Mobile Computing

COMP5216/ COMP4216

Week 02

Semester 2, 2022

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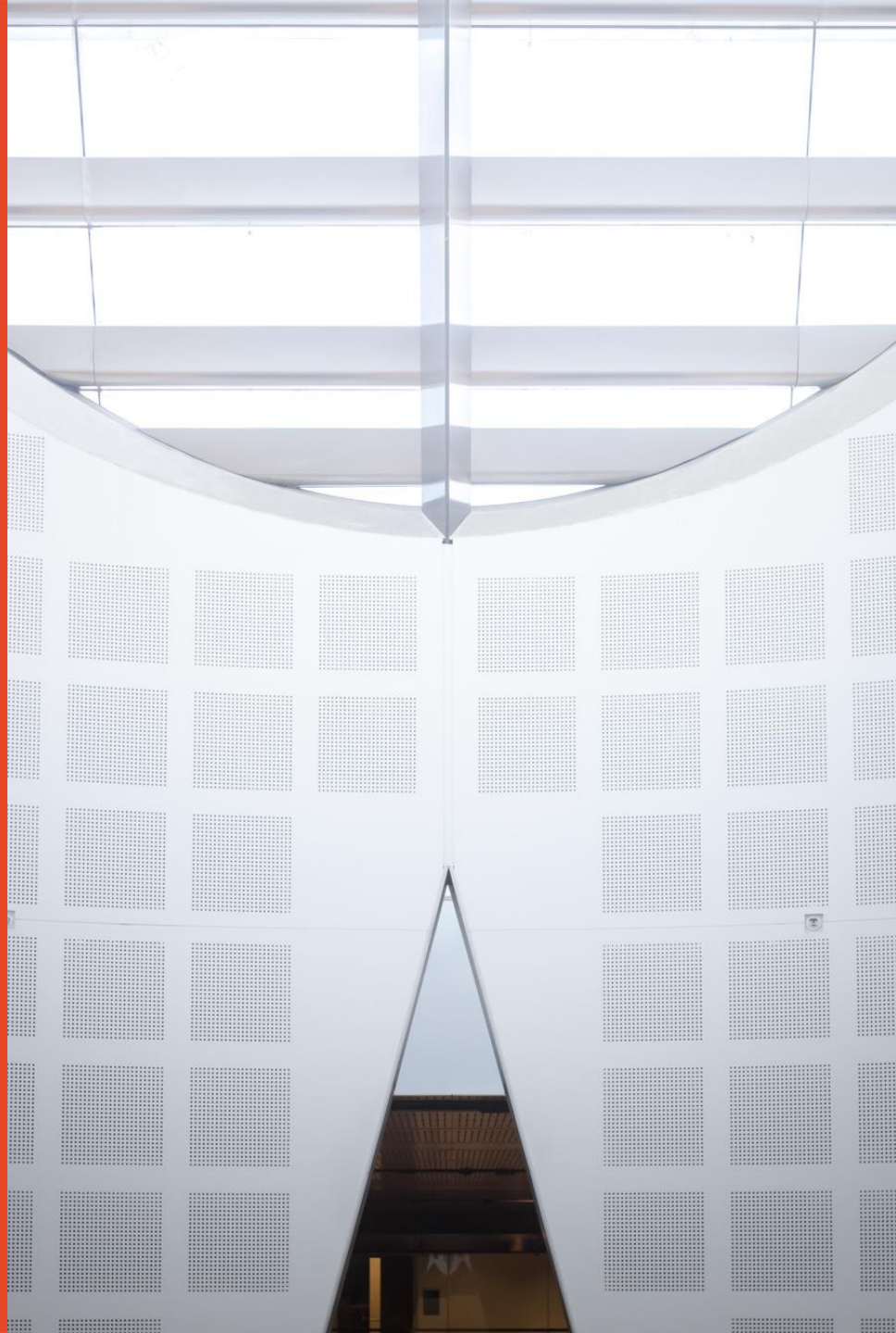
School of Computer Science

THE UNIVERSITY OF SYDNEY



Outline

- Mobile Ecosystem
- App development workflow
- How to come up with app ideas through problems ?
- Group Project

Mobile Ecosystem

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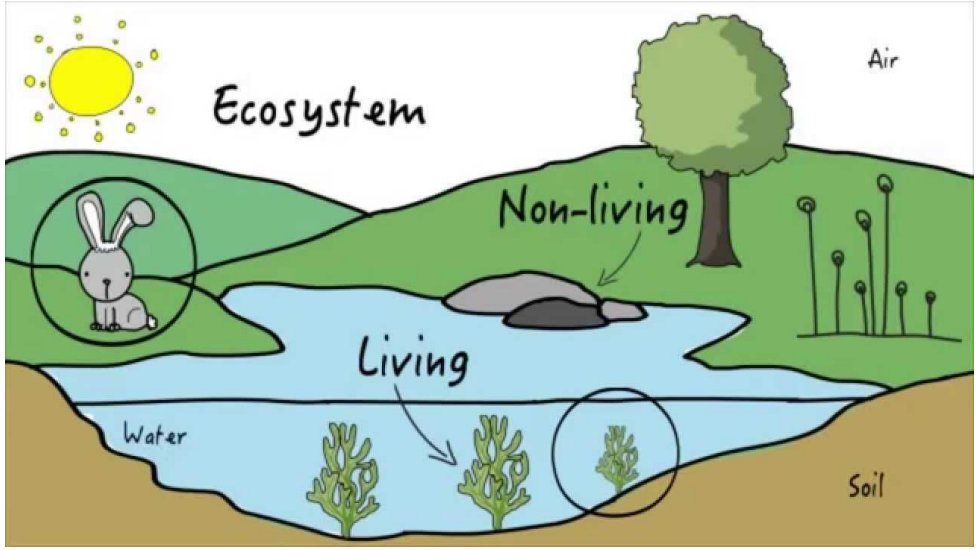
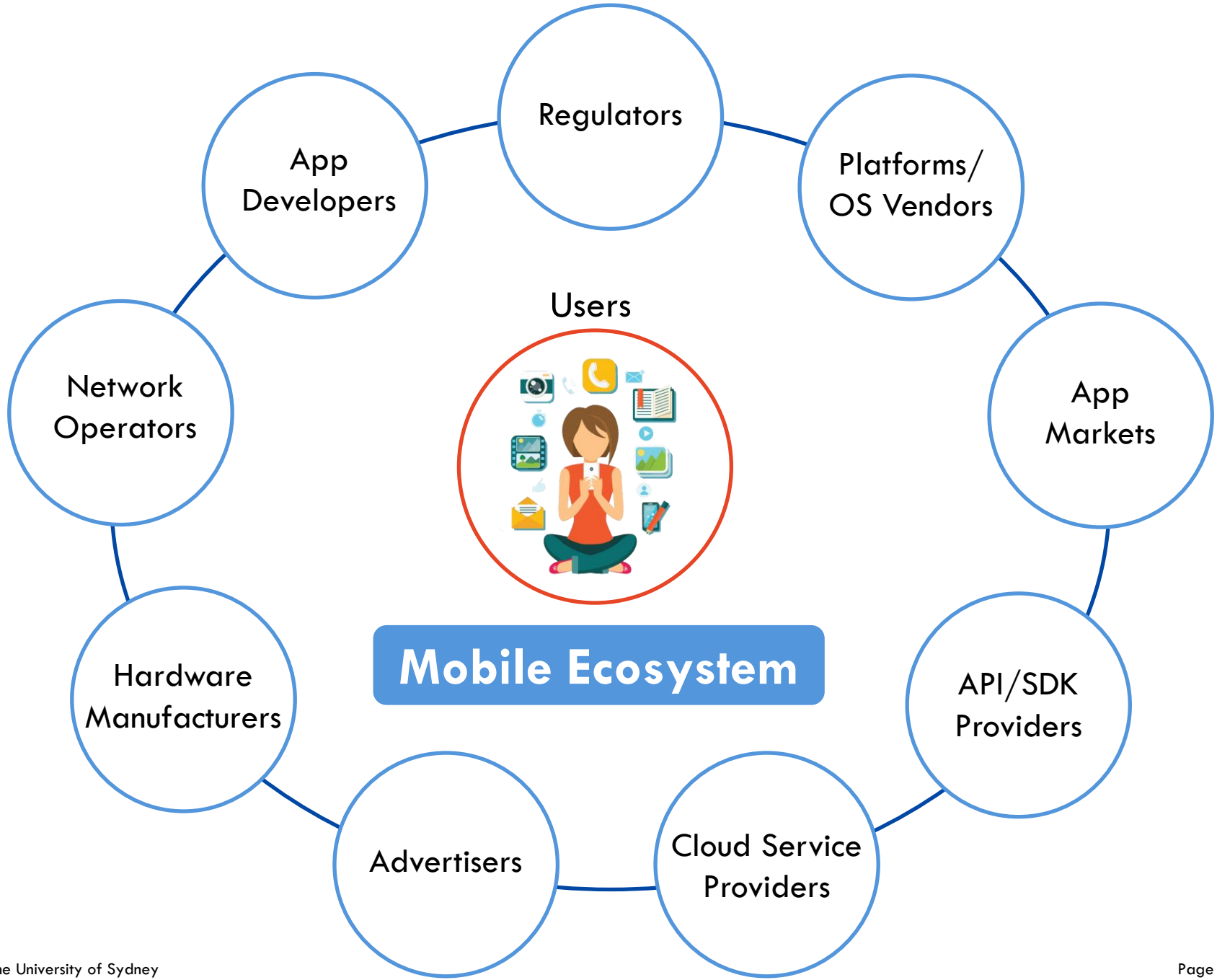
Mobile Ecosystem

- Number stakeholders interact as a system to provide or consume hardware and software related to smartphones, each having different benefits (financial or non-financial).

