

DESIGN & COMPUTATION LITERACY WORKSHOP: DESIGN & CODING: CONCEPTS TO PROCESSES

Bernard Suen
Center for Entrepreneurship
Chinese University of Hong Kong

Our Agenda Today

Session 1 (2 hrs)

- 1. Adapt to new lifestyle and work mode in a **disruptive age****
- 2. Innovation in a service economy disrupted by **COVID-19****
- 3. Digital transformation in high gear**
- 4. From **service** professionals to service designers and service makers**
- 5. Literacy and skills for **cross-disciplinary learning** and competency — introducing **design thinking** and **computational thinking**.**
- 6. CUHK Maker Space: Objectives, strategies and initiatives**

Session 2 (1 hr)

1. The **two tracks**: programmer vs. non-programmer
2. Artificial intelligence **for all**: potentials and limitations
3. From data collection to data visualization — process in building IoT, AR/VR/MR and **data driven applications**
4. Programming for **people** and programming for **machines**
5. From visual **programming tools** to hardcore programming in JavaScript and Python
6. The **Big 3**, HTML/CSS/JS, for starting the coding journey

Session 3 (4 hrs)

- 1. Visual programming as a start with examples from Scratch, Micro:bit, CocoRobo, App Inventor, and Thunkable**
- 2. Introducing Google Blockly for visual programming in HTML and CSS**
- 3. From learning Google Blockly to learning JavaScript and other programming languages such as PHP and Python**
- 4. Hands-on exercise in building a website in HTML/CSS/JS**
- 5. Hosting the website on Github**

Session 1

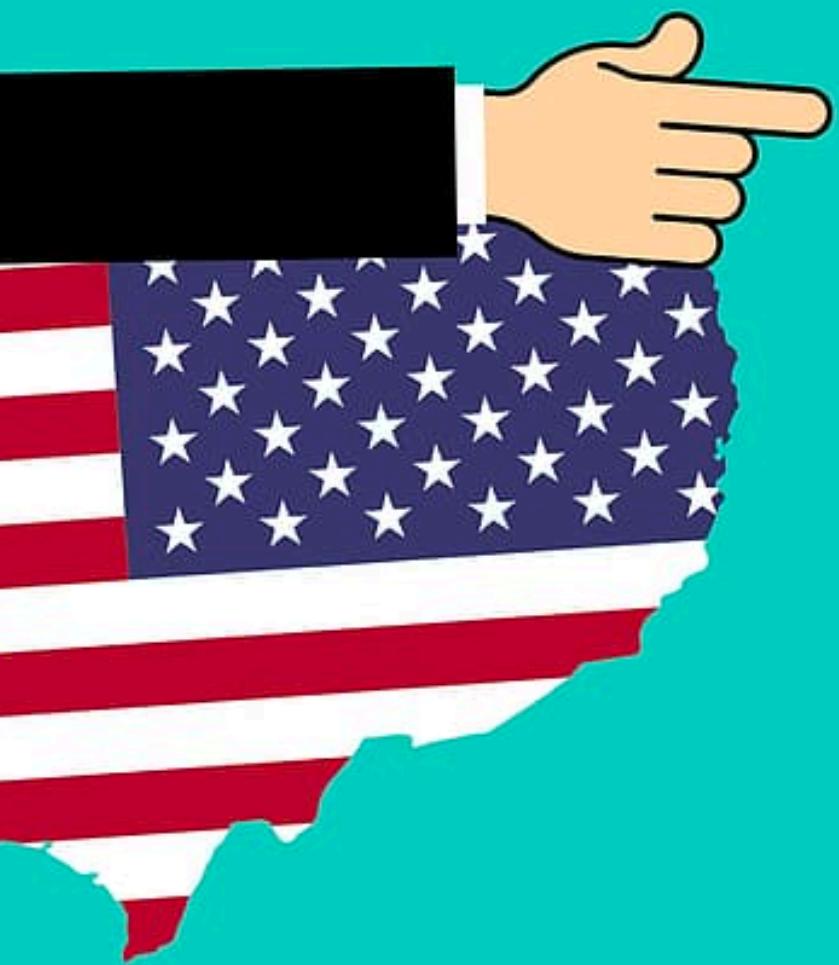
A Disrupted World



CORONAVIRUS



**Our life disrupted
and COVID19 is not
the only cause.**



New World Order in the Making



Besides the environmental, political and economic challenges, there are other rapid changes threatening our survival.

Will AI take over our jobs?

Transformation at the Work Place



ntdtv.com



Who Rules the Platform Will Rule the World

Digital platforms are crossing industry boundaries to disrupt incumbents.



Synced

AI TECHNOLOGY & INDUSTRY REVIEW

FEATURE ▾

INDUSTRY ▾

TECHNOLOGY

COMMUNITY ▾

ABOUT US ▾

AI CHINA INDUSTRY UNITED STATES

Amazon Go vs Alibaba Tao Cafe: Staffless Shop Showdown

Amazon and Alibaba's brick-and-mortar-but-no-staff shops offer very different user experiences. To bring you first-hand feedback, Synced visited them.

Source: The Synced, Jan 22, 2018



Chinese Internet Giant Tencent Invests \$70 Million In Healthcare Group DXY

Catherine Shu @catherineshu / Sep 2, 2014

Comment



Source: Tech Crunch, Sep 2, 2014

The New York Times

Amazon Wants to Disrupt Health Care in America. In China, Tech Giants Already Have.

[查看简体中文版](#) | [查看繁體中文版](#)

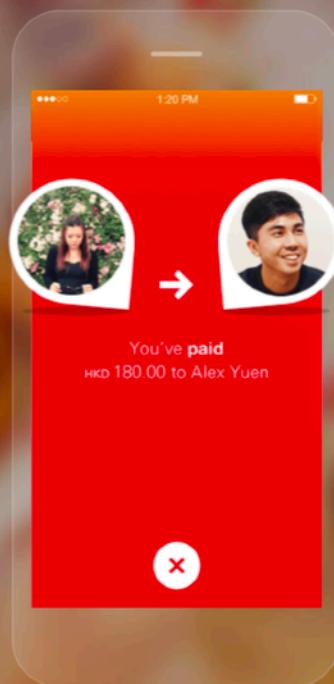
By SUI-LEE WEE and PAUL MOZUR JAN. 31, 2018



Source: The New York Times, Jan 31, 2018

The traditional companies are *waking up*...

Pay anyone with any bank



Discover more

Pay your friends with just a few taps,
regardless of which Hong Kong local
bank they use and without ever asking
for an account number.

How it works

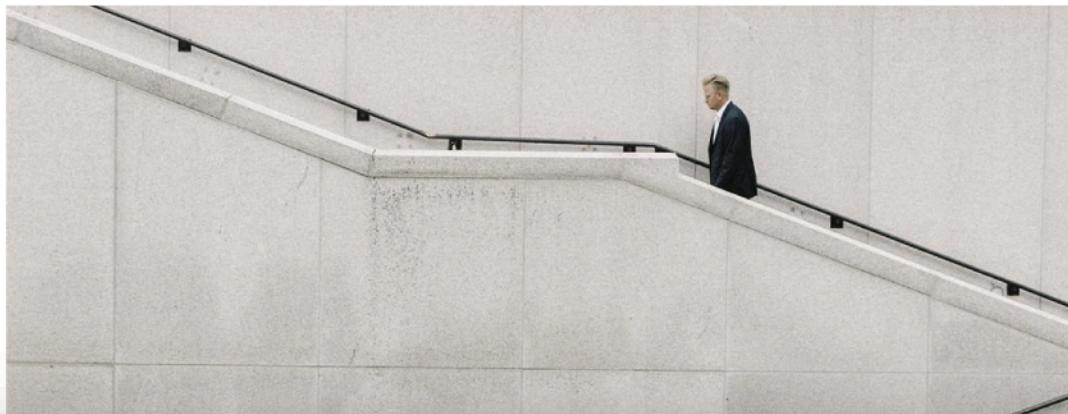


What does it matter to me?

01.03.19

Watch for these 5 hiring trends in 2019

As we head into a new year, leading recruitment executives predict hiring trends to prepare and plan for whether you are looking for a job or looking to fill one.



<https://www.fastcompany.com/90283087/watch-for-these-5-hiring-trends-in-2019>



FAST COMPANY

[DESIGN](#)[TECH](#)[WORK LIFE](#)[CREATIVITY](#)[IMPACT](#)[AUDIO](#)[VIDEO](#)[NEWS](#)[RECOMMENDER](#)[SUBSC...](#)

TECHNOLOGY WILL CONTINUE TO BE INDISPUTABLE

Though Novoselsky does predict STEM-related occupations will dominate fast-growing occupations, with a big quest for software and app developers, as well as IT specialists, technology isn't only in these fields. In fact, she explains, outside of traditional tech, jobs like registered nurses, postsecondary teachers, accountants and auditors will increase in demand, and people in these roles will encounter tech more regularly during their day-to-day tasks. According to a CareerBuilder survey, 69% of employers said every job is essentially a “tech job” because some part of the responsibilities is dependent on their ability utilize various technologies. “This shift will push companies



HK News Center

Our Company ▾

Our Products ▾

Blogs & Communities ▾

Press Tools ▾

中文

Digital Transformation to Contribute US\$9 Billion to Hong Kong GDP by 2021

Apr 20, 2018 | [Microsoft News Center](#)



MEMBERSHIP

SERVICES

EVENTS

COMMITTEES

PUBLICATIONS & NEWS

RECRUITMENT

Mercer: Digital transformation still a challenge for Hong Kong

90% of companies in Hong Kong are planning organisational changes in order to keep in step with ongoing digital innovation. However, only 42% of companies feel confident in reskilling the current employee base...



OUR SERVICES | DIGITAL TRANSFORMATION

OUR SERVICES

COMMUNITY

SUPPORT & RESOURCE

Digital Transfo

Reindustrialisation involves a digital transformation to help enterprises progress towards performing high value functions in the industrial value chain. This is the key first step to reindustrialisation in Hong Kong.

Barriers to Digital Transformation

	SMEs	Large Enterprises	All
Funding	67%	66%	66%
Restriction from legacy system	53%	42%	49%
Awareness of management	33%	63%	44%
Awareness of employee	38%	50%	42%
Skill & talent	33%	32%	33%
Cybersecurity	32%	32%	32%
Data management	20%	11%	16%

Source: Research on Digital Transformation in Hong Kong Business Sector by Hong Kong Productivity Centre September 2019

Is tech enough for getting ahead in innovation?

NATHAN HURST DESIGN 05.15.13 6:30 AM

SHARE

SHARE
23TWEET
18

PIN

COMMENT
0

EMAIL

BIG CORPORATIONS ARE BUYING FIRMS IN DROVES

McKinsey --> Lunar

Accenture --> Fjord

Google --> Mike & Maaike

Facebook --> Hot Studio

CapitalOne --> AdaptivePath



NATHAN HURST DESIGN 05.15.13 6:30 AM

SHARE

SHARE
23TWEET
18

PIN

COMMENT
0

EMAIL

BIG CORPORATIONS ARE BUYING DESIGN FIRMS IN DROVES

McKinsey --> Lunar

Accenture --> Fjord

Google --> Mike & Maaike

Facebook --> Hot Studio

CapitalOne --> AdaptivePath



The surprising thing Google learned about its employees – and what it means for today's students

By Valerie Strauss December 20, 2017 [Email the author](#)



(Marcio Jose Sanchez/AP)

"In 2013, Google decided to test its hiring hypothesis by crunching every bit and byte of hiring, firing, and promotion data accumulated since the company's incorporation in 1998. Project Oxygen shocked everyone by concluding that, among the eight most important qualities of Google's top employees, STEM expertise comes in dead last. The seven top characteristics of success at Google are all soft skills: being a good coach; communicating and listening well; possessing insights into others (including others different values and points of view); having empathy toward and being supportive of one's colleagues; being a good critical thinker and problem solver; and being able to make connections across complex ideas."



Tech / Innovation

Hong Kong urged to adopt design thinking to stay innovative in technology era

Creative mindsets are increasingly being sought after as cities like Hong Kong strive to stay competitive in rapidly changing technological landscape



Zen Soo

Published: 5:00am, 10 Oct, 2018

 Why you can trust SCMP

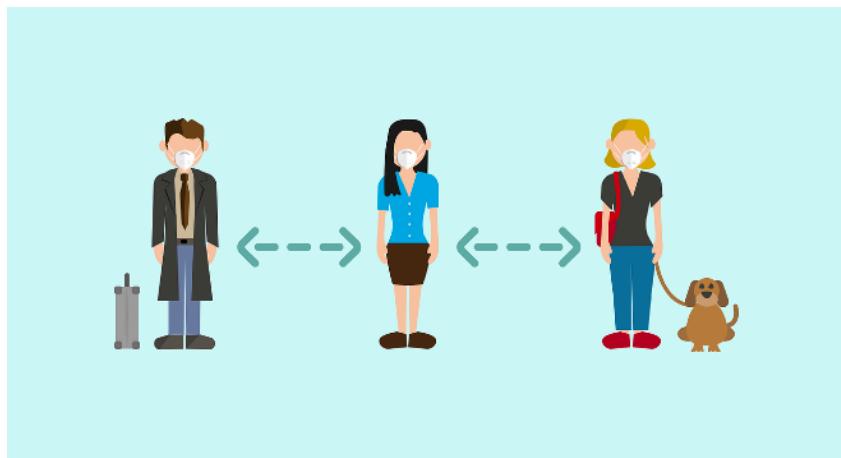


**What do future Hong Kong talents
need to survive and seek fulfilment in
such a world?**

Hong Kong Economy by Major Sectors

Economic Activity	2014	2015	2016	2017	2018 I
Agriculture, fishing, mining and quarrying	0.1	0.1	0.1	0.1	0.1
Manufacturing	1.3	1.1	1.1	1.1	1.0
Electricity, gas and water supply, and waste management	1.6	1.5	1.4	1.4	1.3
Construction	4.4	4.6	5.2	5.1	4.5
Services	92.7	92.7	92.2	92.4	93.1

Covid-19 Impacts on the Service Sector



Source:pixabay.com



Source:pexels.com



Digital Pulse

Article

How businesses are reinventing themselves in the time of COVID-19

• Ben Cotter

22 Apr 2020

7 minutes

Trends

Industry

Insights

≡ McKinsey
& Company
Risk

COVID-19: Implications for business

July 16, 2020 | Executive Briefing



German Industry
and Commerce Ltd.
德國工商會有限公司

24/04/2020 | Hong Kong China Germany

Driving Digital Transformation: Business after Covid-19

In the first quarter of 2020, many businesses have had to incorporate new digital tools and strategies into their work processes to mitigate the paralysing effects of Covid-19. While hardly any company has been able to conduct business as usual, digital communication solutions have been helping many companies maintain stable operations even under highly adverse circumstances. In the long term, measures implemented in response to the crisis could speed up the digital transformation process and make businesses more resilient against future disruptions.



Business solutions for COVID-19 disruption

In a global crisis, the right solutions can help you navigate uncertainty, adapt to changing conditions and become more resilient

[Read the COVID-19 Action Guide](#)



Skills Needed to Foster Digital Transformation in the Service Sector in a Disruptive Age

But we need to get our **mindset and **thinking** right
before acquiring the skills.**

Bitesize

[Home](#) > [KS3](#) > [Computer Science](#) > [Computational thinking](#)

Introduction to computational thinking

Before computers can be used to solve a problem, the problem itself and the ways in which it could be resolved must be understood. Computational thinking techniques help with these tasks.

Revise
Test

< 1 2 >

What is computational thinking?

Computers can be used to help us solve problems. However, before a problem can be tackled, the problem itself and the ways in which it could be solved need to be understood.

Computational thinking allows us to do this.

More Guides

[Introduction to computational thinking](#)

[Decomposition](#)



[Pattern recognition](#)



[Abstraction](#)



[Algorithms](#)



[Evaluating solutions](#)



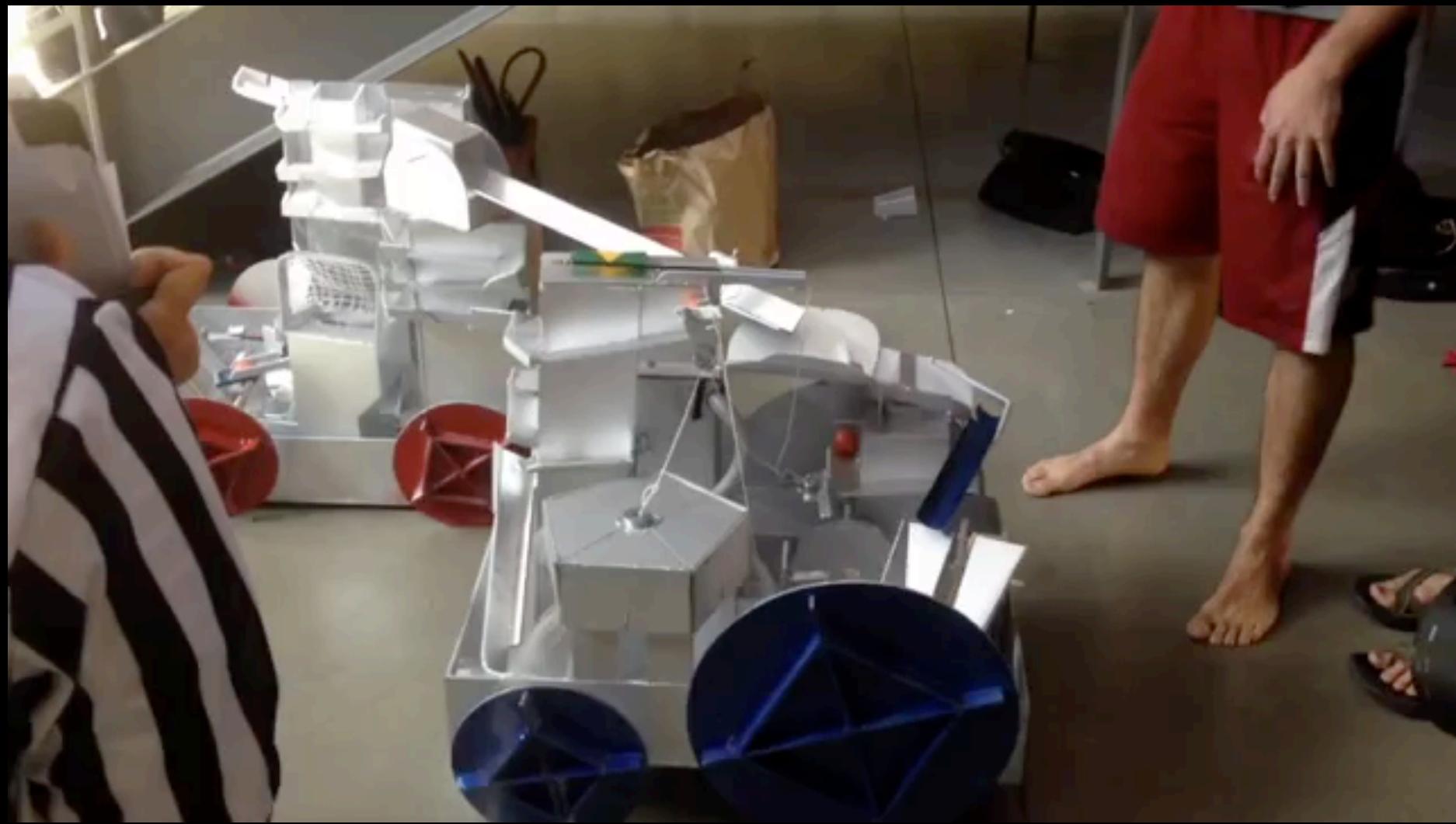


<https://www.youtube.com/watch?v=5dFxQRcsKpw>

<https://www.youtube.com/watch?v=59pfsj4nvl8>

Design Thinking at Stanford University

<https://www.youtube.com/watch?v=XgpQXSVdm2w>



**What do future Hong Kong talents
need to survive and seek fulfilment in
such a world?**

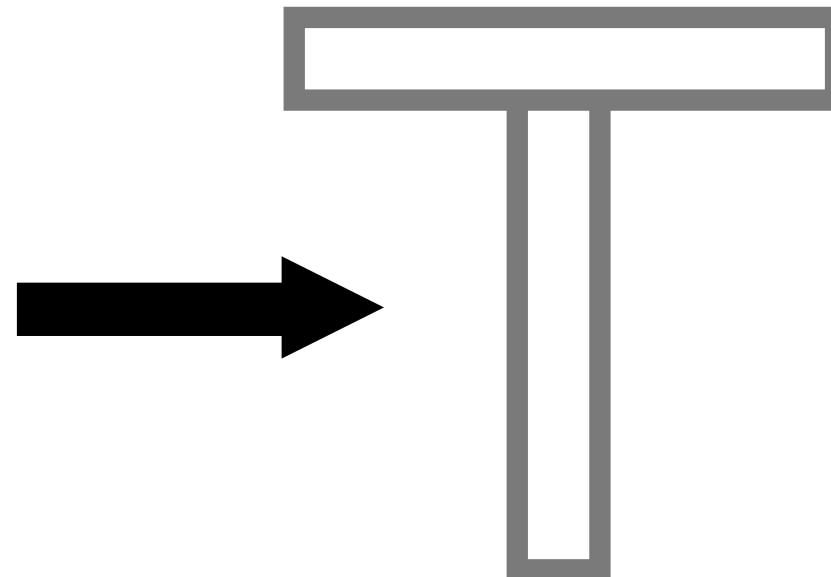
**Skills Needed to Foster Digital
Transformation in the Service Sector
in a Disruptive Age.**

We need T-Shaped Skills.

