of a module of the application. And collective scalability of various modules. For running microservices, docker containers are used on mesos. Aurora is used for long running services and cron jobs.

Routing and Service Discovery - An essential part of a ride-hailing application, optimal dispatch not only improves the service rate but also minimises the cost of dispatch. This is achieved by using APIs (based on google maps). A service oriented architecture (SOA) is used and the services are written using any language or framework (all the services need not be written in the same language). Communication between services occurs using tools like HAProxy and Hyperbahn.

Development, Deployment and Testing - This is achieved through simulations on virtual machines.

The tech-stack mentioned above is just a tip of the iceberg, for example, The hybrid cloud model itself has many functionalities, and it keeps on expanding when the data becomes too large to be handled with the current technology. (Lozinski, 2020)

App Comparison

Login - In Uber, there is a minimalist design, where the user is focused on entering only information (their phone number), or proceeding through social login. Ola differs in this aspect. In addition to this, Ola makes it imperative for the user to switch on their GPS. Doing this gives less User control and freedom. When Ola app prompts the user for selecting a mobile number (in case of dual sim), the interface is plain, and inconsistent with the interface of the ola app.

Landing screen - In Uber, the screen shows only one prompt and proceeds according to steps in the user journey. This prevents the user from being distracted. In Ola, the user is presented with the option to select source and destination, followed by ride options on the same screen. As the GPS is switched on, a step is minimised, if there is no change in pick up point. The shade of the source mentioned here is very light and at first sight, it seems like it is a placeholder text and the source is not selected. In addition, there are other tiles that talk about offers and measures put in place because of

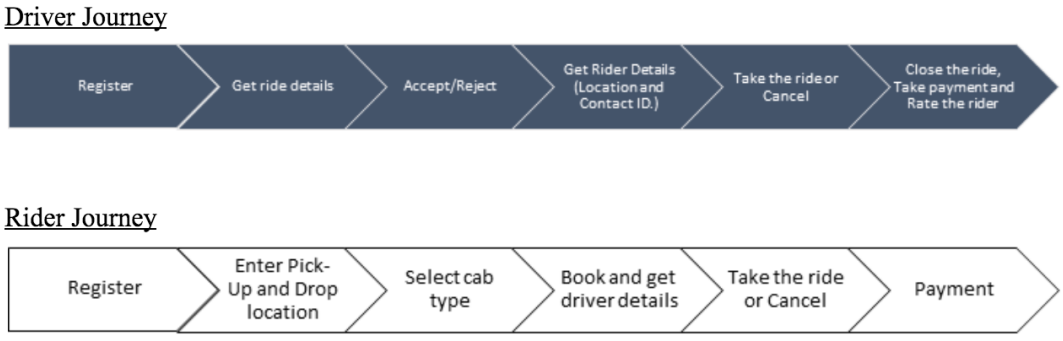
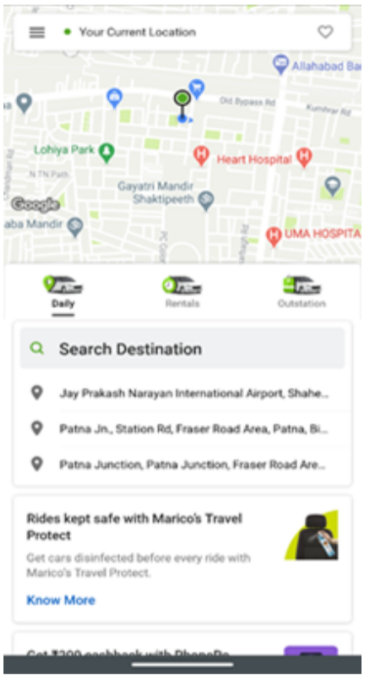
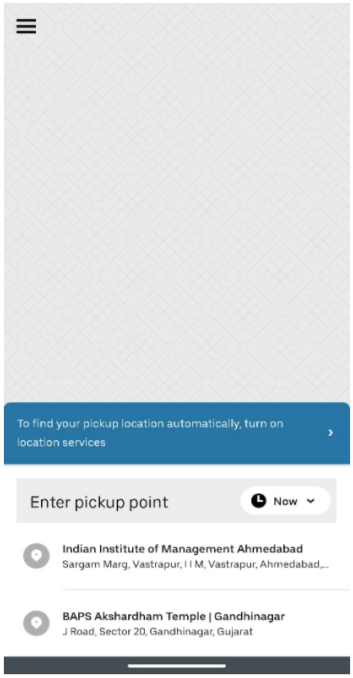


Figure 15.2 User Journey



(Ola, V 5.2.6, Date taken: 17 Sept 2020)



(Uber, V 4.334.10002, Date taken: 27 Sept 2020)

Figure 15.3 Illustrative comparison of ola and uber booking screens

COVID. The offer from PhonePe helps Ola in monetizing and also in retention of users, but at the same time, they do not play a major role in decision making. Further, this information is provided at other screens as well. This creates a redundancy. The design of Uber's app complies with Hick's law which states that "the more options are available to a person, the longer it will take for him or her to make a decision about which option is the best."

Confirming the ride - Uber has a default option that is based on the previous rides taken by the user. Ola's default option is "Book Any" most of the time, which is not an economical choice for every rider. Once the ride is confirmed, and the rider closes the app, and then re-opens, the screen doesn't show current booking; they must go to the ride history option and select their current ride, to check the status of the ride. Further, Ola mentions the colour of the car, which can provide a mirror to the real world.

Scheduling the ride -The option to ride later comes on the landing page of Uber, but in case of Ola, it comes once the user has selected the route. Further, Uber integrates the ride details with the calendar. These factors make it easier for the customer to use Uber. the button on Uber to confirm the ride covers the breadth of the screen. This makes it easier for any user to easily operate the app. In Ola, the button to confirm the ride is on the right side of the screen, which in a way favours the right-handed users.

COVID-19 upgrades - Before a ride is confirmed on Ola, a screen prompts the user to follow the safety guidelines. This can instil trust in the user regarding the ride. Further, there is a page in the app regarding

COVID-19, that explains in detail the steps undertaken for a secure ride. That page also makes the use of authority, by showing feedback from the customers regarding the same. This was not observed in Uber.

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TRAVEL TECH

The COVID-19 pandemic has very severely affected the travel industry, and will probably continue to be the reason for its transformation. The sector was already transforming before the lockdown, with tech companies enabling users to travel better. In 2019 the travel industry was at its peak with only leisure travel spending at $4.7 trillion (Statista, 2020). A user journey for travel, currently comprises mainly discovery (where to go, what to do), booking (for transport, lodging, activities) and experience (supporting the during travel needs).

There are a variety of players in each step of the user journey and many players that cut across all three. Given a very long customer journey and technology advancements in both the digital and physical world, the strategy of a company is determined by the choices it makes on its business model.

On the basis of a known umbrella business model, we list nine different categories which are shaping the modern day travel experience of the customers (Skift, 2016).

Customer Segments

- Solo Travellers
- Friends
- Couples
- Families
- Business Travellers

Value Proposition

- Information Providers/Listing
- Booking
- Aggregators/Price Comparison
- Service Providers

Revenue Models

- Advertisements
- B2B & B2C Sales
- Commission
- Convenience Fees

Figure 16.1 List of choices across business model elements for travel tech Companies

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Figure 16.2 Examples of companies in different business categories

Convenience and ability to compare prices have pushed the adoption of Online Travel Agencies (OTA) in India. The leaders now compete for a larger share of the market, and to do the same, continually focus on offering better services and improving customer experience. The website and mobile app experience become a big part of the overall user interaction with an OTA.

To develop or evaluate UX in a product we must look at it by keeping in mind five basic principles of UX Design (Barua, 2019)

1. Design for your users, not for yourself: Build for an identified user persona and not for yourself. Make it easy and delightful for these users to use the product.
2. Feedback: Give users a little visual confirmation/response for their actions.
3. Digestibility: Show users only limited content, which they can comprehend.
4. Clarity: Design to minimize confusion by ensuring elements work as expected.
5. Familiarity: Take design cues from real word or acceptable digital standards.

We compare the UX of two popular OTA apps in India: MakeMyTrip & Yatra.

Use Case #1: Experience of Booking Flight Tickets

Stage	MakeMyTrip	Yatra
Login Page*	- Clean UI with friendly priming on Best Deals to increase user excitement	- Lot of login Alternatives - User not asked to log in till personal information needed for booking
Home Page*	- Highly Overloaded with options and banners causing confusion	- Highly Overloaded with options including some that aren't a user's priority
Flights Discovery Page	- Easy Flight Search & Date Picker with Pricing information - Complex sorting menu requiring an extra click	- Easy Flight Search & Date Picker with Pricing information - Easy sorting menu with a mostly familiar process
Flights Booking Page	- Lot of information affecting user digestibility and causing user fatigue - Auto apply of best offers and picking of saved traveller information add to ease of use - Cross-sell of cab services to user needs well timed and beneficial to both parties	- Lot of information affecting use digestibility and causing user fatigue - Auto apply of best offers and picking of saved traveller information add to ease of use - Additional pop up for the purchase of insurance before allowing a confirmation might seem pushy
Payment Page*	- Multiple payments options - Recommended and Saved options help save the user time	- Multiple payments options - Recommended and Saved options help save the user time

Use Case #2: Experience of Booking Hotels

Stage	MakeMyTrip	Yatra
Hotels Discovery Page	- Easy Hotel Search with the ability to input Location, Dates, Guests & Room requirements - "Trip Type" filter might enable personalization for users	- Easy Hotel Search with ability to input Location, Dates, Guests & Room and Check-In/Out timing requirements
Hotels Listing Page	- Recommended deals to help the user discover special offers - Map view helps user select as per their location preference - Sorting is complex, and the filters are not aligned with user needs and rather are set as per MMT offers	- Easy and multiple sorting options help users find their hotel faster - Search option allowing users to look for a specific hotel saves time and effort - Filters based on amenities help in better shortlisting - 3rd party ratings giving more confidence during selection rather than app native ratings
Hotels Booking Page	- Video + photo gallery helped built user confidence - Easy checkout page with all essential details mentioned again before confirmation	- Photo gallery for all hotels helped built user confidence - Auto best offer applies to save the user some time on the checkout

**Login Page, Home Page and Payment Page are same across both experiences*

Recommending a new feature using CIRCLES Framework

The CIRCLES framework (Lewis, 2016) is used by product managers for identifying new features & products as it provides an exhaustive & structured framework for the same.

Stage 1: Clarify Your Goals

At this stage, one must aim to clarify doubts in order to provide suitable recommendations. Some possible questions at this stage could be:

- What is the end goal of this feature?
  - Increase user engagement
  - Improve UI/UX
  - **Increase revenue / sales**
    - **Additional In-App Purchases**
    - **Increased bookings**
    - **Increased advertising revenues**
  - Increase market share of product
- Does the feature have to be in any specific domain of the current app structure, e.g. Hotels, Flights, etc.?
  - **Yes, it has to be cohesive with the existing structure**
  - No, it has to cover a new domain

We have clarified that the new feature needs to increase revenues through one of the three revenue streams, and it has to be cohesive with the existing structure.

Stage 2: Identify User Personas

Knowing and understanding customers and their needs are crucial. Let us consider the customers we had identified using the Business Model developed earlier in this chapter. We will attempt to create a background of their general behaviours, demographics, app journey and possible needs to achieve clarity.

Family	Solo Traveler	Business Traveler
		
- Families are groups of individuals who are likely travelling with kids. - This customer segment would like procedures that are family-friendly, i.e. suitable to their kids' needs as well as their own.	- Solo Travelers are individuals who are commuting by themselves without any colleagues, family or friends for accompaniment. - Since they are alone, they would prefer systems which they can navigate by themselves as well. For example, they might like vending machines over takeaway food counters since they don't have to worry about keeping a check of their baggage.	-A business traveller is an individual who travels between destinations typically alone or with their colleagues for pure business purposes. - They prefer services that are good quality and professional and want to avoid all forms of delay. In general, they look for very low interface and hassle-free procedures

Stage 3: Report Use Case

In this stage, we try to connect the aforementioned user personas with their needs.

Family	Solo Traveler	Business Traveler
		
- I want to be able to compare the entertainment options at different hotels for my kids - I want convenient seating areas at the airport with my kids with food, toilets etc.	- I want a place to keep my luggage securely when I visit the washroom or food stalls at the airport - I want someone to accompany me for activities & tours that can't be done alone	- I don't want the hassle of checking into hotels for short term trips. I want a comfortable rest stop with few disturbances, good quality WiFi and charging ports where I can rejuvenate. - I want easy web check-in to avoid lines - I want to be able to compare hotels based on their amenities like business centres, WiFi speeds etc.

Stage 4: Cut Through Use Cases

In this step, we cut through different use cases listed above and choose a few that stand out based on our criteria or goals like revenues (in this case) or customer benefits. Based on the above use cases & our end goal of increasing revenue, we shortlist our top cases:

1. Quality Airport Seating
2. Compare / Filter Hotels

These are chosen as they would be more likely to have a higher frequency of use and be relatively easier to monetize as compared to the other options.

Stage 5: List Solutions

In this step, we list a couple of solutions to solve the above-shortlisted use cases. The most feasible solutions, meeting users' needs post this step, will be considered for evaluation.

Use Cases	Quality Airport Seating	Compare/Filter Hotels
Solutions	**- Lounge Discovery & Booking** The mechanism to book seats at an airport lounge any time between booking & journey dates. Check for compatible card offers, view the number of empty seats etc. - Internal Airport Maps Contain details like current footfall, eating and charging options. This option might be infeasible due to airport security restrictions	- New Filters Provide additional filters which suit user needs. However, a large number of filters can reduce user-friendliness. **- Hotel Comparator** Add multiple hotels to your consideration set & compare them on a customizable set of attributes (similar to mobile phone specs comparison)

Stage 6: Evaluate Tradeoffs

In this step, we evaluate the solutions on various metrics to identify which solution will be most beneficial for the end-user while simultaneously meeting our goals and not overburdening our development resources.

Metric	Lounge Discovery & Booking	Hotel Comparator
Frequency of Use	Medium to High	High
Dev. Complexity	Medium	High
Target Market	Business Travelers	Families & Solo Travelers
Revenue Source	Increases revenue through in-app purchases	Increases revenue by increasing customer engagement, leading to higher advertising revenues
KPI Metrics	- % of flight ticket customers who use this feature - % growth in lounge bookings - % growth in revenues from flight lounge bookings	- % increase in customer activity time - %increase in customer visit frequency - % increase in advertising revenues

Step 7: Summarize

In the final step, we discuss our identified solution and the rationale behind the same: “For our identified goal of increasing revenue by developing a new feature within the constraints of the existing infrastructure, I recommend developing a Lounge Discovery and Booking Feature. This feature will primarily target Business users with families being secondary targets. It has been chosen as business travellers typically have a high frequency of travel, and since their bills are reimbursed through company accounts, they are less likely to be price elastic. We can promote this feature to be an alternative to booking hotel rooms for shorter trips. This feature is also less complex to develop than the alternatives and the KPIs are easier to measure for an increase in revenue as they share a direct link as compared to advertising revenues”

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Amrit Verma

EDTECH

Industry Overview

'EdTech' refers to the use of technology in the education sector, starting from smart devices in classrooms, test prep platforms and online certifications for skill development. India has over 1,100 million wireless internet subscribers (Statista, 2019) with a high rate of adoption. The EdTech sector stood fourth amongst all sectors, with 8.5% of total startup investments in 2018 (Statista, 2018).

The startups involved in K12 and online certifications have accounted for a significant share (~88%) of $1.6 billion worth of investments, in the education sector between 2014 and 2019 (inc42, 2020). This skewed funding is in part due to the grades-first approach of the Indian market and the need for skilled labour in the fast-growing services sector. Moreover, Indians have a higher willingness to pay for education, and consumer income inelasticity in this market is greater than even healthcare in some cases.

Customer Needs

Currently, the apps in the market work as a supplement to the classrooms, like the tuition classes where the student's learning is self-paced and tailored to their learning speed.

A school student may start using such an app at a very young age, and continue using it through to grade 12, and for associated competitive exams.Hence, their journey becomes all the more critical. Therefore, the experience should not be homogenous for everyone, as is the case in industries like ride-hailing, where the service is the same irrespective of the characteristics of the user. It needs to be tailored to individual ability and interests.

Student Journey

The typical customer journey of a school student on an EduTech platform looks like:

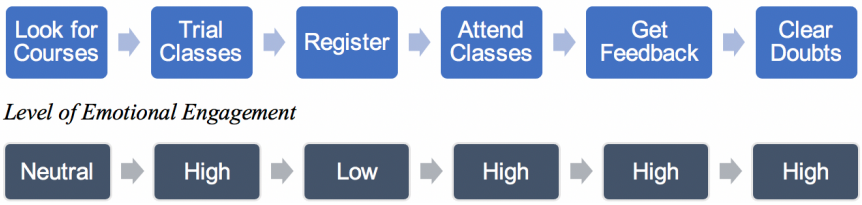

Figure 17.1 Student Journey

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Parent Journey

Parents play an essential role in all the major decisions of their kids, and education is no different. As the amount involved is significant with typical yearly packages in the tune of 10000 and above, the sale is only possible when both the students and their parents see value in the platform.