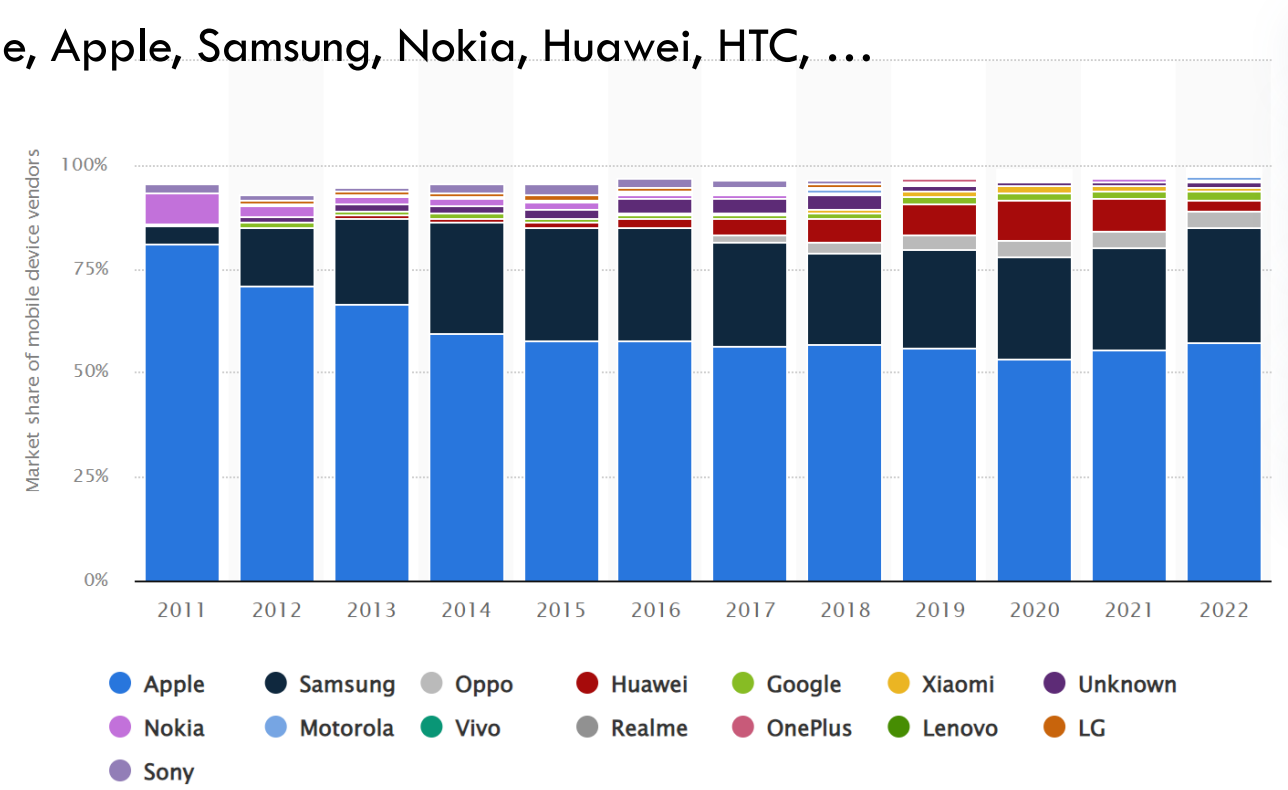
- Example stakeholders,
  - Manufacturers
  - Distributors
  - Infrastructure providers
  - Advertisers
  - Users




Regulators
App Developers
Platforms/ OS Vendors
Users
Network Operators
App Markets
Mobile Ecosystem
Hardware Manufacturers
API/SDK Providers
Advertisers
Cloud Service Providers

Hardware Manufacturers

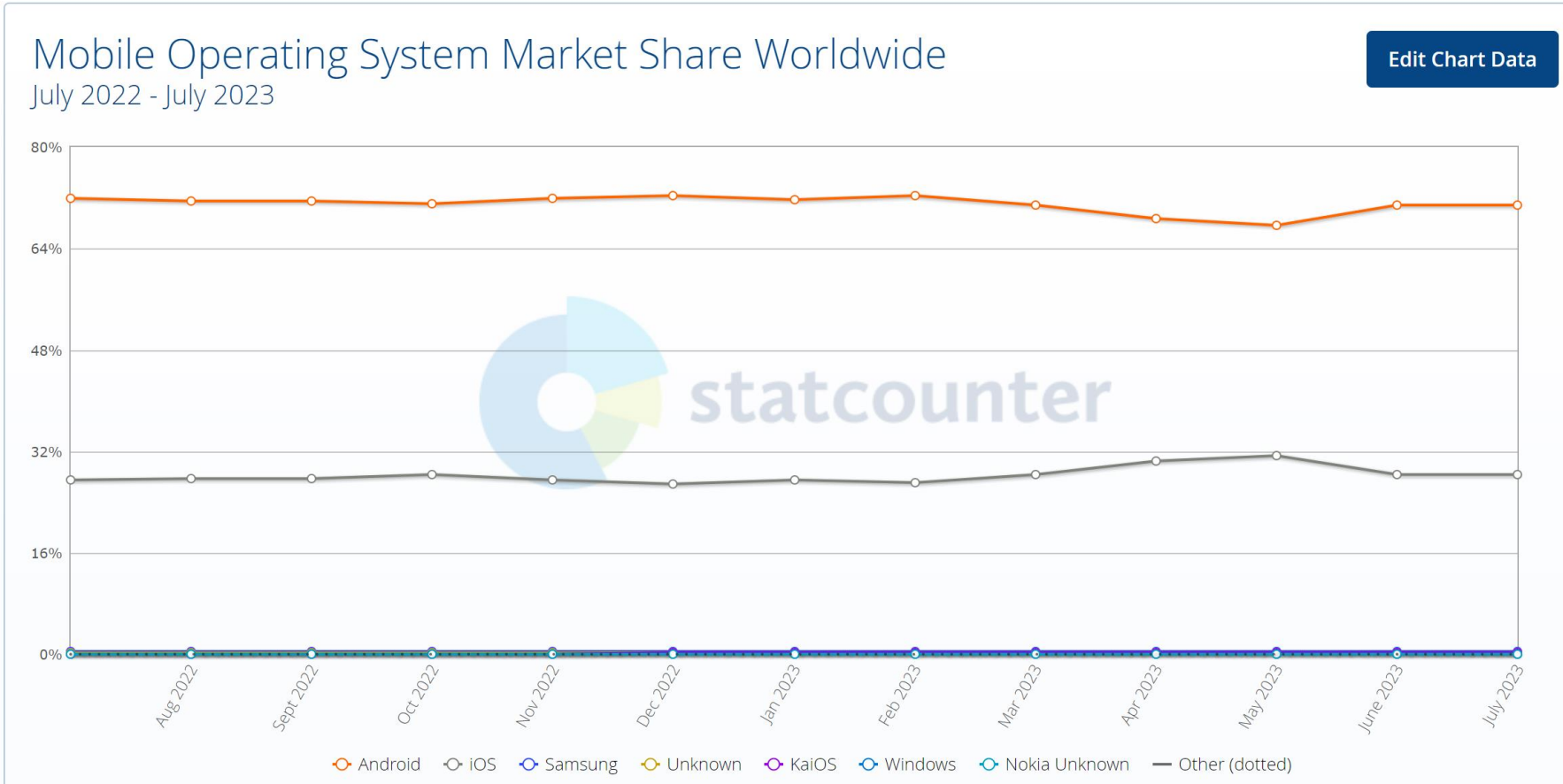
- Hardware:
  - Google, Apple, Samsung, Nokia, Huawei, HTC, …



  - Market share of mobile device vendors in Australia- https://www.statista.com

Android	iOS	Samsung	KaiOS	Unknown	Windows
70.9%	28.36%	0.38%	0.15%	0.15%	0.02%

Mobile Operating System Market Share Worldwide - July 2023



Platforms/OS Vendors

	OS	Maintained By	OS Details	Hardware Vendors	Development Tools
android	Android	Google	Unix-like	Samsung HTC Motorola	Android Studio Eclipse Java
iOS	iOS	Apple	Unix-like	Apple	Xcode Swift (Used to be Object C)
Windows Phone	Windows	Microsoft	Windows	Microsoft HTC (Nokia)	Visual Studio C#
BlackBerry	Blackberry	RIM	Unix-like	RIM	Momentics IDE C/C++

Many other small players

fire os 阿里云OS TIZEN ubuntu Firefox OS

Smartphone platforms

	OS	Maintained By	OS Details	Hardware Vendors	Development Tools
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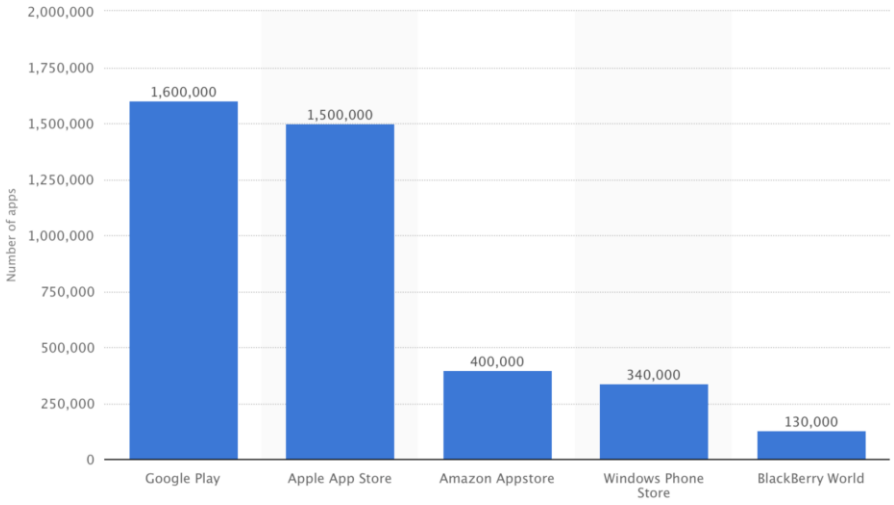
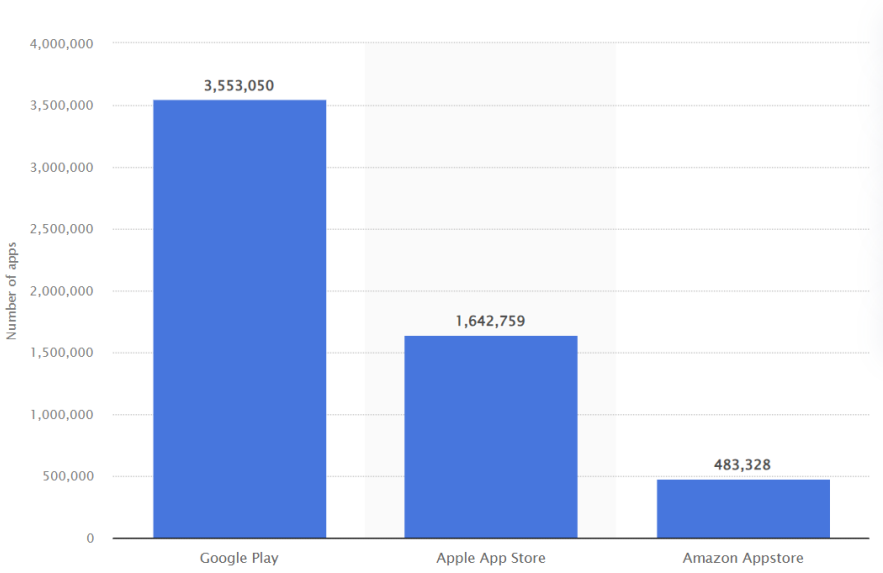
App Markets





https://www.statista.com

Smartphone apps

- **Free:** Users can download and use these apps without any direct cost. However, most of the time these apps contain in-app advertisements.

- **Paid:** In the case of paid apps, users are required to make a payment before the app can be downloaded. Subscription based apps involve a recurring payment to get continuous access to the services offered.

- **Freemium:** These apps are offered for free as well. However, a user only has access to a limited set of features or levels of the app, and the rest is locked.