**I-Shaped Talent of
the Industrial Age**



**T-Shaped Talent of
the Network Age**



The Power of Interdisciplinary Learning

What's a T-shaped person?

T-shaped people have two kinds of characteristics, hence the use of the letter “T” to describe them. The vertical stroke of the “T” is a depth of skill that allows them to contribute to the creative process. That can be from any number of different fields: an industrial designer, an architect, a social scientist, a business specialist or a mechanical engineer. The horizontal stroke of the “T” is the disposition for collaboration across disciplines. It is composed of two things. First, empathy. It's important because it allows people to imagine the problem from another perspective- to stand in somebody else's shoes. Second, they tend to get very enthusiastic about other people's disciplines, to the point that they may actually start to practice them. Tshaped people have both depth and breadth in their skills.

Source: chiefexecutive.net

By Morten T. Hansen -

January 21, 2010

Business / Banking & Finance

How design thinking's user-centric approach helps Hong Kong embrace a cashless future

- While many Hong Kong residents prefer paying in cash, multinational bank HSBC has been leading the change with PayMe, a popular mobile payment app
- Experts say the app's success is rooted in its design thinking approach, which places user-centricity at the heart of product development

In Partnership With:
Hong Kong Design Centre



Eric Cheung

Published: 10:30am, 12 Jun, 2020 ▾

Source: South China Morning Post

At its core, design thinking is highly collaborative, involving people from varied backgrounds to co-create user-centric, commercially viable and technically feasible solutions. That's exactly how the PayMe team, according to Guiridlian, was formed and continues to run.

"Initially, we had a small core team of HSBC employees, cherry picked from different parts of the bank to bring their individual expertise to such a project – from payment specialists to product owners, risk and legal, technology and design," Guiridlian says.

Source: SCMP, June 12, 2020



HSBC

PayMe Senior UI Designer - Retail Banking and Wealth Mana

Job level	Middle
Location	Within Hong Kong
Employment type	
Industry	Banking
Job function	Banking / Finance > Corporate Banking Banking / Finance > Corporate Finance Banking / Finance > Others
Published On	01/03/2018

ref. 0000AK2K

Some careers shine brighter than others

If you're looking for a role that will help you stand out at HSBC, take a look at how our people are making a difference.

Digital Transformation

HSBC aims to work like a fintech

[More job posts by Gigi Onag](#) | Aug 1, 2017 5:18am

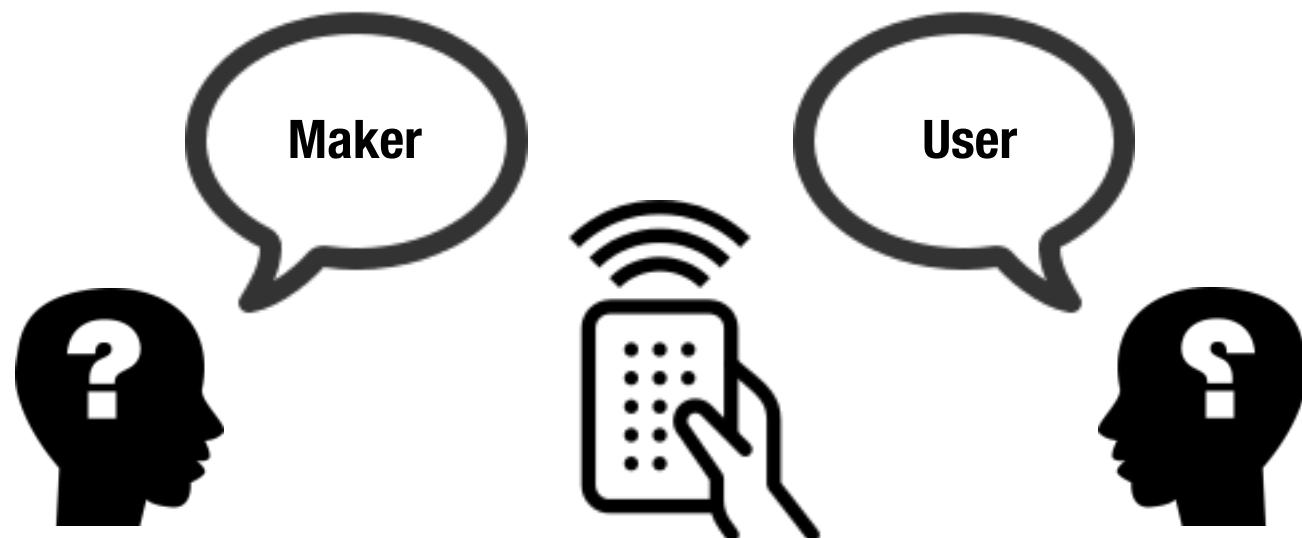


**Why being T-shaped and multidisciplinary
is so important?**

Because our “thinking**” is bounded.**



Gap exists between their mental models



Adapted from Donald Norman, "The Design of Everyday Thing"

Thinking involves the construction of mental models in our mind for understanding the world and ourselves. But our mental models are often bounded by our upbringing, life experience, education, social status, and cultural background.

A multi-disciplinary team made up of T-shaped talents enable a more diversified understanding of the problem beyond one's own bounded mental model.



CS50, Harvard's Largest Class Expands Its Line Up of Courses

A place for explorers & experimenters at Stanford University.

[What We Do](#)[How We Do It](#)[Our Impact](#)[The Home Team](#)[How to start a d.school](#)



Minor in Entrepreneurship and Innovation (EPIN)

is coming in September 2017!

EPIN (pronounced as “\e-pin\”, sounds similar to “epic”) is a university-wide minor programme in entrepreneurship and innovation. CUHK students dare to be different. You are passionate to create and break new grounds. This is a platform to learn, practice and make things happen.



Maker Bubble

Bring Design Concepts into Everyday Life





BASc
Bachelor of
Arts & Sciences



BASc AppliedAI Design+ FinTech GHD SDS

ENTREPRENEURSHIP

INNOVATION



Bachelor of Arts & Sciences

The University of Hong Kong



BASc | HKU
Bachelor of Arts & Sciences

The new Bachelor of Arts & Sciences degrees, involving all ten faculties, are aimed at nurturing globally-minded thinkers and leaders able to leverage their interdisciplinary knowledge and skills to address the contemporary and future challenges of our increasingly complex world.



Bachelor of Arts & Sciences



AppliedAI



Design +



FinTech



Global Health & Development

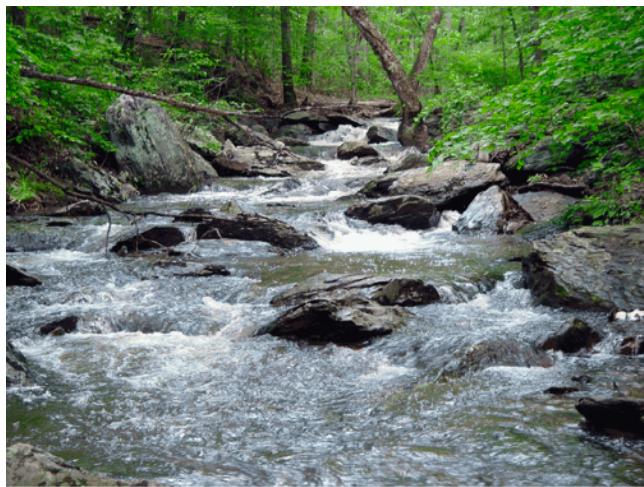


Social Data Science

What is “design”?

“What is not nature is design.”

**David M. Kelley
Founder IDEO and
Stanford D-School**



What is “thinking”?

Thinking involves the construction of mental models in our mind for understanding the world and ourself.

“水”



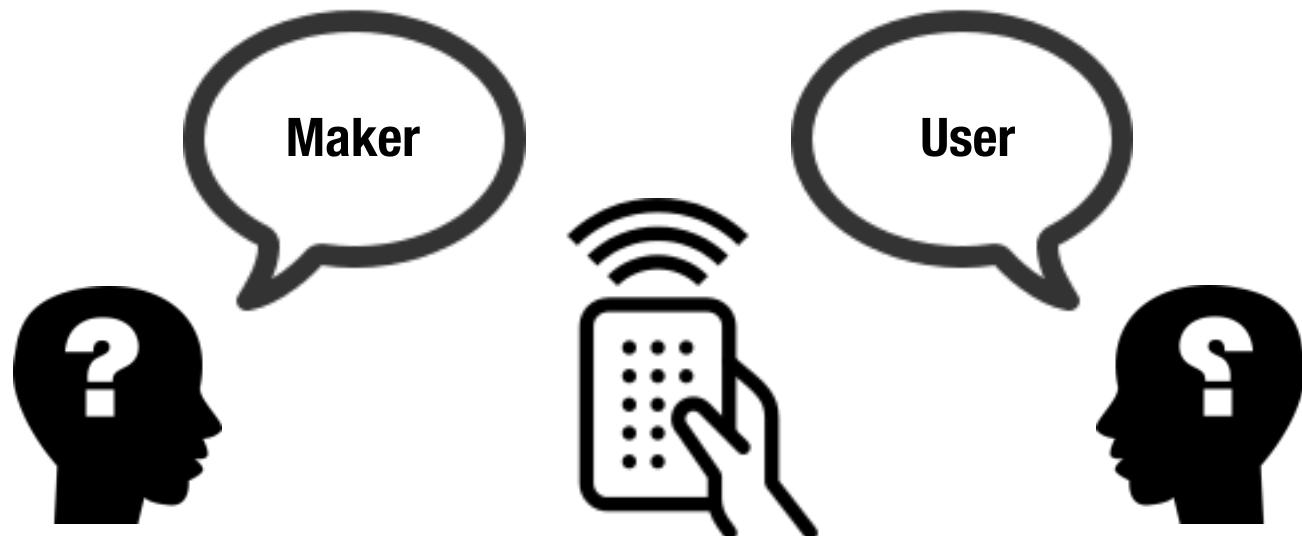
“Water”



H_2O

But...

Gap exists between their **mental models**



Adapted from Donald Norman, "The Design of Everyday Thing"

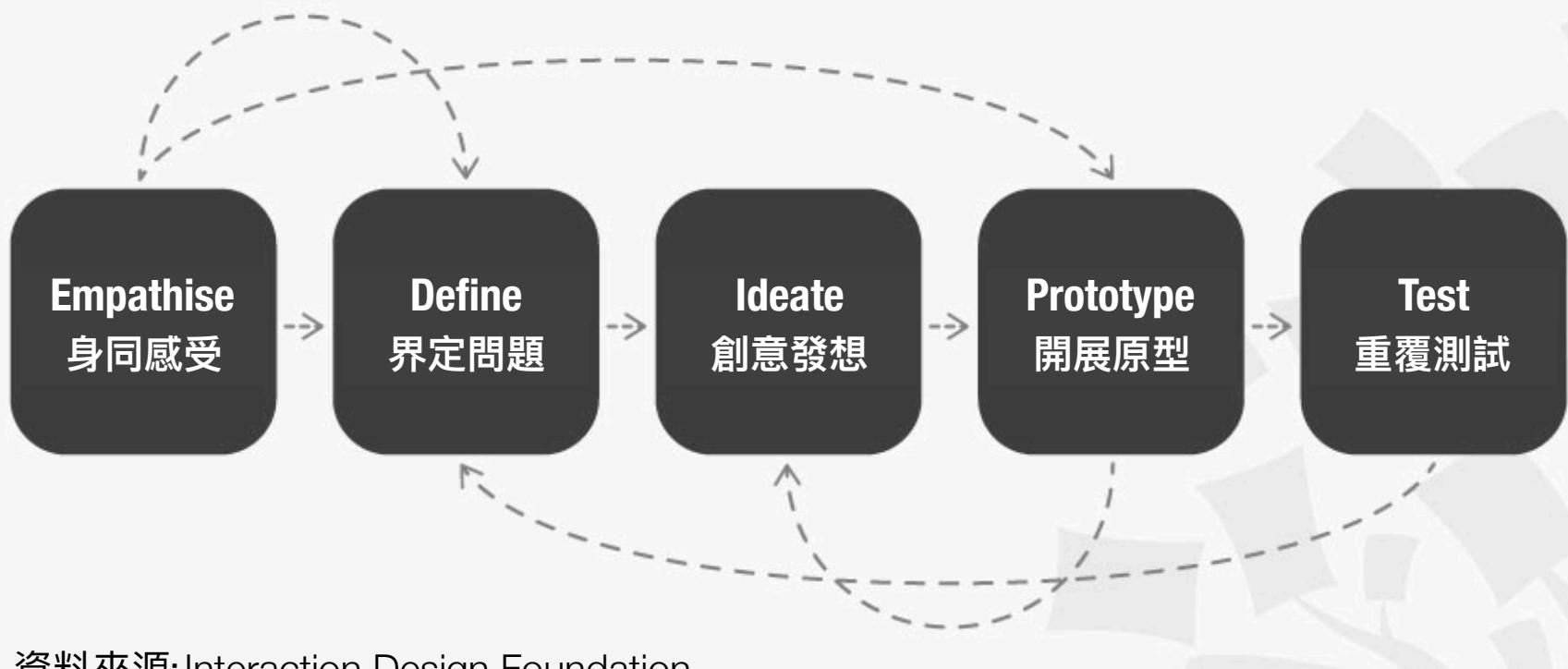
**The gap affects how we view the things
and people around us and how we
interact with them.**

**How might we effectively address people's
needs if we cannot see things as they do
due to our different mental models?**

Design Thinking enters the picture.

Design Thinking is a **process that turns
needs into solutions.**

The Design Thinking Process



資料來源:Interaction Design Foundation

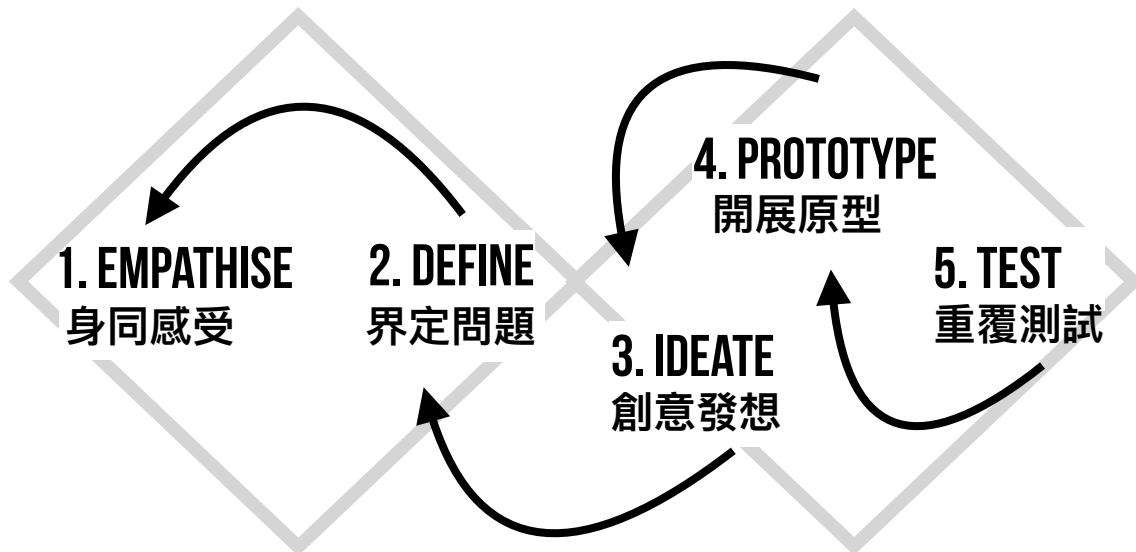


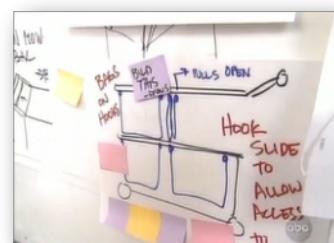
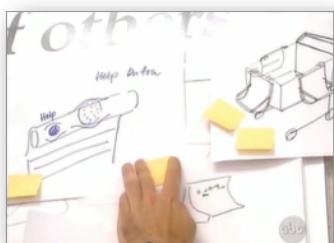
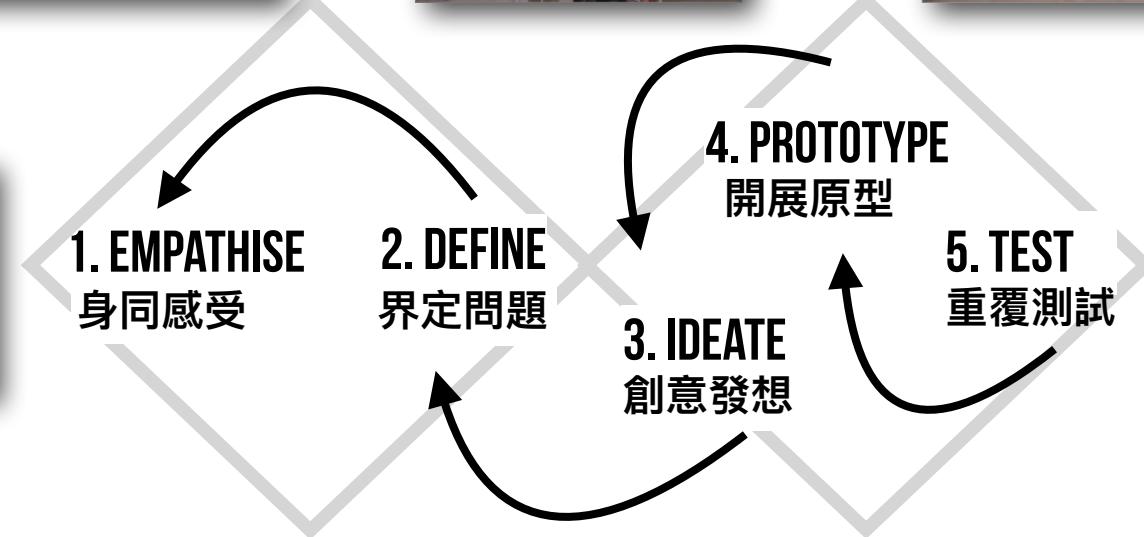
CASE STUDY: REDESIGNING THE SHOPPING CART

Four Key Elements of Design Thinking

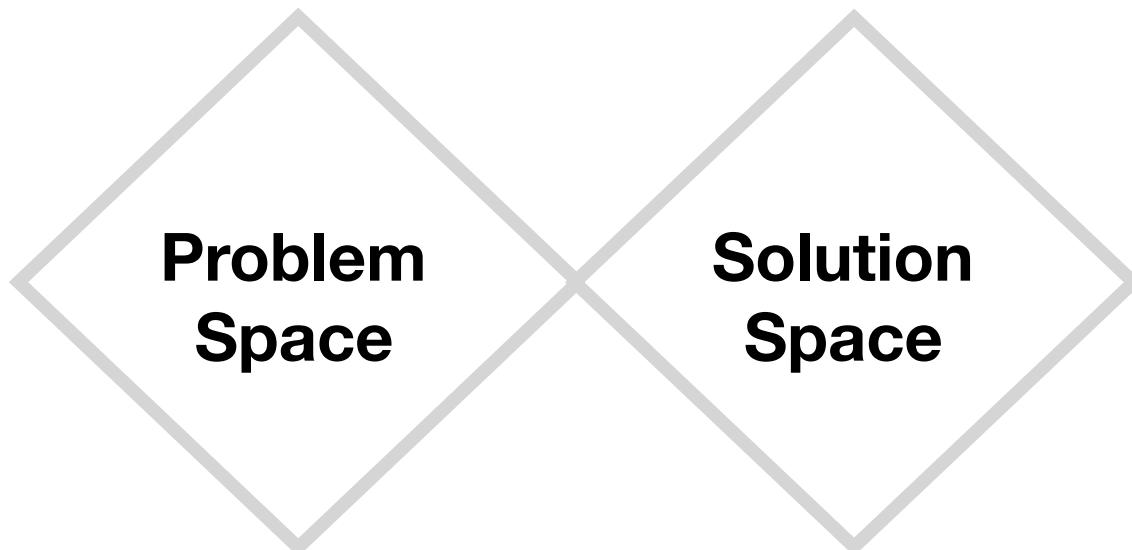
- ✓ Human Centric
- ✓ Iterative
- ✓ Interdisciplinary
- ✓ Diverge and Converge

Double Diamond Model (雙鑽模式)





Double Diamond Model (雙鑽模式)



**Answer a few important questions
throughout the process.**



**Who desire what and why?
(USABILITY AND DESIRABILITY)**



**What is technically and organizationally feasible?
(FEASIBILITY)**

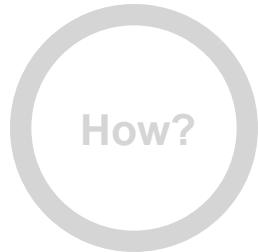


**What can be financially viable?
(VIABILITY)**

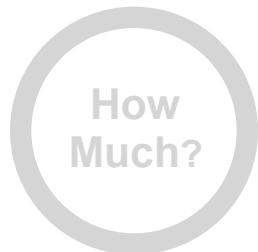
Adapted from IDEO Design Thinking Toolkit