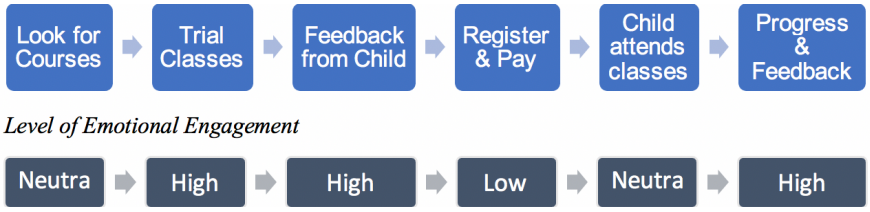

Figure 17.2 Parent Journey

Byju's

Founded in 2011, Byju's is the highest valued EdTech company in India with a valuation of $11 billion as of September 2020 (inc42, 2020). It engages in online tutoring with pre-recorded course videos, which can be viewed either through a mobile application (iOS/ Android) or on the Byju's tablet.

Byju's has a range of apps, which targets students from kindergarten right up to grade 12, as well as for competitive exams, which significantly increases the customer lifetime value.

Figure 17.3 Byju's range of apps

Vedantu

Founded in 2011, it operates as a marketplace for teachers and students where the students can enrol in classes of the tutor of their choice. It uses a proprietary virtual learning environment, WAVE (Whiteboard Audio Video Environment) to deliver live classes through its website and mobile applications.

Vedantu caters to students of grades 6 to 12, primarily from the CBSE and ICSE boards. They provide summarised notes at the end of each class.

Business Model Canvas

The points in red are specific to Byju's & those in yellow are specific to Vedantu, while the remaining points apply to both the companies.

Figure 17.4 Business model canvas

Evaluation of the Product

The companies operating on the subscription model have two primary tasks at hand. Firstly, signing up the customer, and secondly, reducing the churn through higher engagement and value delivery. The UI/UX and features of the apps have been evaluated based on the following three stages:

- Trial & On-boarding
- Nurturing & Expansion (Nielsen's Heuristics)
- Renewal & Loyalty

Trial & On-Boarding

Critical Factors	Byju's	Vedantu
Pricing	Yearly subscription fees. Actual prices vary based on location sales agents.	Freemium model. Upgrade to a yearly subscription.
Trial Classes	Minimum trial period pre-buying.	Trial live classes & notes.
Awareness/ Promotion	Free classes for one year on account of COVID-19. Advertisements, Celebrity Endorsements. Watch on any device, any time.	Free courses for one year on account of COVID-19. TV Ads, Social Media. Watch on any device, any time.
Ease of Use	Mostly single click. Design based on user: Cartoons for kids, simple vanilla for parents. Recommendations to start.	Option to explore courses & webinars on the landing page. Mostly single click. Minimalist design.
Options of Subscription	In-app purchases not allowed, need to contact service agents. Only yearly subscriptions.	Only yearly subscriptions.

Nielsen's Design Heuristics

Critical Factors	Byju's	Vedantu
Visibility of System Status	Messages like *'Ready, set, go'*, *'Let's keep exploring'* appear when loading content.	Loading status not visible while changing tabs.
Match between System & the Real World	Animated lessons with familiar Disney characters for kids up to grade 3. Test feedback and progress monitoring for parents.	Live classes that mimic the classroom sitting with students asking questions. Students get to take back notes for revision.
User Control & Freedom	Easy navigation through categories and sub-categories.	Mismatch in the redirection while using the on-screen and smartphone's back button.
Consistency & Standards	Consistent themes & graphics. Seamless integration of the various apps with the Parent Connect app.	Consistency of colour of graphics. All live classes happen in the standard WAVE environment.

Error Prevention	Minimizes the videos into a thumbnail, if back button pressed by mistake.	A countdown timer for the upcoming classes. Options on the navigation drawer inadvertently lead to an error page.
Recognition rather than Recall	Recommended list of lessons. Progress monitoring for parents to guide the child. Dedicated search bar absent.	Timer for upcoming classes. Alert to view any missed lessons. Dedicated search bar absent.
Flexibility & Efficiency of Use	Handholds the student for most of the duration.	Provides notes for easier revision of the lessons.

Aesthetic & Minimalist Design	Landscape Mode. Background: Dark (Disney Early Learn), Light (Parent Connect). High-resolution graphics. The kids' app at times looks cluttered due to a lot of dark colours and characters.	Portrait mode, changeable to landscape for videos. Light background. Minimal yet sufficient data during ongoing classes. Landing page, on reopening the app shows promotions of extracurricular classes/events.
Recognize & Recover from Errors	Quick prompt on errors in user input and option to correct.	Quick prompt on errors. Redirects to the home page on most occasions.
Help & Documentation	No documented help section.	No documented help section. Option to mail a query.

Renewal & Loyalty

Critical Factors	Byju's	Vedantu
Service Quality	Freemium Model: Pay to unlock features. Schedule sessions for working on doubts & queries. Seamless integration of Parent Connect app with others for monitoring progress.	Freemium Model: Pay to unlock features. Continuous resolution of doubts during live classes.
Renewal	Yearly subscription renewed on moving to next grade.	Yearly subscription renewed on moving to next grade.
Value Added Products	No upselling/cross-selling on the app. However, the same is prevalent when agents are selling.	The landing page shows extracurricular classes/events.

Recommendations and Product Improvement

- Introduction of a Search Bar: It would allow students to directly look for the lesson, without wasting time in remembering the path, and navigating to the same.
- Inclusion of a Help Document: A guide to help resolve issues on the go would improve the user experience, as the current methods of calling up the service executive, or waiting for a reply on the mail is too cumbersome.
- In-app Purchases: Allow up-gradation of the content by paying from within the app, without calling up the service centre, with transparent pricing.

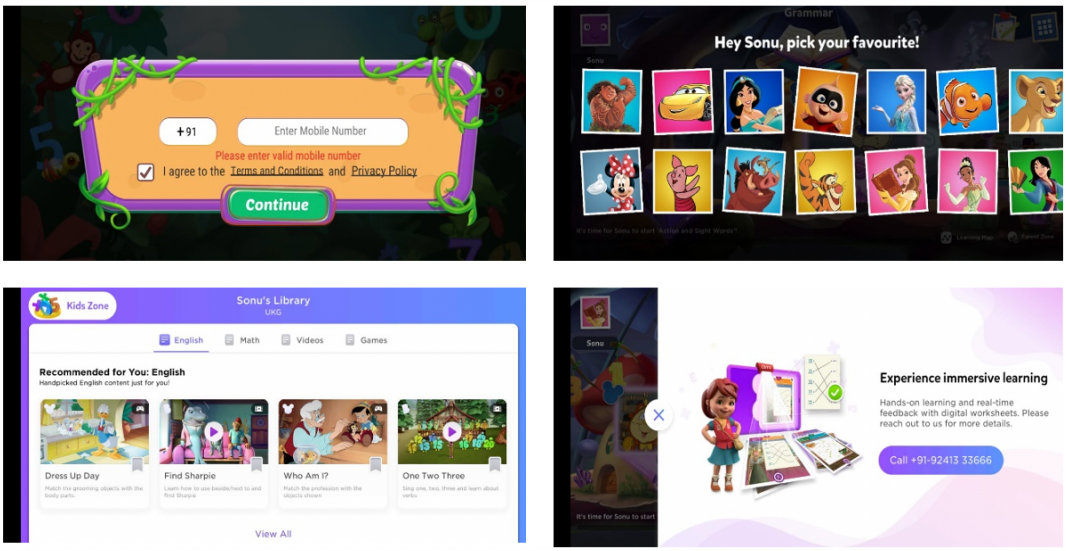

Figure 17.5 Disney Byju's early learn app (v 2.8.0; 21st sep 2020)

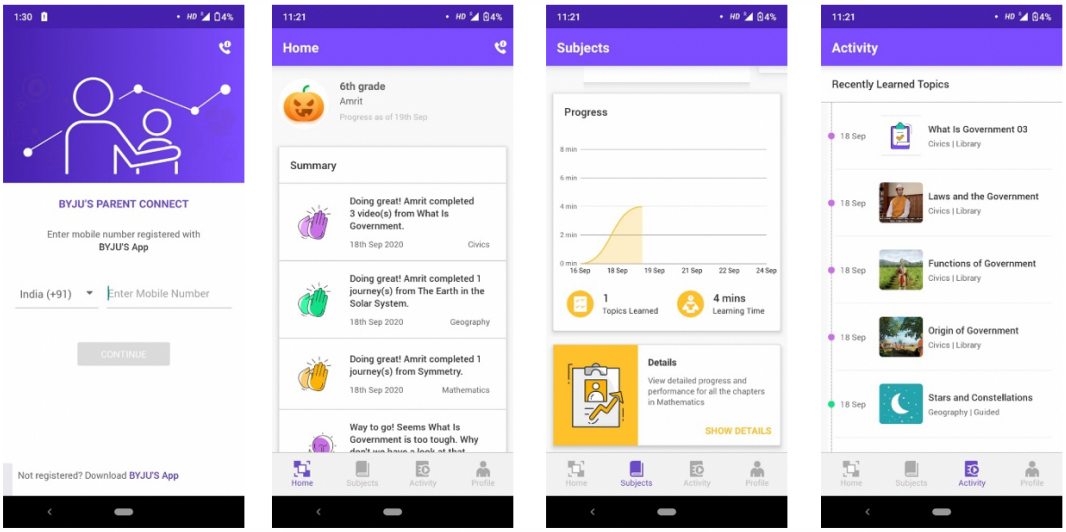

Figure 17.6 Byju's parent connect app (v 3.3.0; 21st sep 2020)

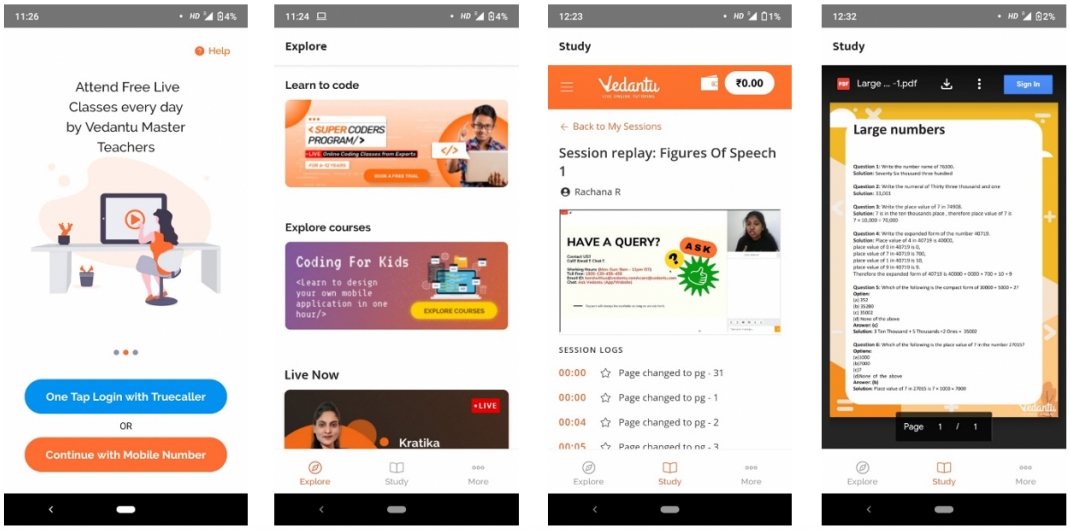

Figure 17.7 Vedantu app (v 1.7.3; 21st sep 2020)

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Dhiraj Kulkarni

FOODTECH

Industry Overview

Foodtech applications have seen tremendous growth in recent years. The contribution of online orders to the overall food delivery market has grown from 2% in 2016 to 11% in 2020. Zomato has shown an increase of 4x in the number of orders in the first quarter of 2020 as compared to 2019, showing the increasing popularity of the online food delivery applications. The industry comprises a multitude of business models. Some of the prominent business models include:

- **Restaurant Aggregator:** These are the platforms that host the restaurants and allow users to search for restaurants. For example, Zomato, Swiggy.
- **On-Demand Food:** These restaurants have their own centralized kitchens and take orders through their own application/website. For example, Rebel Foods, Freshmenu.
- **Ready to heat food:** The platforms which provide the ready to heat meals depending on the demand or the subscription. For example, Freshly.
- **Home Food to the office:** These companies enable users to place delivery orders, and offer pickup facilities for the food prepared by home chefs. For example, Ootabox.
- **Recipe Discovery:** These platforms enable users to search, store, and upload their recipes. For example, Tastemade.
- **Personalized nutrition:** These companies offer personalized nutrition plans and diet to the users. For example, DayTwo.

Other business models include, but are not limited to dine out apps, recommendation apps, innovative restaurants, catering platforms, chef marketplaces, and novel foods.For further discussion, the restaurant aggregator business model is chosen, and in particular, Zomato and Swiggy are the focus applications.

Business Model Analysis

Swiggy: Swiggy is limited to helping users to find restaurants/dishes. Once the user places an order, Swiggy's delivery partners will visit the restaurant to pick the order and will deliver to the customers.

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Figure 18.1 Swiggy business model canvas

Zomato: In addition to what Swiggy offers, Zomato also provides a platform to explore the detailed reviews of the restaurant along with a pickup option. They also provide a 'hyperpure' option to restaurants, aimed at providing high quality fresh raw material to the restaurants. The elements of business canvas which differ from Swiggy are colored in red.

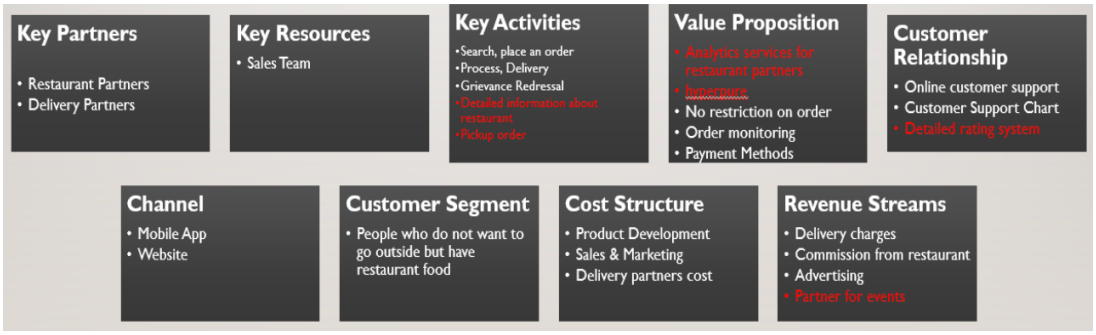

Figure 18.2 Zomato business model canvas

User Persona

Three different user personas can be defined on the basis of the frequency of orders and the affinity towards dishes.

1. A user who is new to the platform and wants to explore various restaurants, or the user who does not have any bias towards a particular restaurant or dish.
2. A repeat user who wants to explore the dishes of a particular cuisine/restaurant only.
3. A repeat user who orders previously ordered items from favorite restaurants frequently.

Typical User Journey

Swiggy: The typical user journey in Swiggy is as below:

- Login/Signup: The user logs in, either using mobile number/email or social media accounts. The user can skip the process of login and explore the menu of the restaurant.
- Restaurant Search: The user searches for the restaurant and selects a restaurant from which they want to order.
- Placing the Order: The user selects the dishes that they want to have from a restaurant and then places an order.
- Tracking: After the payment is done, the user tracks the progress of the order.

Zomato: The typical user journey in Zomato is:

- Login/Signup: The user logs in either using mobile number/email or social media accounts. The user can skip the process of login and explore the menu of the restaurant.
- Restaurant Search: The user searches for the restaurant and selects a restaurant from which they want to order.
- There are two choices available to the users of Zomato, either similar to the Swiggy user, they can place the order, or can explore more about the restaurant through detailed reviews and photos.
- Tracking: If the user goes for placing an online order through the application, he/she can track the progress of the order.

App Critique and Comparison

Disclaimers: The critique is done on the basis of the apps' design as on 1st Oct, 2020.

Sign-in Option: Lazy sign-in is an important feature, considering a hungry user will be looking for food quickly and hence forced sign in at the start can increase the bounce rate. Both the applications give an option of lazy signing in and allow users to explore the dishes and restaurants without mandating them to log in. The sign in can be done when the user is placing the order. But, the option to skip the login is more intuitive in the case of Zomato with the button title as 'Skip'. In the case of Swiggy, the option of lazy sign-in is available with button tile 'Swiggy' making it less intuitive than Zomato.