Third Party API/SDKs Providers

- Advertising (Provides In-App advertisements)

- Analytics (Collect data from users for analytics)

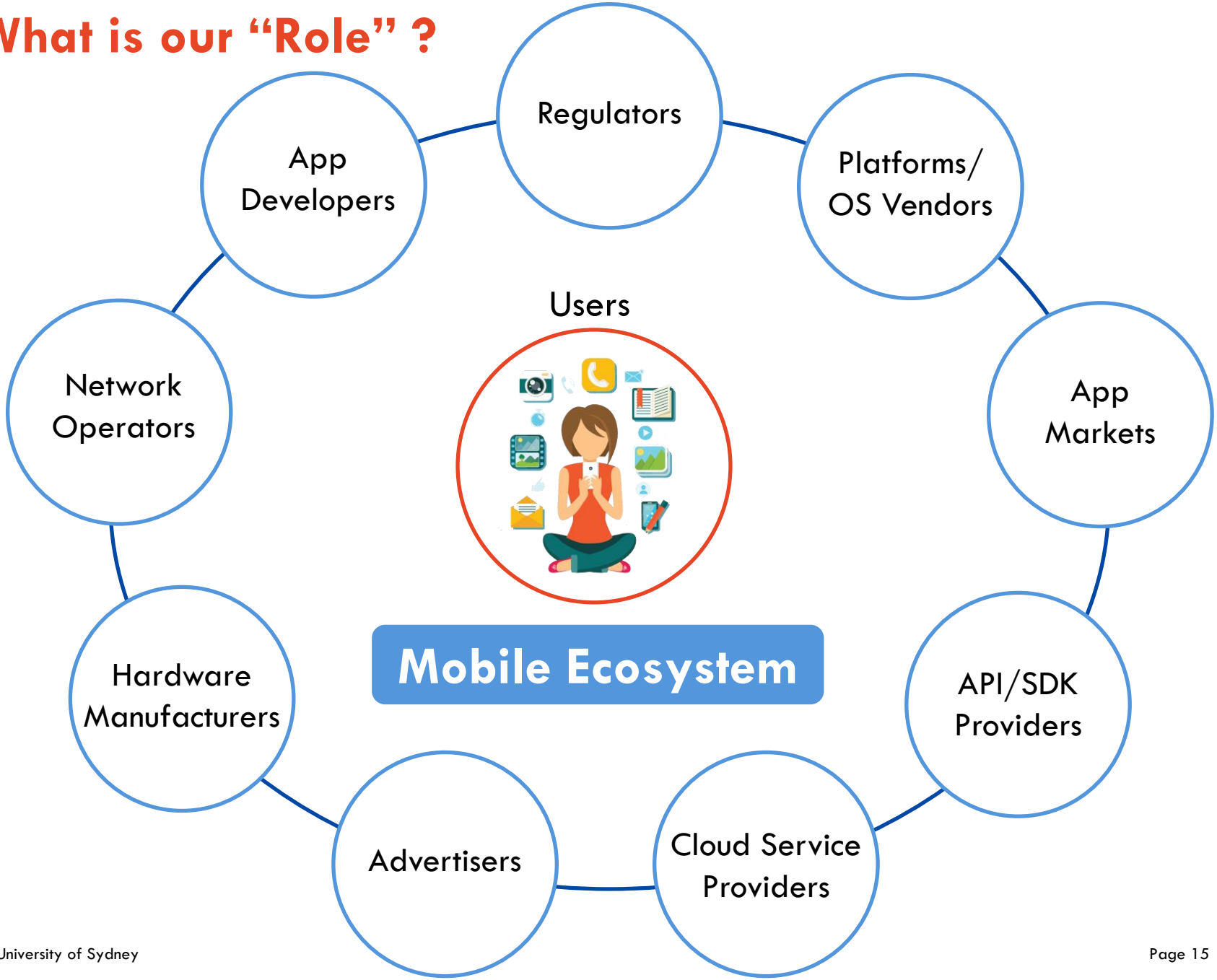
- Bug Tracking (Assist developers identify problems/bugs)

- Payments (Provides capabilities to support in-app purchases)

Regulators

- Government Regulations
  - Australian Consumer Rights
  - https://www.accc.gov.au/consumers/consumer-rights-guarantees
  - EU General Data Protection Regulation (GDPR)
  - https://www.eugdpr.org
  - NIST – National Institute of Standards and Technology
  - https://www.nist.gov
- Industry standards
  - ISO standards, IEEE standards
- Human ethics
  - USYD Research Ethics and Integrity
  - https://intranet.sydney.edu.au/research-support/ethics-integrity/human-ethics.html

What is our "Role" ?



What is your "Role" ?

As students of COMP5216/COMP4216

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What is our "Role" ?

As students of COMP5216

Role: Uncovering the true potential of mobile devices

→ Mobile Computing (App developers)

Challenges

- Sensitive personal data
  - Storage, management, sharing
- Resource utilization
  - Computation, network, power, storage
- User interaction
  - Voice, text, touch, gestures

- Your work will impact all stakeholders on the chain.

Background does not matter

- Does computer programming limited to Computer Science students ?
- **Mobile Computing is becoming a commodity**

- Mobile computing is for everyone !

Outcomes

- Pursue your passion
- Exercise your creativity
- Gain rewarding experiences
- Understand mobile computing techniques
- Thorough knowledge of mobile app based eco-system

At the end of the course;

- You will be able to develop your own mobile app
- May be you will be able to publish it in the app store
- May be you will be able to start your own business
- Participate and win an App Competition

- Knowledge and experience in mobile computing will be useful;
  - For your final year thesis project
  - To improve your productivity
  - Pursue your passion as a hobby
  - Just for Fun !
  - **Improve your chances of getting a better job**

App development workflow

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App development workflow

Six Steps

1. Define Goals
2. Analyse Requirements
3. Design Workflow: sketch UI, wireframe or storyboard
4. Design project structure
5. Implement codes
6. Test, debug, and release

1. Design Goals

- Goals vs Ideas
  - Value

Value Propositions

- To meet the needs of customers/users
  - What value do we deliver to customers ?
  - Which one of customers' problems we are helping to solve ?
  - What bundles of products and services are we offering to each Customer Segment ?
  - Which customer needs are we satisfying ?

- In business context
  - Offerings from the product
  - What distinguishes itself from its competitors
    - Quantitative – price and efficiency
    - Qualitative – overall customer experience and outcome

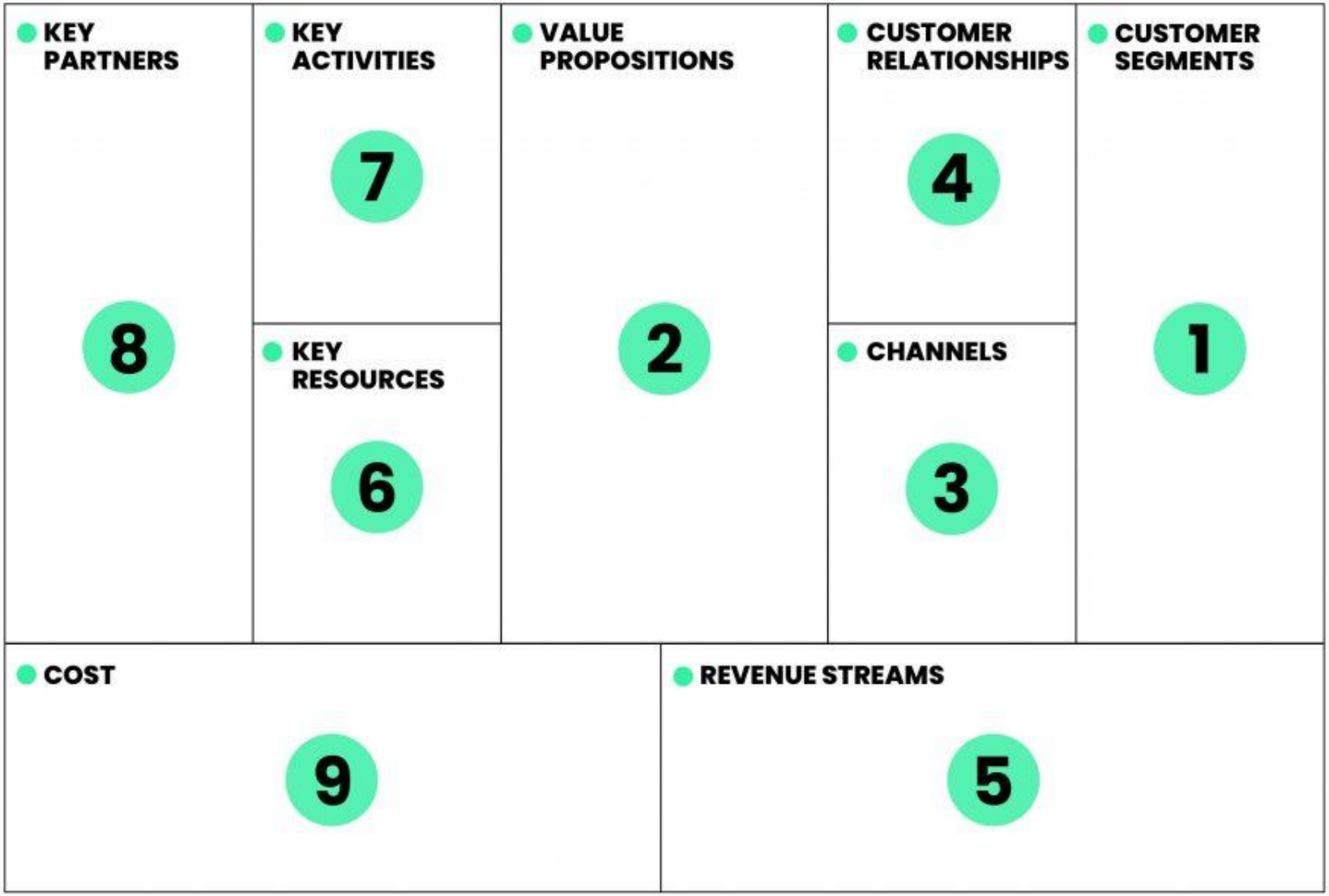
2. Requirement Analyses

- How to deliver the values
  - Tasks
  - User scenarios
- How the app will function
  - Key interactions in the app
  - Secondary functions
    - Features in the first version that are “nice to have”
- Understand the field
  - Find out whether there are other apps out there doing the same thing
- Obtain insights of the problem
  - Find design inspiration for your app
  - Find information on the technical requirement for your app
  - Find out how you can market and monetize your app

Business Model Canvas

- Proposed by business theorist Alexander Osterwalder
- A strategic management and lean startup template for developing new or documenting existing business models.
- It is a visual chart with elements describing a firm's or product's value proposition, infrastructure, customers, and finances.
  - https://www.alexandercowan.com/business-model-canvas-templates/

BUSINESS MODEL CANVAS



BUSINESS MODEL CANVAS - NETFLIX

The Power MBA

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
Internet service providers (ISP) 3rd party studios	Content procurement Application development 3rd party licensing	On-demand video Huge selection of content Original content Competitive price point	Self-service platform	Mass market
	KEY RESOURCES Streaming rights Internet bandwidth Recommendation algorithm Content library		**CHANNELS** Website App store Affiliate partners	

COST	REVENUE STREAMS
In-house content production 3rd party licensing Streaming application (staff, maintenance, etc,.)	Subscriptions