**Who desire what and why?
(USABILITY AND DESIRABILITY)**



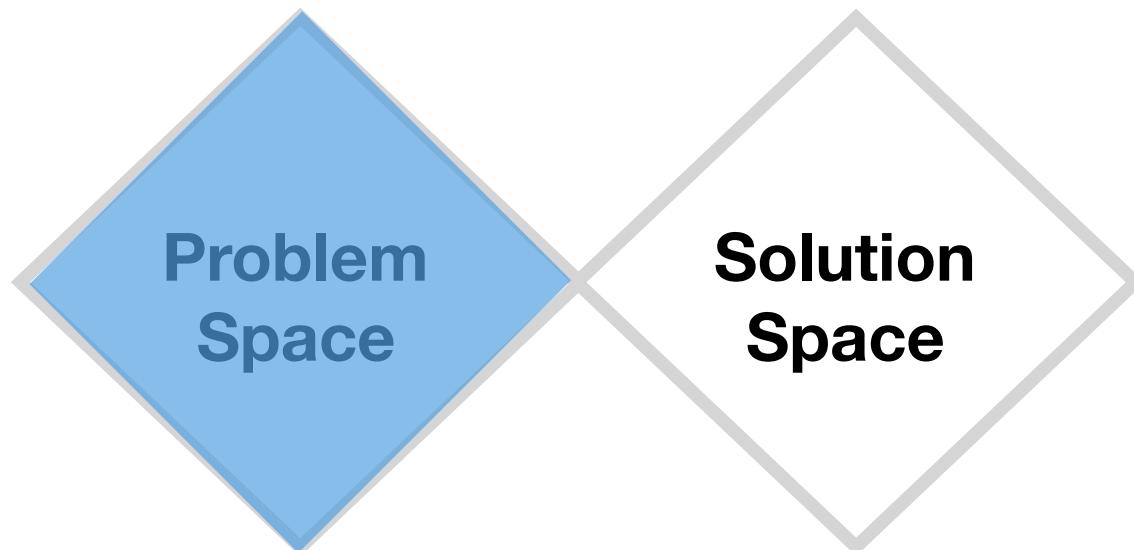
**What is technically and organizationally feasible?
(FEASIBILITY)**



**What can be financially viable?
(VIABILITY)**

Adapted from IDEO Design Thinking Toolkit

Double Diamond Model (雙鑽模式)



Empathize



Source: Flickr ([mliu92](#))

Journey Map



CASE STUDY: REDESIGNING THE Source: IDEO TRAIN INTERIOR





EXPERIENCE OF USING X

EXPERIENCE = JOURNEY = STORY

DESIGN "X"

THE SHOPPING CART EXPERIENCE



BEFORE



DURING



AFTER

USER EXPERIENCE IS A JOURNEY, A STORY

THE JOURNEY AS A STORY

elements (元素)

1. 人 (人物) PERSONA
2. 景 (場景) CONTEXT
3. 物 (物件) ARTEFACTS
4. 用 (用例) TASK TO DO

structure(結構)

1. 起 (背景) BACKGROUND
2. 承 (問題) CHALLENGE
3. 轉 (回應) RESPONSE
4. 合 (結果) IMPACT

資料來源---劇本導引：

資訊時代產品與服務設計新法

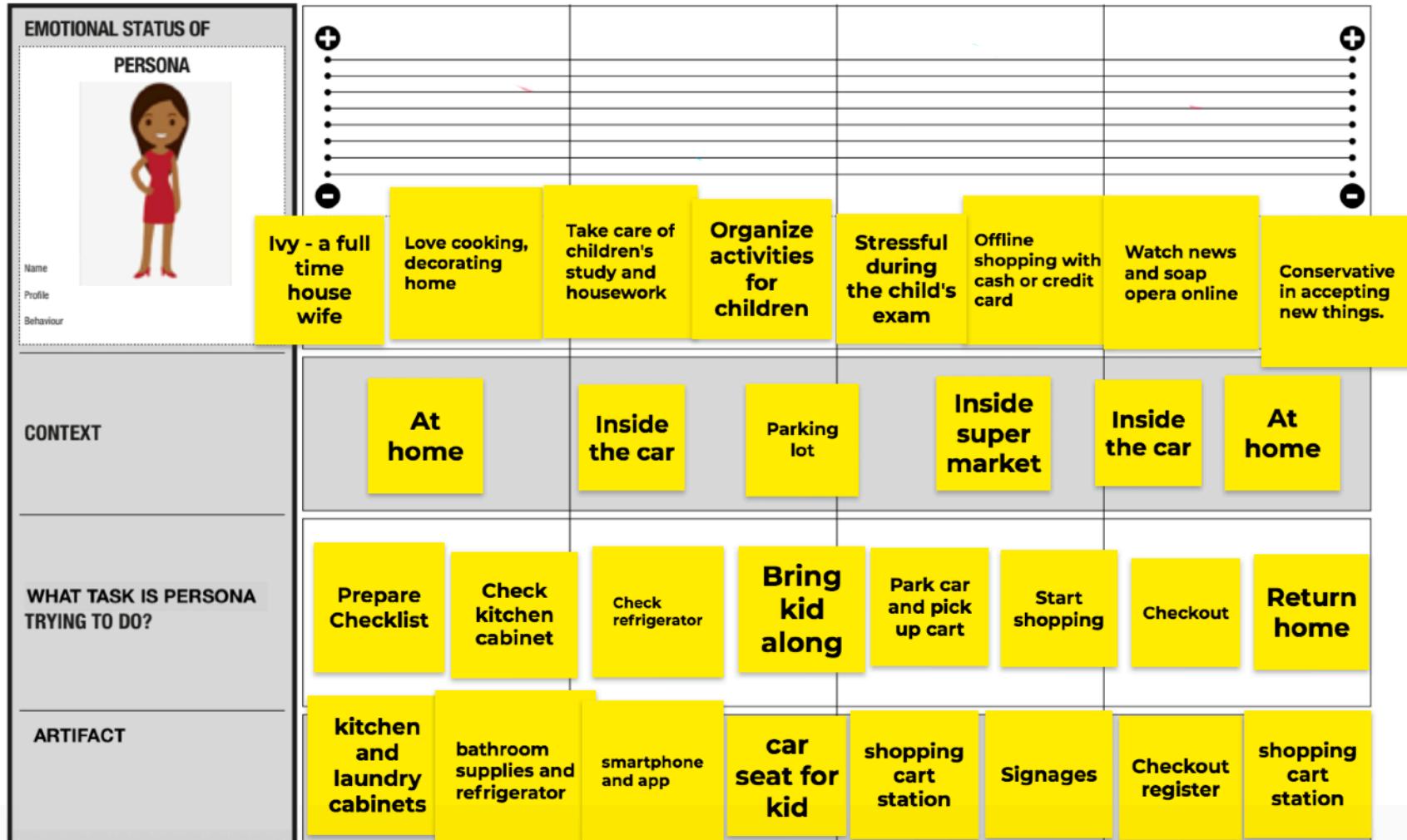
作者余德彰, 林文綺, 王介丘

Onboarding: Setting the stage for the journey

Where to Start and Where to End

CUSTOMER JOURNEY MAPPING

designthinkersacademy



Define

Throughout the journey, what problems did you discover?

Please list them.

Hard to find shopping items.

Take a long time to checkout.

Take care of kids while shopping.

Shopping carts get stolen.

Throughout the journey, what problems did you discover?

Please list them.

Hard to find shopping items.

Take a long time to checkout.

Take care of kids while shopping.

Shopping carts get stolen.

Don't really know what is lacking.

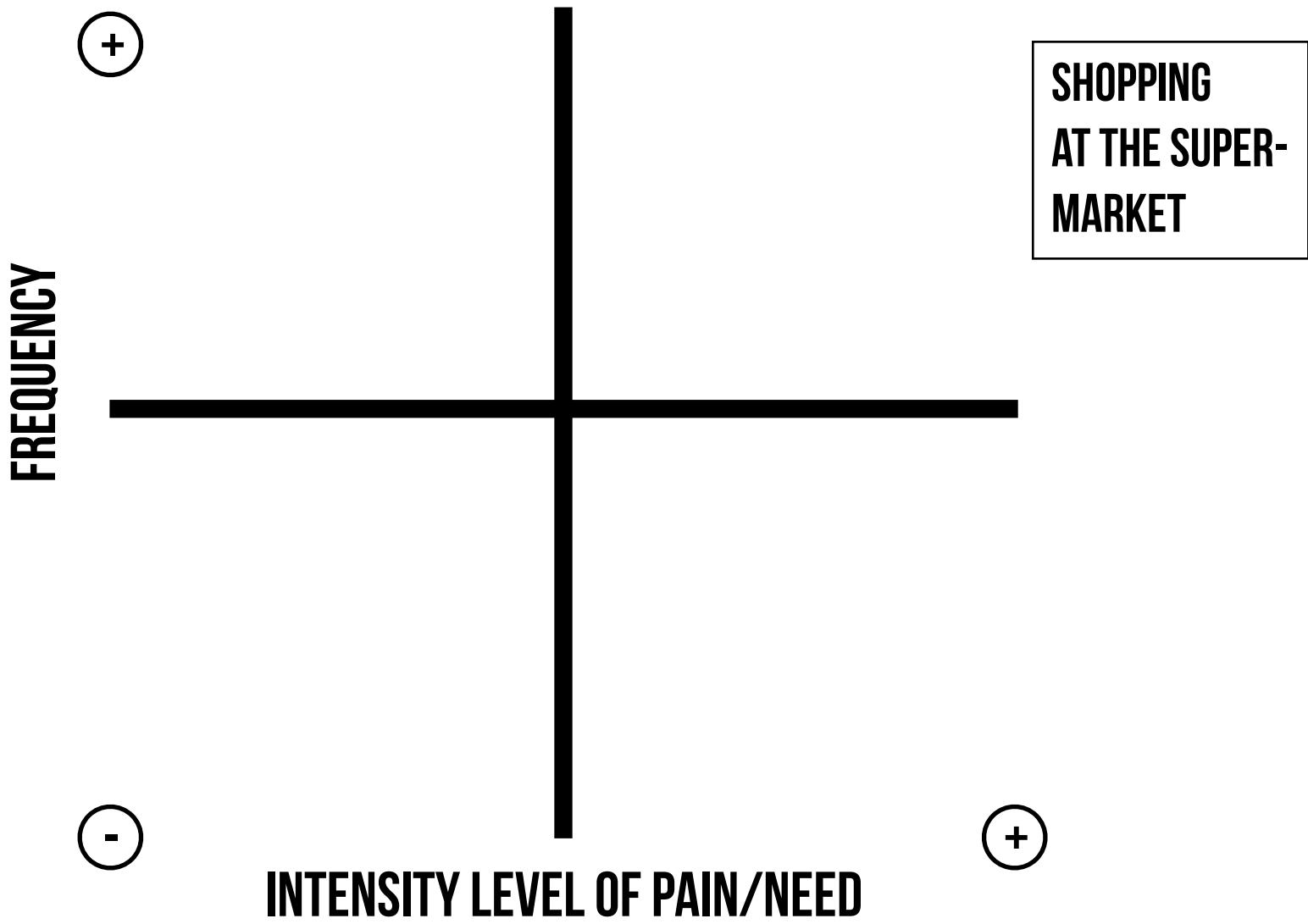
Take time to check inventory.

Too many things to carry.

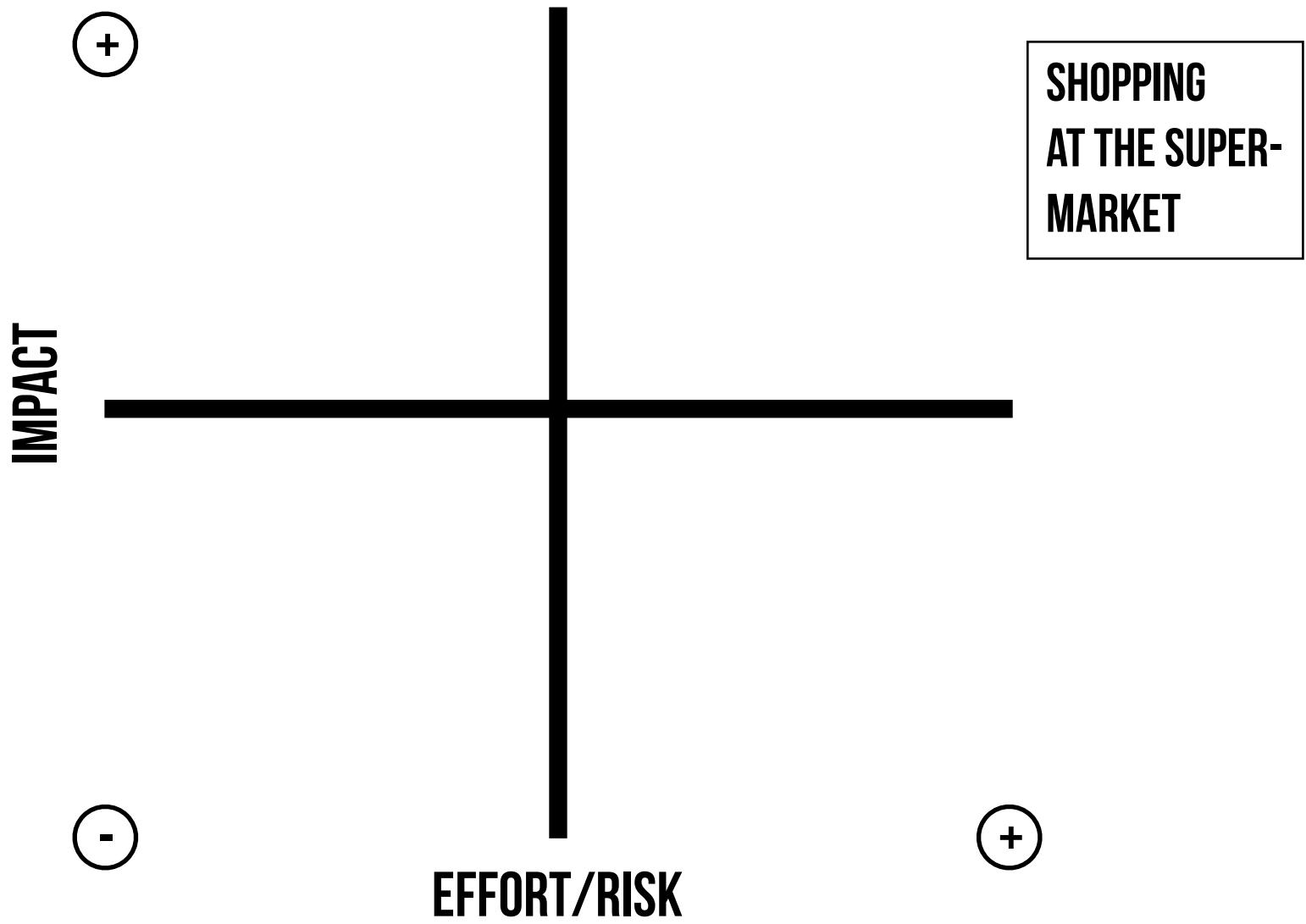
Forget to buy some of the items.

Painpoint Diagram (2 x 2 Matrix)

**SHOPPING
AT THE SUPER-
MARKET**



Impact Diagram (2 x 2 Matrix)



How might we?

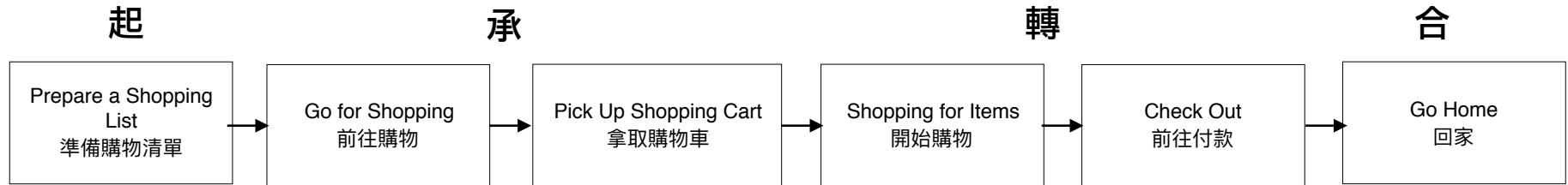
Problem Statement

How might we make _____ (**who**) address
the problem of _____
_____ (**what**) to achieve the goal of
_____ (**why**)?

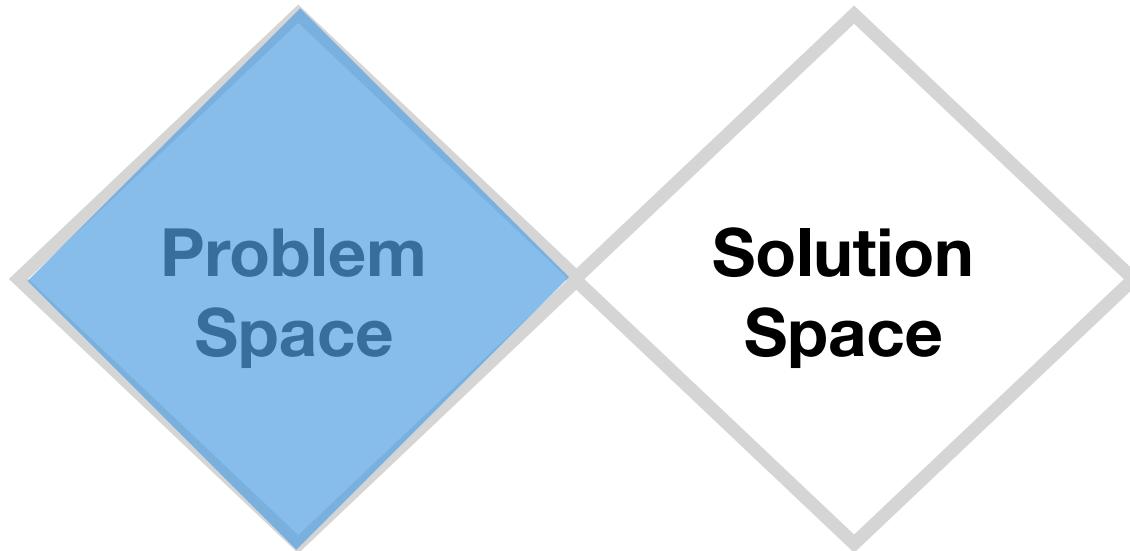
Can we redefine the problem?

From Journey Map to Story Map

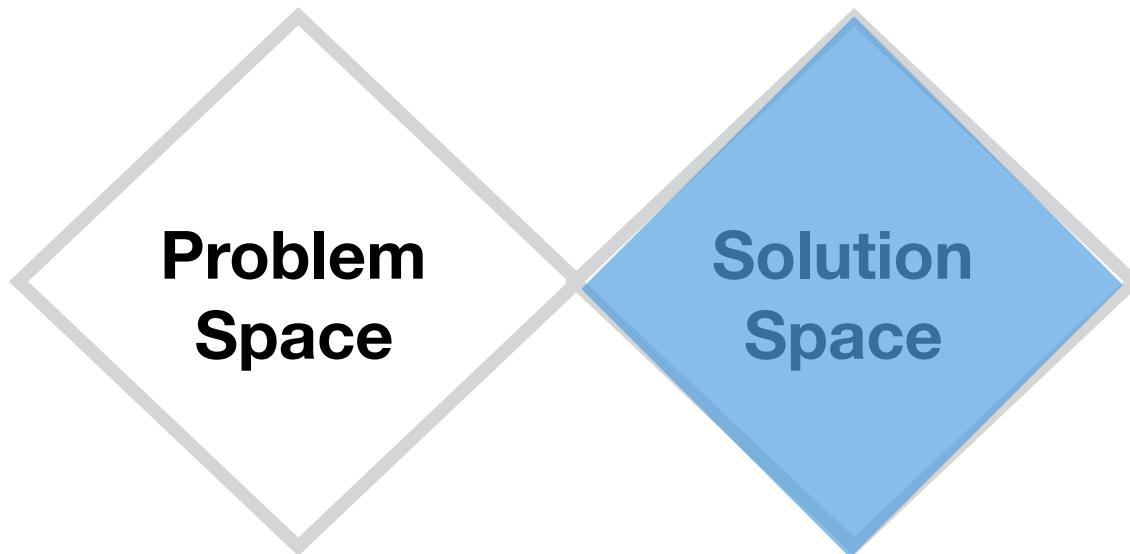
Story Map of a House Wife Shopping at a Supermarket
家庭主婦超市購物故事圖



Double Diamond Model (雙鑽模式)



Double Diamond Model (雙鑽模式)



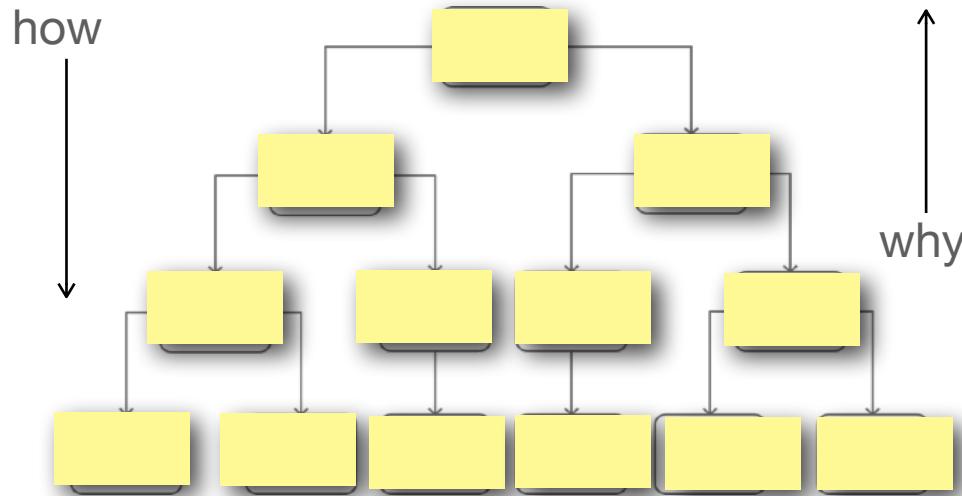
Ideate

Why/How Laddering 為何如何層級圖

Why How Laddering 為何如何層級圖

參考資料來源: d.school

我們如何能.. HOW MIGHT WE...