Restaurant Explorer Page: This is the page where the users will explore the different restaurants available.

Swiggy: Swiggy's restaurant explorer page looks cluttered, with offers floating everywhere. They could instead have only one row for offers, rather than bombarding the users with offers. They do provide 'Top Picks for You' at the beginning, accounting for the user preferences or the past orders of a user. In the restaurant display panel, they have time for delivery, the average cost per person, and the rating of the restaurant. But they do not have any filters on the page. Also, the extracted number of people who have rated the restaurant is unknown, impacting the trust of the user. Towards the bottom of the page, the user has search, cart, and account options. The cart option seems unwarranted when there are no items in the option. The option could have been made dynamic.

Zomato: Zomato's restaurant explorer page contains a list of restaurants, similar to the Swiggy. But the information related to the number of orders since the lockdown has been imposed is given so as to gain the trust of the user. There is also an option to bookmark a particular restaurant. Also, the filtering options including cuisine, rating, cost per person along with sorting options by delivery time, cost, and popularity are available, easing out the process of finding the best suitable restaurant for the user. The app also offers top brands in the spotlight, what's new on Zomato, and other options to help out explorers to try new items or the items liked by the community. Towards the bottom of the screen, there are options for history, videos, and account

management. The history option is particularly useful for the third persona, who might be interested in repeating the past orders frequently. Also, the video option gives access to Zomato originals, cook with pros, easy to cook recipes increasing the user engagement in the application.

Restaurant Landing Page: When the user finalizes which restaurant to order from, they land on the restaurant's landing page, where they can select dishes, from the restaurant's menu.

Swiggy: The restaurant landing page in Swiggy shows a rating, delivery time, and cost per person on the page. The number of people who have rated the restaurant is not made public and is shown as 20+ or null on the page. Swiggy could show the number of reviewers explicitly, to gain more customer trust and add credibility to the rating system. Also, it provides an option to mark a restaurant as a favorite. As compared to Zomato's bookmark feature, mentioned in the restaurant explorer page, the favorite restaurant feature in Swiggy is well placed, as the user will mark a restaurant favorite only after looking at the menu. The page also marks some of the dishes as best sellers on the menu, but they are randomly placed on the menu. Swiggy could have placed the best seller items at the top. to provide the user convenience of finding the popular dishes.

Zomato: Zomato's landing page has detailed reviews of the restaurant, along with time for delivery. The review highlights are also provided, to get the gist of all the reviews making the process of going through the review easy and comfortable for the user. The app also provides reviews for all the dishes in the restaurant for gaining the trust of the user. This, in my opinion, is one of the top differentiating features in Zomato, as not all the dishes in the restaurants are equally good. It also provides best seller dishes, and unlike Swiggy, best seller dishes are displayed at the top, making the ordering process convenient for the users. Zomato also tries to increase the order value through suggestions such as popular add-ons, which get displayed when the user is in the process of completing the payment.

Covid Related Initiatives: In times like Covid, users care about safety the most. In any food delivery platform, food transfers from restaurant personnel to delivery partners to customers. As multiple people are involved in the end-to-end delivery of food, gaining the trust of the users, providing them with confidence around the safety measures taken by the platform is of paramount importance to any food delivery platform.

Swiggy: Swiggy mentions 'delivery partner safety' on its restaurant explorer page. But it does not mention the safety precautions followed by a restaurant. Also, the delivery partner safety banner is not at the top of the page. Hence, the user at first glance, would not see the initiatives taken by Swiggy to deliver the food safely.

Zomato: Zomato mentions how food delivery is safe and how customers' safety is a priority for them. They have also mentioned the number of orders delivered since the lockdown started. They also mention the number of orders from each restaurant, giving a sense of safety to the customers. On the restaurant's landing page,

Zomato explicitly mentions the safety measures followed by a particular restaurant in an attempt to reinforce the trust in the customer.

In a nutshell, zomato appears to be doing better in terms of customer convenience, easing out the process of food ordering, bringing in more transparency and customer engagement. Order tracking on the apps is not covered in this chapter, and is left to the reader to explore.

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PRODUCT MANAGEMENT INTERVIEW CASES

Section 4

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Ishmeet Singh, Yuvraj Singh Bawa

GUESTIMMATE 1

Problem

Interviewer: Estimate the number of Instagram uploads occurring in India

Ask clarifying questions

Candidate: I'd like to ask some clarifying questions. Do you want me to estimate the number of uploads per day or per year?

Interviewer: Uploads per day.

Candidate: Do uploads consist of posts or stories or both?

Interviewer: Consider only posts.

Candidate: Are we considering personal or business accounts?

Interviewer: Consider only personal accounts for now.

Comments: The clarifying questions showcase the candidate's understanding of the different types of uploads that can be made on Instagram (posts, stories), and the user profiles (personal, business). It portrays a sense of comprehensiveness.

Strategy Formulation

Candidate: I will approach this problem by estimating the number of personal users on Instagram with the average number of uploads they make each day. First, I shall estimate the number of personal users. Then I will come up with the average number of uploads figures by splitting these users into categories based on frequency of use.

Interviewer: Alright, go ahead.

Guesstimate

(Candidate writes down the following on a sheet of paper)

General equation:
uploads = [# of users on Instagram] * [avg. number of uploads per person each day]

Candidate: To estimate the number of personal users of Instagram, I will multiply the following parameters: (Candidate writes down the following on a sheet of paper)

[# of users on Instagram] = [population of India] * [% population with smartphone and access to internet] * [% of people on Instagram] * [% of monthly active users]

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Candidate: The population of India is 1.2 billion. Due to an all-time high penetration of mobile services, I estimate that 40% users have a smartphone with access to internet. Instagram is the third most popular app on the Play Store with over a billion downloads, so I assume that 50% of these users have Instagram. About 30% of these accounts would be fake or inactive, leaving us with 70% monthly active users.

Interviewer: Sounds reasonable.

(Candidate writes down the following on a sheet of paper)
[# of users on Instagram] = 1.2 billion * 40% * 50% * 70% = 168 million

Candidate: I'll round that off to 170 million. Now, I'll estimate the average number of uploads per person per day. For this, I'll divide the monthly active users into three categories, with rough estimates for the percentage of users in each category from my own experience:

1. Light users: 1 post every month on an average - 30% = 51 million
2. Moderate users: 1 post every 10 days on an average - 60% = 102 million
3. Heavy users: 1 post every 2 days on an average -10% = 17 million

Therefore, number of posts per day = 51 * 1/30+ 102 * 1/10 + 17 * 1/2 ≈ 20 million posts

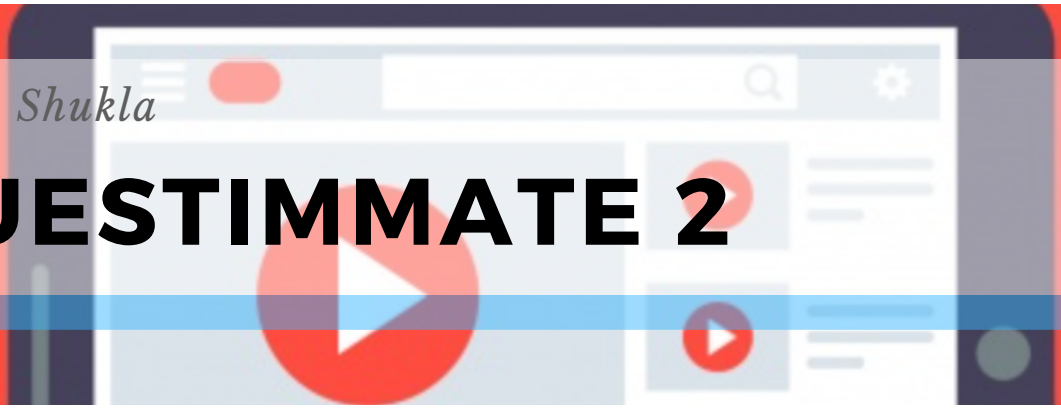
Additional ways of segmenting which could be done:

- Age/gender wise segmentation for posting habits
- Users could be Indians or tourists making posts in India

Interviewer: Sounds good, thank you.

Comments:

The candidate provides rationale for every estimate they make. They also simplify their calculations by rounding off. This is a good trick, as numbers can start getting complicated when segmentation is done. The Candidate also provides alternate ways of segmenting, which shows that they understand that trends can vary across user demographics.



Akash Shukla

GUESTIMMATE 2

Interviewer: Estimate the revenue that YouTube makes in a day?

Interviewee: Interesting! To estimate the total revenue, I will have to break down the same into revenue streams. As per my knowledge, YouTube has multiple revenue streams - Ads, YouTube music, YouTube TV, affiliate marketing, etc. Ad revenues form the majority of this. Am I missing any revenue stream? Do you want me to go into a particular revenue stream or across all of them?

Interviewer: Since you mentioned that ad revenues form a bulk of it, let's deep dive into that.

Interviewee: Sure, do you want me to consider the ad revenues of YouTube globally or in a specific geography?

Interviewer: Good that you asked that! Lets look at estimating the revenues specifically in the US.

Interviewee: Alright so the approach I'm going to take is as follows -

Youtube ad revenues = Total number of ad views x avg charge per ad view

Youtube ad revenues = Videos watched per day x Avg ads/video x avg charge per ad view

For estimating the total number of ad views, there are two ways we can go about it - estimating from the demand side as to how many videos do people watch on YouTube on a daily basis. The second way is from the supply side as to how many video views does YouTube have the capacity to serve. Since, in this case capacity will not be a problem as YouTube can easily scale up its infra to serve the demand, we should go via demand estimation. Does this sound fair?

Interviewer: Alright, that does sound like a plan. Lets go ahead.

Interviewee: For estimating the total number of ad views in a day, I will start with the population of the US, segment it into age intervals and then assume a percentage of them that watches YouTube videos on a daily basis. This will give me average total daily Youtube viewers in the US. Then, I will assume the number of videos watched by each of these age segments on a daily basis to get to the total number of Youtube video views in a day. Assuming a percentage of this has ads on it, we can get to the total ad views per day in the US.

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I will start with the total US population as 300 m with an average life expectancy of 80 years and assume a uniform age distribution.

Estimating the avg number of YouTube users per day -

- 0 - 5 yrs : doesn't watch => 0
- 5 - 10 yrs : watches on 50% of the days => (5/80)*300*50% = ~10m
- 10 - 20 yrs: watch daily => (10/80)*300*100% = ~40m
- 20 - 40 yrs: watch daily => (20/80)*300*100% = 75m
- 40 - 60 yrs: watch on 75% of the days => (20/80)*300*75% = ~60m
- 60 - 80 yrs: watch on 50% days => (20/80)*300*50% = ~40m

So now we have the daily viewers across age segments we can go ahead with calculating the daily views -

- 0 - 5 yrs : 0 daily views
- 5 - 10 yrs : watch 5 videos per day => 5*10 = 50m views
- 10 - 20 yrs: watch 20 videos per day => 20*40 = 800m views
- 20 - 40 yrs: watch 10 videos per day => 10*75 = 750m views
- 40 - 60 yrs: watch 5 videos per day => 5*60 = 300m views
- 60 - 80 yrs: watch 5 videos per day => 5*40 = 200m views

Hence, we get the total number of views as = 50+800+750+300+200 = 2.1 billion views

We will assume that of these 2.1 billion views, 50% of them have ads showing up on them => This gives us a total of ~1bn ad views per day.

Total estimate the ad revenues, I'll assume a per $10 charge per 1000 views to the advertisers.

Total ad revenues = 10 * 1 billion/1000 = $10 million per day

Interviewer: Alright anything else that you would want to see in this?

Interviewee: I would like to have a sanity check on this answer. I'm getting a per annum Youtube revenues of = $10 * 365 = $3.65 billion

I know that Google makes ad revenues of ~$100 billion on an annual basis of which YouTube contributes around 10-15%. This brings global youtube revenues to around $10-$15 billion.

$3.65 billion forms a big chunk of this revenue coming from the US alone. It sounds sane given the higher internet penetration in the country as compared to other geographies.

Interviewer: Alright, sounds fair, we can end the interview here.

Akash Shukla

GUESTIMMATE 3

Interviewer: Estimate the market size for driverless cars.

Interviewee: Interesting! I've a few questions regarding the problem statement before I get into structuring a solution for the same. So, is there a particular geographic area that we are considering for the estimation?

Interviewer: Yes! I would like you to estimate the market size for the same in the US.

Interviewee: Sure. Also, do you want me to estimate market size in terms of unit volumes or in terms of total value of cars sold?

Interviewer: That's a good question. Let's look at it in terms of the unit volumes.

Interviewee: Great, we can always get to the total value by multiplying with an average unit price. So, that makes sense. Lastly, the market size will include both B2B and B2C sales. Should I consider both?

Interviewer: Lets only go for the B2C or purchases made by US households.

Interviewee: Understood! So here's how I'll structure this problem as - I'll formulate the market size of driverless cars as a percentage of the total new car purchases in the US -

Driverless cars unit sales = New car purchases in the US x Market share of driverless carsNext, I would estimate the total car purchases in the US in an year by considering the replacement cycle of the car -

New car purchases in an year = Total number of cars in the US/Car replacement cycleTo estimate the total number of cars in a country - I will start with the population of the country and estimate the number of households in the same by assuming an average household size. Further, I will then multiply the same with an average car per household assumption -

Total number of cars in the US = Total number of households x Avg. cars per household

Total number of households = Total population/Average household size

So, does this sound like a fair approach?

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Interviewer: Yes, that sounds fair! Lets go ahead.

Interviewee: Great! So, let's start with the US population of 300 million. I will assume an average household size of 4 in the US to get the total number of households in the country as - 300/4 = 75 million households.

Further, given that the US is a high income country combined with a much higher percentage of women in the workforce, we can safely assume that on an average, the households in the US will have a car each for both the elder male and female members. Hence, I will continue by assuming the average number of cars per household as 2.

Hence, we can formulate the total number of cars in the US as = 75 * 2 = 150 million

Now, I'll estimate the total car sales in the US on an annual basis. For the same, using my prior knowledge, I'll assume a car replacement cycle of 10 years. This means that each car would be replaced by a new one after 10 years of usage. This gives us the total number of cars sold in an year in the US as - 150 million/10 years = 15 million cars per year

Interviewer: Great, so now that we have reached the total number of car sales in a year, how would you estimate the driverless cars market size?

Interviewee: I know that in the US, Tesla is the largest producer of driverless cars. Further, with the model 3 being its most affordable car in the driverless segment, Tesla had sold about 300k cars which is around 1.66% of the total market size. I'll assume this market share to further increase marginally to around 2% to get total driverless cars sale as -

15 million x 2% = 300,000 cars

Hence, we reach a market size of 300k driverless cars being sold in the US per year.

Interviewer: Interesting! Alright, we can close this year.

Yuvraj Singh Bawa

GUESTIMMATE 4

Problem

Interviewer: Estimate Zoom's daily server usage during the lockdown period

Ask clarifying questions

Candidate: I'd like to ask some clarifying questions. My understanding is that Zoom's server usage would comprise of the following:

1. Storing information about its users and their call logs
2. Streaming the data (audio, video and text) to and from participants in a zoom call
3. Miscellaneous processing tasks (backend)

Among these, I believe that the second point would take up the majority share of the server usage. Shall I proceed with this assumption?

Interviewer: Yes, that sounds right.

Candidate: Do you want me to account for global usage or constrained to particular geography, such as India?

Interviewer: Consider the usage for India.

Candidate: Are we considering personal, student, or business accounts?

Interviewer: You can consider business accounts for now.

Candidates: Among business accounts, should I account for both event streaming or just professional calls between employees?

Interview: You may proceed with the latter.

Comments:
The clarifying questions showcase the candidate's understanding of the different types of data usage that Zoom may have and the types of users it caters to.

Strategy Formulation

Candidate: I will approach this problem by estimating the number of employed personnel in India working white collar jobs. My assumption is that most of these people would be using some video conferencing app for their work day. Zoom has two main competitors that I can think of- Microsoft Teams and Google Meet. However, Zoom has the major share of video-conferencing app users, so I will assume that 60% of the white-collar employees use Zoom.

Interviewer: Alright, go ahead.

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Candidate: I will use the following general equation:
Daily server usage = # of Zoom users * data usage per user
=60% of white collar employees * data usage per hour * # hours per user

Candidate: First, I will start with the number of zoom users. As there are a large number of jobs in India that are in the manufacturing and agriculture sector, I will assume that 10% of the workforce is employed in white collar jobs. And to estimate the workforce, I will assume that 80% of adults in the age range of 20-60 in India are employed. I will assume that the population is uniformly distributed between the ages of 0-80, so 50% of the population is in the 20-60 range.# of white collar employees= 10%* 80% * 50%* population of India = 48 million. 60 % of this is roughly 30 million.