BUSINESS MODEL CANVAS - NETFLIX

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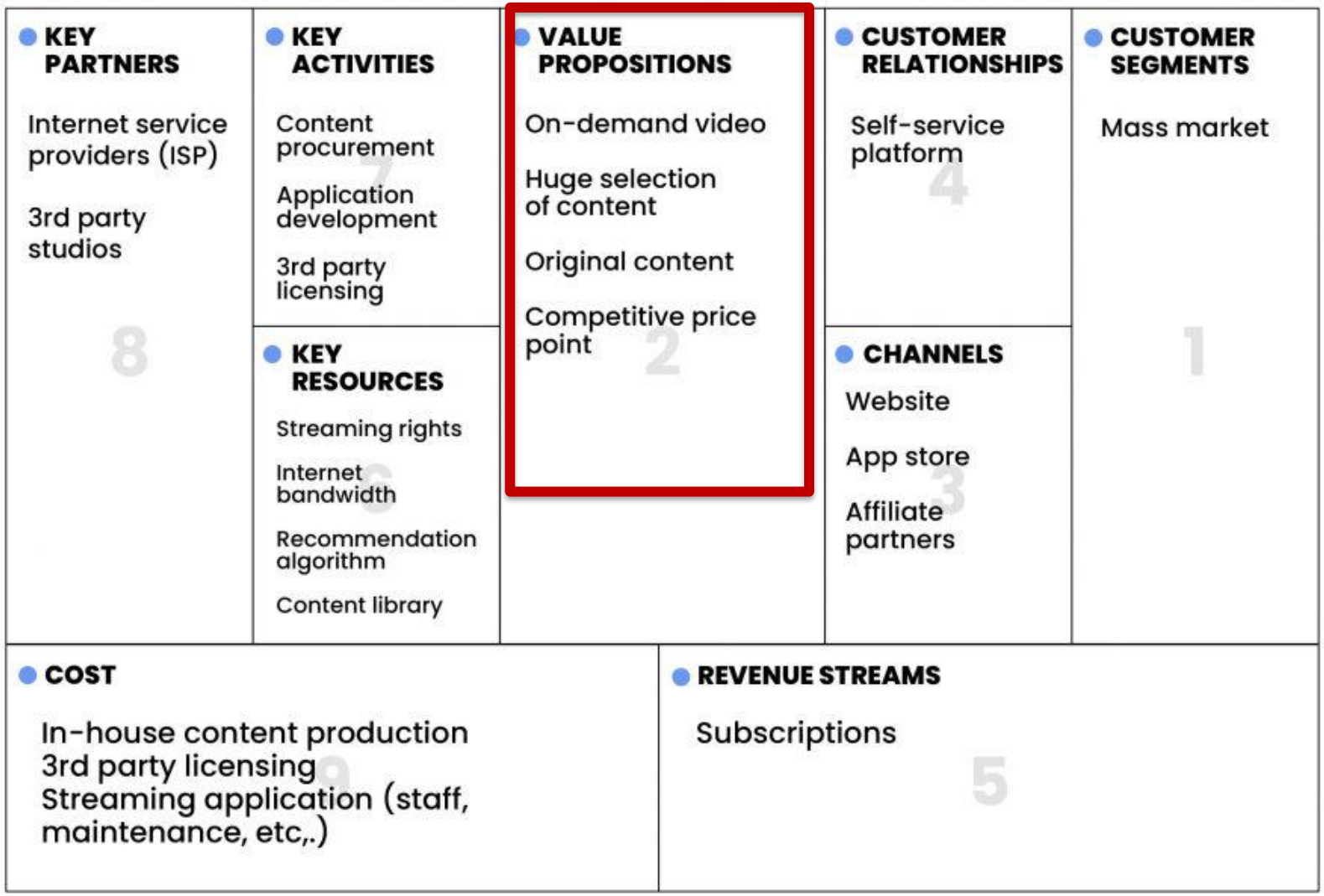

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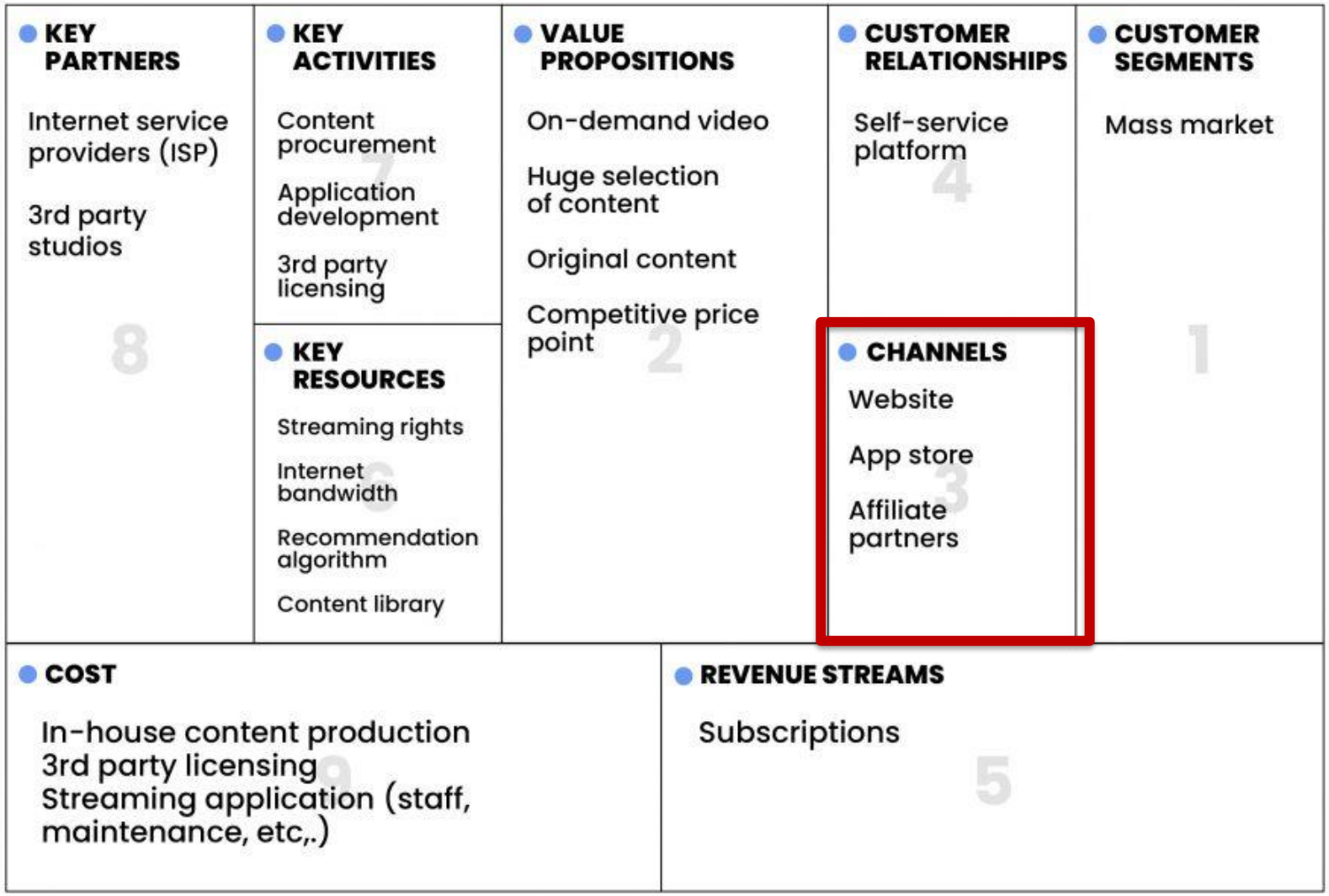

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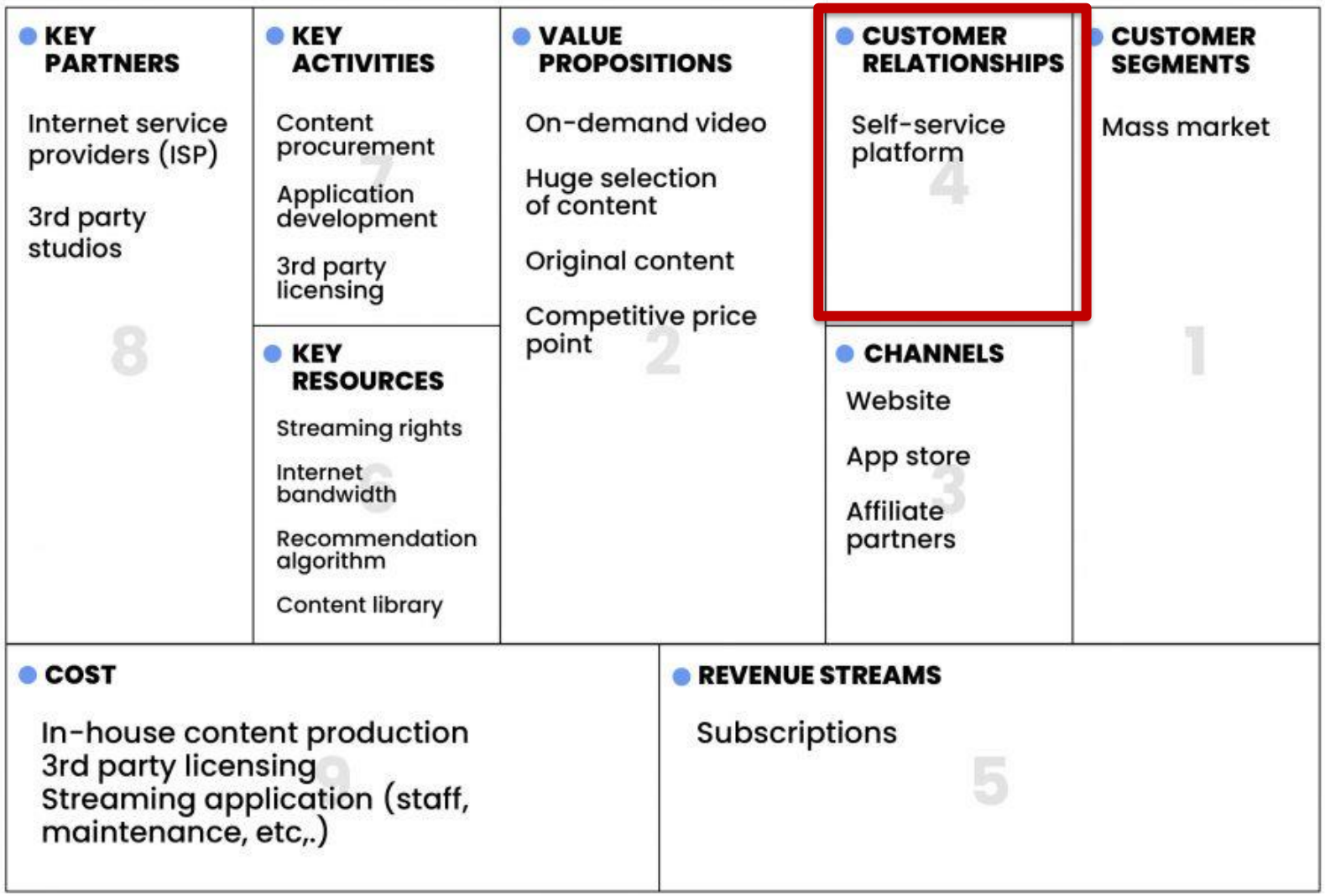

BUSINESS MODEL CANVAS - NETFLIX

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KEY PARTNERS

Internet service providers (ISP)

3rd party studios

KEY ACTIVITIES

Content procurement

Application development

3rd party licensing

KEY RESOURCES

Streaming rights

Internet bandwidth

Recommendation algorithm

Content library

VALUE PROPOSITIONS

On-demand video

Huge selection of content

Original content

Competitive price point

CUSTOMER RELATIONSHIPS

Self-service platform

CHANNELS

Website

App store

Affiliate partners

CUSTOMER SEGMENTS

Mass market

COST

In-house content production
3rd party licensing
Streaming application (staff, maintenance, etc,.)