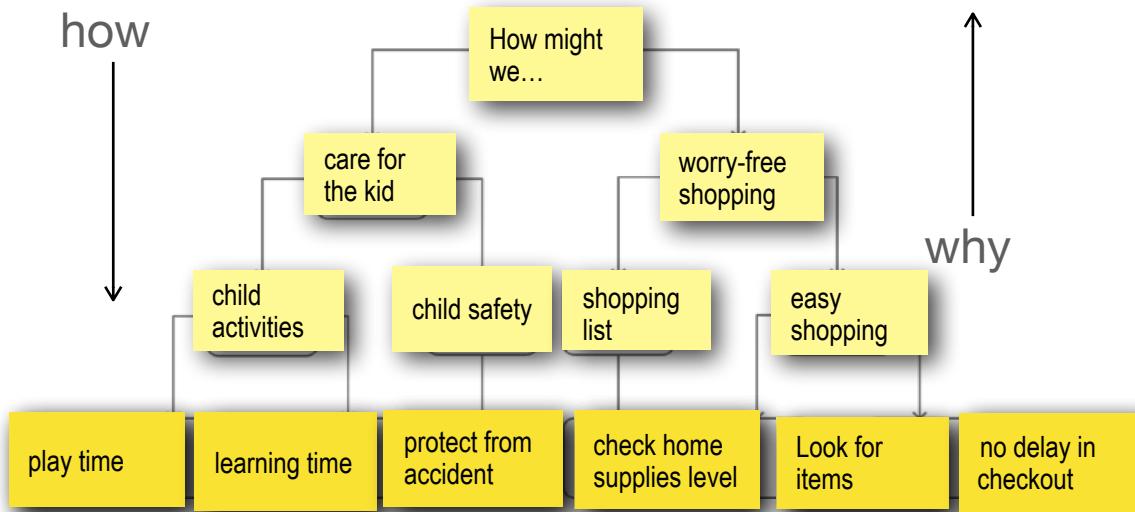


Why How Laddering 為何如何層級圖

參考資料來源: d.school

我們如何能..

HOW MIGHT WE...



How might we make a full time mom (who) address the problem of caring for her kid's safety and efficiently finishing up her shopping (what) to achieve the goal of making good use of her time to keep the family and herself happy (why)?



**Who desire what and why?
(USABILITY AND DESIRABILITY)**



**What is technically and organizationally feasible?
(FEASIBILITY)**



**What can be financially viable?
(VIABILITY)**

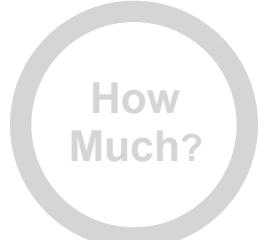
Adapted from IDEO Design Thinking Toolkit



Who desire what and why?
(USABILITY AND DESIRABILITY)



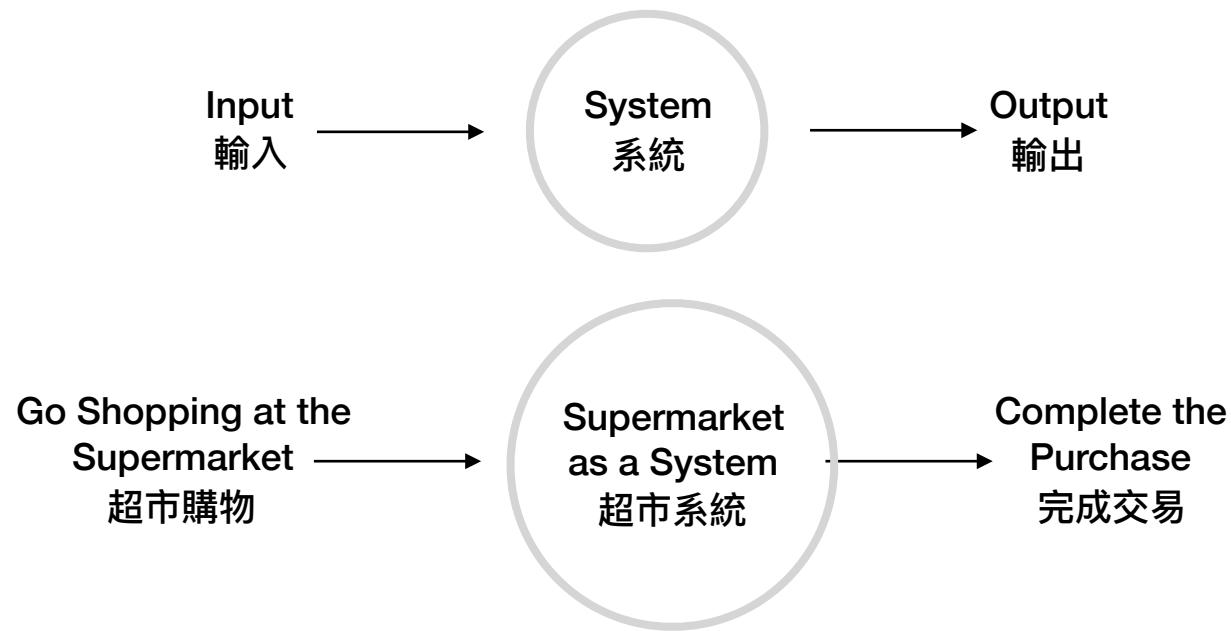
**What is technically and organizationally feasible?
(FEASIBILITY)**

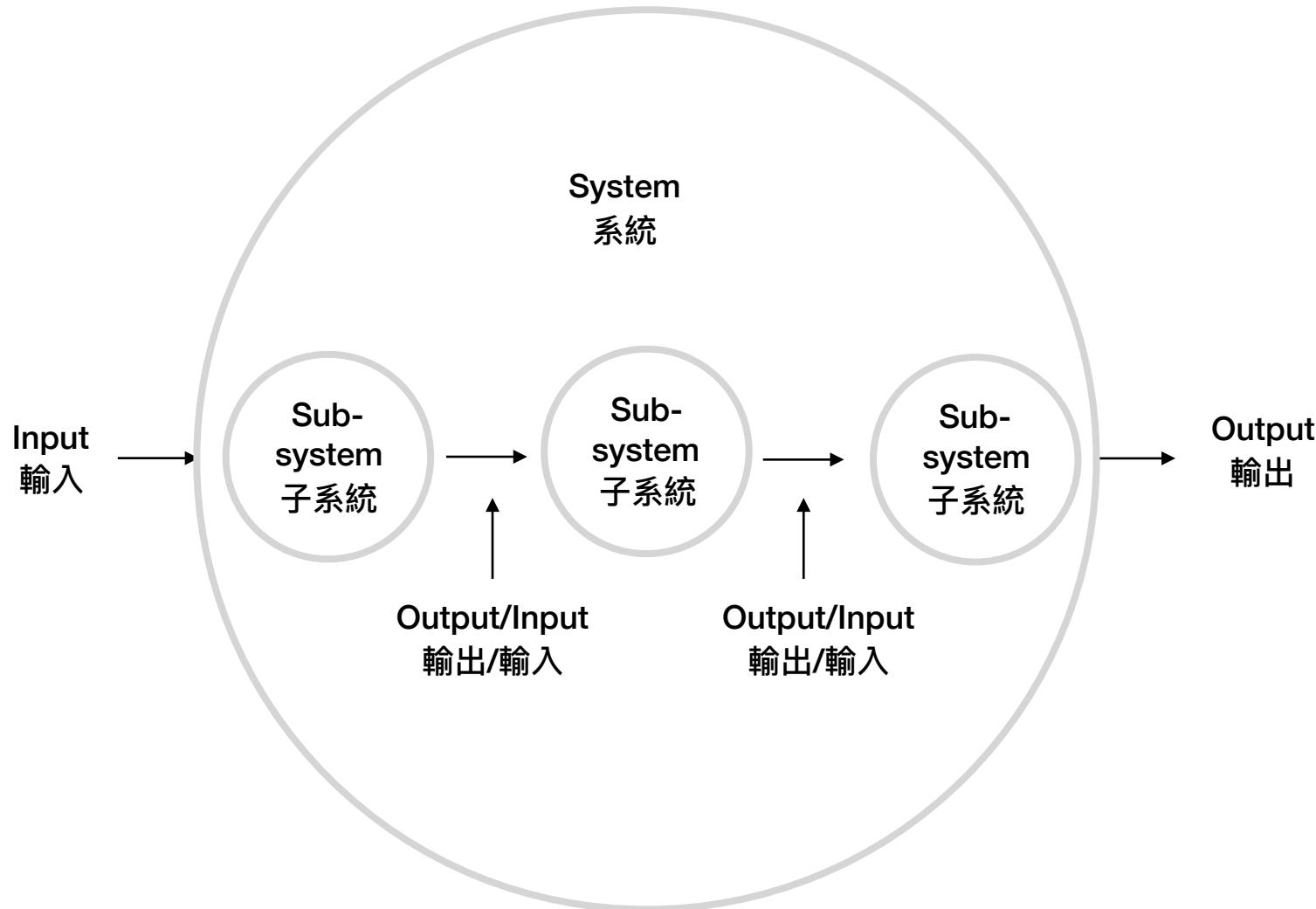


What can be financially viable?
(VIABILITY)

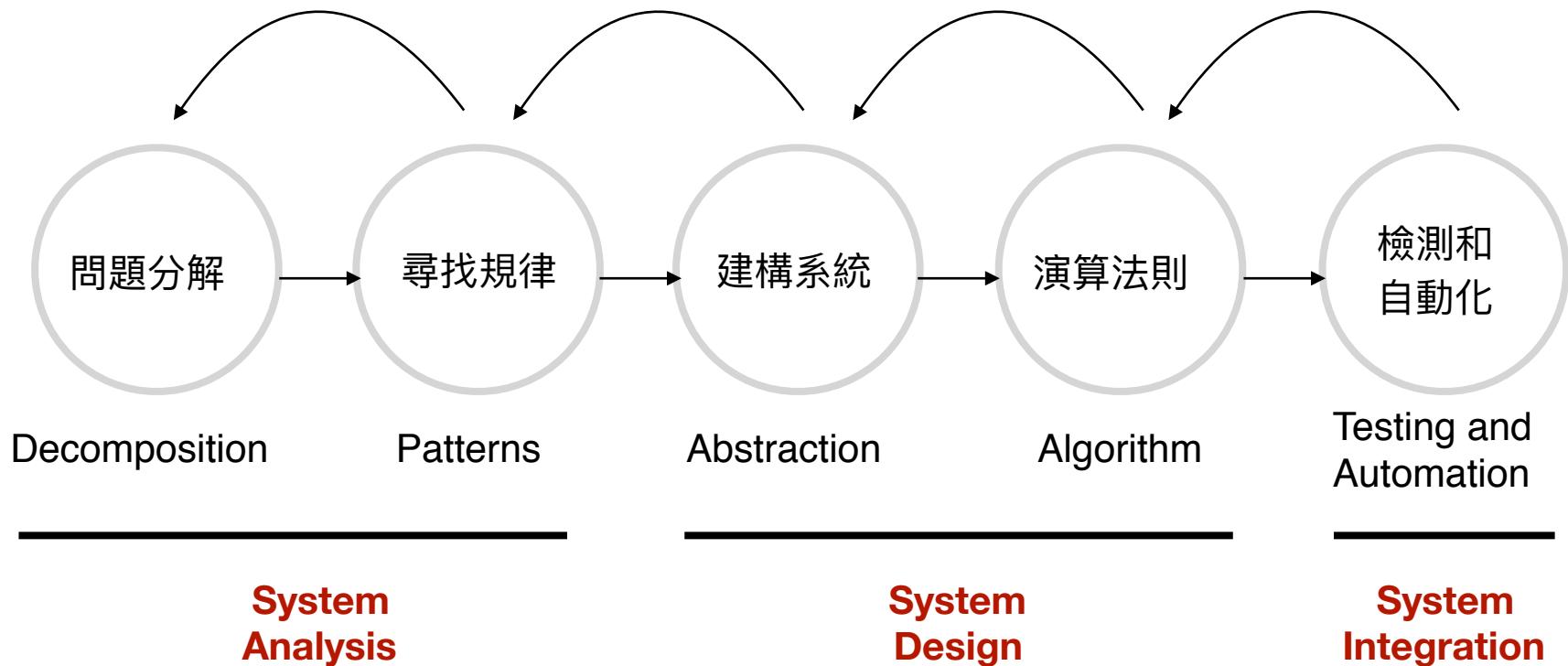
Adapted from IDEO Design
Thinking Toolkit

Computational Thinking dissects and
represents problems in a way that can be
solved by an automated system.





5 Major Components of Computational Thinking



Decomposition

Pattern

Abstraction

Algorithm

Automation &
Testing

分解 (Decomposition)

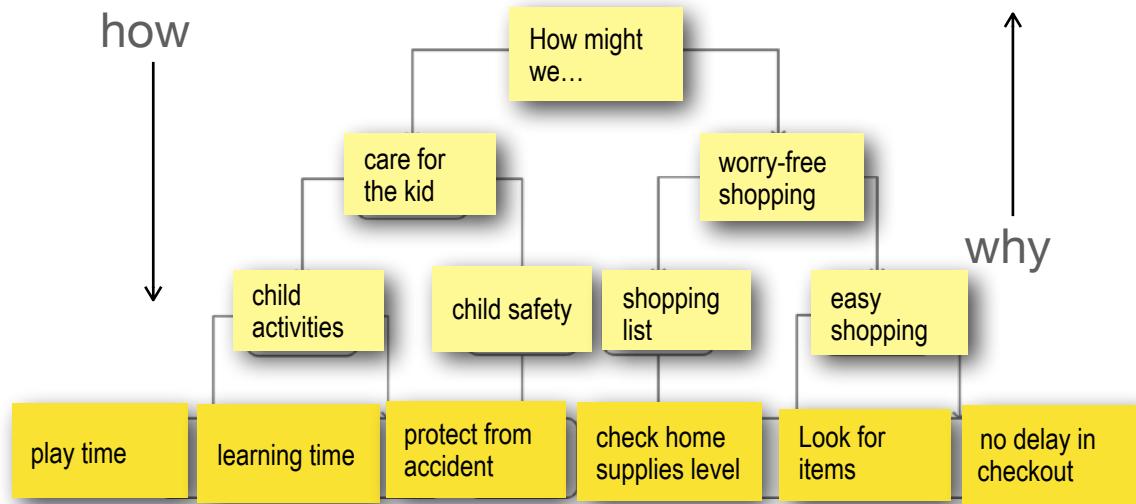
Break a problem
down into
smaller parts.

Why How Laddering 為何如何層級圖

參考資料來源: d.school

我們如何能..

HOW MIGHT WE...



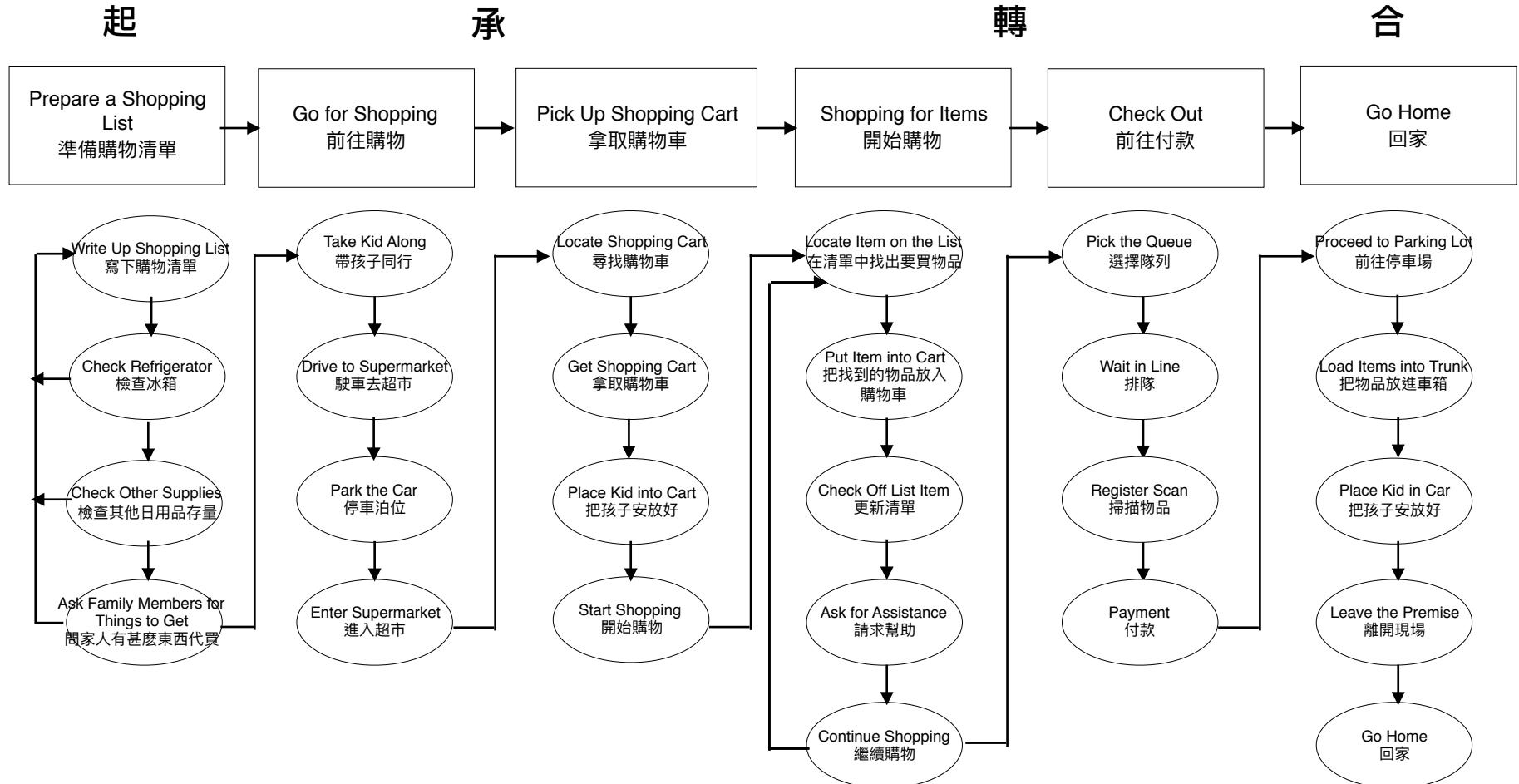
How might we make a full time mom (who) address the problem of caring for her kid's safety and efficiently finishing up her shopping (what) to achieve the goal of making good use of her time to keep the family and herself happy (why)?

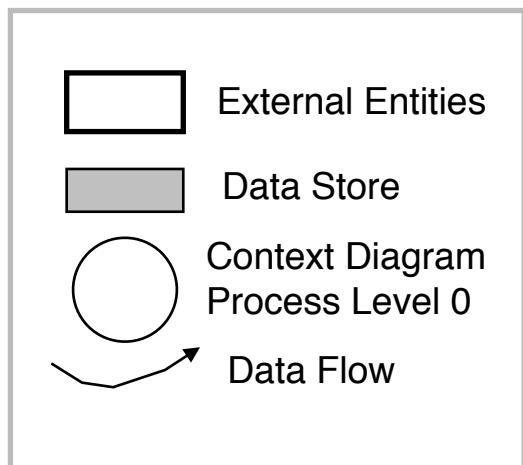
尋找規律 (Patterns)

Discover similarities
between things.