Among the white collar employees too, there would be a gradation in usage based on how critical collaborative tasks are to their job or how much time of their work day is spent in a meeting. So for estimating data usage, I will consider three categories of users:

- Heavy users: >50% of the work day spent in a meeting => >4 hours
- Medium users: 1-2 hours
- Light users: <1 hour

Candidate: I will make a simplifying assumption that users are distributed among these categories roughly normally, so 20% of the users are heavy users, 60% are medium and 20% are light users and that the usage for the categories is exactly 4, 1.5 hours and 0.5 hours respectively.So, average usage per user = 20%*4 + 60% *1.5 + 20% *0.5 =1.8 hours, which is roughly 2 hours.

Candidate: Finally, to get the data usage per hour, drawing from my personal experience, a zoom call functions best when I have access to at least 1 Mbps of data. So I will assume that a zoom call uses 1 Mbps of data in a call. This equates to 360 Mb of data in a n hour.

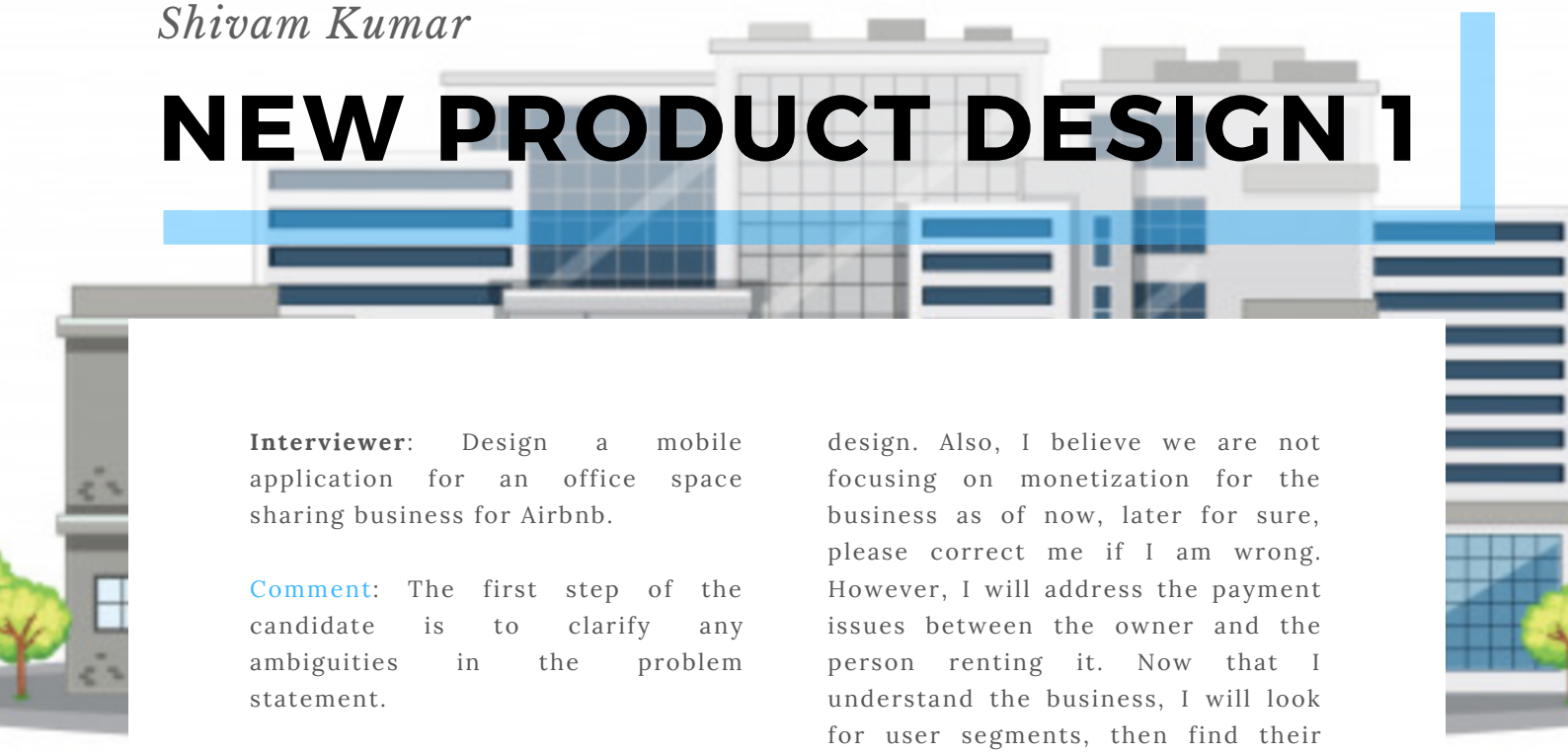
So, finally we have:
30 million zoom users * 2 hours * 360 Mb/hour = 21,600 million Mb = 21.6 Tb/ day

Interviewer: Sounds good, thank you.

Comments:
The candidate provides rationale for every estimate they make. They also simplify their calculations by rounding off. This is a good trick, as numbers can start getting complicated when segmentation is done.

Shivam Kumar

NEW PRODUCT DESIGN 1



Interviewer: Design a mobile application for an office space sharing business for Airbnb.

Comment: The first step of the candidate is to clarify any ambiguities in the problem statement.

Candidate: Before moving further, I would like to understand a bit more about the problem at hand. What is the exact business model of this office sharing app? For whom would we be designing the app, the owner or the renter? And lastly, what is the objective of this app.

Interviewer: Good questions. The whole business idea is that people with extra office space can rent out to start-ups or freelancers, Airbnb will take the empty space and remodel it, but the owner will take care of the operations. We need to design the app for both owner and the renter. As of now, the objective is to get as many customers as possible on board.

Candidate: That's helpful. I am assuming that the person who is renting the space is the owner, just to reduce the complexity of the design. Also, I believe we are not focusing on monetization for the business as of now, later for sure, please correct me if I am wrong. However, I will address the payment issues between the owner and the person renting it. Now that I understand the business, I will look for user segments, then find their needs, build user stories, search for solutions and create an MVP to fit these solutions.

Comment: After understanding the problem statement, the candidate clears all his/her assumptions beforehand. Also, he/she gives an overall flow of how he/she is attacking the problem. This helps to keep the interviewer intact with the broad view, and aligned with the candidate's thought. It's always good to first give a high-level view and then go on to the detailing.

Candidate: There are 3 users for this application

1. Owner
2. The person renting it
3. Airbnb

Which one should I focus on?

Interviewer: You may decide that.

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Candidate: For any multi-sided platform, it is important to solve the chicken-egg problem. Taking the example of Uber who first focused on on-boarding the drivers, I will also focus on owners. Since we are focusing on the owner, we must first define their persona. Mostly, the owner will be a person or a company who have extra space in their building which can be monetized. They will be comfortable in sharing their space to a stranger. If it is a company, this will be an additional source of money.

Comment: The candidate chose a particular user to focus, but he/she also gave a proper rationale for that. He/she backed it up a similar business model like of Uber to rightly choose the user. It would have been better if the candidate would be gone deeper about the user(the owner) like their demographics, their size, their location etc.

Candidate: Few of the needs of the owners would be

1. Finding reliable people to rent it to, also the ability to approve or decline requests
2. Furnish and maintain the space with office supplies
3. Estimated rent and information on rental periods and owner's rules
4. Payment and customer support
5. Security of the place

The user needs can be analyzed by navigating through the steps the owner would need to go through the whole process.

So the needs of the user should be identified at each stage of the process.

Comment: It's always good to break down the whole process into intermediary stages and figure out the customer in these stages, this helps in getting the exhaustive list of user needs, and avoids missing of any important part.

Interviewer: Fair enough. But how will you prioritize among the different needs of the user?

Candidate: Since we are focusing on MVP, I will look at the most needed features which are 2, 3, and 4. So my user stories as an owner are : Keep a check on the office supplies and other furniture, replenish them whenever necessaryI want to know the rent I will get so that I can decide whether it is meaningful for me or notA way to interact with the system to confirm/cancel bookings and settlements

Comment: Prioritizing the requirements is one of the key roles of a product manager. Since its a boundary spanning role, product managers are bombarded with multiple tasks of the product, from the business team, from the engineering team, from the marketing team etc, but the product managers have to make hard calls on prioritizing the requirements. Some of them use the effort-impact matrix to do this, however, there are multiple other frameworks as well.

Candidate: For an MVP, I will address all the stories individually first

Solution to story 1:

- Display the list of all the supplies and furniture available in the location.
- Provide the capability to the place orders through the app itself, Airbnb can provide support.
- An ability to display to the renters what all furniture and equipment is present in the office.

Solution to story 2:

- Option for the owner to send the rent to the person renting it
- Rent estimation based on
  - Space occupied
  - No. of days
  - Special requests/Customisation
  - Number of people/employees

Solution to Story 3:

- A tab to manage request for renting. Option to confirm/cancel or chat with an interested person.
- Have a payment gateway to pay full rent in advance. Provide a weekly settlement into the owner's account. Cancellations/Refunds will be handled by Airbnb in between settlements

Interviewer: Would you go ahead with all of these?

Candidate: No, I will evaluate the solutions in each story based on customer impact and its ease of implementation. After the evaluation, I will select 1,2 in S1, 2 in S2, 1,2 in S3 for the MVP. Do you like me to go in detail about these?

Interviewer: No, this is good. Thanks for your time and all the best.

Comment: Candidate could have explained here a bit more about how selected the features for the MVP, however, since the interviewer confirmed then it's fine. It's always better to back up your arguments with data and logic, interviewers are looking for critical thinking of the ability of the candidate.

Yuvraj Singh Bawa

NEW PRODUCT DESIGN 2

Interviewer: Design an Alexa skill for artists/designers that can be monetized.

Comprehend the situation

Candidate: Let me just clarify the problem statement. I need to design an Alexa skill for artists or designers. I am assuming that this means that the skill I am designing shall have a voice-interface?

Interviewer: Yes. You may feel free to add other interfaces too.

Candidate: Okay. Are we targeting a particular segment of artists? Sculpters/painters/graphic artists, etc.?

Interviewer: You can consider any artists or designers.

Interviewer: You can consider any artists or designers.

Identify the customers & Report their needs

Candidate: I will first try to identify certain user personas that the Alexa skill can cater to. Among artists, the most attractive market that has a demonstrable monetization potential is that of graphic artists and designers. They use products like Adobe Illustrator, GIMP, etc. to create designs ranging from posters and flexes to logos for clients. This is one market segment that I can think of targeting. Their needs include searching for appropriate graphics to be used in their designs and being able to create the designs in a time-efficient manner.

The second segment I can think of are UI designers who create mock ups of ads, apps, and websites. These customers can be catered to with the value proposition of having voice-assisted designing.

Interviewer: Sounds good.

Comment: This problem statement requires you to create a revenue generating product, so it is good to identify use cases up front that have demonstrable monetizing potential.

Cut, through prioritization

Candidate: As the business goal is to have a monetizable skill, I will prioritize among the two personas on monetization potential. I am aware that Adobe products are provided for a high subscription fees. Thus, I think that professional graphic designers

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are much more willing to pay for a product that they can use, whereas for UI designers, prototyping is a secondary activity. So, I would choose graphic designers as my target users.

List Solutions

Interviewer: In what way would this Alexa skill cater to graphic designers?

Candidate: The typical user journey for a graphic designer is: ideation->planning->searching for graphics/vector clipart to be used->designing->iterating. One of the issues that I used to face when I would create posters for my college fest was finding appropriate graphics to be used on the posters. That is one pain point that can be addressed among the users: search for graphics to be used in their designs, as an add on tool for some graphic design software.

Interviewer: So, how would this work?

Candidate: The user can call, "Alexa, find me animal clip-arts". Apart from asking for clip-arts from a premium library that can be built by partnering with firms like ShutterStock, the users can also use Alexa to make use of voice assistance to rapidly prototype designs and storyboards. They can ask for the right elements and with a touch interface and the voice interface reposition elements on their canvas to generate quick designs.

Interviewer: What are the possible revenue streams from this product?

Candidate: The primary revenue stream is from the sales of the Alexa-based add-on (which would have to be done in conjunction with the graphic design software). The second stream is from commission on sale of premium designs from shutterstock.

Evaluate Trade-offs

Interviewer: As a PM, would you work on this product to bring it to market?

Candidate: No. My reasons for not pursuing this product to market would be:

1. The size of this market is very small, and developing such a skill would require a lot of product development effort. It is not easy to seamlessly integrate voice plugins with sophisticated software like Illustrator.
2. Amazon focuses on creating value for users and creating a complete ecosystem. As a skill that would be a secondary add on to a graphic software, that would be opted by a few graphic designers, and that shows limited potential outside this market, I would not recommend developing this product.

Comment: The candidate draws on personal experience. This gives more credibility to their assumptions and prioritization criteria. They also show that it is okay to answer the 'Would you build this product?' question negatively, if you can give a logical and/or business reason for the same.

Mounica Rudra

NEW PRODUCT DESIGN 3

Interviewer: Design a product for social media apps to fight Covid-19

Comprehend the situation

Interviewee: Is the main purpose of this product to access information easily and reduce misinformation going around and be a reliable source for data?

Interviewer: Yes, Along with this we would also use this product to build strong support communities in this difficult times

Interviewee: Sure, We can also share safe practices to be followed.

Interviewer: Sure, Go ahead

Customer Identification and reporting their needs

Interviewee: I would like to segregate users based on the emergency and their impact on the situation. So, the main segments would be

- Healthcare workers
- Covid -19 patients
- Government
- Others (Friends, family and everyone else)

I would like to first define the user needs of these segments and pick the most critical one to solve. Is that okay?

Interviewer: That sounds okay

Interviewee: Defining user needs for each of the categories

Healthcare workers:

- Need to communicate with other hospitals and government officials to confirm protocols to be followed
- Availability of kits, medicines etc.
- As this is a heavy stress period, concentration should be there on the mental health of healthcare workers.
- Express concerns and update the status of patients etc.

Covid - 19 Patients:

- Confirmed patients: Steps to be followed next and actions to be taken
- Non - confirmed patients: Starting from testing procedure, what are the steps to be followed

Government:

- Send alert messages when new cases are detected
- General information and rules to be followed - in terms of conveying them to citizens or checking if they are being followed etc.,
- Track confirmed patients and returnees from abroad

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- Act as single channel to address all the frequent concerns and questions that public might have
- Act as a medium to let public know of the new schemes by government

All the other users

- Act as single trusted source for all the information
- Protocols to be followed as advised by WHO and other governments

For the purpose of this interview I would like to address the issues faced by healthcare workers as they are the ones most impacted and have to spend long hours at hospital, away from family and are really important for us to catch a hold of the situation.

To define these personas a little more, they are mostly doctors, nurses, hospital staff and other staff related to healthcare. The assumption here will be that most of these people are well connected with technology and are often 25 years or older.

Possible solutions - healthcare workers especially doctors and nurses

In the problems mentioned above for the healthcare workers I would suggest the following solutions

- Online counselling app to healthcare workers working directly with Covid patients: This will be available for both healthcare professionals and their families to help them get through this stressful situation
- Information portal : This will act as a source where doctors from different hospitals will be able to update different requirements they have (like blood, plasma, PPE kits etc.,) and update multiple things like number of patients etc., and because large amount of people already use different platforms this will be helpful
- One of the other objectives in these times is morale building. If we enable users on facebook to appreciate the real world events happening around them, this would act as a motivator for health care workers in these tough times. This can probably include sending appreciation stories to their profile, or give some badges or ratings on different platforms.

While suggesting these you may face some questions like by whom, who will support the platform and funding etc., be careful to not quote something totally unrealistic.

Cut through prioritization

To come up with the prioritization list let's consider engineering costs and the number of people this will impact.

- So, in my opinion the Information portal has the highest ROI amongst the suggested options because in these tough times, it is hard to get correct data and harder to fulfill the requirements needed. This might act as one of the ways in bridging that gap.
- This can be followed by Online counselling app as keeping doctors mentally healthy is also critical.

- At the end we can have facebook stories where others can appreciate the real word happenings to increase morale of doctors and nurses.

Success metrics

- #people using this service (in terms of regions, professions in a time frame like 1 months, 3 months etc.,) - helps us understand the attractiveness of our features
- #of requests answered by government officials in terms of supplying kits, filling up vacancies, addressing concerns (converted) - on daily basis

Summary

To summarise, data has a crucial role to play to understand the spread of disease, capacity of workforce we have, necessity of medical equipment etc., so the process of data sharing should be seamless, for this reason the idea of an information portal is prioritised.

Jayant Jain

NEW PRODUCT DESIGN 4

Interviewer: Design a new bicycle renting app to be used in a college's campus.

Interviewee: So we have to design a bicycle renting application for the people staying in large college campuses. I want to confirm that the goal of this product will be to provide an easy mode of commute for the college's residents? Also, will these bicycles be allowed to be driven outside campus?