REVENUE STREAMS

Subscriptions

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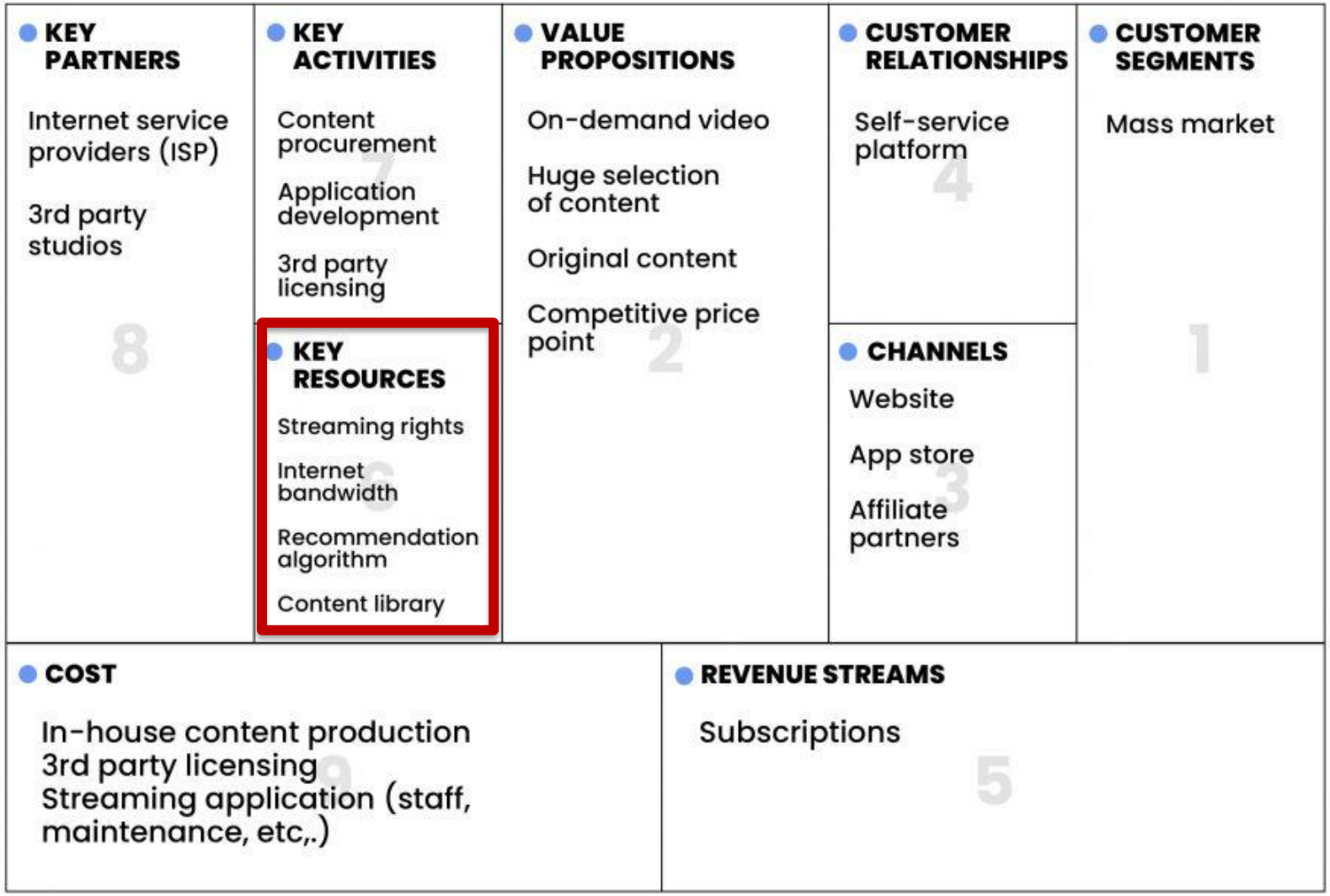

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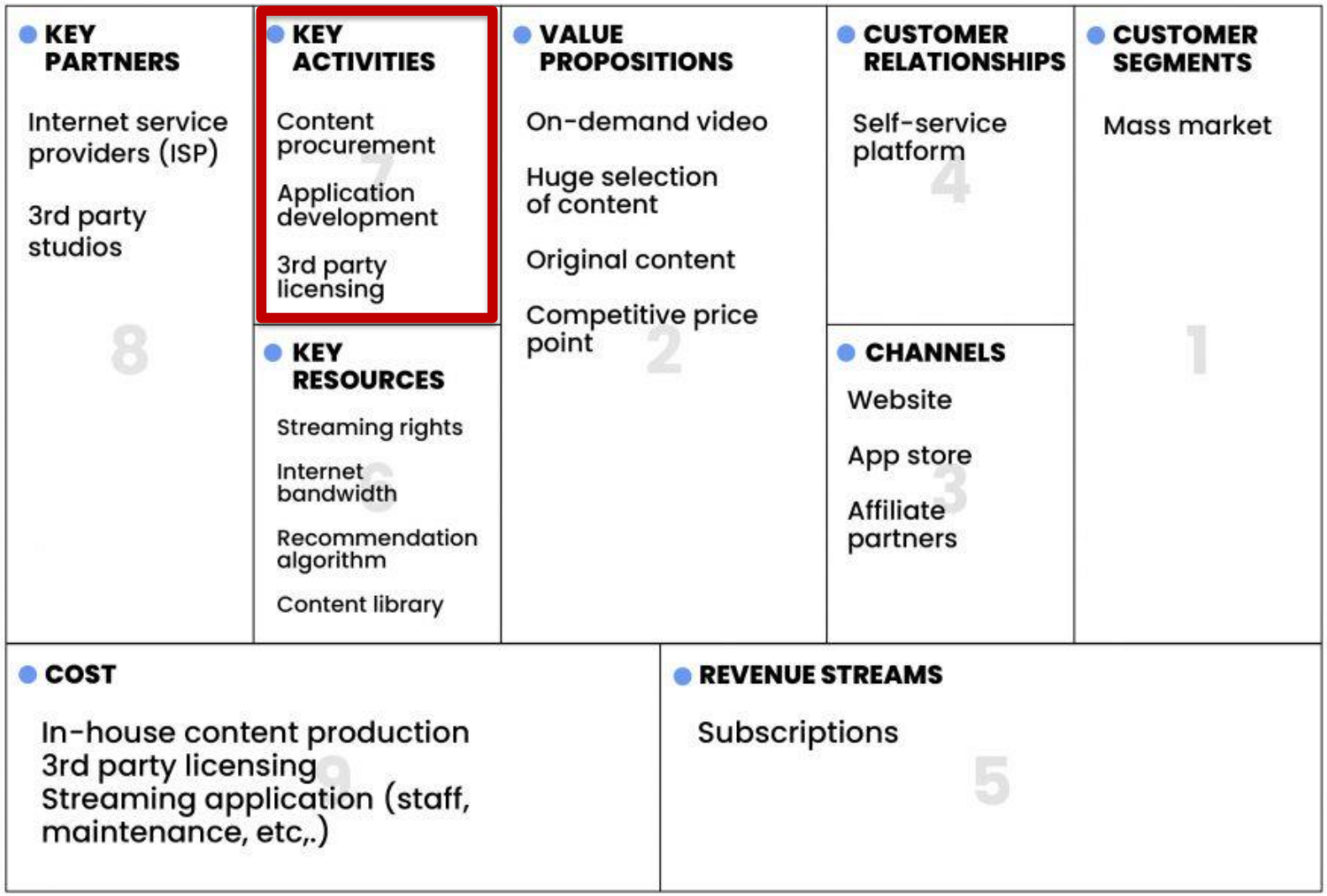

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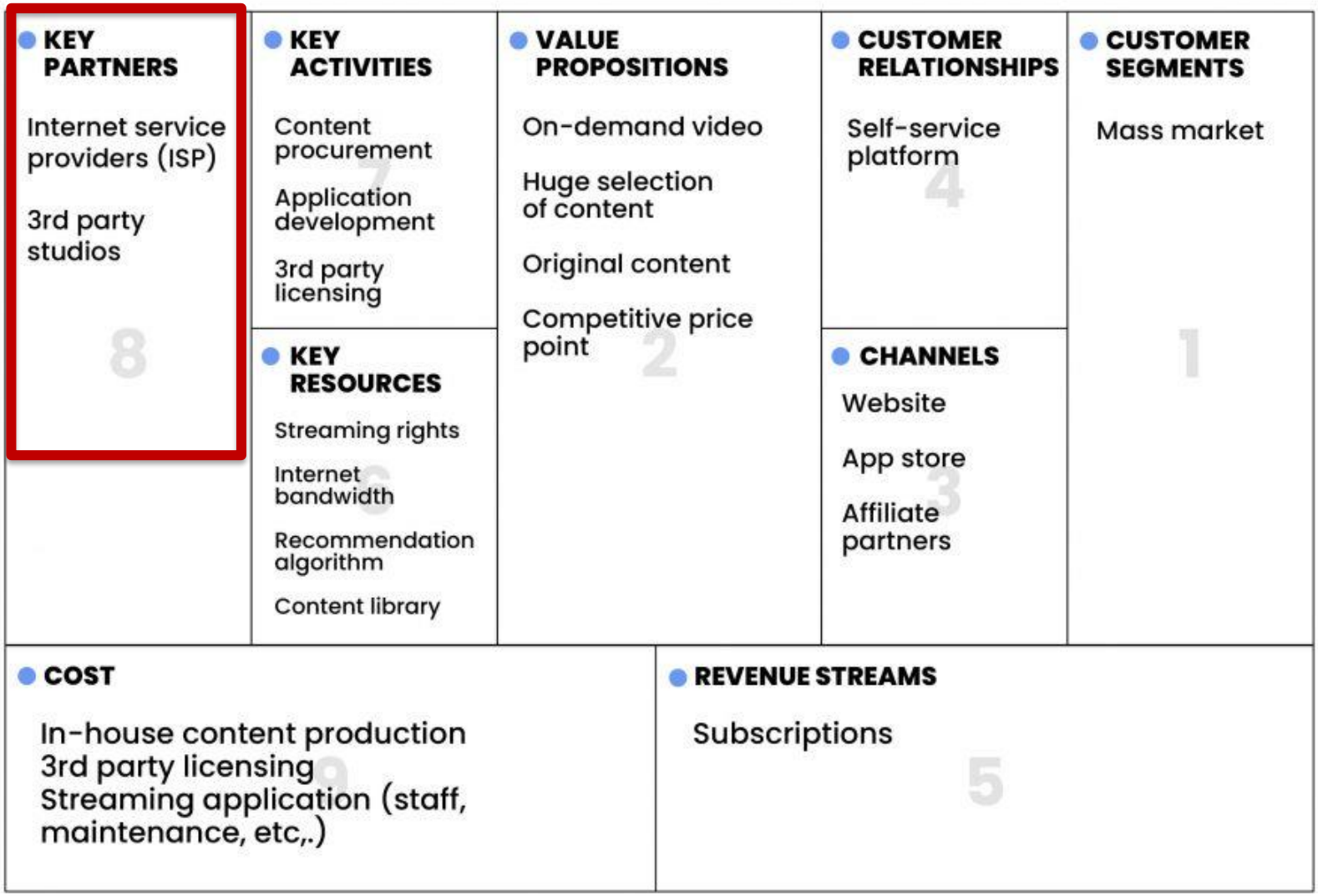