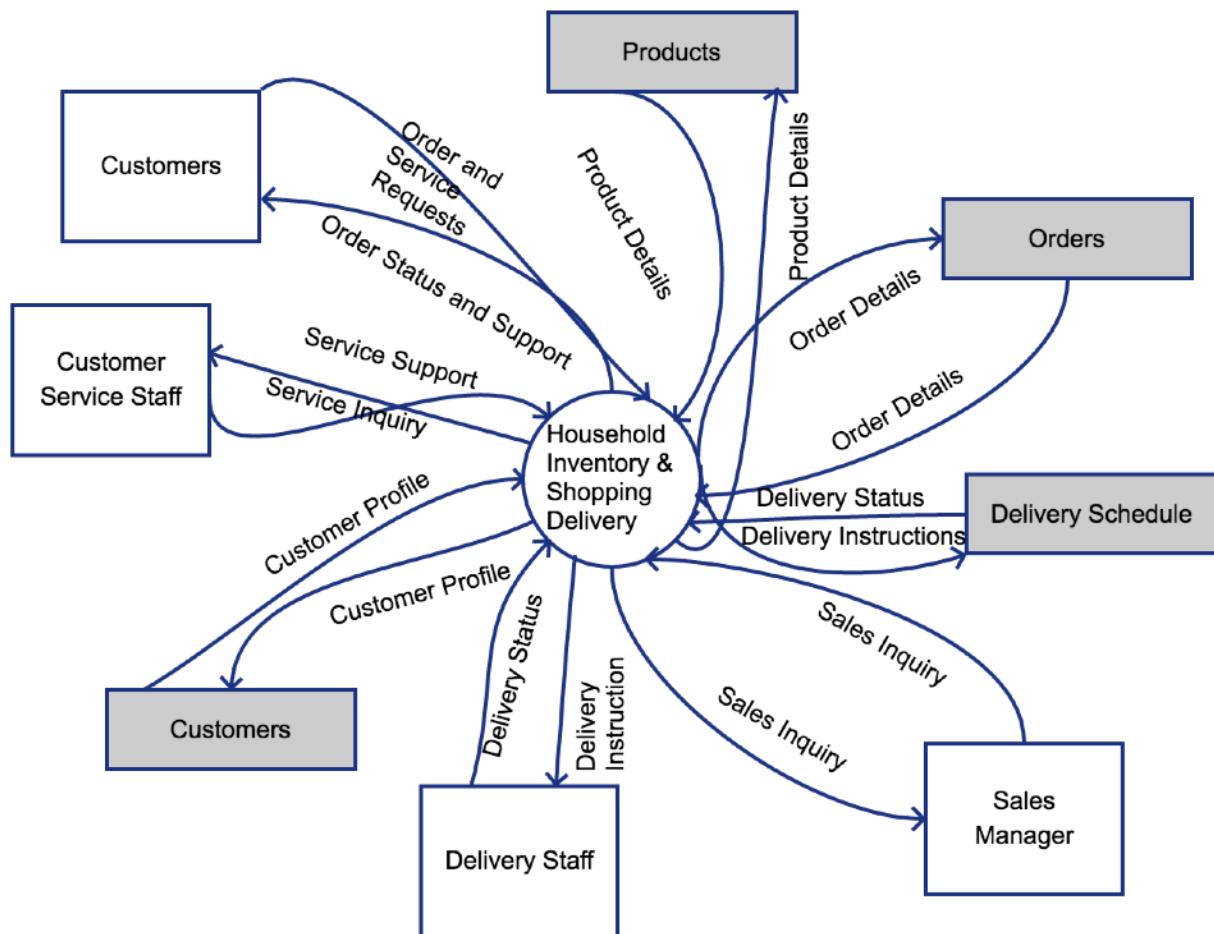
Story Map of a House Wife Shopping at a Supermarket

家庭主婦超市購物故事圖





Data Flow Diagram

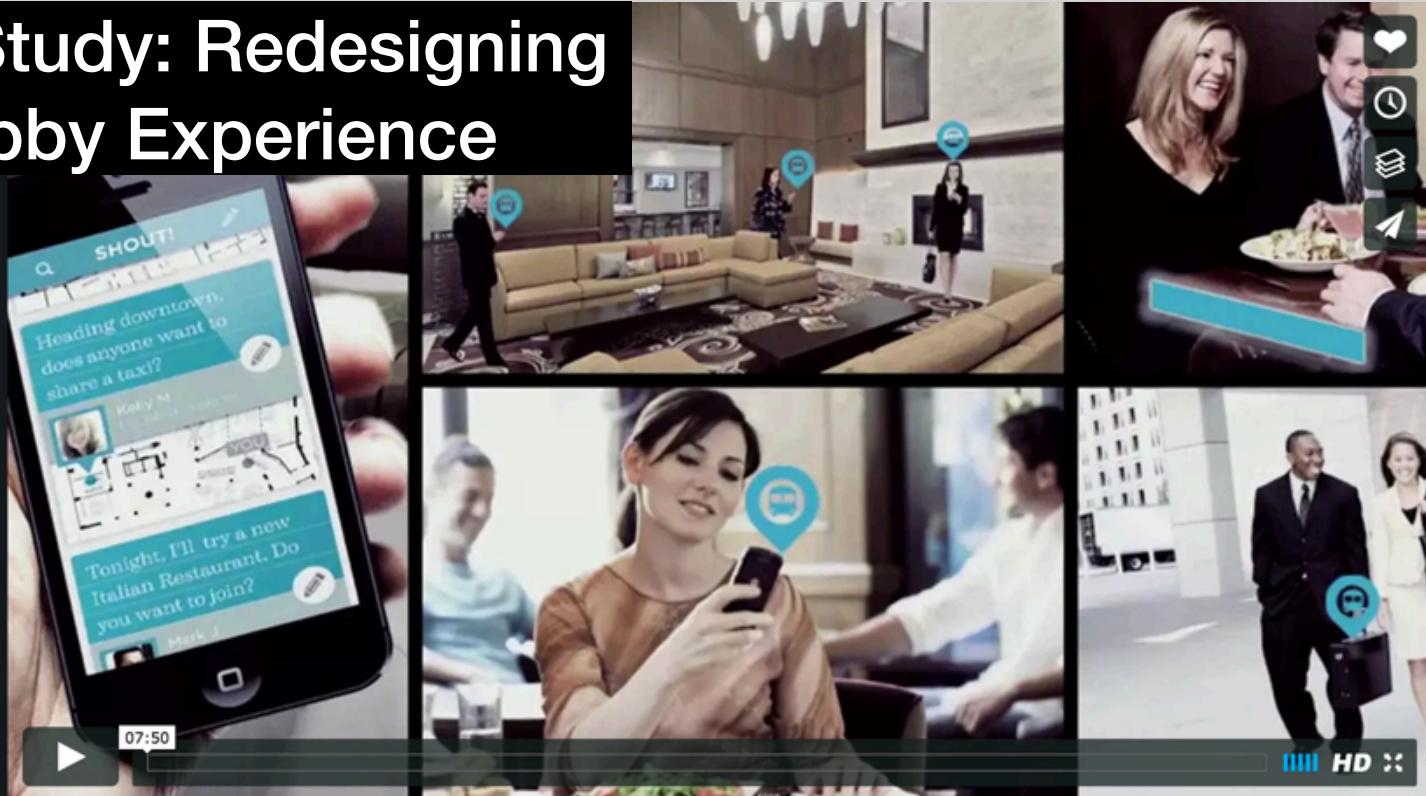


Can this process be further broken down?



From Journey Map to Data Flow Diagram

Case Study: Redesigning the Lobby Experience



Exploring the Hotel Experience of the Future with Marriott Hotels

Source: MIT Mobile Experience Lab

<https://design.mit.edu/projects/the-future-hotel-experience>

FIELD STUDY OBSERVATION AT THE HOTEL

We noticed a desire for customer autonomy, contextualized experiences, and public privacy.



Source: MIT Mobile Experience Lab



Source: MIT Mobile Experience Lab

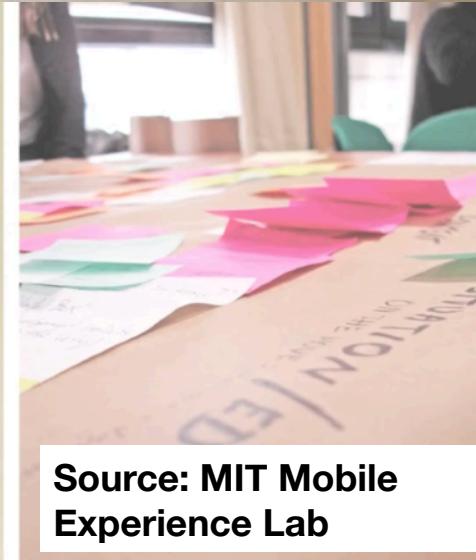
avid social explorer

Gen Y travelers seeking personalized yet serendipitous experiences, good company to share them with, and the ability to capture and celebrate them.



bored lobbygoer in transition

Anyone using the lobby as a meeting place or gathering point, looking to pass the time and avoid awkwardness.



Source: MIT Mobile Experience Lab

How can Marriott regain the market from Airbnb?

PROBLEM STATEMENT:

How might we make _____ (who) achieve
_____ (what) so that
_____ (why)?

PROBLEM STATEMENT:

How might we make marriott guests
feel like **nodes within a network**
while encouraging
interactions in the lobby space?

**Source: MIT Mobile
Experience Lab**

Future Journey Mapping

HOME



Joins loyalty program, creates a profile & installs phone app.

LOBBY

ROOM

BOOKING

CHECK-IN

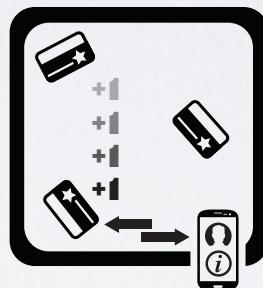
MEETUP

RETURN

USER JOURNEY MAP

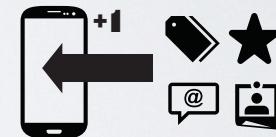


Given physical loyalty card on check-in — stores profile info, points & doubles as room key.



(Can be done in lobby or room)
Set availability via orientation of card. (Lobby only) Loyalty points awarded to cards at the same table. Table lights up to show activity, interests shown on table & lobby display map. Profiles added to app network.

INTERACTIONS OUTSIDE HOTEL



Prompted by app to tag places visited, ratings & social media for points — added to in-app database of recommendations.

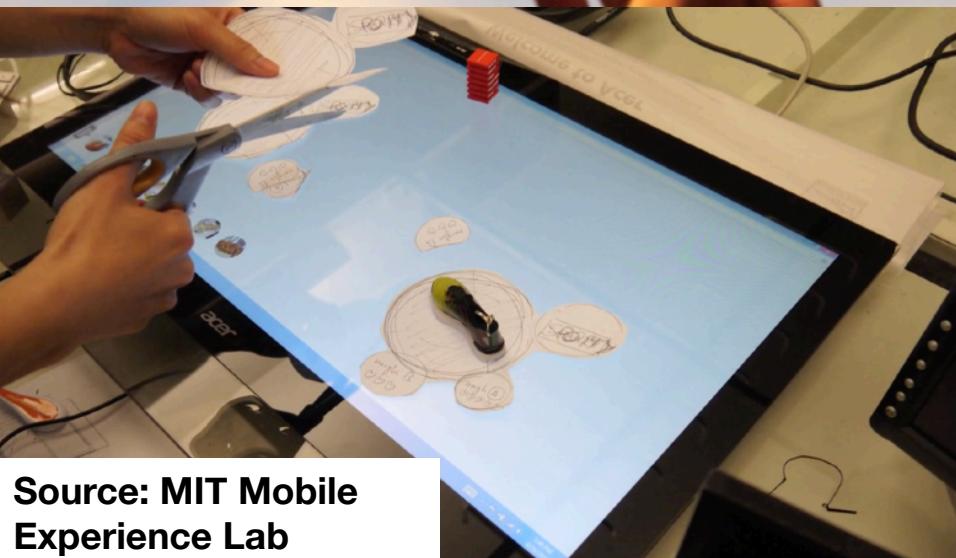
Source: MIT Mobile Experience Lab



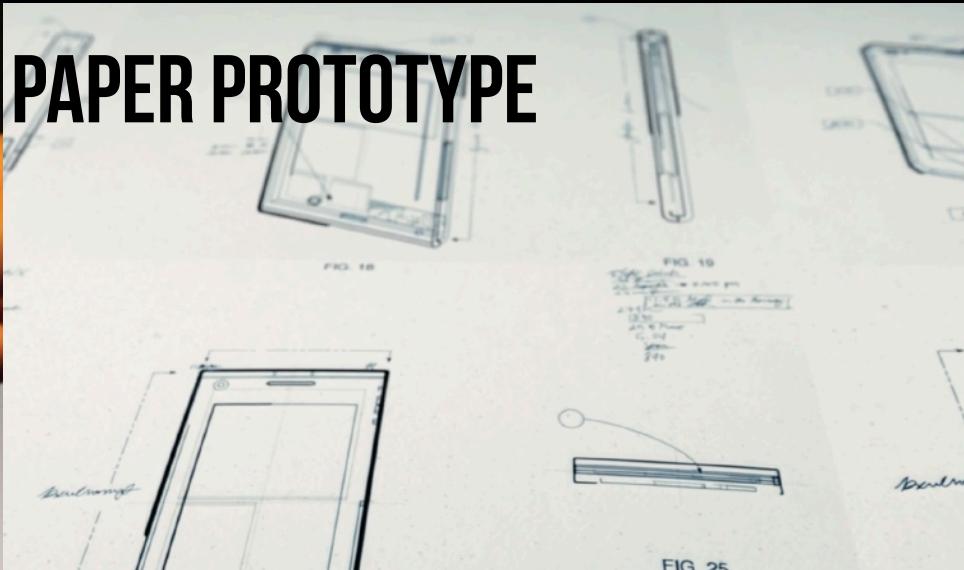
**How would the team find out if the new
installation will be adopted?**

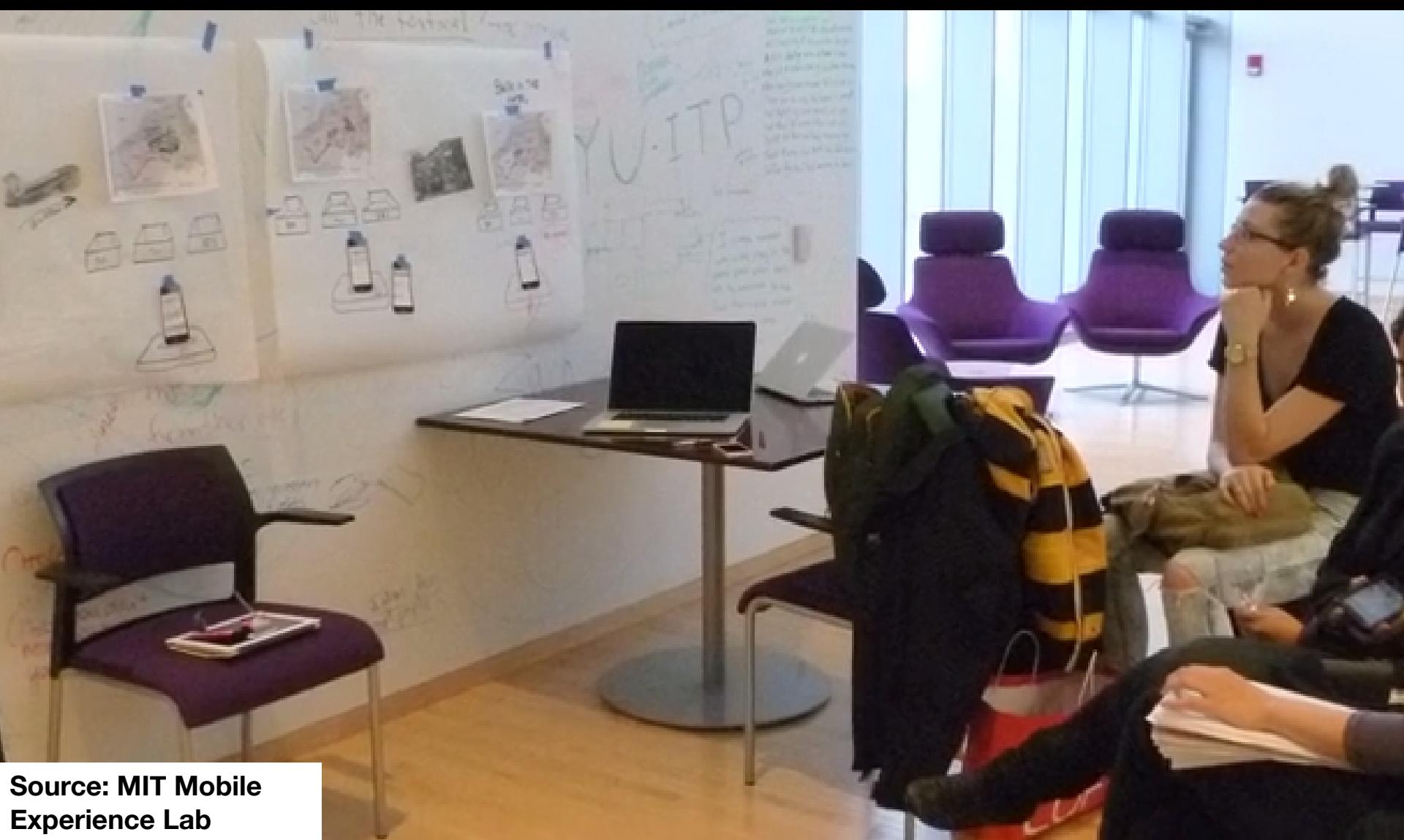
SKETCH AND PAPER PROTOTYPE

The coaster.