Interviewer: Yes, this is the goal. The bicycle can be driven only inside the campus.

Interviewee: Then this can be a mobile application, thus, giving users the flexibility to plan the commute from anywhere. Moving forward, I will first identify the customers for the product, then list down and prioritize their needs. Then, I will brainstorm the solutions and prioritize among them for the MVP. Lastly, I will define the success metrics for the product. Does this plan look good?

Interviewer: Yes, please continue.

Interviewee: There can be following type of users:

- Residents:
  - College students: They would be young (generally, 18 yrs to 30 yrs) and tech savvy. However, they will have lower willingness to pay. They might use the bicycles for faster commuting between hostels and academic complexes, and for leisure campus rides.
  - Faculty members: The younger section of faculty members might be interested in utilizing the bicycles for commuting within campus. Their willingness to pay would be higher than that of students.
  - College staff: They would comprise guards, mess workers and workers in food outlets. Fewer of these will be tech savvy and have higher willingness to pay than students. Their main goal would be to travel from one location to another faster and carry goods.
- Visitors: They may visit the campus during fests, conferences and competitions. Their willingness to pay might be higher when compared to resident students. Their goal would be to travel from dorms to event locations faster and sightseeing.

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Whom shall I focus on for this interview?

Interviewer: Lets focus on students.

Interviewee: Sure. I will first list down the needs of a student as per their user journey.
1. A student would want to find the nearest available bicycle so that she is aware of where the bicycle can be picked from. Furthermore, she would block the bicycle for some time so that no one else takes it by the time she reaches there.

2. She might need directions to reach the nearest bicycle stand.

3. After reaching the location, she would have to identify her bicycle and unlock it to start the ride.

4. New students might want to be navigated to the destination. Students will also require an emergency contact number whom they can reach out in case the bicycle breaks in the route.

5. She will end the ride after reaching the destination so that she can stop the meter from charging her anymore.

6. She would want to make the payment through the apps she commonly uses so that she doesn't have to maintain a new wallet.

7. She would want to generate recurring bicycle booking requests so that she can have a mode to commute for each of her classes.

8. She might want to synchronize her academic calendar with bicycle booking so that a bicycle can be tentatively blocked for her.

For MVP, we would initially focus on fulfilling the following needs so that students rent the bicycle for easy commuting: 1, 2, 3, 5, 6.

Brainstorming few features for MVP of mobile application and also measuring their impact:

	Features	User Impact	Cost of building impact
1	GPS on college campus map for finding the nearest pick up point with available bicycle	High	Low
2	Maintaining state of bicycle: available, not available, soon available	High	Low
3	Blocking the bicycle and making it unavailable for other users for a time duration	High	Low
4	Measuring estimated time to reach destination and making it soon available at that point	High	High
5	If a bicycle is not currently available, the user should get to know an estimated availability time	High	High
6	Whenever users leave the hostel, provide him with a push notification if a bicycle is available near them	Low	High
7	The user should be able to navigate to the available bicycle	Low	Low

8	The user can scan a barcode on bicycle through app to unlock it and start the ride	High	Medium
9	The user enter the destination and be navigated to the nearest drop point from there	Medium	Low
10	The user should be able to end his ride through the mobile app	High	Low
11	When the user ends the ride, the bicycle should be locked automatically	High	Medium
12	The user should not be allowed to end a ride if he is not at a drop location	High	Low
13	The user should be able to link UPI and wallets with the app for ease of payments	High	Medium
14	The user should able to see the ride duration and distance travelled for past rides	Low	Medium
15	Gamification can be implemented by maintaining a leaderboard on the distance travelled and also providing users with badges for motivation	Medium	High
16	An alert should be shown if user takes the bicycle outside the campus	High	Low

Based on this, I will prioritize the following features: 1, 2, 3, 8, 10, 11, 12, 13, 16.

To measure the success of the product, I would track the following metrics:

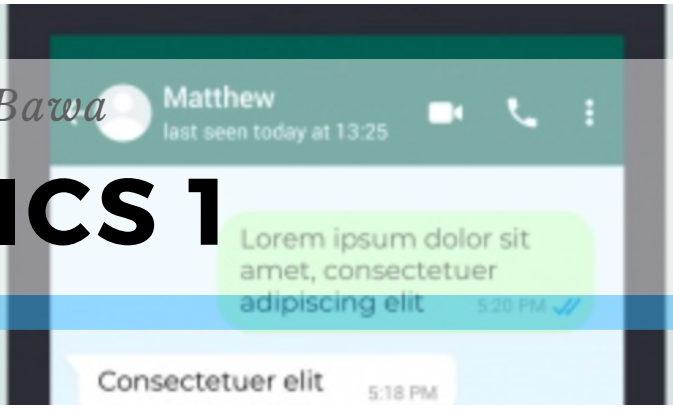
- No. of app downloads per month
- No. of new registrations per month
- No. of rides per month
- Average duration of a ride
- Average distance of a ride
- Percentage of pickups from each point
- Percentage of drops from each points

Would you like me to do something more?

Interviewer: This is good. Thank you!

Yuvraj Singh Bawa

METRICS 1



Interviewer: How will you measure the success of WhatsApp's in-app video playing feature?

Describe the feature & its goal

Candidate: First, I would like to describe the feature and my understanding of its objective. WhatsApp has introduced an in-app video playing feature, whereby users can play YouTube videos from within the chat window itself. I think the objective of the feature is to keep the users within the app context, so that the time spent on WhatsApp can be increased. There are three types of interactions that can be done when this feature is in use:

1. Expand the video to full screen
2. Close the video
3. Watch the video on YouTube by clicking on the YouTube icon

Interviewer: That sounds good. Please proceed.

Walk through the customer journey

Candidate: The user's journey for using this feature would look like this:

- Activation: The user receives a link to a YouTube video on WhatsApp
- Engagement: They click on the link, and the video starts playing within the app
- Engagement: They can expand the video to full screen, or stop viewing by clicking on the close button
- Alternately, they can click on the YouTube button to be taken to the YouTube app
  - If they chose this option, they can either continue browsing on YouTube (Leakage), or return to WhatsApp

Quantify behaviour in the customer journey

Candidate: Since this feature would be available only on phones with an Android version that supports in-app windows, and an update version of the app, all the metrics should account for that.

Activation

- % of users that play a link they are sent
- Relative activation rate: % of users with this feature available that play a video v/s % of users without the feature who play a video (which opens the YouTube app instead)

Engagement

- % of users who played the link and watched the video (either partly or wholly)

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- Relative return rate: % of users who stayed in WhatsApp after they stopped watching the video v/s % of users without the feature who return to WhatsApp after watching the video
- Time spent on WhatsApp by users with this feature v/s without this feature

Leakage:

- % of users with the feature opting to view the video on YouTube
- % of users who opted to view the video on YouTube that returned to WhatsApp

Evaluate the metrics

Candidate: The engagement metrics will give a picture of whether the feature has boosted time spent on WhatsApp and whether it enables users to engage with YouTube content more frequently.

Ease of measurement: The metrics can be easily tracked by logging actions of the users.

Wrap up

Candidate: To summarize, the in-app video playing feature is an effort by WhatsApp to boost time spent by users within WhatsApp as well as enable more media consumption for users. Primarily, the relative activation and retention rates will help evaluate these value propositions of the feature.

Shivam Kumar

METRICS 2

Interviewer: How do you measure the success of the Instagram story highlights features?

Understand the feature and its objective

Comment: The first step for deciding product metrics is to understand the product objectives well.

Candidate: I would like to clarify my understanding of the Instagram story highlight feature and its objective. You may interrupt and correct me if my understanding is wrong. So, basically, the Instagram story highlights is a feature to describe a particular account in crisp selected stories. The intention of the highlights could be multiple. For instance, if we talk of a photography page, the highlight might include its best photo works to indicate the level of quality to its clients. If the Instagram page is about a tech product, its highlight may include how to use the product in stepwise, or maybe the answer to the frequently asked questions about the product. So, the objective of the story highlights feature is to reduce viewer's time to understand/know about the Instagram profile/product in a short span of time and thus increase the conversion rate for these accounts. Conversion might mean different things for different accounts, for instance, for the personal account it could mean increased followers/likes, for business accounts, it could mean increased product sales etc.

Also, Instagram has introduced a story archive feature which is the backbone of highlights feature. So, even after 24 hours of posting a story, you can get those stories in the archive.

Interviewer: Bang on. You are right, please go ahead.

Candidate: Thanks. So, users can make any old stories a highlight, which will be present on the Instagram account until and unless it is removed manually by the account owner. It just acts like key highlighted posts for the account. These highlights are like small circular icons, similar to story icons present on top of all of the posts on the account page.

So, there are two stakeholders in this system:

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- Account owner: The account owner follows the below steps:
  - Click on the new button on account page
  - Select the Instagram stories to be highlighted
  - Confirm the stories to make them the highlight

Apart from this, there is one more way to add Instagram highlights. Once the user has posted one Instagram story, they can visit their story and click on the highlights button below. Then confirm to make it a highlight.

- Account visitor: Once a user visited the Instagram account, they can see all the highlighted story in circular icons on the account page. Then they can click on the highlight of their choice and they will be able to get the story like any other Instagram story.

Interviewer: Yes correct, you have got the product correctly. Now tell me, how will we measure its success.

Candidate: Let's go through the customer journey in phases. I have already explained the detailed steps for both the account owner and visitor. Now, let's get into the customer journey stages.

Awareness: The account owner should be made aware that such a feature exists. It is currently being done at two places, on the account page and on the story page.

- Average # of times highlight button clicks per story on the story page
- Average # of times highlight button clicks on the account page per account page visit per user

Engagement: The engagement here indicates whether the account owner is able to engage with this feature or not, basically the highlights they created. For account visitors, the engagement depends on various other factors like time spent by visitors on other's account seeing these highlights and so on.

- Percentage of number highlights created to the number of stories posted per user per month.
- Percentage of number highlights created, from account page to the number of stories posted per user per month.
- Percentage of number highlights created, from story page to the number of stories posted per user per month.Average time spent on watching other account's highlights per user per month.

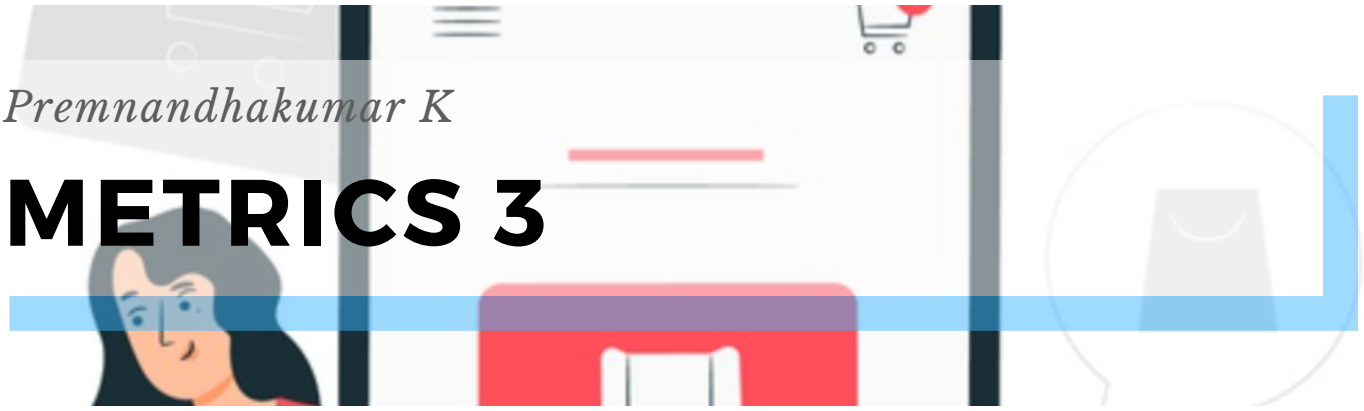
Conversion: The whole purpose of the feature is to improve the conversion for users. So, once a user has engaged with other's highlights, he/she should be able to quickly understand about the other's account and make decisions whether to follow or not, whether to buy their product or not etc.

- Average time spent on another account's page per user per month.
- Percentage of highlight viewers following other's page per user per month.
- Percentage of highlight viewers ordering services from other's account per user per month
- Average time spend on other's account before following them per user per month
- Average time spent on other's account before placing the order for their products/services per user per month.

Comment: Always try to quantify the metrics like what is the time range we are talking about, is it per month, is it per day etc. Also, each stage of the product has different objectives and thus the metrics should be aligned with that. Thus, we must be first clear what we expect from a particular stage, for instance, what is expected out of Awareness stage, or conversion stage and then align your metrics to their objectives.

Premnandhakumar K

METRICS 3



Interviewer - You are a product manager at a leading E-commerce company. What will be the metrics that you would follow/ observe?

Candidate - What are the platforms on which the company exits?

Interviewer - The company has a presence both in a mobile application and on the internet platform.

Candidate - Okay. The points of consideration for a PM are Revenue, User Experience and Offering listings to ensure that there are plenty of choices.

For a mobile application, identify the journey of the consumer through the app.

I'd like to follow the customer journey and quantify customers behaviour at different points of the journey.

- Download the app through Google or apple play store. So the quantifiable metrics are
  - Number of downloads per day
  - Number of downloads per month
  - Number of uninstalls per month (to identify the churn rate)
  - Rating on the play store page
  - Distribution of 5 stars vs 1 stars
- Signup
  - Number of new registrations
  - Number of existing registrations using it for the 1st time (Switching to the mobile app from the internet site)
  - % of logged-in customers
- Browsing the product
  - Total Searches through users
  - The number of organic searches for a particular product
  - Number of recommendations landing to the product page
- Adding to the cart
  - Number of products added to the cart
  - Value of the cart
  - Number of product removals from the cart
- Purchase
  - Cart to final purchase conversion
  - Cancelled purchases
  - Number of transactions in a period
  - Size of transactions
- After Purchase
  - Return rate - % of products that are returned out of total sales
  - Refund rate - monetary value that is refunded out of the total sales
  - Number of service calls

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For an e-commerce site, identify the journey of the consumer

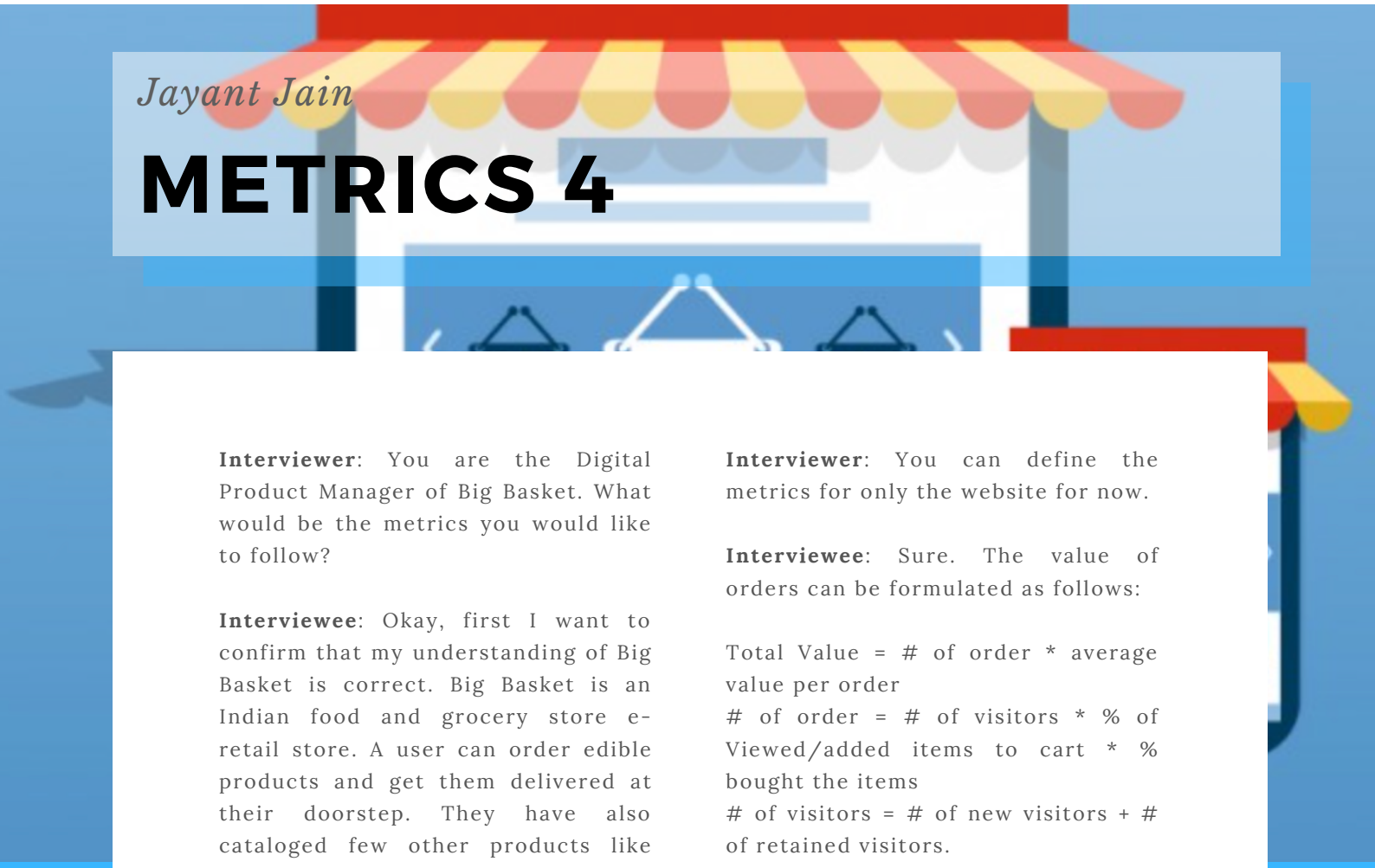
I'd like to follow a similar procedure for identifying the metrics to be followed for the website.