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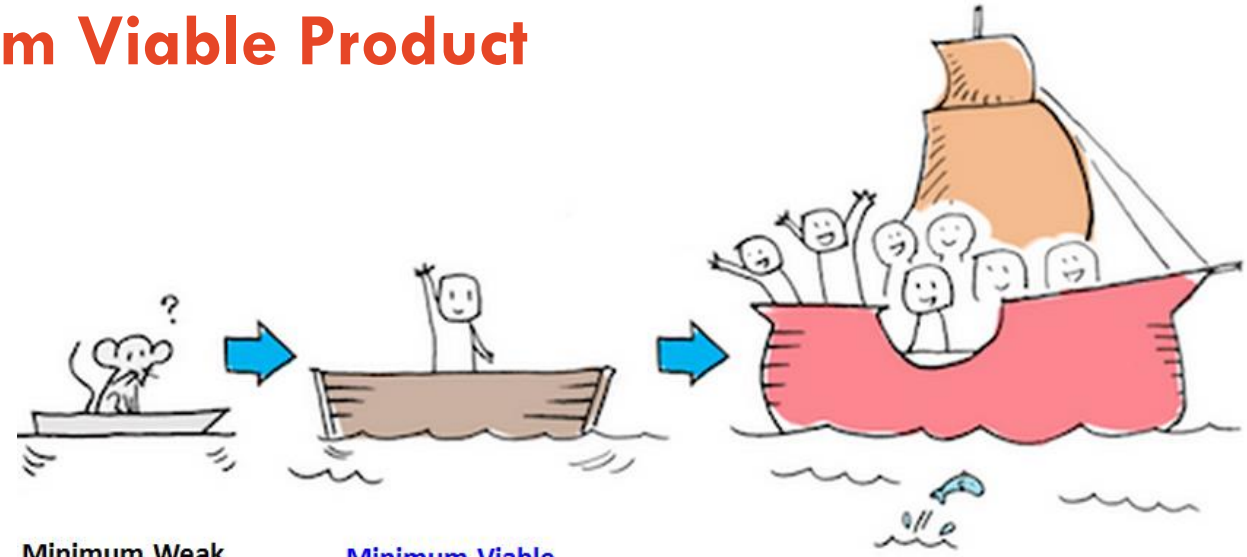
Business Model Canvas: A 9-Step Guide to Analzye Any Business (thepowermba.com)

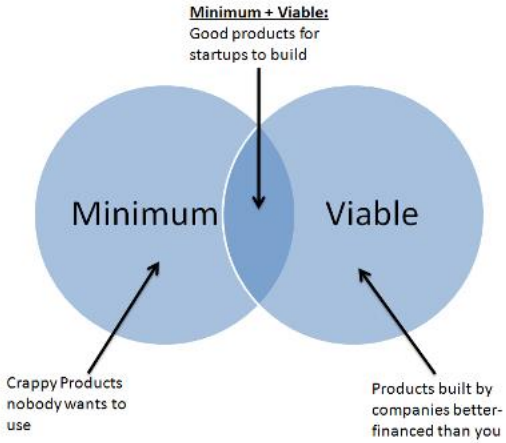
Minimum Viable Product

Minimum Viable Product



"The MVP is that version of the product that enables a full turn of the Build-Measure-Learn loop with a minimum amount of effort and the least amount of development time.

- Ries, Eric (2011-09-13). The Lean Startup (p. 77), Random House, Inc.. Kindle Edition.

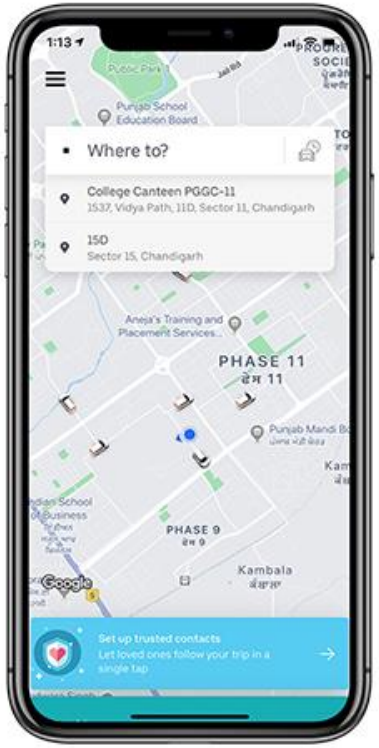


MVP Example Uber

Minimum Viable

UberCab' s MVP, 2009

Viable product

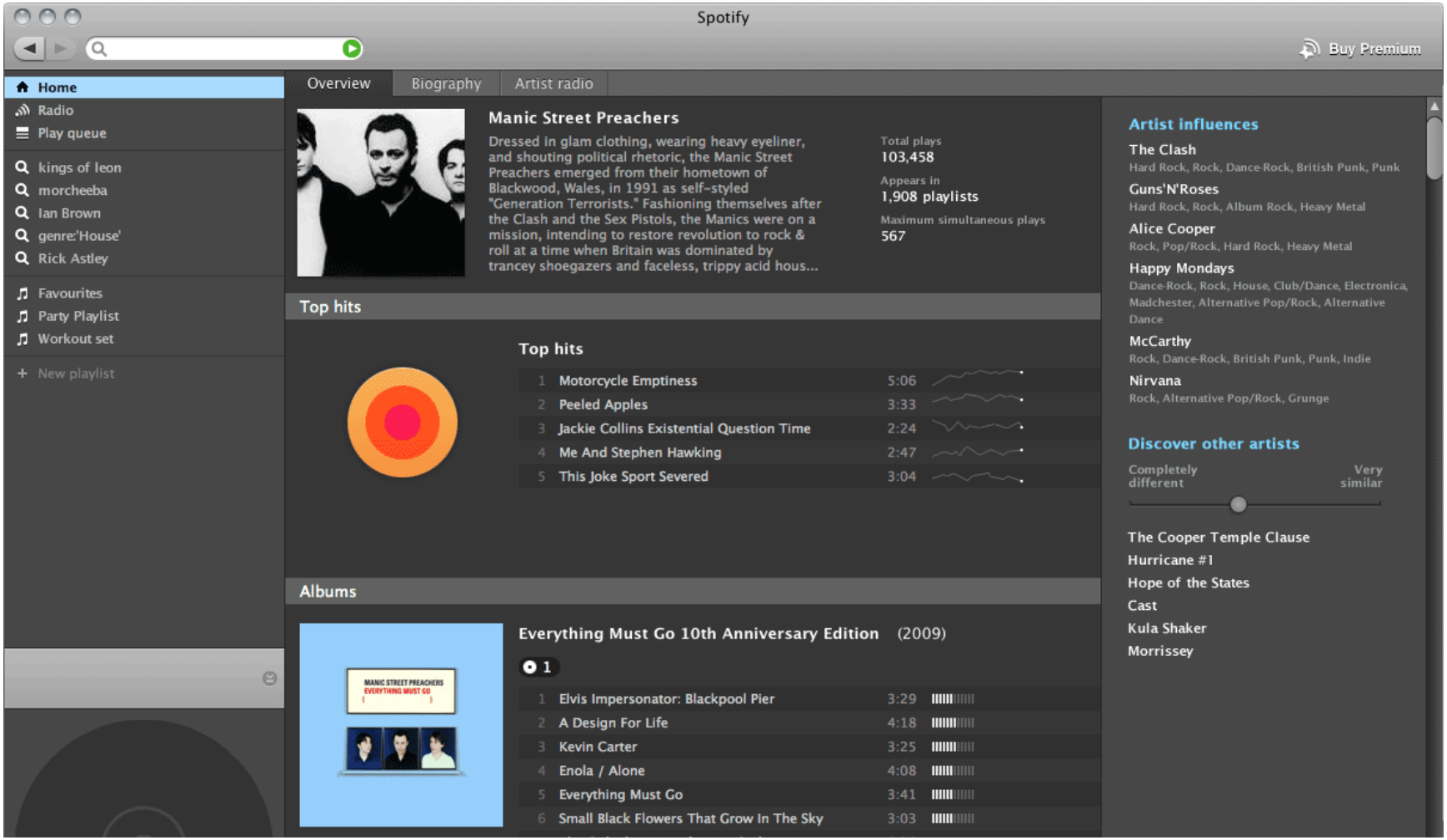


Uber Mobile App version 2019

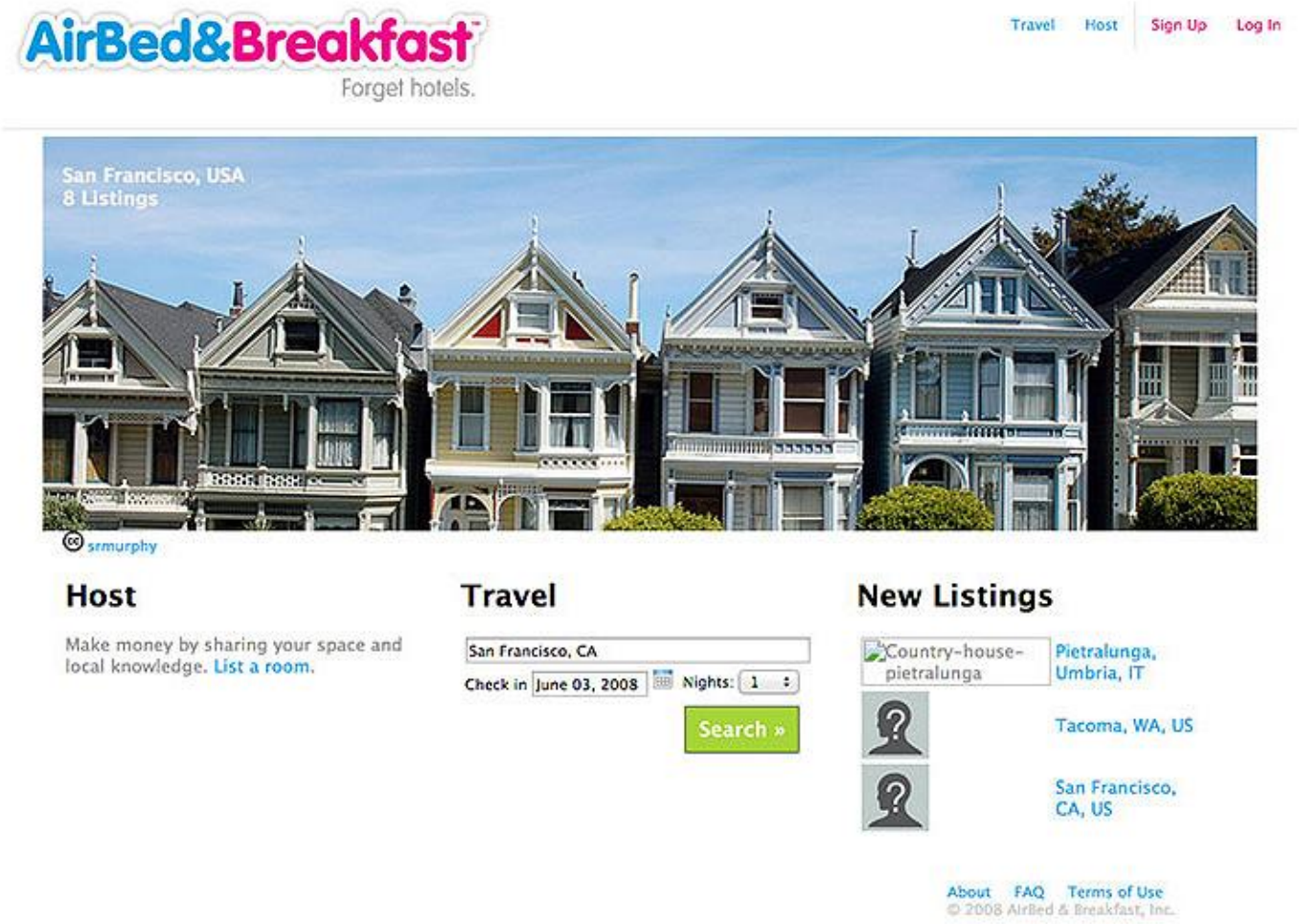
- PUSH NOTIFICATIONS
- DRIVER'S RATINGS AND REVIEWS
- FARE ESTIMATION
- BOOKING RIDE HISTORY
- REGISTER/LOG IN VIA SOCIAL MEDIA
- MESSAGING
- TRACKING
- PRICE CALCULATION
- PAYMENT INTEGRATION
- BOOKING INTERFACE