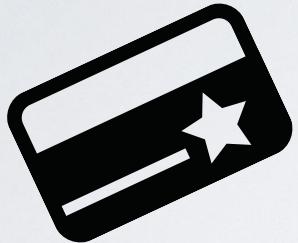
Source: MIT Mobile Experience Lab





Source: MIT Mobile
Experience Lab

THE CARD



THE TABLE



THE APP



room key
point counter
status symbol

the social hub

shared memory
social networks
recommendations

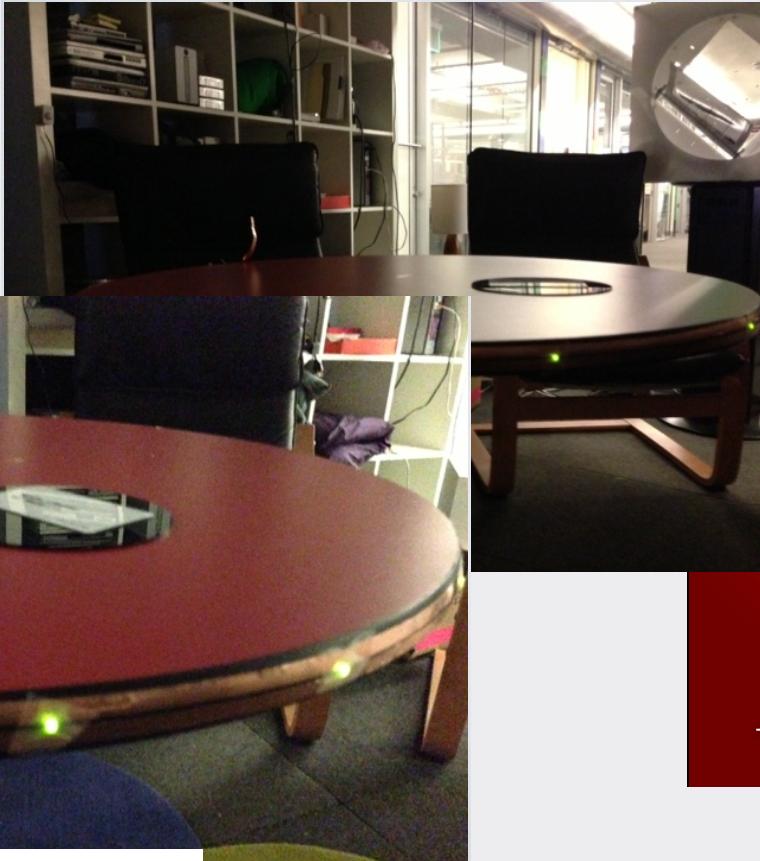
LOYALTY

INTERACTION

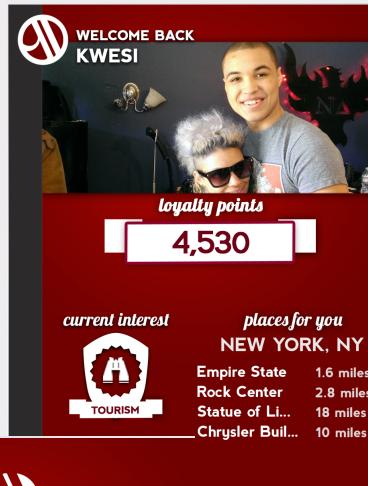
DATA

Source: MIT Mobile
Experience Lab

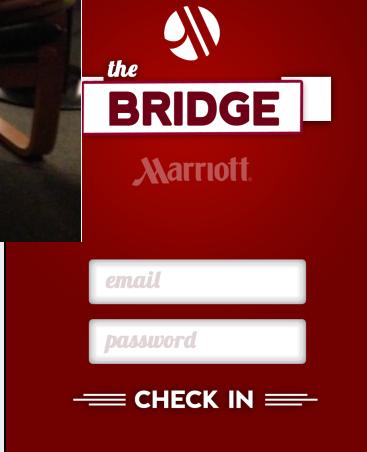
TABLE



Source: MIT Mobile Experience Lab



APP

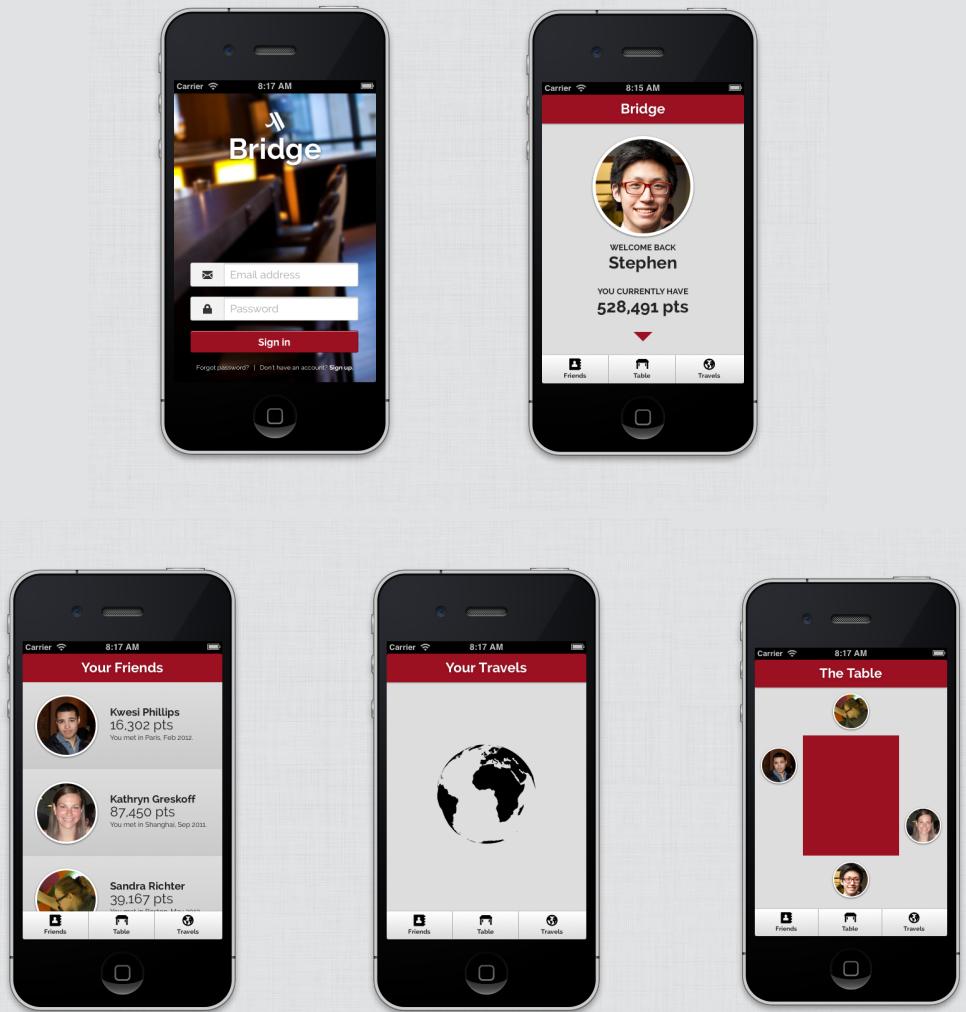


CARD



MOCK-UP DIGITAL EXPERIENCE

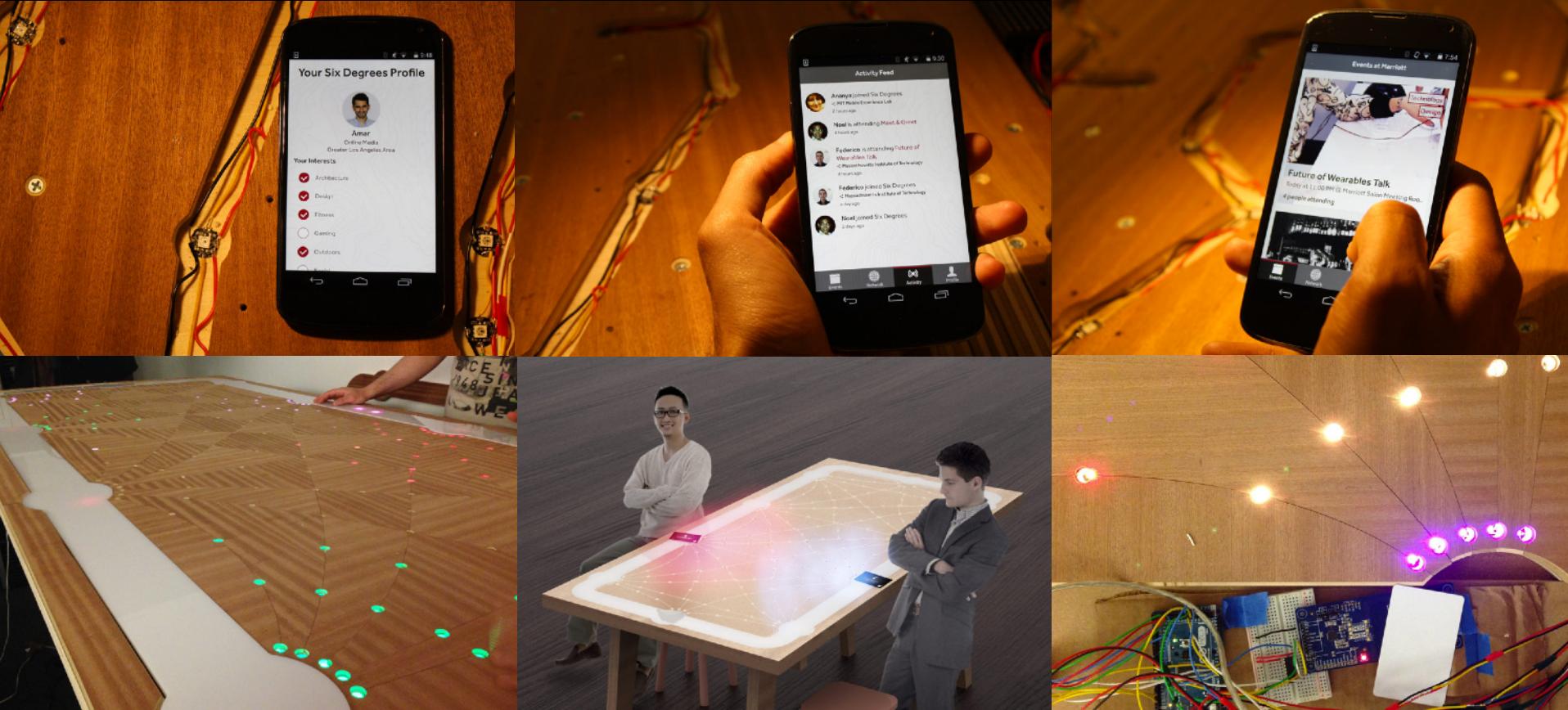
Source: MIT Mobile Experience Lab





ROLE PLAY PHYSICAL EXPERIENCE

Source: MIT Mobile Experience Lab





MARRIOTT **SIX DEGREES**

A social network for the connected lobby



<https://design.mit.edu/projects/marriott-six-degrees-a-social-platform-for-the-hotel-lobby>

Six Degrees is a prototype social network designed for the hotel lobby by the [**MIT Mobile Experience Lab**](#) in collaboration with [**Marriott Hotels**](#).

Through Six Degrees, guests can discover how they are connected to one another, and can socialize with one another in events planned by Marriott. The platform is designed to highlight the connections that already exist between guests, while encouraging new connections to form.

From Design Thinking to Computational Thinking

**Changing from the mental model of a
user/customer to the mental model of a
producer/operator**

- ✓ From observing user experience to gathering data and building system
- ✓ From user empathy and insight to data analytics and cost-benefit analysis

From Journey Map to Data Flow Diagram

HOME
LOBBY
ROOM



Booking

USER JOURNEY MAP

profile, activity, location, points



Check-in

Give check-in point



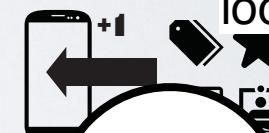
Meetup

Profile, activity, location, points
of users at the same table. Table lights up to show activity, interests shown on table & lobby display map. Profiles added to app network.

INTERIOR
OUTSIDE

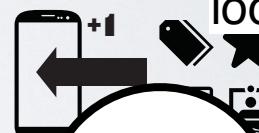


Database



Review & Rating

profile, activity, location, points



RETURN

BOOKING

CHECK-IN

MEETUP

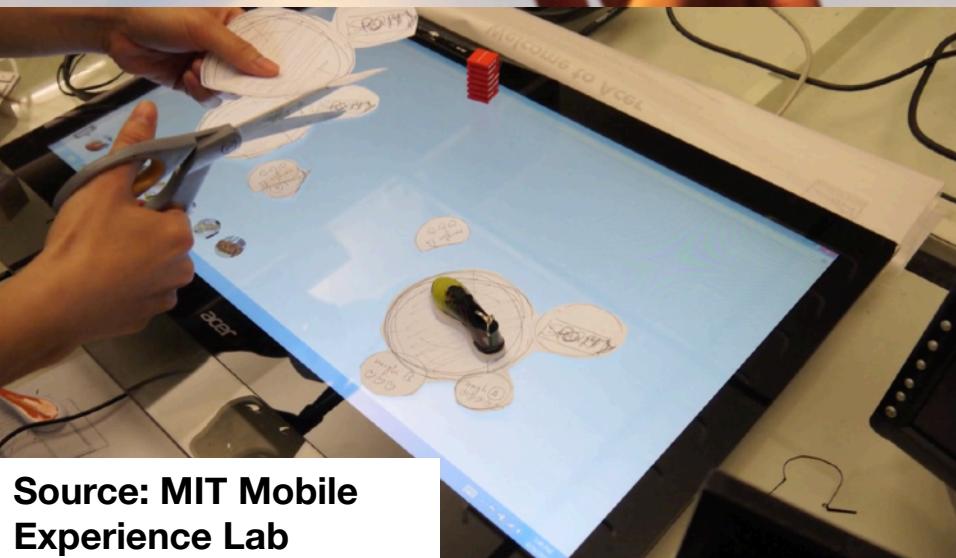
Source: MIT Mobile Experience Lab

Integration of Design Thinking and Computational Thinking

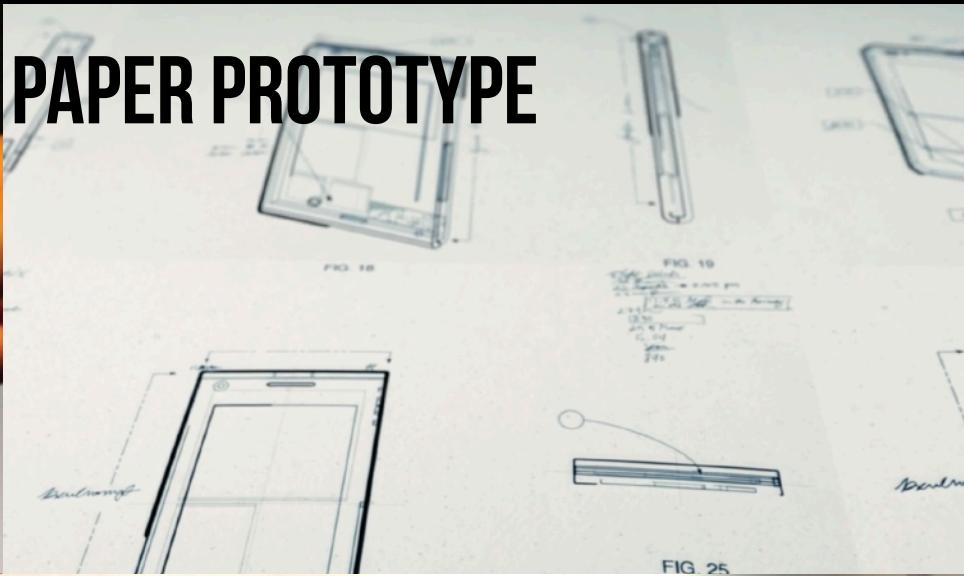
設計思維 Design Thinking	運算思維 Computational Thinking	內容重點 Main Points
同理心 Empathy	分解 Decomposition	Collect stories from stakeholders for framing and decomposing the problem into sub-problems.
界定問題 Definition	模式 Patterns	Define the problem and functional and content requirements for collecting data to support ongoing system development and future operations.
創意發想 Ideation	抽象化 Abstraction	Build hypothesis for explaining or fostering the outcome and assemble the required data and processes for validation and evaluation
開展原型 Prototyping	算法 Algorithm	Validate the hypothesis through physical prototypes and software models.
重複測試 Testing	自動化 Automation	Evaluate findings through unit, integrated and user acceptance testing and automated system operations

Prototype & Test

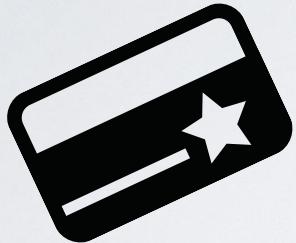
SKETCH AND PAPER PROTOTYPE



Source: MIT Mobile Experience Lab



THE CARD



THE TABLE



THE APP



room key
point counter
status symbol

the social hub

shared memory
social networks
recommendations

LOYALTY

INTERACTION

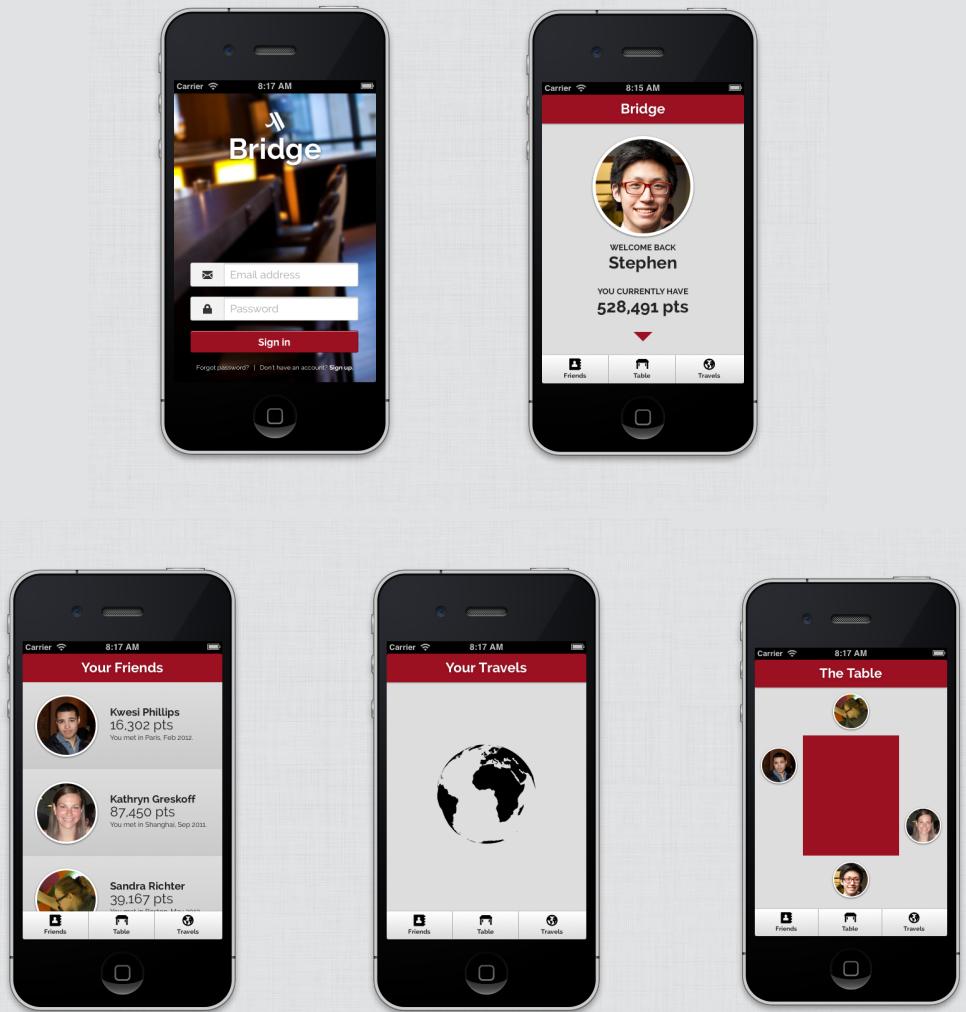
DATA

Source: MIT Mobile
Experience Lab

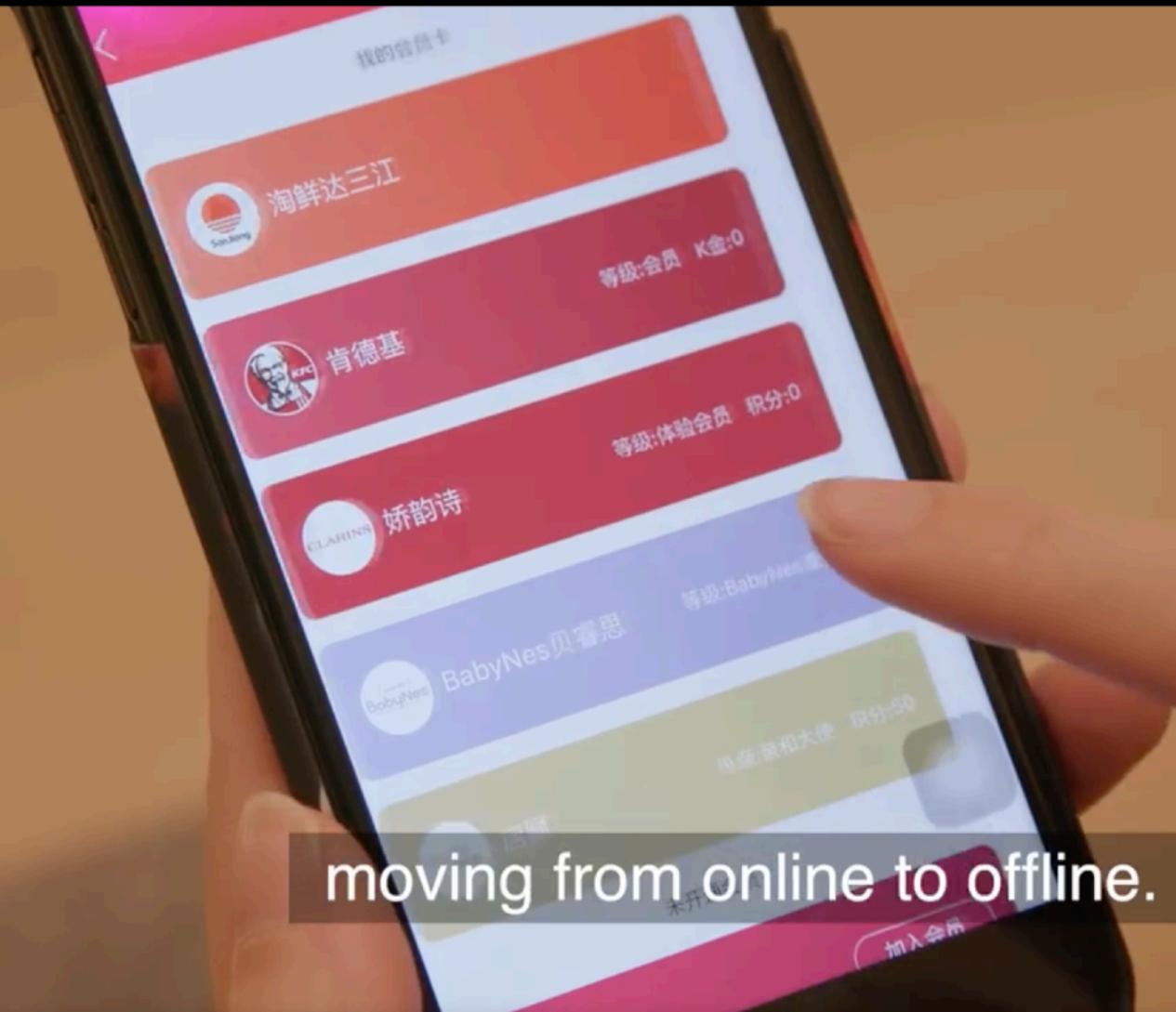


MOCK-UP DIGITAL EXPERIENCE

Source: MIT Mobile Experience Lab



Assumptions to be Tested





But also thinking more about logistics and data technology



online ordering for home delivery

A photograph showing a delivery person from behind, wearing a yellow cap and a yellow vest over a dark jacket. They are pushing a grey metal shopping cart filled with grocery bags towards the entrance of a building. The building has brown and black panels. Some greenery is visible in the foreground.

can get their groceries in as fast as 30 minutes.