- Google searches
  - Google Search Organic Impressions - Number of instances when the customer sees the website in Google search results.
  - Rank on Google search engine results
  - Click-Through Rate - % of instances when the website gets clicked out of all the impressions through search results.
  - CTR on paid Ads - % of instances when the website gets clicked out of all the impressions through paid ads.
- Visits the product
  - Total Users
  - Organic searches
- Browses the product
  - Bounce Rate - % of visitors who enter the site and then leave rather than continuing to view other pages within the same site.
  - Pages/Session - No of pages visited per session.
  - Time on Sited. Exit rate on Product pages
- Registers
  - % of Logged In Users out of Total users
  - % of New Signups
- Adds to Cart
  - Number of items in cart per user
  - Cart Abandonment Rate - the rate at which the customer abandons the cart instead of making a purchase
- Pays
  - Cart to final purchase conversion
  - Cancelled purchases
  - Number of transactions in a period
  - Size of transactions
- Reaches out in case of issues
  - Return Rate
  - Refund Rate
  - Support calls in call centre
- Comes back and starts all over again
  - Retention Rate
  - Frequency of usage
  - Return on Investment
  - Customer acquisition cost
  - Month-on-Month growth
  - Churn rate
  - Stickiness
  - Daily/ Monthly active users
  - Daily sessions per user
  - Session duration
  - Lifetime to date
  - Customer Lifetime Value
  - Average revenue per user

The Metrics that are relevant for the company:

- Return on Investment
- Customer acquisition cost
- Retention rate
- Churn rate
- Stickiness
- Daily/ Monthly active users
- Daily sessions per user
- Session duration
- Lifetime to date
- Customer Lifetime Value
- The average revenue per user
- Month-on-Month growth

To summarize, the customer journey is almost the same for website and mobile app except for the discovery part, which happens via Search and Playstore respectively. The quantifiable metrics across the customer journey are enumerated here. Finally, we also listed down the metrics that the company should follow.



Jayant Jain

METRICS 4

Interviewer: You are the Digital Product Manager of Big Basket. What would be the metrics you would like to follow?

Interviewee: Okay, first I want to confirm that my understanding of Big Basket is correct. Big Basket is an Indian food and grocery store e-retail store. A user can order edible products and get them delivered at their doorstep. They have also cataloged few other products like aluminium foil and mugs. Moreover, the users can use both a mobile app and website for placing an order.

Interviewer: Yes, you may move forward.

Interviewee: Could you please share the business goal which we would like to report through the metrics.

Interviewer: Assume that the goal of the business is to increase the value of orders placed.

Interviewee: I will create a user journey map, identify which actions indicate success and failure towards placing order and then define the actionable lagging indicators. Should I do it for both, website and mobile app?

Interviewer: You can define the metrics for only the website for now.

Interviewee: Sure. The value of orders can be formulated as follows:

Total Value = # of order * average value per order
# of order = # of visitors * % of Viewed/added items to cart * % bought the items
# of visitors = # of new visitors + # of retained visitors.

The user would go through the following journey:

- The user either lands the home page through url or the product page through a search engine.
- The user then browses through the website either through navigation or through the search box.
- The user adds the products he wants to purchase to the basket.
- The user can also save the product. For saving, Big Basket will ask the user to login or register. The user can create custom lists and add the items to the list for repeated purchase.
- For ordering the products from the basket also, Big Basket will ask the user to login or register. The user can review the items we want to buy and then click on checkout.

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- Following this, the user is navigated to the checkout screen. Here, the user can select or add the delivery address. He can also select an appropriate delivery slot and apply for a voucher.
- Users can also opt to buy the BBstar membership if he plans to order frequently with high value carts.
- The user is then navigated to his preferred payment gateway for placing the order.
- After placing the order, the user is navigated to the confirmation screen. Confirmatory email and message is also delivered.
- The user can connect with the customer care any time to make a change in order or delivery time slot or requesting cancellation.
- The user receives the confirmation after the order is delivered at the doorstep.

In this journey, the user goes through 5 stages:
Awareness: The users can visit Big Basket either through url or search engine. Through search engines also, the user can navigate through organic search results or inorganic paid results. Hence we can have following metrics:

- No. of visits per month
- Percentage of visits through organic results per month
- Percentage of visits through inorganic results per month
- Rank on search engine results

Engagement: The user browses through the website to find products. The following can be measured to improve user engagement:

- Bounce rate per product or category page per month
- Average no. of pages visited per session per month
- Average time of a session per month Average quantity per product added to the basket per month
- Number of saved lists per monthPercentage of users using referrals per month
- Percentage of logged in users per month
- Percentage of new registrations per month
- No. of complaints per month
- No. of orders per user per month
- Value of returns per month
- Daily active users
- Monthly active users

Conversion: After adding the products to the basket, the user reviews the basket and checks out. The following can be measured to improve conversion:

- Average number of items in the basket per month
- Average value of items in the basket per month
- Basket abandonment rate per month
- Order cancellation rate per month
- Average order value per user per month
- Percentage of users who select similar products during checkout per month
- Percentage of users applying vouchers per month
- Value of vouchers applied per month

Retention: The user should again opt for Big Basket for further purchases within 2 weeks. The following can be measured to improve retention:

- Percentage of users opting for BBstar membership per month
- Percentage of users buying again per month

Referral: The users can also be a marketer for our product through word of mouth and sharing referral code.

- Percentage of users sharing referrals per month

Interviewer: This is great. Thank you!

Mahendra B

GO TO MARKET STRATEGY 1

Interviewer: You are PM at the Facebook building for India. You're tasked to come up with a Go to Market strategy for a dating application that Facebook has come up with.

Candidate: Before I move on, I want to clarify the marketing goal. It is to launch the application in India?

Interviewer: Yes, you need to come up with a strategy to launch this application in India.

Candidate: Sure. I would like to start off by analyzing the current dating application market. Dating is among the top-grossing categories on the Google play store in India. People are willing to pay for such products. The top applications which in can recall are Tinder, Bumble. They are a global product. There are quite a few local products as well. But all these are dating applications first. None of them have the capabilities that Facebook has, in terms of Social graph, user preferences, etc. Most of the users are between the ages of 18 - 27. They are usually in college or early stages of their professional careers. Most of the dating platforms follow a freemium model. They also use ads to generate revenue. One of the main reasons for a freemium model is to get the users to use the product and realize the value before asking them to pay. There is also the aspect of network effects. Getting more users on the platform is very important for its success.

Interviewer: So how does Facebook fit in this market? What can Facebook do differently?

Candidate: Talking about Facebook, I think the goal of Facebook is to bring the world close together and help build communities. A dating platform that enables building new connections fits right into its vision. The key strength of Facebook is its data. It can leverage this data to find an almost perfect match. However, dating experiences vary from culture to culture. Facebook has to keep in mind that dating expectations are completely different in India compared to western countries. So the data on users and their networks can be leveraged to build a product that people can trust. Dating platforms in the market struggle to keep the platform clean of bots and fake accounts. This is a huge problem, which is hard to solve

without taxing the actual users to give out personal information. However, the current platforms have the advantage of understanding the users' behavior. They also have brand equity. This would take quite some time to build. Facebook can have features like fraud detection and a better recommendation system to win over the customers' trust. So Facebook should focus on providing a platform for building lasting relationships as they have enough data about the users and their behavior.

Interviewer: Okay, this is good. Considering this to be what the application does, how would you go about launching it?

Candidate: Sure. I would like to divide the marketing activities into three buckets. Pre-launch, Launch, and Post-launch. I would like to go through this one by one.

Interviewer: Sounds great. Go on

Candidate: Okay.

Pre-launch - Facebook should ideally start by testing it in a few regions within India. Probably start with metro cities like Mumbai, Bangalore where the dating culture is more progressive. Facebook should create hype around the product. They could release teasers, small clips showing what the product could do.

Launch - They should launch the product by creating a virtual/ live event. All the competitors in the market are kind of established, so Facebook should seek to make an impression on its users.

Post-launch - Facebook should actively market the product and educate the users about how this platform is different from its competitors. They can use existing products like Facebook and Messenger to market this product.

Now, talking about distribution; Facebook can launch this as a separate application. Facebook has access to 300 million Indian users and they can use this user base to market the product to.

Interviewer: Now let's move on to the retention of these users.

Candidate: Sure. When it comes to dating platforms, retention is dependent on the value people derive in terms of connections made. Facebook should not focus on whether the said match goes on a date or meet up in real life as there are a lot of other factors beyond Facebook control. The primary focus should be on how happy a user is with the kind of people they meet on the platform. We can measure this by seeing how long they interact with each other on the platform and also if they add each other on Facebook as friends. We can also ask them for feedback a week after they start interacting with each other. We need to message the feedback in such a way that the users realize why the feedback is being taken.

Interviewer: How would you go about pricing this product?

Candidate: The product should be free for all users. New experiences can be added later which can be made paid. We can also tap into live experiences with virtual parties, events, etc. They can also create a pro version for the user which would unlock several features to find better matches or even find matches quicker.

Interviewer: This is good. Could you please summarize the whole plan?

Candidate: Sure. The goal for Facebook would be to stand out and differentiate itself from the competition. The focus should be on building long term relationships, be it friendship or dating. Moving on to marketing, Facebook should focus on creating hype towards the product. This will also set the right expectations for the users. They should back that up with a launch that involves its users. However, it would be a product that would determine success. Most platforms don't have enough data to find the perfect match for a person. Therefore, the value derived from the platform is not maximum. Also, these platforms struggle to identify bots or fake accounts on their platform. Facebook can differentiate itself by solving these very problems.

Premnandhakumar K

GO TO MARKET STRATEGY 2

Interviewer - The company "Grocers" wants to launch a product which does grocery delivery service. Give us a Go-to-market strategy for the company.

Candidate - What are the goals of the company? What are the company's strengths and weaknesses?

Interviewer - The company wants to capture market share in Tier-2 cities and towns in the country. The product has vernacular language support, which adds further strength to the company's goal of entering Tier-2 cities and towns.

Candidate - What does the product do and what is the value proposition for the customer? What are the strengths and weaknesses of the product?

Interviewer - The product delivers goods listed on the app/website to your doorstep, with a minimal delivery charge. With the stress on social distancing, the product gives the freedom of shopping from home.

Strengths: The product captures data and the same can be used to predict demand, improve product features, introduce new services, make the logistics cheaper. The product has features like scheduling of delivery, taking limited credit, vernacular language support.

Weaknesses: Security of customer data, Technical glitches in the product, Mismatch or errors by the human agents in the system like delivery agents.

Candidate - How do competitors position their products? What are their strengths and weaknesses?

Interviewer - Given the current changing scenario, we can divide the competitors based on the delivery channels as Online Delivery platforms and physical stores.

Within Online Platforms, we have Hyperlocal services (like Bigbasket, Grofers, Swiggy Genie etc) and E-Commerce platforms (like Amazon, Flipkart etc). The hyperlocal delivery services now have a quicker delivery time when compared to the E-commerce platforms. E-Commerce platforms are venturing into grocery delivery now lately. The advantage that the online platforms have are the aggregation of orders and that

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successively helps in planning the deliveries and procurement better. Also, tech products give abundant user data, from which insights can be mined and used.

Within the traditional physical stores, we have Organised and Unorganised retail. In organised retail, we have big players (like Reliance Fresh, Big Bazaar, D-Mart etc) and small players (like local supermarkets). Big players have the advantage of big basket size and enjoy economies of scale Under unorganized retail, we have the local kirana stores. The unorganized retail usually works with low volume and high margin sales.

Since our target market is Tier-2 cities and towns, we do not have Big Organized retailers and Hyperlocal delivery services to a large extent. The major competitors still would be physical stores only.

Candidate - Who are our customers? What do customers want to use the product for? How do they pay for the product?

Interviewer - With the pandemic situation, working professionals in metros have moved to WFH. They are either working from their homes in the same city or have moved to their homes in Tier-2 cities and towns. They now live with their parents, who are aged and have a higher risk due to the pandemic.

They would take sufficient precautions to ensure that the aged parents are safe and would be inclined to use all the means available to ensure that. The customers can use our product to do their usual grocery shopping in a safer manner.

We offer different payment options for the customers like Cards, Wallets, UPI and also take credit with a limit based on the customer profile. There is subscription-based payment for certain products such as milk, which can be delivered daily. Our revenue stream includes the delivery fee and the margins that we get on each order.

Candidate - What are the trends? What are the legal and regional issues?

Interviewer - The Online e-commerce industry is currently growing very fast due to the Covid'19 scare. Many new players are coming in, like Amazon, Flipkart who are getting into the grocery category to meet the increased demand amidst Covid'19.

Candidate - I want to segregate the marketing activities in 3 headers, pre-launch, launch, and post-launch. I'll cover different aspects like Product, Distribution, Promotion, Partnerships, Retention strategy, Pricing that are associated with the launch.

- Speaking about the features that the product must have, While moving to Tier-3 cities and towns, it is necessary to focus on regional features like vernacular languages, buying habits of consumers, traditional customs etc.
- Regarding distribution, the product can be available as an App on the Playstore, Website and Ordering via Phone. Ordering via phone is an important channel to consider because our goal is to capture tier-2 cities and towns.

- About Promotions, An outbound marketing strategy can be used to cover the audience in masses, again due to the nature of consumers in Tier-2 cities. While a significant number of people in these places would have ordered online, our outbound marketing strategy should be focused on making this a habit.
- Partnerships with wholesalers and suppliers. Partnerships with local farmers to buy fresh produce, at low prices.
- To keep users actively using the product, retention strategies like Promotions and discounts based on a Loyalty program.
- Our Pricing strategy can be offensive or defensive. The offensive could be price leadership, penetration pricing, price/performance pricing, or promotional discounts. Defensive could be value-based, maintaining the highest price, price skimming, or bait-and-switch pricing. We could go with an Offensive pricing with promotional discounts to capture market share from Local supermarkets and Kirana stores.

Interviewer - Can you summarize the launch strategy for the company and wrap it up?

Candidate - The company is aiming to capture a market share in the grocery space in Tier-2 cities and towns in India, through Online delivery service.

- To target the Tier-2 consumers effectively, the product has vernacular language support, Ordering via Calls, Outbound marketing strategy to educate and create awareness among the people.
- Partnerships with farmers and mandis would enable procuring fresh supplies in a lower cost.
- Loyalty programs to ensure customer retention, accumulated data would enable better logistics planning and hence cheaper delivery costs.
- The product pitches in the enable the convenience of shopping from home, amidst and post Covid'19 where physical distancing is very important. The competitors here are Local supermarkets and Kirana stores where the consumers have to interact physically. Whereas our product enables consumers to follow physical distancing.

Aditya Doiphode

GO TO MARKET STRATEGY 3

How would you launch a Multi-Cloud architecture service in India?

Marketing Goal

Ask clarification questions to understand what the main objective is-

- The objective is to raise awareness for the technology and how can the company help with the assembly and deployment of the solution.
- As you can assume, this is a B2B marketing case.

Analysis

Company – What are the goals of the company? What are the company's strengths and weaknesses?

- The company is an emerging player in the cloud service industry with partnerships with multiple cloud infrastructure providers. The focus is selling the clients on the idea of having public as well as private cloud for a seamless access to all the data.
- The company has been a pioneer in the tech world and is well renowned for its hardware products. They are looking for an expansion to other sectors as the competition in their primary industry is growing at a rapid space.
- The key partnerships from the primary business carries over to this business smoothly. There are synergies in both sides of the business.
- Because the company is not well known in the space, raising awareness of their capabilities and the variety of solutions is important.

Product- What exactly is the product? What are the key differentiating factors?