SellnShip

MVP Example 2- Spotify



MVP Example 3 Airbnb

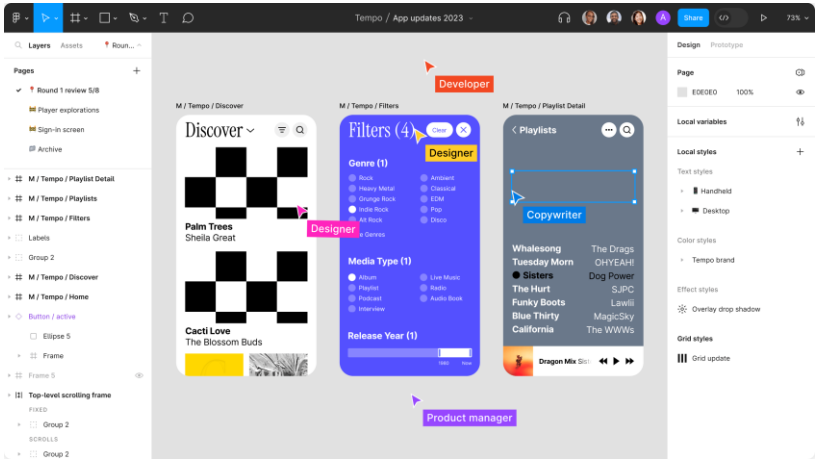


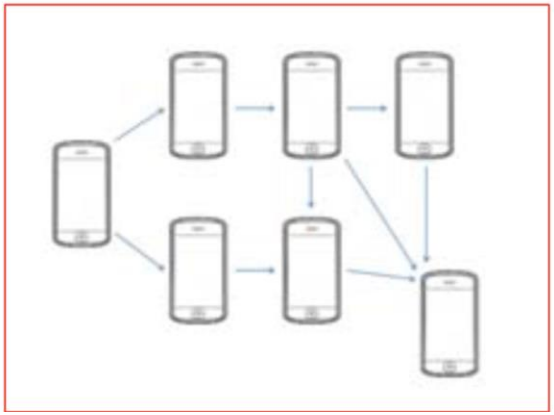
3. Design Workflow

- Platform specific UI styles
  - iOS - https://developer.apple.com/design/human-interface-guidelines/
  - Android - https://developer.android.com/design/

3. Design Workflow - UI (User Interface)

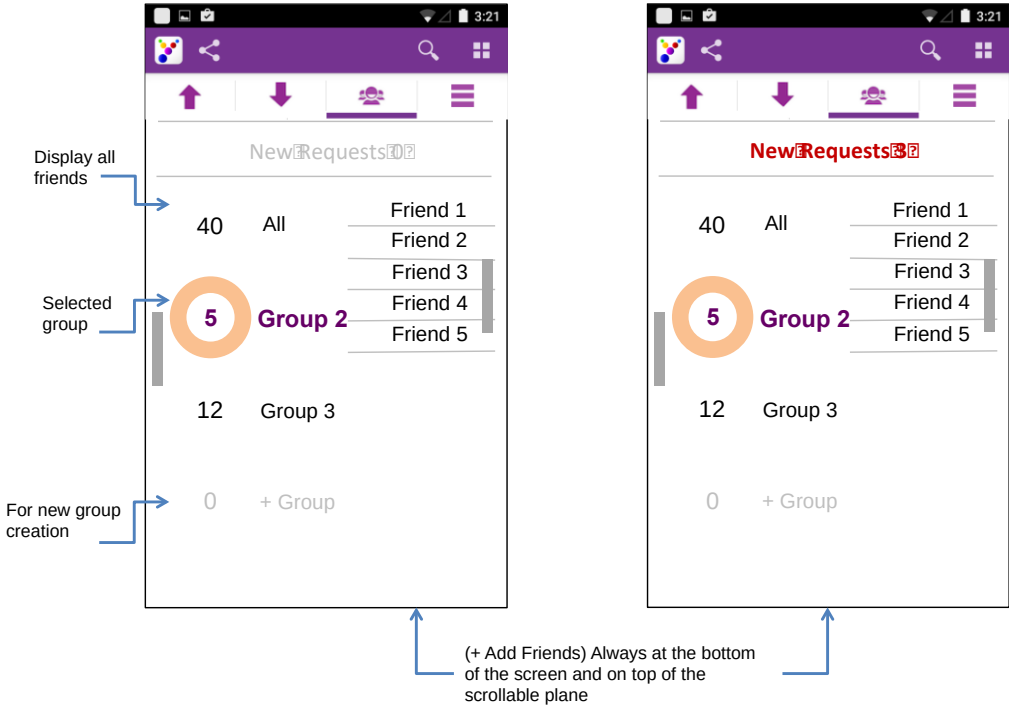
- Sketching wireframes
- Tools (not free)
  - Balsamiq - https://balsamiq.com/
  - Moqups- https://moqups.com/
  - HotGloo - https://www.hotgloo.com/
  - Figma - https://www.figma.com
  - Sketch - https://www.sketch.com/
  - JustinMind https://www.justinmind.com/





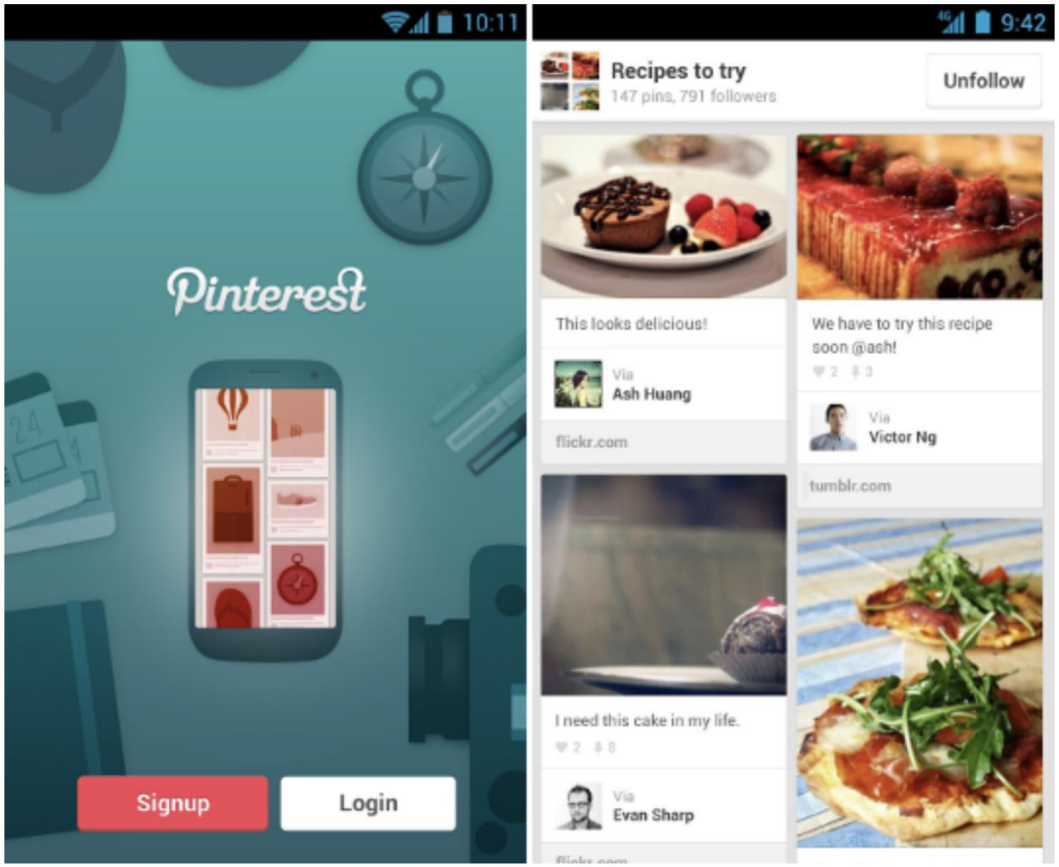
3. Design Workflow - UI (User Interface)

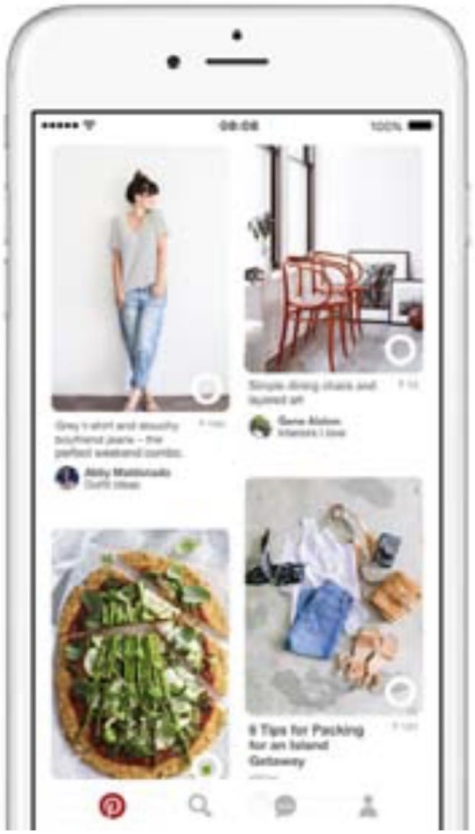
- Tools (free)
  - MS PowerPoint
  - Apple Keynote
  - Apple - https://developer.apple.com/design/resources/
  - Android - https://material.io/design/introduction/#principles



3. Design Workflow - UI (User Interface)

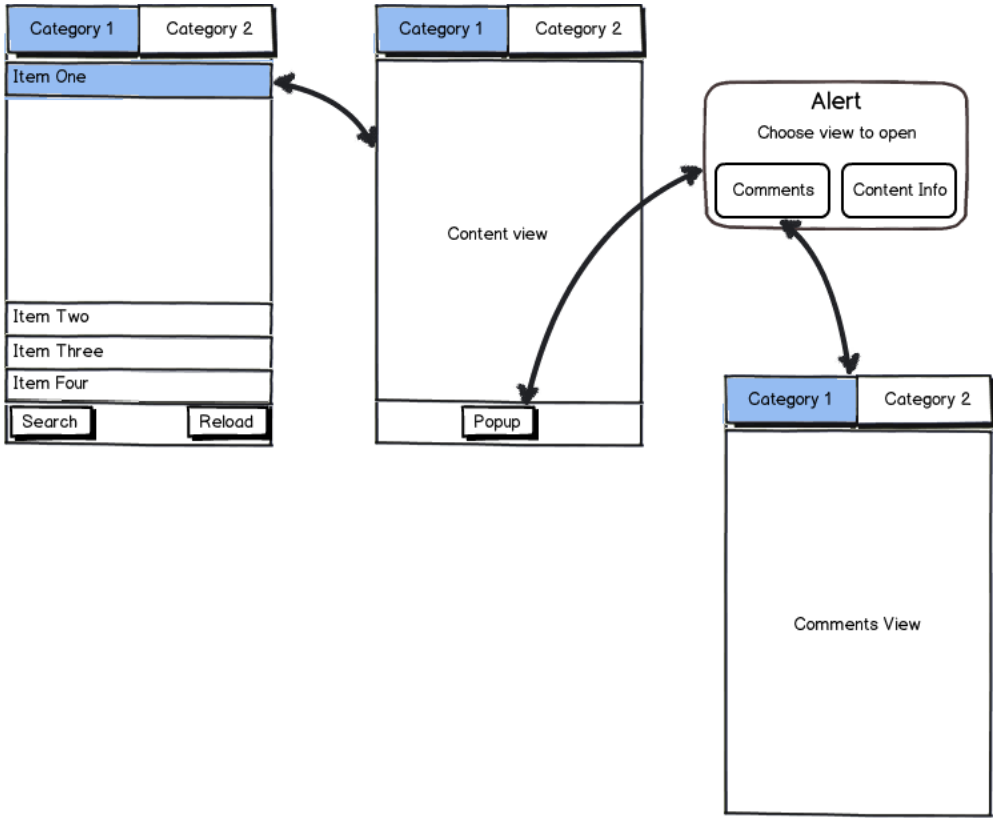
– Learn from good designs





3. Design Workflow

- Test your UI on the device
  - POP - https://marvelapp.com/pop/
  - Balsamiq - https://balsamiq.com/