Reinventing Marriott's Lobby Experience

**From journey mapping to data flow diagramming:
Turn story into system, UX into data.**

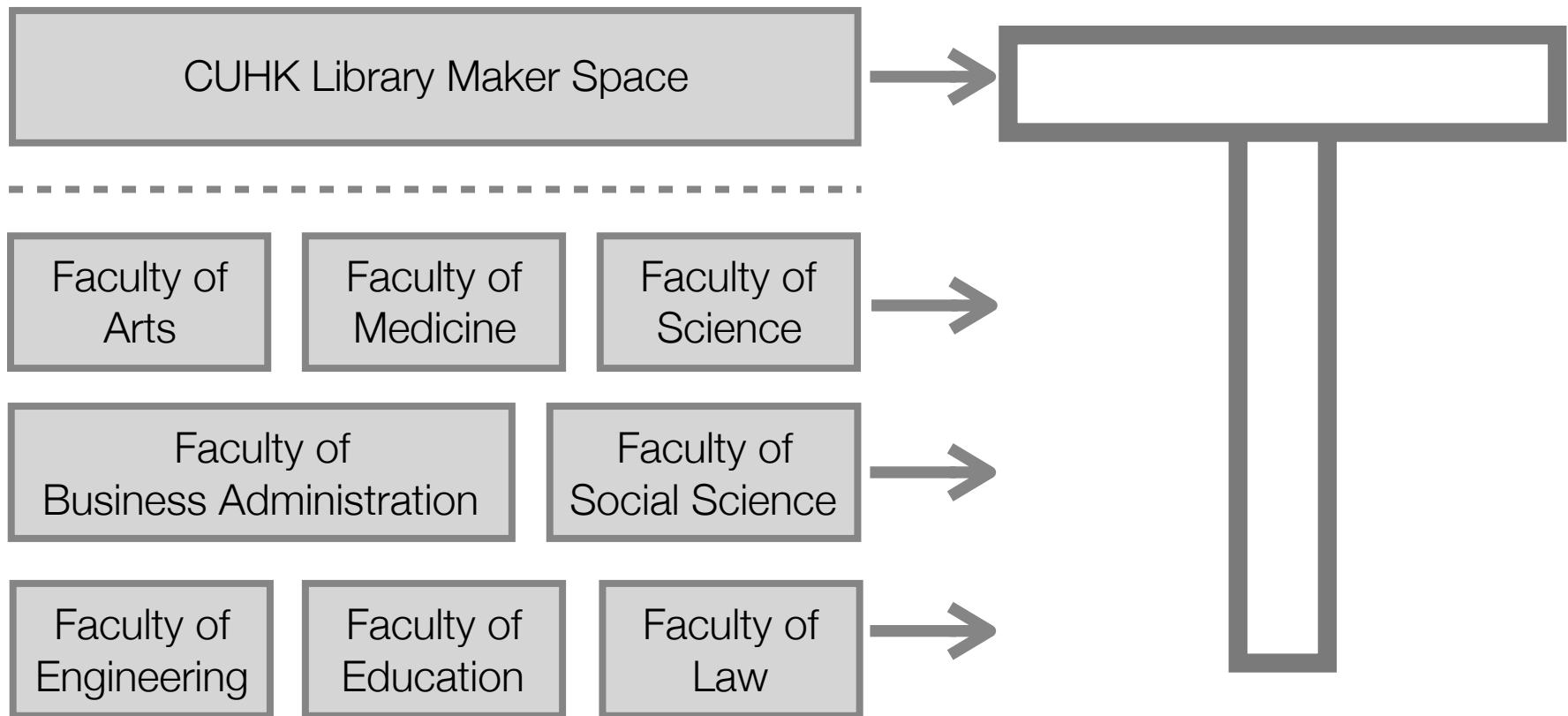
Obviously, thinking is not enough. We need “doing” to make things happen. That’s why we need to nurture more makers who can think and do to foster innovation and digital transformation.

CU Maker Space

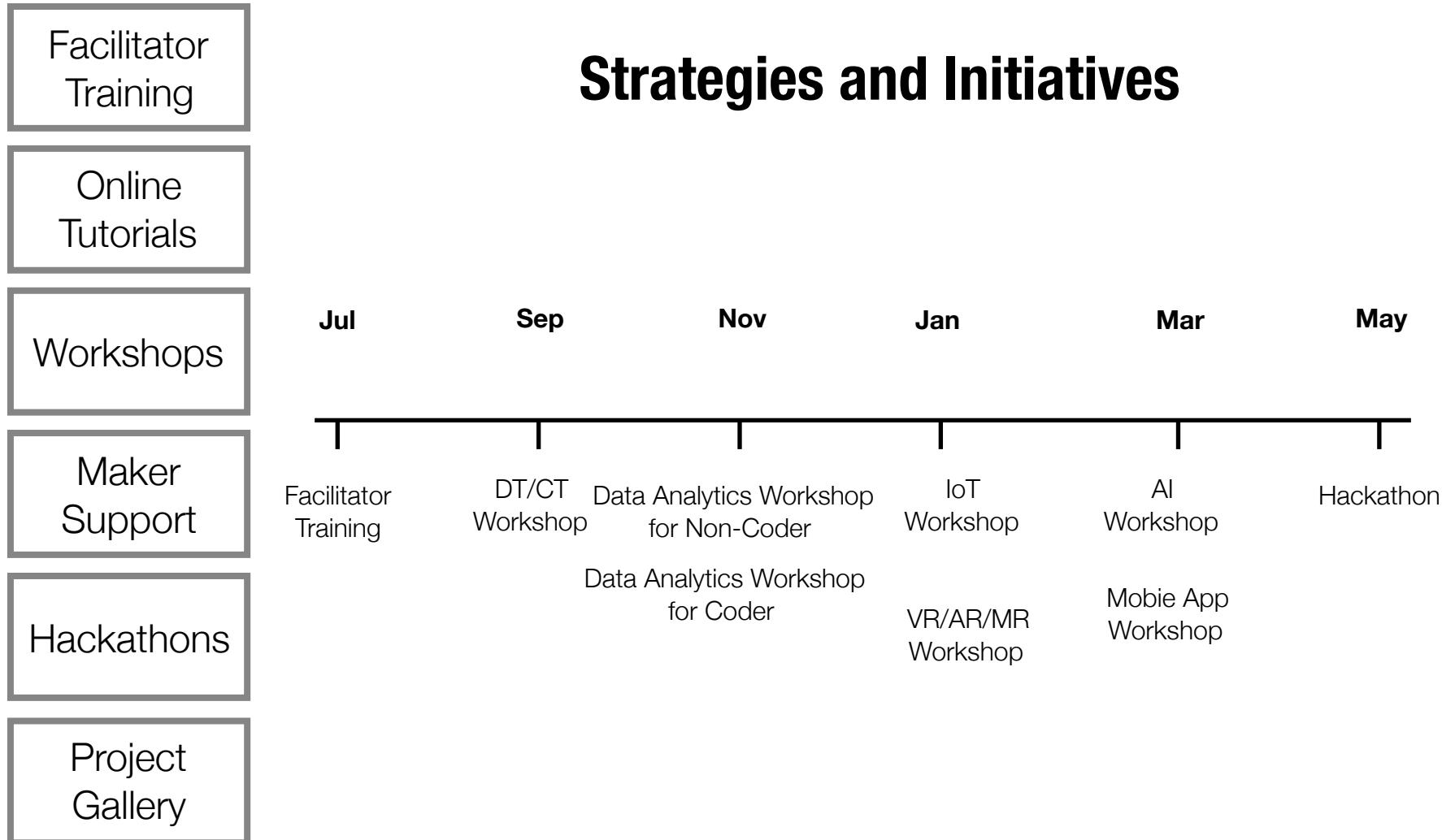
1. Objectives
2. Strategies
3. Initiatives



Objectives



Strategies and Initiatives



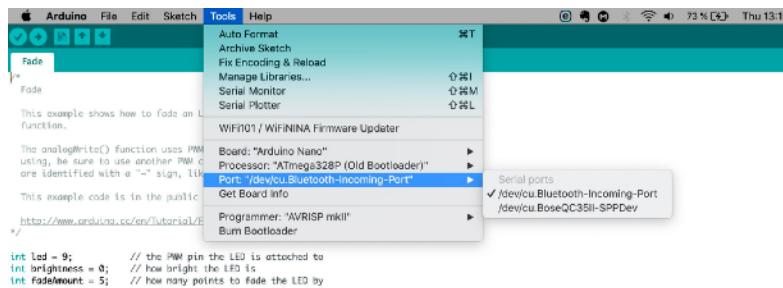
Session 2

Session 2 (1 hr)

1. The **two tracks**: programmer vs. non-programmer
2. Artificial intelligence **for all**: potentials and limitations
3. From data collection to data visualization — process in building IoT, AR/VR/MR and **data driven applications**
4. Programming for **people** and programming for **machines**
5. From visual **programming tools** to hardcore programming in JavaScript and Python
6. The **Big 3**, HTML/CSS/JS, for starting the coding journey

Why the “Two” Tracks?

Programming for Machine

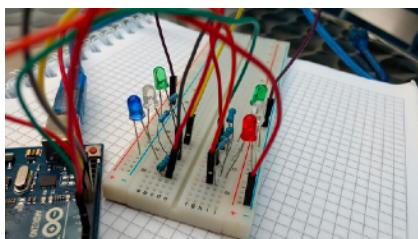


```
int led = 9; // the PWM pin the LED is attached to
int brightness = 0; // how bright the LED is
int fadeAmount = 5; // how many points to fade the LED by

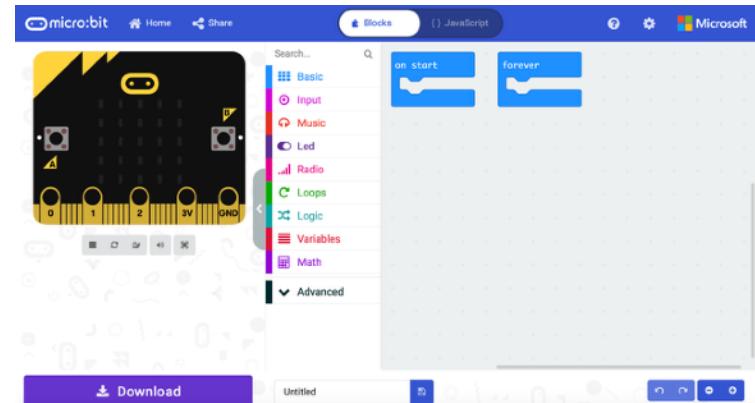
// the setup routine runs once when you press reset:
void setup() {
  // declare pin 9 to be an output:
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop() {
  // set the brightness:
  analogWrite(led, brightness);

  // change the brightness a little each loop:
  brightness = brightness + fadeAmount;
  if (brightness > 255) {
    fadeAmount = -fadeAmount;
  }
  if (brightness < 0) {
    fadeAmount = -fadeAmount;
  }
}
```



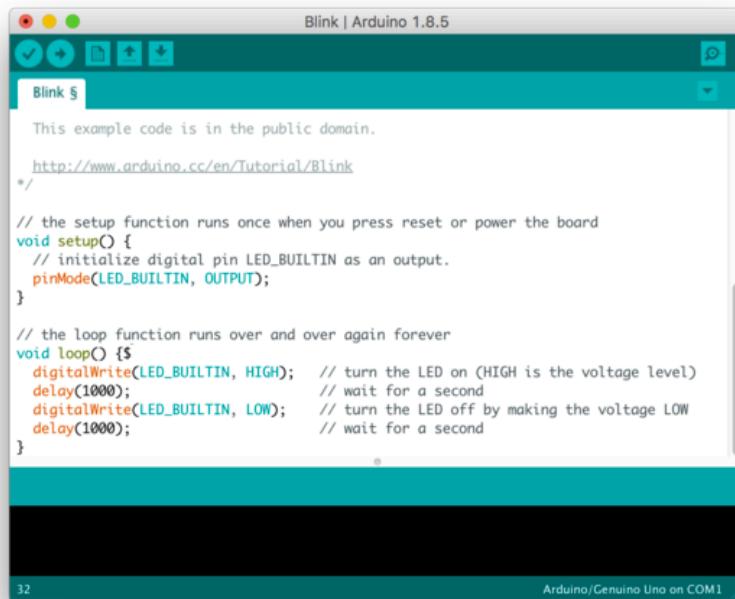
Programming for People



The Microsoft micro:bit interface shows a Scratch-style programming environment. On the left, a micro:bit board icon is displayed with various pins labeled. To the right, there are two main script areas: one for 'on start' and another for 'forever'. The 'on start' script contains a 'when green flag clicked' hat and a 'say [microbit v1.]' block. The 'forever' script contains a 'repeat []' loop with a 'say [microbit v1.]' block inside. A sidebar on the right lists categories: Basic, Input, Music, Led, Radio, Loops, Logic, Variables, and Math. At the bottom, there are 'Download' and 'Untitled' buttons.



IoT Programming



The screenshot shows the Arduino IDE interface with the title "Blink | Arduino 1.8.5". The code editor contains the classic "Blink" sketch. The code is as follows:

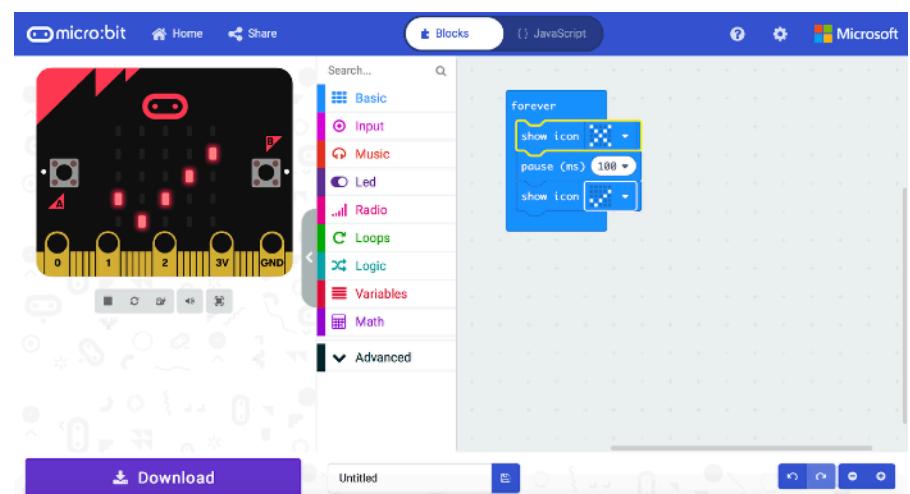
```
/*
 * This example code is in the public domain.
 * http://www.arduino.cc/en/Tutorial/Blink
 */

// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)
  delay(1000); // wait for a second
  digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the voltage LOW
  delay(1000); // wait for a second
}
```

The status bar at the bottom indicates "32" and "Arduino/Cenuine Uno on COM1".

Programmer Track



Non-Programmer Track

Web Scrapping

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 C Run Cell Code

```
In [1]: 1 import requests
2 import csv
3 import pandas as pd
4 from bs4 import BeautifulSoup
5
6 # quote_page = requests.get('http://startubbeat.hkej.com/?tag=fintech&paged=1')
7 # soup = BeautifulSoup(quote_page.text, 'html.parser')
8
9 header = ['page #', 'title', 'url', 'details', 'post date']
10 data = []
11
12 # Display and store away 2 pages of scrapped data from startubbeat.hkej.com
13 for i in range(1,4):
14     quote_page = requests.get('http://startubbeat.hkej.com/?tag=fintech&paged=' + str(i))
15     print("\n***** Page " + str(i) + " in action *****")
16     soup = BeautifulSoup(quote_page.content, 'html.parser')
17
18     for article in soup.find_all("div", attrs={"class": "archive-text"}):
19         # for article in soup.find_all('div', class_ = 'archive-text'):
20             page_no = str(i)
21             title = article.a.text.encode('utf-8').strip()
22             decoded_title = title.decode('utf-8')
23             url = article.a.get('href')
24             details = article.p.text.encode('utf-8').strip()
25             decoded_details = details.decode('utf-8')
26             post_date = article.div.ul.li.text
27             print(decoded_title)
28             print(url)
29             print(decoded_details)
30             print(post_date)
31             data.append((page_no, decoded_title, url, decoded_details, post_date))
32
33 df = pd.DataFrame(data,
34 columns = header
35 df.to_csv('startub_beat_data_1.csv', sep='\t', encoding='utf-8')

***** Page 1 in action *****
港官方數碼幣料兩年內試用
http://startubbeat.hkej.com/?p=89686
各國近年紛紛探索央行數碼貨幣 (Central Bank Digital Currency, CBDC) ,不但中國正加快進行「數字貨幣/電子支付」 (DC/EP) 試點計劃,香港近年亦在此領域積極研究,區塊鏈科技初創CryptoBLK就與香港金融管理局 (金管局) 合作,參與相關項目。
Posted July 13, 2020
日本告別現金 (老占)
http://startubbeat.hkej.com/?p=89672
日本是一個現金社會,電子貨幣、支付寶和微信支付、Apple Pay一直都流行不起來。日本人更不喜歡「革命」兩字,認為這是「殺頭」的意思。
```

Programmer Track

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 C Run Cell Code

startupbeat.hkej.com/?tag=fintech&paged=1

FinTech – StartUpBeat FinTech – StartUpBeat - Page 1

信報 HK STARTUPS 融資紀錄 人工智能 FINTECH 生物科

StartUpB

堅持初心 繼續團結 (莫乃光)

All posts tagged "FinTech"

港官方數碼幣料兩年內試用

各國近年紛紛探索央行數碼貨幣 (Central Bank Digital Currency, CBDC) ,不但中國正加快進行「數字貨幣/電子支付」 (DC/EP) 試點計劃,香港近年亦在此領域積極研究,區塊鏈科技初創CryptoBLK就與香港金融管理局 (金管局) 合作,參與相關項目。

CSV/Excel JSON CSV/Excel Wide (beta)

Posts_title	Posts_url	Posts_content	Posts_date
港官方數碼幣料兩年內試用	http://startubbeat.hkej.com/?p=89686	各國近年紛紛探索央	Posted July 13, 2020

This is a live preview. When you are ready to run your project, click Get Data.

Show more data Visuals enabled (advanced)

... Select page +
Select Posts +
Extract title
Extract url
Relative content ↓ +
Relative date ↑ +
Relative pic ↗ +
Select next
Click each next item (1)
and go to main_template
Get Data

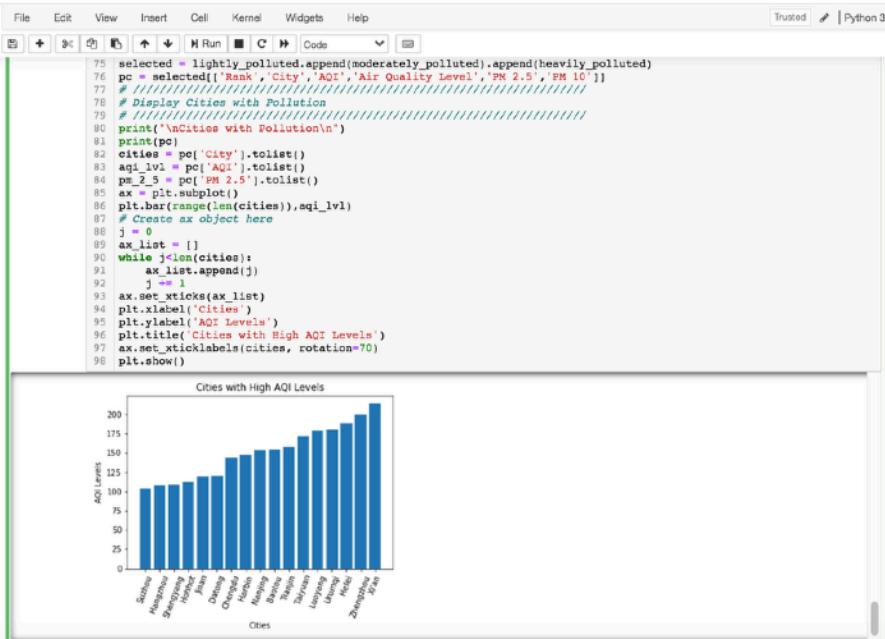
Loads a new page Uses AJAX

Go to Existing Template main_template
Go to Another Project

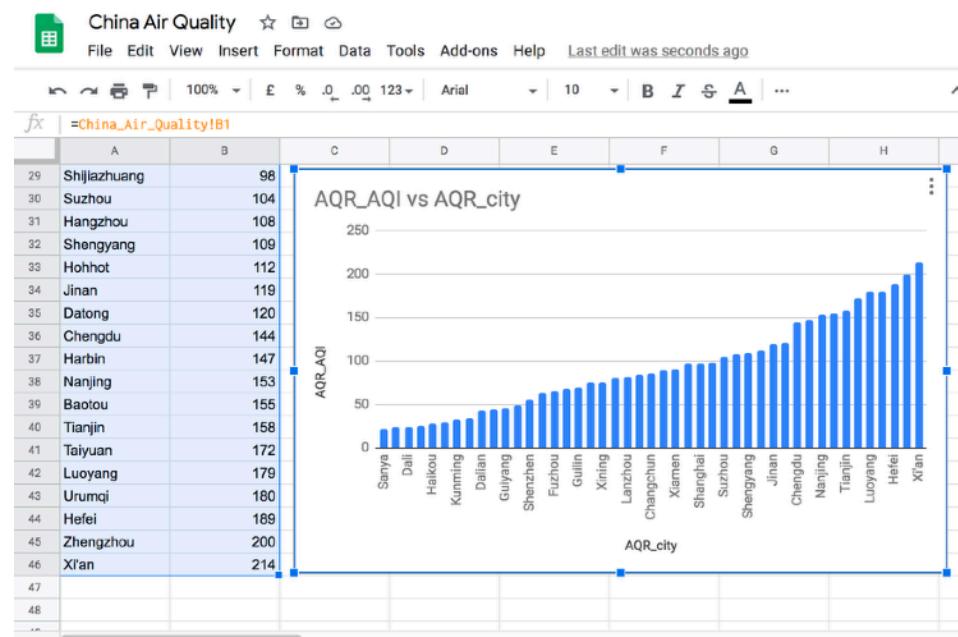
API Tutorials Contact

Non-Programmer Track

Making Charts



Programmer Track



Non-Programmer Track

Database Management

Server: localhost:3306 Database: abc Table: User

Browse Structure SQL Search Insert Export Import Privileges Operations Triggers

Show query box

Showing rows 0 - 3 (4 total). Query took 0.0023 seconds.

```
SELECT `id`, `public_id`, `name`, `password`, `admin` FROM `User` WHERE `id` > 4
```

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

	id	public_id	name	password	admin
<input type="checkbox"/>	7	dfe165cc-8e12-4029-82d1-028f3dacad68	John	sha256\$1BqSuelv\$0c4b6c558a319b0129a254b575b1a5153...	0
<input type="checkbox"/>	9	e01aac07-d9e3-476c-a679-88kf2fb6750	Winnie	sha256\$cOvvXS03gct7682000fdb34e467854d8e06f0d7cfb50b...	0
<input type="checkbox"/>	14	79cb6fe7-9387-4119-95e5-2d92101df4a	George	sha256\$kt7KK!e\$499e580a5d5a3229a3700e09d230b6be16...	0
<input type="checkbox"/>	16	2c9b56dd-234b-4cc5-8c05-c9c3f603201b	Stephen	sha256\$U9cDqtpbaec27b72f5ef26a34ef19b0f5c795a0b...	0

Show all | Number of rows: 25 Filter rows: Search this table Sort by key: None

+ Options

Check all With selected: Edit Copy Delete

Print Copy to clipboard Export Display chart Create view

Project Tracking

Staff Task Projects

Views Grid view 1 hidden field Filter Group Sort Color ...