- The product is a service provided by the company where they will create a platform for the client which can host information on both public clouds like Microsoft Azure, AWS etc. and private cloud through data centres. The service would include both gaining access to public cloud as well as deployment of private data centres to host a private cloud.
- The differentiating factor is the number of different partnerships the company has with different component manufacturers, OEM's and ISV's. Hence the optimisation of parts and integration done by the partnership is much more efficient than doing this individually. This aspect needs to be highlighted.

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Competitors- Who are the major competitors? What are the substitutes to the products?

- A couple of other Global System integrators(GSI's) have a service in this domain but the company's offering is more detailed and it helps with the ground up build. In comparison to competitive services where you would have to avail multiple services to achieve the same end result.
- Talking about the substitutes, the company can opt to have either public cloud let's say from AWS or just go for private cloud where lets say Lenovo would build them the servers and the company goes to some ISV for the software and integrate it themselves.

Customers- Who are the customers? Which decision makers should be targeted for the campaigns?

- The clients are big companies with a lot of data which needs to be accessed easily. Conveying to them the advantages of having Multi-cloud infrastructure is key.
- Ideally the decision makers like CIO's should be targeted for a more focused campaign. But engaging with managers and technical architects is important. Raising awareness for the solution amongst the bottom of the pyramid is important.
- The revenue for the company is from both, deployment of the solution as well as the service provided for keeping the infrastructure up and running.

Market Landscape- In the post covid world, there is a need for on the go access to information and that is made possible by a Multi-cloud solution. There are issues with public cloud, they might shut down, at that point of time, it would be good to have a private cloud which hosts the information as well. This also works the other way around.

Marketing Activities

The activities are bifurcated on the basis of the objective being fulfilled by them, feel free to use these examples for any other case where you can identify application for them-

Lead Acquisition- Mass broadcast programs can be conducted to generate opt-ins as well as leads for targeted communication. The programs can include broad technology podcasts, newsletters, contests(eg. Hackathons) etc.

Raising Awareness- This needs to be more solution specific. Talking more about the application of the solution and its benefits. This can include Webinars, thought leadership programs, Product demos etc.

Targeted engagement- This is a more focused program. This will include demos for the product for a selected set of people. Engagement with people already interested in cloud infrastructure and training them in ways of engaging with the company.

Strengthening existing accounts- This is focused for decision makers in existing clients. Engaging with clients who already do business with the company is easier than gaining a new audience. The barriers to entry are lower and they already trust the company to give them a good service as they already do business with the company. Incentivising first hand usage of tools needs to be inculcated in some manner.

Messaging

Usefulness of Multi- Cloud in a post covid world- The pain point which needs to be described is how some companies felt handicapped when they had to move to work from home. Many companies didn't have the right infrastructure to facilitate work from home. That is where companies having a multi cloud architecture had no issues mobilising their workforce. In the future it would be great to have the option to host their workforce in a work from home setting.

Usefulness of Partnership- The different partnerships need to be highlighted. It would be great to use the partner's marketing reach and end user influence to drive the campaigns. Highlight the optimisation capabilities which come on working with the partner.

Wrapping up

Restate the Objective of Marketing

- The objective is to educate people on the usefulness of having a Multi-Cloud infrastructure.
- Raising awareness for the product and the various partnerships done by the company to deliver the best product.

Summarising activities

- The messaging for the marketing activities need to be as described in the previous section.
- When it comes to activities, the practices need to start with broad reach campaigns to gain newer leads.
- Utilise the new leads to understand trends and do targeted campaigns like Webinars, demos, thought leadership events etc.
- Engage with the scattered decision makers
- Have focused programs for CIO's to educate them on ways of improving the IT infrastructure of their companies. Collaborating with technology analysts or brands like CIO by IDG can help in getting legitimacy for the events.
- Create solution collaterals along with the partners. Having joint collaterals will help as the reach would be broader if contacts for all the partners are leveraged. Solution collaterals can include creating Whitepapers and Syndicate reports.

Following all these practices would surely help in differentiating the product for the competitors and make it more appealing compared to the substitutes. In all, awareness for Multi-Cloud solutions would be increased.

Mounica Rudra

GO TO MARKET STRATEGY 4

Interviewer: Lyft wants to enter Indian market, what should be its go to market strategy?

Candidate: Lyft has both ride sharing and Food delivery. Is there anything specific that I should be focusing on?

Interviewer: Let's focus on ride sharing.

Candidate: In ride sharing should we focus on only cars or should we also look at Autos and bikes?

Interviewer: We'll just keep it to cars for now.

For this lets first analyze the situation in the market.

Company

Lyft is a ride sharing app like OLA and Uber. It connects riders and drivers and allows an easier mode of transportation. Lyft has many verticals in other countries like Uber does in India (Autos, Shared, normal etc.,). We need to decide in which segments we are going to launch initially and the future plan.

Lets now explore the opportunity on the segments. one of the main things to keep in mind is the traffic in India, along with this we also need to keep in mind demand and supply for these segments. My suggestion in here is to take use of high number of cars existing already and give good benefits to drivers so they use lyft more than other competitors

Coming to our customers most of them might not know about the brand itself and most of them might be regular customers to other competitors we have. We need to give them a compelling reason to try out our app, can be discounts, more safety etc.

As we know we have 2 major competitors currently and many upcoming ones. Uber expanded into this market with a lot of competition and was successful, if we have a compelling differentiating factor we can also be successful as customers look for best options for them. We can probably tie up with local car dealers to create localisation feelings among customers which would probably encourage drivers to join us. We should also invest heavily into

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marketing initially and probably be a loss making firm like Amazon initially to get customers to try our product. In addition to this our pricing strategy is unique and will help us in remaining competitive.

Market Conditions

If we divide India into rural, suburban and Metropolitan we need to decide on where to launch first and what would make sense to achieve our goal. Because major customers are there in Metropolitans that would be the first place to launch according to me.

Regulatory Issues

Along with these we also need to consider regulatory issues and rules that the country has so that we won't get into trouble later which might spoil the brand reputation.

Now that we have analysed different components we should go to the launching strategies. Let's divide the activities into 3 stages: Pre launch, Launch itself and Post launch.

Pre-launch

- Marketing Activities
  - Billboard ads, news paper ads, pamphlets, experience videos from other countries etc.
- Enough supply according to the demand in the area
  - Offer monetary benefits to drivers better than competitors
  - Referral programmes
  - Tie ups with local dealers
- Training and adhering to rules
  - Compulsory training for drivers to improve customer experience as they are the face of our brand

Launch

- Promotions and discounts for riders, customers
- Advertisements in local news papers, pamphlets Tie ups with corporates
- Blogs with influencers/celebrities to create positive images etc., can be done.

Post Launch

This is where we measure the metrics. I think these are the metrics which we make more sense in this case.

For Acquisition

- #customers in time frames like 1 month, 3 months and 6 months
- #drivers in time frames like 1 month, 3 months and 6 months
- #app downloads in time frames like 1 month, 3 months and 6 months

For Revenue

- Expenditure/ride - 3 months Vs 6 months
- Revenue/ride - 3 months Vs 6 months

For Customer Experience

- # of repeat customers in a week
- Wait time (average) in a day
- #cancellations in a day
- Ratings given by customers on average

In addition to all this we should proactively reach out to customers with complaints to resolve them soon for better experience and also reach out to people for feedback for continuous improvement.

Mahendra B

PRICING 1

Interviewer: JioSaavn is a music streaming service that wants to launch a family music plan for its users. How would you go about it?

Interviewee: Sure, from what I understand JioSaavn wants to launch a new subscription plan aimed at families. So I have to come up with a pricing strategy for this plan?

Interviewer: Yes, go ahead.

Interviewee: Okay, and I assume the goal of the pricing strategy is to attract more users. Especially, the users who are not earning or those who are taken care of by others in the family.

Interviewer: Fair enough. How would you go about pricing such a plan?

Interviewee: From what I know music streaming is a very competitive market in India and I would like to concentrate on competitor based pricing. However various players target different customer segments. To identify the most appropriate competitors to benchmark against, I would look at the customer segment that we would be targeting this plan and identify the competitors targeting the same customer base. I assume JioSaavn's main user base is those listening to regional songs and this plan would be targeted towards the same user segment. (One can use a matrix to better represent the market)

Interviewer: Sure, go ahead.

Interviewee: I think Gaana and Wynk are the appropriate competitors. I would look at their pricing strategies as well as the offerings they provide to their customers.

Interviewer: Here is the pricing chart.

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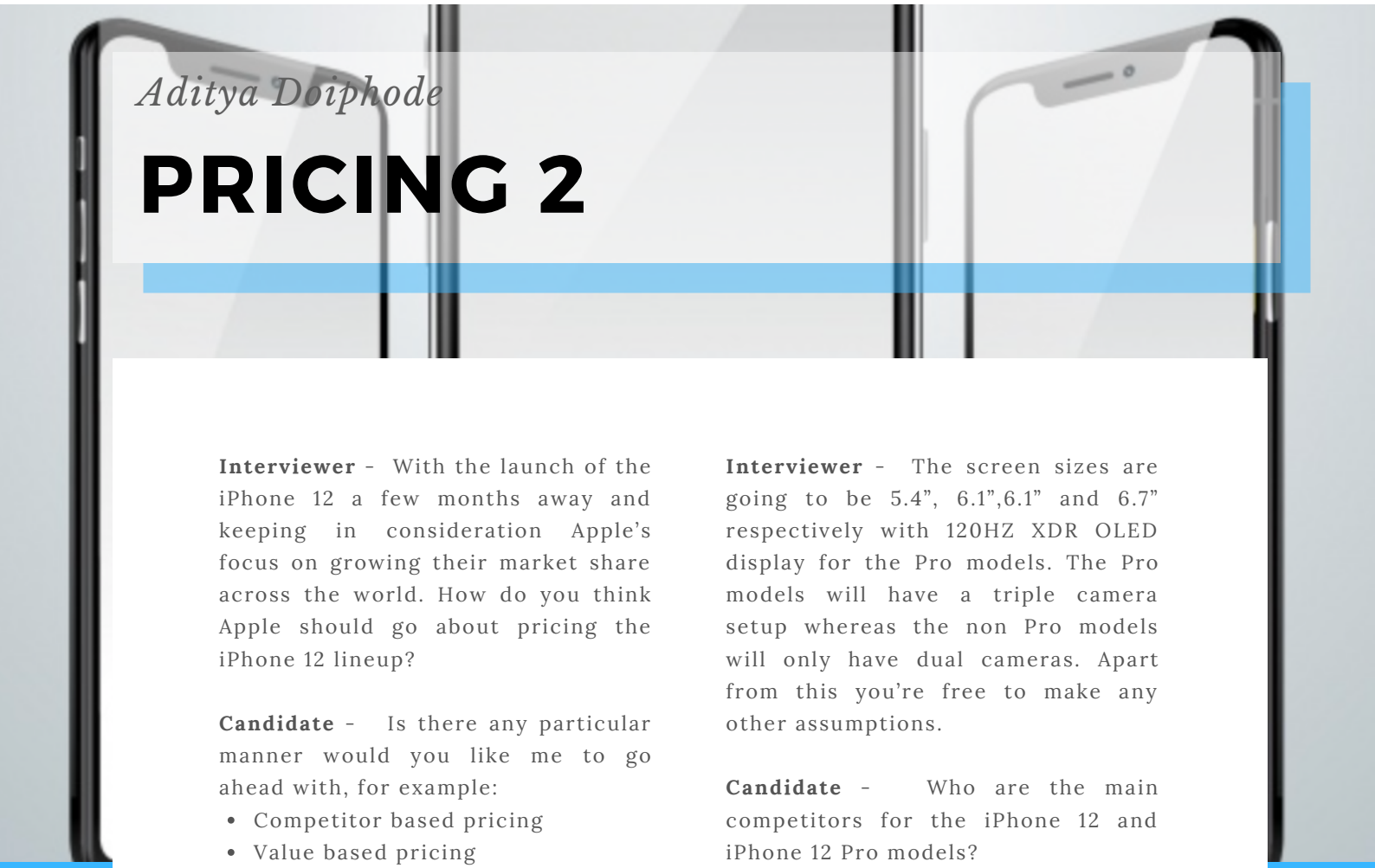
Streaming Service	JioSaavn	Gaana	Wynk
Pricing	Rs 99 for 1 month; Rs 999 for 1 year	Rs 99 for 1 month; Rs 999 for 1 year	Rs 99 for 1 month
Free features	Listen to tracks with ads, Lyrics	Listen to tracks with ads, Lyrics	Listen to tracks with ads
Paid features	Unlimited downloads for offline listening; 320kbps audio; No ads;	Unlimited ad-free tracks, Download songs offline, HD Audio;	Unlimited ad-free tracks, Download songs offline
Family plan	-	499 (upto 5 people)	-

Interviewee: Looking at the chart, I see that there is very little differentiation wrt to the offering from each streaming service. I think the appropriate pricing would be Rs 499 for 5 users or Rs 399 for 4 users. We can probably run experiments to see which of these offers would be more attractive to the users. There is another data point I would look at to ensure that we are not missing out on any opportunities. I would look at the number of subscribers to each of these streaming services. Especially the number of paid users. If we are significantly lagging behind the competitors, I would consider pricing it more aggressively. If not, I would stick to the competitors' pricing range. The market is very competitive, and being aggressive about pricing might lead to a price war.

To summarize, I would price it the same as the competition but maybe run a few experiments to find the right value proposition. I would also take into consideration the market and JioSaavns position in the market. I would make sure the pricing strategy is aligned with the overall strategy of the company.

Interviewer: Great! This sounds good.



Aditya Doiphode

PRICING 2

Interviewer - With the launch of the iPhone 12 a few months away and keeping in consideration Apple's focus on growing their market share across the world. How do you think Apple should go about pricing the iPhone 12 lineup?

Candidate - Is there any particular manner would you like me to go ahead with, for example:

- Competitor based pricing
- Value based pricing
- Cost based pricing

Interviewer - You are free to go ahead anyway you would like.

Candidate - Sure, in that case I would prefer going with the Competitor based pricing. It would be great if you could further explain the product portfolio for the iPhone 12 lineup?

Interviewer - Sure, there are going to be four models, namely- iPhone 12, iPhone 12 Max, iPhone 12 Pro and iPhone 12 Pro Max.

Candidate - Can you tell me the key differentiators between the models?

Interviewer - The screen sizes are going to be 5.4", 6.1",6.1" and 6.7" respectively with 120HZ XDR OLED display for the Pro models. The Pro models will have a triple camera setup whereas the non Pro models will only have dual cameras. Apart from this you're free to make any other assumptions.

Candidate - Who are the main competitors for the iPhone 12 and iPhone 12 Pro models?

Interviewer - You can consider the OnePlus 8/Huawei P30 Pro and Samsung S20+ to be the competitors respectively.

Candidate - How much do those retail for?

Interviewer - OnePlus 8 retails for $699, Huawei P30 Pro retails for $599 and Samsung S20+ retails for $899.

Candidate - Do I need to consider different storage variants or just a single base storage variant for all the models?

Interviewer - Just consider the base models with 128GB storage.

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Candidate - Thanks for the background information, there are three different ways we can look at pricing

- Customer's willingness to pay
- Competitive pricing
- Cost-based pricing

First I'll start looking at the product from the customer's perspective. The customer will look for the best alternative to our product or find a substitute product. Negotiators call it BATNA or the best alternative to a negotiated agreement. Here I would call it the customer's willingness to pay.

In the case of the iPhone 12, the next best alternatives are prices at $599 and $699. This gap of $100 is something Apple can think about playing around in. The perception for an OnePlus device is that it's a good product but the cost doesn't justify the high premium they are asking for their brand. When it comes to Huawei P30 Pro the brand image is not that of a premium smartphone but that of a Chinese manufacturer. If Apple prices the iPhone at a cost lower than that of the Huawei P30 Pro then that would give out the perception that the iPhone 12 is just a cheaper version of the superior Pro models. That would be detrimental to the iPhone 12 as a standalone phone. Hence it is logical to cost the iPhone 12 more than $599.Apple also need to consider the screen size of the iPhone 12. At 5.4" the iPhone 12 would be significantly smaller than the OnePlus 8. In mass consumer markets like India, the perception is that bigger the smartphone screen the more premium and desirable it is. Hence pricing the iPhone 12 at a cost higher than OnePlus 8 would hit the sales severely in such markets. Hence it is suggested that the iPhone 12 be priced between $599 and $699.

As for the iPhone 12 Pro model, its competitor the Samsung S20+ retails for $899. We also need to consider the bigger iPhone 12 Pro Max model. It would be better to have a Pro model iPhone which costs higher than Samsung's flagship model. There is always the bigger iPhone 12 Pro Max model to be the best that Apple offers which can command a premium over other competitors flagship. Pricing Apple's flagship iPhone 12 Pro Max higher that all the other competitors will help in two ways-

- Help maintain Apple's brand image of being the most premium smartphone and its always a statement to carry an iPhone.
- It would help skimming from the top and tap into the super-premium/luxury smartphone market.