4. Design Project Structure

- Frontend
  - UI implementation
    - Separation of concerns
    - MVC framework (Model-View-Controller)
    - MVP (Model-View-Presenter) and MVVM (Model-View-View-Model) (HW)
- Backend
  - Use cloud service as much as possible

- Always think about the impact of your design on other stakeholders of the eco-systems
  - Users
  - Networks
  - …,

5. Implementing the Code

- **Mobile app development is increasingly getting easier !**
  - OS APIs
  - Web/Cloud services APIs
  - Third party SDKs
  - Third party libraries

- Develop as a team
  - 1- Front-end, 1- Back-end, 1- UI/UX, 1- Manager
  - Agile software development
  - Scrum - https://www.atlassian.com/agile/scrum

- **Take advantage from collaborative tools**
  - Bitbucket - https://www.bitbucket.org
  - Github - https://github.com
  - Slack - https://slack.com

6. Testing and Debugging

- Not only functions
- But also the feedback from users, such as how they use the app
  - Verifying value propositions
  - Taking note of their actions
  - Adapting your UI/UX to them
  - App Analytics SDKs

- **Beta version release**
  - Lets you to distribute the app to known users

- Customer development
  - Users other than your friends and family members: getting out of the building

How to find app ideas?

Ideas

- **Existing ideas**
  - Even if you find someone else working on the same thing, you're probably not too late.
  - Worrying that you're late is one of the signs of a good idea

- **Extension to existing ideas**
  - Analogy between two domains
    - Airbnb vs Bike sharing
    - Facebook vs Linkedin
  - Add an extra feature
  - Opposite thinking
    - Hospital vs Home health-care

- **Innovative ideas**

Ideas

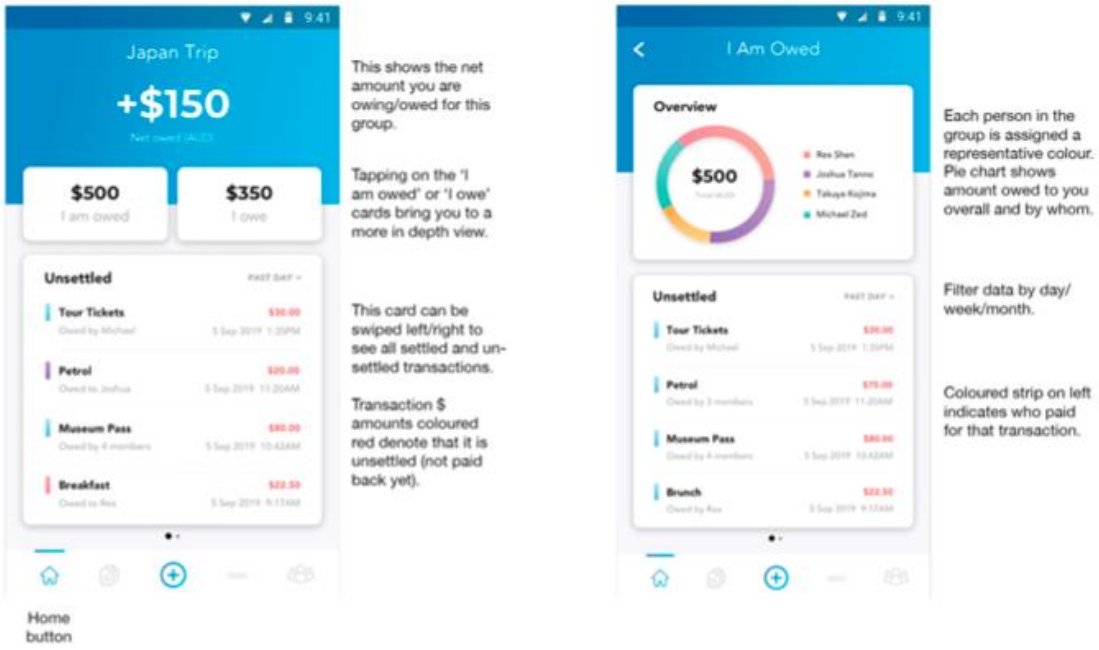
- The way to get good ideas is not to try to think of your assignment
  - The most common mistake developers make is to solve problems no one has
  - It yields bad ideas that sound plausible enough to fool you into working on them
  - "made-up" or "sitcom" ideas
- Two types of successful ideas/solutions
  - Entering a market with existing competitors, but armed with some secret weapon that will get them all the users (like iPhone)
  - Entering a market that looks small, but which will turn out to be big (like Microsoft)
- **Look for problems, preferably problems you have yourself**

Own problems

- The general problems you have
  - Online social network
  - Something to get real-time bus timetable
  - Garage sale
  - Discussion forum
  - Something needed in your previous job
  - …
- Something at least some users who really need, not just may be one day, but want it urgently.

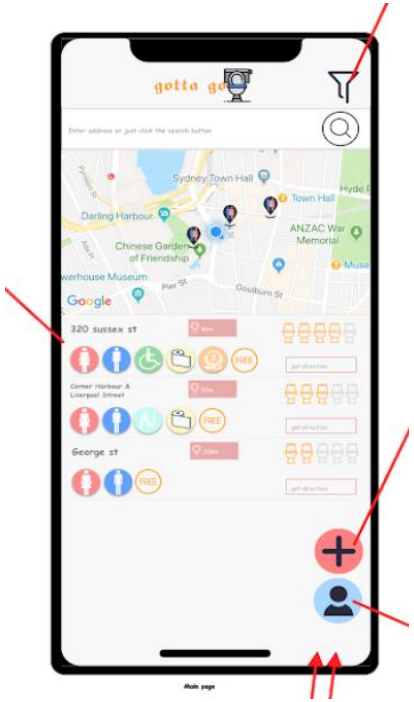
Examples from past years…

- **ClearPay: Sharing cost of bills**
- "when splitting the cost of a meal during a trip, it is common for a single person to pay on behalf of the rest of the group, and get reimbursed the appropriate amount later."
- "Our proposed app will solve the issues associated with both approaches by allowing users to synchronize their shared expenses via Bluetooth instead of the internet. This way, all people in the group would have the same information about who and how much they owe, but would not need internet access to do so. "



Examples from past years…

- **Gotta Go: a unique solution to the problem of finding public restrooms.**
- "How many times have we went into a public restroom, and see missing toilet seats, toilet papers, and unflushed toilets? What about getting lost in the unfamiliar streets, and we suddenly need to use the bathroom? Our app is the solution to finding the adequate public restrooms. Our app gives users the ability to find a public bathroom near them, and allows them to rate the bathrooms in terms of hygiene and functionality."



Where are the problems ?

- Alert to opportunities
  - Dropbox: forgetting USB sticks
- **Live in the future, then build what's missing.**

- Be open-minded
  - Turn off the filters that usually prevent you from seeing them
    - Why is your inbox overflowing? Why do you get so much email? What problems are people trying to solve by sending you email? Are there better ways to solve them? Why do you keep emails around after you've read them? Is an inbox the optimal tool for that?

- **Live in the future, then build what seems interesting.**

Inter-disciplinary Problems

- Learning about some other field, you'll probably see problems that software could solve.
  - (a) the inhabitants of that domain are not as likely as software people to have already solved their problems with software, and
  - (b) since you come into the new domain totally ignorant, you don't even know what the status quo is to take it for granted.

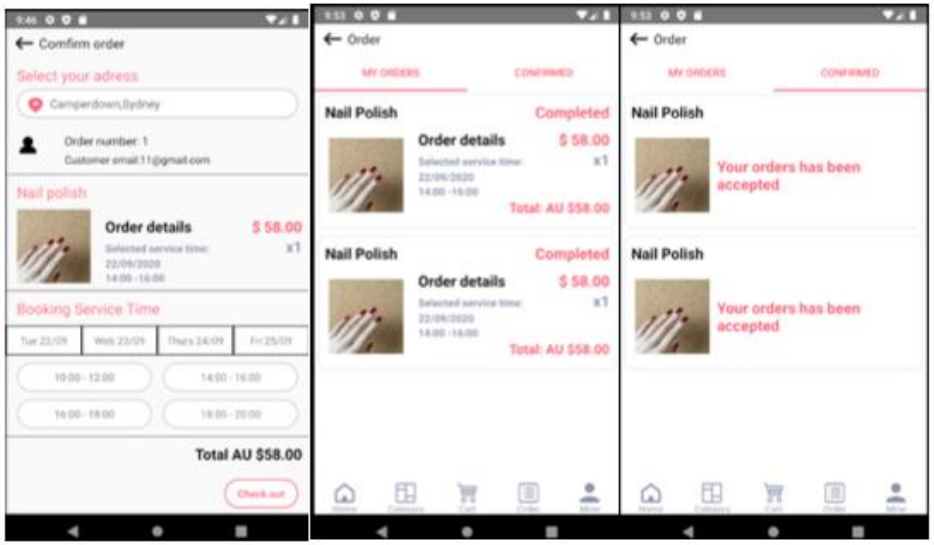
- Taking a class on, say, genetics; or better still, go work for a biotech company.
  - **One way to ensure you do a good job solving other people's problems is to make them your own.**

Problems

- Serve a small initial group
  - High demands → high competition
  - E.g. Apple, Google, Facebook, Microsoft, etc.
- Make the users who care about your product happy
  - First iPhone does not have copy/paste function
- Germ problems
  - Hard to tell, even experienced investors
  - Airbnb
    - Let hosts rent out space on their floors during conventions. They didn't foresee the expansion of this idea; it forced itself upon them gradually

Examples from past years…

- **Beauty Delivery: Booking & Delivery application for make-up**
- "A research shows that food takeaway and drive-through services has grown exponentially during the epidemic session [1]. At the same time, business models shift under the impact of COVID-19, people make shopping choices by judging if the certain service or good are essential while they are restricted to gain services or goods at shop [2]."



What's Next ?

- Assignment 1 is available in Canvas. Due in 2 weeks.
- Project will be available this week.
  - Start forming groups and thinking about ideas
- Tutorial 2
  - Handling interactions with Intents
  - Tutors will help you to sign-in/register for project groups
  - Register the group with the tutorial class of most members
- **Please use "COMP5216" or "COMP4216" on the subject when you email me.**
- **Have fun developing your own apps !**