Interviewer - So what are your recommendations?

Candidate - For the iPhone 12 model, I would suggest to cost it at $649. This would help undercut the mass popular OnePlus 8 while preserving the iPhone's brand name by not becoming a cheap phone or being compared to the Huawei P30 Pro. This can help in selling more quantity of iPhones and the revenue would be driven by the surge in demand for the apple accessories, app store licensing fees and also from other services like apple music and iCloud storage that iPhone provides.

The larger of the non Pro models, the iPhone 12 Max can be priced at $749 as a better alternative to the iPhone 12 and would also seem superior to the $699 priced OnePlus 8.

Coming to the Pro series of phones, here I would suggest that the iPhone needs to preserve its premium brand image. Even if Samsung comes up with a more expensive series of phones before the next cycle of Apple iPhones, the cost of iPhone 12 Pro should be at least on par with the flagship phones from other manufacturers. Hence I would suggest to price the iPhone 12 Pro model $100 over the price of the competitor. There is always a cheaper non Pro series for a customer with a smaller budget. The iPhone 12 Pro Max, being the flagship product offered by Apple, commands a premium for the larger screen over the standard pro model. Hence I would suggest to price it at $1099.

Interviewer - Can you summarize the pricing for me?

Candidate - The iPhone 12 should be priced at $649, the iPhone 12 Max should be priced at $749. The Pro models would charge a significant premium, partly because of the technology used in them and partly because of it being the flagship offering by Apple. Hence, the iPhone 12 Pro should be priced at $999 and the iPhone 12 Pro Max should be priced at $1099.

Akash Shukla

PRICING 3

Interviewer: Recently, Disney has partnered with Hotstar to provide its Disney+ streaming services in India. This poses a major threat to the user base of Netflix. As a product manager at Netflix, you need to formulate a competitive response in terms of the pricing and product strategy of Netflix in India.

Interviewee: So, I understand that the objective here is to preserve and grow the user base (market share) of Netflix in India. Is that right?

Interviewer: Yes, that sounds fair. Go ahead.

Interviewee: Alright, we can look at the pricing policy of Netflix through three lenses –

- Competitor based pricing
- Value based pricing
- Cost based pricing

I would look at Hotstar and Primevideo as the only two major competitors of Netflix. Can you tell me more about the current pricing policy of these platforms?

Interviewer: Following are the pricing models of the three players.

Hotstar			
Plan	**Monthly price**	**Annual subscription price**	**Benefits**
VIP	Not Available	399	Disney+ movies, sports, hotstar specials
Premium	299	1499	All of above + American shows + Disney originals

Prime Video			
Plan	**Monthly price**	**Annual subscription price**	**Benefits**
Amazon Prime	129	999	Free early amazon delivery, video, music subscription

Netflix			
Plan	**Monthly price**	**Annual subscription price**	**Benefits**
1 screen	500	Not available	-
2 screens	650	Not available	HD streaming
4 screens	800	Not available	UHD streaming

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Interviewee: It seems that from a competitive angle, a Netflix subscription becomes economical only when shared among 4 different users. Further, Netflix doesn't provide annual subscriptions. This can increase churn rates due to higher monthly costs for the users. Further, Netflix shows a clear instance of decoy pricing wherein its cheapest pricing subscription of 500 is a decoy to stimulate users to opt for the marginally higher priced options which in turn cost users less on an individual basis.

Looking at the pricing strategy of competition, I would suggest Netflix to decrease its lowest price to a competitive level close to 300. This goes in line with increasing the user base within the highly price conscious customers in India. It would be economical for viewers to buy a single screen plan while eliminating the market friction involved in finding a co-subscriber for the "2 screens" version to reduce cost.

Moreover, it would not negatively impact the top-line, as the change in product mix is likely to be compensated by the higher number of users buying the low-price subscription.

Further, I also recommend a second-degree price discrimination by providing annual subscriptions. This would attract the users with a lower price point perceived on a monthly basis and would also help reduce user churn that happens on a monthly basis due to higher monthly subscription charges.Interviewer: Alright, that sounds fair. What else you would be looking at?

Interviewer: Alright, that sounds fair. What else you would be looking at?

Interviewee: We also need to analyze the value proposition of the three platforms and how they stimulate trial and stimulate renewal. Hence, to do so, I would be looking at the following parameters across the platforms.

	Hotstar	Primevideo	Netflix
Trial simulation policy	Provides some tv, sports and news content for free + 30-day free trial	30-day free trial	30-day free trial
User segments	- TV series and movie watchers - News watchers - Sports watchers	- TV series and movie watchers	- TV series and movie watchers
Competitive Advantage	Exclusive content from Disney and Marvel. Strives to get the most popular content such as Game of Thrones on the platform.	Primevideo is offered along with other Amazon prime incentives. The price of the complete bundle is the lowest. Partners with Bollywood producers to get the movies on the platform at the earliest.	Has the highest amount of Foreign video content. Unlike its competitors, it emphasizes the most on high quality originally produced exclusive content.
Emphasis on regional content	All Disney content dubbed in major regional languages; High amount of regional content available	High amount of regional content available, Major emphasis on Bollywood	Relatively low regional content available. Majority of content not dubbed in regional languages

The value that Netflix provides lies in its originally produced content such as House of Cards, etc. However, this competitive advantage is weathering off due to popular Disney and MCU content coming up on Hotstar. This entails that from a value perspective, it's difficult for Netflix to justify a price premium based just on its exclusive content.

Netflix should look at increasing its trial. An offensive strategy for the same can be to provide some content for free coupled with its existing 30-day free trial policy, something that Hotstar has been doing since its inception. To increase conversion of these prospects to paid-users, Netflix can adopt a strategy of providing the pilot episodes of some of its most popular web series for free. This would psychologically increase the tendency of users to buy a subscription.

I would also recommend Netflix to inculcate third-degree price discrimination by providing separate content options to users at different price points. In case of Netflix, these product options can be

- Non-original content – American TV shows, movies, etc.
- Netflix originals content + Non-original content.

Decoy pricing should be used in these product options to stimulate users to buy the complete bundle of Netflix originals and non-original content.

Further, Netflix should lay emphasis on dubbing at least the most popular content to regional languages to enhance its reach to people from across the country.

Further, moving on to cost based pricing, it doesn't make sense to analyze it from a cost perspective as the variable cost involved in serving every additional subscriber is close to null. This industry comprises primarily of high fixed costs of obtaining content licenses, content production, IT infrastructure costs, etc. and hence shouldn't be looked at through a cost-plus pricing angle.

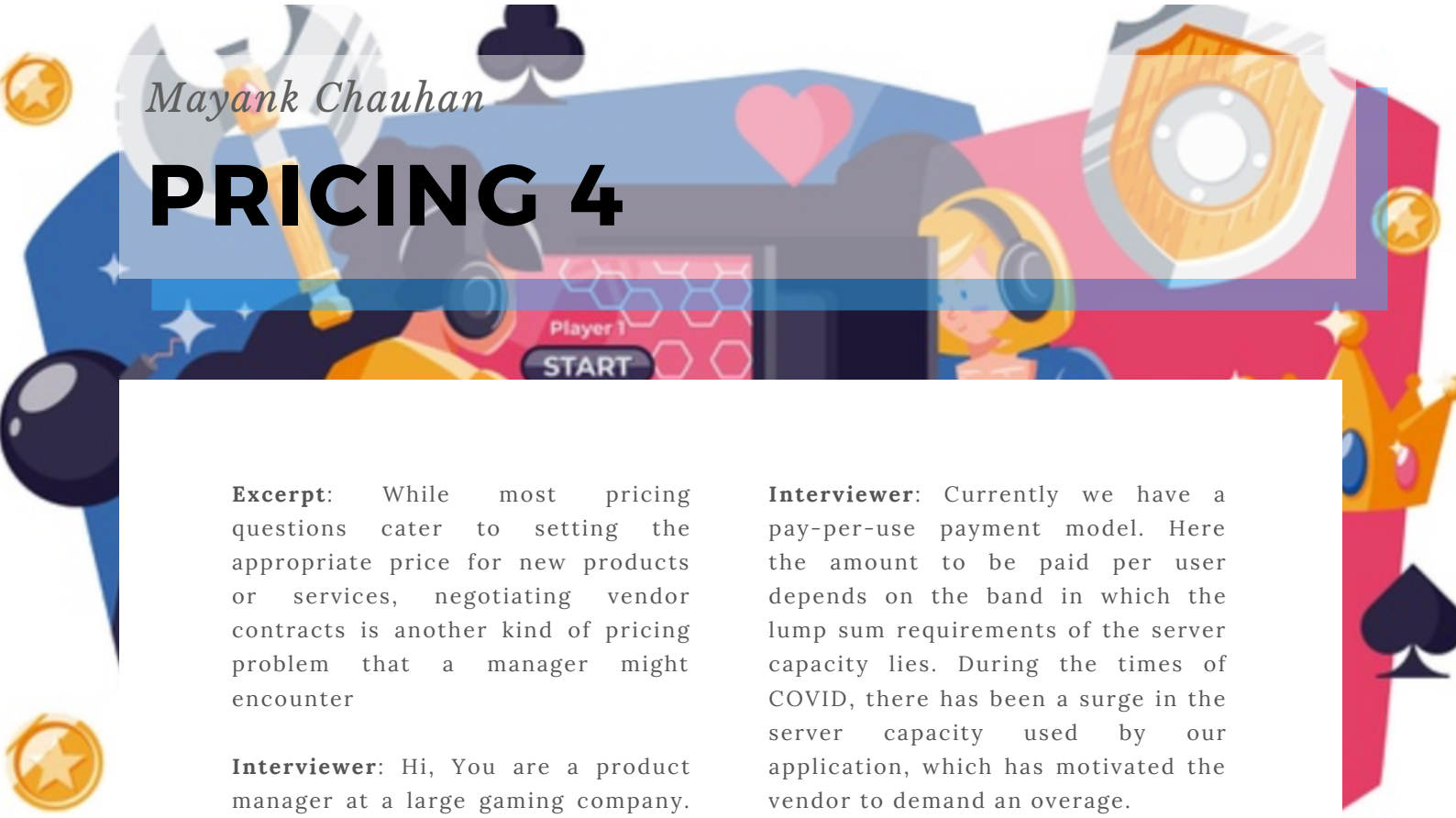
Interviewer: Sure, that looks good. So, can you summarize your recommendations for the pricing and product strategy.

Interviewee: Alright! So, we saw that from a competitive viewpoint, Netflix is priced much higher than its competitors. Further, due to its decoy pricing, its lowest price point of 500 comes at a much higher level than its competitors. Hence, I recommend reducing this lower price point to a competitive level of 325 and shift the decoy pricing towards the 2 product-based options of non-original content and non-original + Netflix original content.

Further, should also implement annual subscriptions to provide for lower price monthly price points for this price-conscious market and at the same time reducing the subscription churn rate.

It can also look at increasing the trial by providing select content for free and adoption a partially freemium model. Also, given the heterogenous market, Netflix should focus on regional content to provide value to the customers and justify its premium pricing.

Interviewer: Alright, sounds good. We can close the case here.



Mayank Chauhan

PRICING 4

Excerpt: While most pricing questions cater to setting the appropriate price for new products or services, negotiating vendor contracts is another kind of pricing problem that a manager might encounter

Interviewer: Hi, You are a product manager at a large gaming company. It has only one application in the market - a multiplayer first-person shooter game. The server for this game is hosted with a third-party vendor who is dissatisfied with the pricing contract that is currently in place and is asking for the payment of overage charges. How would you proceed?

Candidate: That's an interesting question. To begin with I would like to clarify some aspects of the problem.

Interviewer: Go ahead

Candidate: I would like to understand what kind of pricing structure is currently in place, and what is the reason for which the vendor is asking for the renegotiation?

Interviewer: Currently we have a pay-per-use payment model. Here the amount to be paid per user depends on the band in which the lump sum requirements of the server capacity lies. During the times of COVID, there has been a surge in the server capacity used by our application, which has motivated the vendor to demand an overage.

Candidate: Alright. So this surge in usage could be both due to an increase in the usage per active user, or a spike in the number of active users itself. Which one has been the case with us?

Interviewer: Good question. So we have had a spike in the number of users and in addition, the average time for which a user engages with the application has increased too.

Candidate: Also, to understand the business requirements better, I would like to know more about the business model in place. Typically such applications would either generate revenue based on adverts or based on registration fees, or a mix of the two. If the model is ad-based, we would be in a marginally better position, because the increase in engagement time would translate to

higher ad revenue per user. In the case of registration fees, the existing fee would have been decided considering the break-even point with the ongoing server costs - hence the loss of profits would be higher.

Interviewer: Fair analysis. Assume for simplicity that there are no advert based revenues, we are simply using a registration fee-based model.

Candidate: Great so we can approach the issue in the following way. There are two counter forces to shape the response to the situation - Server costing and Product pricing.

Servers can either be our own or from a third-party. The third-party server additionally can be existing or new. The existing one can have the ongoing costing model, or it can be renegotiated.

Since the ongoing costing model is clearly loss-making, we would exclude that from our analysis.

On the pricing end. We can either continue with the current pricing strategy or shift to a new one. The new strategy can, in turn, be registration-based or usage-based.
Is there something else I should consider?

Interviewer: No this looks perfect. What parameters would you evaluate these options on?

Candidate: We could evaluate the options on the revenues (a proxy of pricing success), cost (a proxy of costing success), and risk (a sanity check on whether the option makes sense for the business).

Interviewer: Great. Now you can present your analysis and recommendations

Candidate:
H=High, M=Medium, L=Low

S.No.	Alternative	Rev	Cost	Risk	Evaluation
1	Own Server	L	H	H	Although this option will reduce the reliance on third parties in the future, it has potential risks of downtime during migration. It would involve a fairly high cost and effort. Further, the customers might become inactive once the COVID situation improves, leading to unused capacity. Since the process is long, the revenue realization might be lower than the potential.

2	Third-party server - new	M	L	M	While the costs are low, there would be a risk due to migration, albeit lesser than that posed on migration to own server because the timeframe would be lower and expert assistance would be available from the new vendor. The cost for the transition would be lower than that of option 1 and revenue realization would be higher due to a shorter and smoother transition.
3	Third-party server - existing, renegotiation	H	L	M	The risks related to migration would be the least, however, due to the dependency on one firm, there might be a loss of bargaining power - hence an overall moderate risk. The revenue realization would be maximum given no transition losses. The cost will be less because no capital or fixed payments would have to be done.
4	Current pricing	L	L	M	Maintaining the current pricing would lead to no effect on cost as such, medium risk because the business might suffer losses as a whole and low revenue generation because the usage spike won't be monetized in the best way.
5	Increment registration fees	M	L	M	If the registration fees are incremented, it would lead to an increase in revenue, however, the increase might not be sufficient to recoup all the costs, hence moderate. The cost might not be affected again. In terms of risk, it is moderate because, on one hand, some customers might leave because of increased costs, while on the other, there is still a risk due to only partial recoupment of costs.
6	Usage-based pricing	H	H	H	Usage-based pricing would lead to total monetization of the additional costs from the new users, hence the revenues would be high. The costs would be high as well because having metering of usage would require changes in the application. The risk would be high as well because old customers - who would ideally be using the application more - might exit due to higher costs.

Based on this I would like to recommend options 3 and 5, due to low risks and high returns.

Interviewer: That'd be all, thanks!

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MEET THE TEAM!

MEET THE TEAM

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ABOUT THE BOOK

This is a book for the aspiring Product Manager, new age tech product enthusiast and truly anyone interested in understanding what makes the technology around us so engaging and effective.

Rather than repeat and reuse the wealth of jargon and frameworks that the internet buries one in, this book focuses on 2 simple and powerful ideas. First, it brings the average reader up to speed on today's most relevant technologies, including artificial intelligence and machine learning, and methods of problem solving, such as design thinking. Secondly, it cuts straight to learning by doing, critiquing apps that every reader has used, ranging across Uber, Amazon and Zomato.

Depending on the reader's level of knowledge and understanding of Product Management, they may find tremendous value in each chapter of this book, or crisp insights by leafing through specific sections.

Why is this book needed?
In today's age of information, it is easy enough for aspiring Product Managers to find resources which layout the basics of the PM interview, as well as information on what to expect from the industry. As Product Management continues to grow as a career of choice, and become increasingly competitive, a need was felt for a resource which builds not just a theoretical understanding, but a practical experience and intelligence.

This book therefore was born out of industry relevant discussions and sessions conducted by the ProdMan Club of IIM Ahmedabad & the ProdX Club of IIM Ahmedabad. In each chapter, the learnings and perspectives of the youngest generation of students entering the industry are used to provide the reader with the advantage of cutting edge industry knowledge. These chapters are further refined with insights, springing from a healthy discussion and dissection of concepts, by a group of budding Product Managers. Finally, ideas are presented through simple user journeys and relatable app critiques.

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