	Name	Staff	Where	Name	contains	End Date	Projects
1	MEI, Social Enterprise Challen...	David Chan				11/10/2019	Social Enterprise Challenge
2	Social Enterprise Challenge-M...	Winnie Cheung				10/9/2019	Social Enterprise Challenge
3	Social Enterprise Challenge, C...	Tommy Lee	Interview			27/9/2019	CFE Fund Raising Day / Socia...
4	Data and Media Hackathon-Da...	Winnie Cheung	David Chan	Data Collection		3/10/2019	Data and Media Hackathon
5	Teachers' Day-Meeting-5	David Chan		Meeting		7/10/2019	Teachers' Day
6	Teachers' Day-Proposal Review...	David Chan		Proposal Review		3/10/2019	Teachers' Day

Programmer Track

Non-Programmer Track

Artificial Intelligence

Inside Kaggle you'll find all the code & data you need to do your data science work. Use over 19,000 public datasets and 200,000 public notebooks to conquer any analysis in no time.

Maintained by Kaggle | Starter Code | Finance Datasets | Linguistics Datasets | Data Visualization Kernels

Financial Tweets David Wallach CSV Dataset 50 upvotes	Face Detection in Images DataTurks JSON Dataset 68 upvotes	Star Trek Scripts Gary Broughton JSON Dataset 12 upvotes	Avocado Prices Justin Kiggins CSV Dataset 546 upvotes
---	--	--	---

<https://www.kaggle.com/>

Programmer Track

Teachable Machine

Train a computer to recognize your own images, sounds, & poses.

A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required.

Get Started

TensorFlow.js p5.js Coral Node.js

<https://teachablemachine.withgoogle.com/>

Non-Programmer Track

Artificial Intelligence

Potentials

- 1. Applications across industries**
- 2. Overcome shortage of Experts**
- 3. Augment human decisions**
- 4. Detect complex patterns and achieve breakthroughs**
- 5. Creation of new jobs**

Limitations

- 1. Emergence of new monopolies**
- 2. Algorithmic bias**
- 3. Enlarge digital divide**
- 4. Replace humans in certain jobs**

A woman with long dark hair, wearing a red t-shirt and denim shorts, sits cross-legged on a paved brick path. A large, semi-transparent AR interface overlays the scene. On the left, the text "EXPERIMENT" is displayed above the title "Lines of Play". On the right, the text "Becoming a Maker" is displayed above a curved line of blue 3D rectangular blocks. The background shows a grassy area and a tree.

EXPERIMENT

Lines of Play

An open source AR experiment that uses Google's ARCore Depth API to generate domino art creations that interact with the real world.

[EXPLORE NOW](#)

Becoming a Maker

1,558 experiments and counting...

Experiments are projects that push the boundaries of art, technology, design and culture.

Experiments inspire, teach, and delight.

FILTER BY: [PIXI.js](#) ▾

SORT BY: NEWEST ▾

[3D](#), [A-frame](#), [ARCore](#), [Actions on Google](#), [Android Live Wallpaper API](#), [Android NDK](#), [Android SDK](#), [Android Things](#), [Apps Script](#), [Arduino](#), [Blender](#), [Canvas](#), [Canvas Quiz](#), [Captive Portal](#), [Cardboard SDK](#), [Cast API](#), [Cinder](#), [Cloud Text-to-Speech API](#), [Convnet.js](#), [D3.js](#), [Demoscene](#), [Dialogflow](#), [Firebase](#), [GLSL](#), [GPT-2](#), [Gamepad API](#), [Google Assistant](#), [Google Assistant SDK](#), [Google Cloud AI](#), [Google Cloud Speech API](#), [Google Cloud Vision API](#), [Google Maps Tile API](#), [Google Sheets](#), [Handwriting Recognition](#), [Haxe](#), [Javascript](#), [Keras.js](#), [Kotlin](#), [Kotlin](#), [Magenta.js](#), [Maps Places API](#), [MaryTTS](#), [Nearby API](#), [Nearby API](#), [Node.js](#), [Notification Access API](#), [OpenCV](#), [OpenGL](#), [Opengl](#), [P5.js](#), [Paper.js](#), [Particles](#), [Pixi.js](#), [Polymer](#), [PoseNet](#), [Potree](#), [Processing](#), [Raspberry Pi](#), [Shadercam](#), [Speech Synthesis API](#), [Tango](#), [Teachable Machine](#), [TensorFlow](#), [TensorFlow Lite](#), [Tensorflow](#), [Tensorflow.js](#), [Three.js](#), [Tone.js](#), [Touch Designer](#), [Translate API](#), [USB OTG](#), [Unity](#), [Visualization](#), [Vuforia](#), [Wavenet](#), [Web Audio API](#), [Web Speech API](#), [WebGL](#), [WebMIDI](#), [WebRTC](#), [Websockets](#), [Wekinator](#), [es6](#), [openFrameworks](#), [react.js](#), [t-SNE](#), [tensorflow.js](#)



Blocks JavaScript Python PHP Lua Dart XML ✖️ ▶

Logic
Loops
Math
Text
Lists
Colour
Variables
Functions

From Google Blockly to JavaScript, Python, PHP, etc.

The diagram illustrates a system flow. On the left, the word "Input" is written above the Chinese character "輸入". An arrow points from this text to a central gray circle. Inside the circle, the word "System" is written above the Chinese character "系統". Another arrow points from the circle to the right, where the word "Output" is written above the Chinese character "輸出".

On the far right, there is a vertical stack of three small circular icons: a dot, a plus sign, and a minus sign. Below them is a single horizontal rectangular icon.

Steps for Installing Google Blockly

1. Download **google-blockly zip** file.
2. Unzip the file and rename the folder to “**blocky**”.
3. Download the **blockly-html zip** file.
4. Unzip the file and rename the folder to “**blockly-html**”.
5. Move the **blockly-html** folder into the “**demos**” folder inside the **blocky** folder.
6. Download the **blockly.zip** file. Unzip it and move the **index.html** file from the source into the **demos** folder to replace the old one.
7. Move the **demo.html** file into the **blockly-html** folder to replace the old one.

Blocks JavaScript Python PHP Lua Dart XML ✖️ ➔

Logic
Loops
Math
Text
Lists
Colour
Variables
Functions

From Google Blockly to JavaScript, Python, PHP, etc.

The diagram illustrates the process of translating code blocks into various programming languages. It features a central circle labeled "Google Blockly". An arrow points from the left towards the circle, labeled "Input 輸入 Blocks". Another arrow points away from the circle to the right, labeled "Output 輸出 Codes".

Input 輸入 Blocks

Output 輸出 Codes

Blockly interface elements visible on the right include a trash can icon, a play button, and icons for loops, math, text, lists, colour, variables, and functions.

The Big 3

HTML

CSS

JavaScript

Session 3

Session 3 (4 hrs)

- 1. Visual programming as a start with examples from Scratch, Micro:bit, CocoRobo, App Inventor, and Thunkable**
- 2. Introducing Google Blockly for visual programming in HTML and CSS**
- 3. From learning Google Blockly to learning JavaScript and other programming languages such as PHP and Python**
- 4. Hands-on exercise in building a website in HTML/CSS/JS**
- 5. Hosting the website on Github**

We need a **code editor** to create
HTML/CSS/JS files.

Version 1.47 is now available! Read about the new features and fixes from June.

Code editing. Redefined.

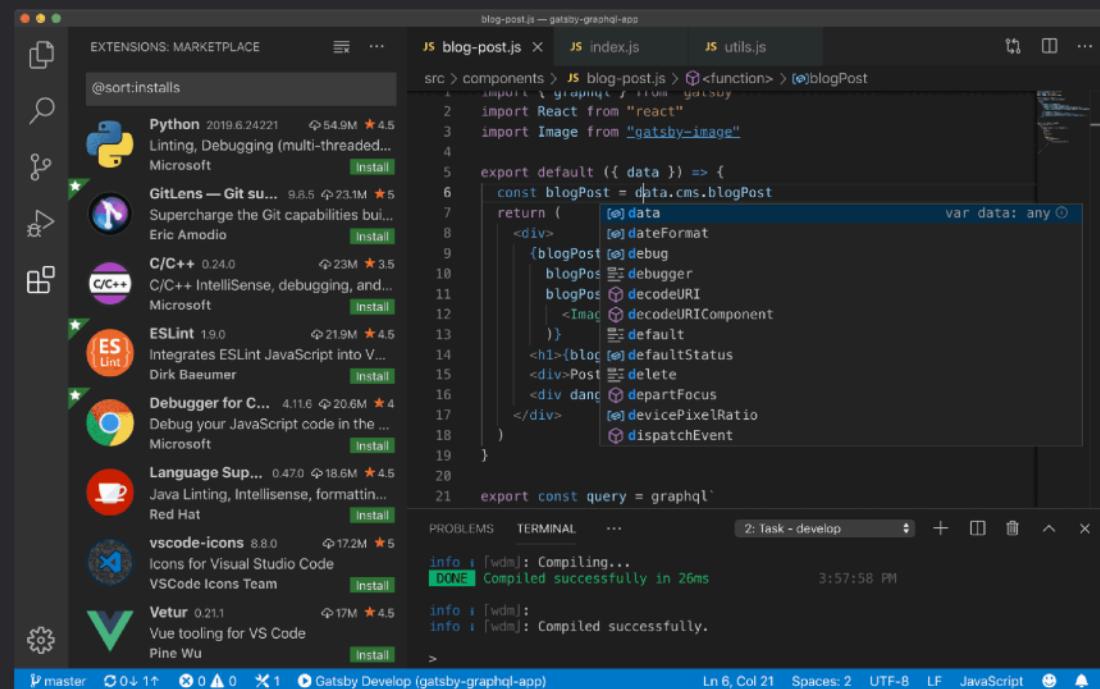
Free. Built on open source. Runs everywhere.

[Download for Mac](#)

Stable Build

[Other platforms and Insiders Edition](#)

By using VS Code, you agree to its
[license](#) and [privacy statement](#).



<https://code.visualstudio.com/>

What does HTML stand for?

(H)yper (T)ext (M)arkup (L)anguage

(M)arkup is a collection of “tags”.

NOUN

HTML

<html>, <head>, <title>, <meta>, <style>, <script>, <body>, <header>, <footer>, <nav>, <main>, <section>, <aside>, <p>,
, <a>, , , , <table>, <div>, <form>

Elements
has
attributes

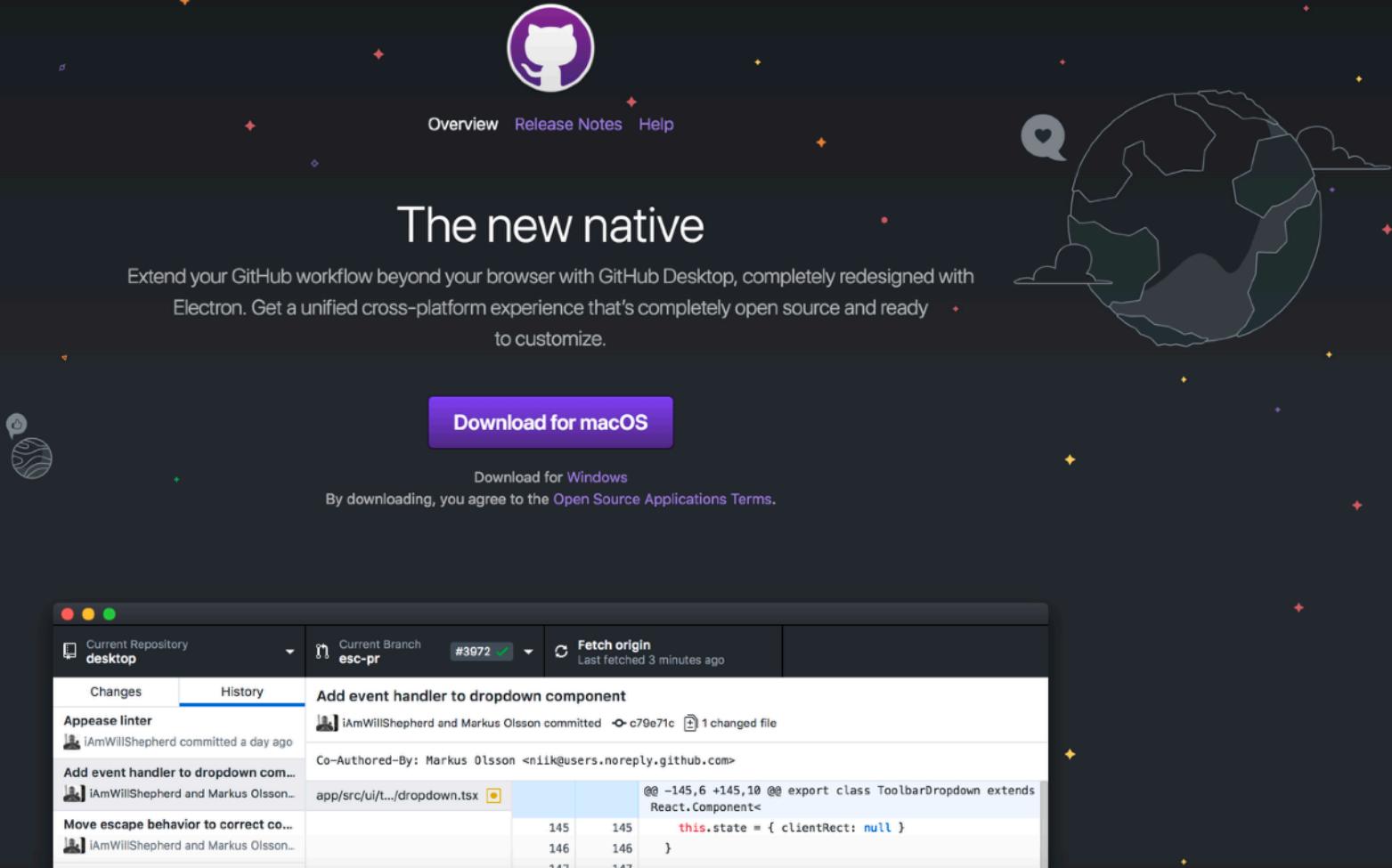
(e.g. color, background-color, position, font-family, font-size, font-style, display, width, margin, border, padding)

First hands-on exercise:

<https://www.wikihow.com/Create-a-Simple-Web-Page-with-HTML> (Step 1 to Step 13)

**Congratulation. You created your 1st html document
(example1.html). Now it's time to upload it to your remote
Github account space.**

Free Web Hosting on the Web



The new native

Extend your GitHub workflow beyond your browser with GitHub Desktop, completely redesigned with Electron. Get a unified cross-platform experience that's completely open source and ready to customize.

Download for macOS

Download for Windows

By downloading, you agree to the [Open Source Applications Terms](#).

Current Repository: desktop

Current Branch: esc-pr #3972

Fetch origin: Last fetched 3 minutes ago

Add event handler to dropdown component

iAmWillShepherd and Markus Olsson committed c79e71c 1 changed file

Co-Authored-By: Markus Olsson <nnik@users.noreply.github.com>

app/src/ui/t.../dropdown.tsx

	145	145	this.state = { clientRect: null }
	146	146	}
	147	147	

<https://desktop.github.com/>



Built for developers

GitHub is a development platform inspired by the way you work. From open source to business, you can host and review code, manage projects, and build software alongside 40 million developers.

Username

Email

Password

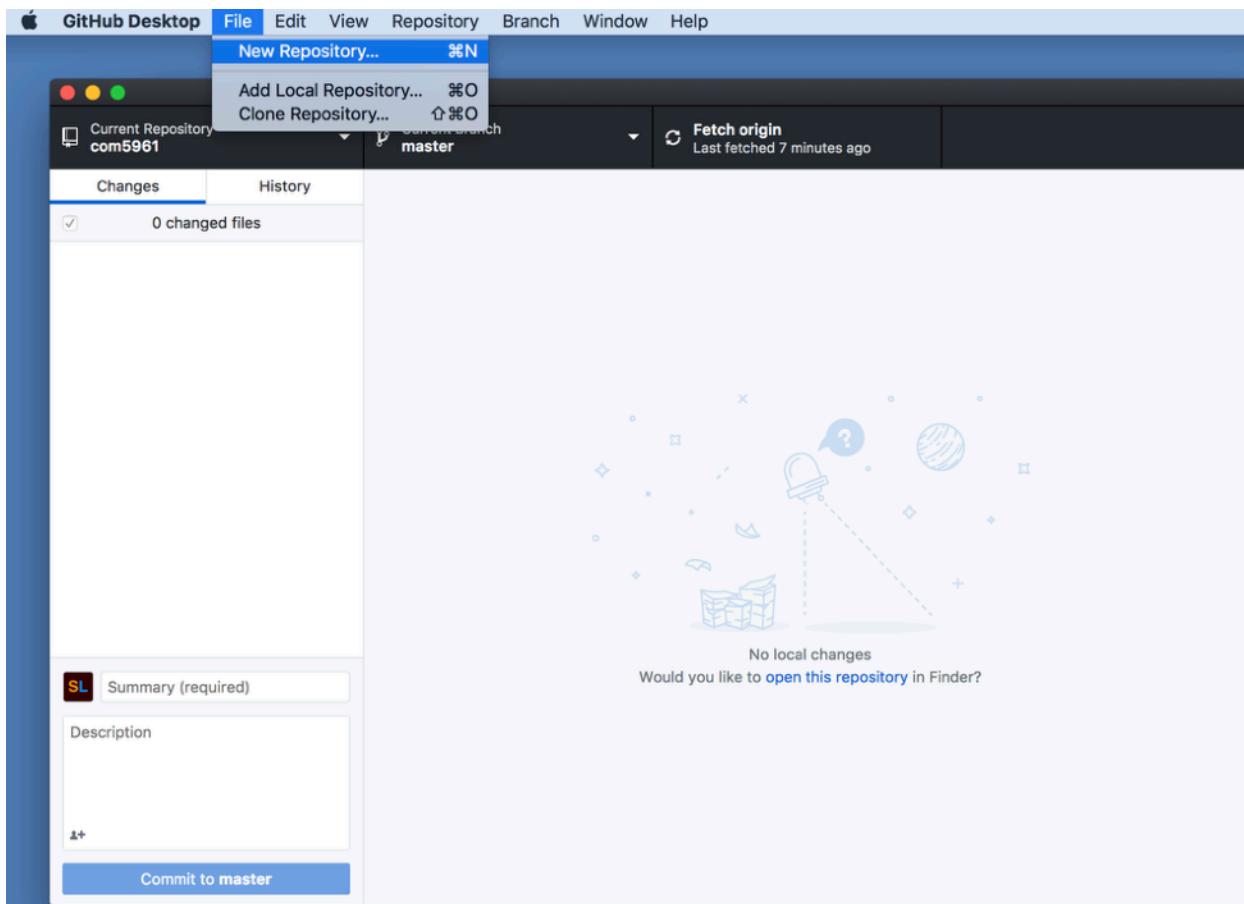
Make sure it's **at least 15 characters** OR **at least 8 characters including a number and a lowercase letter**. [Learn more](#).

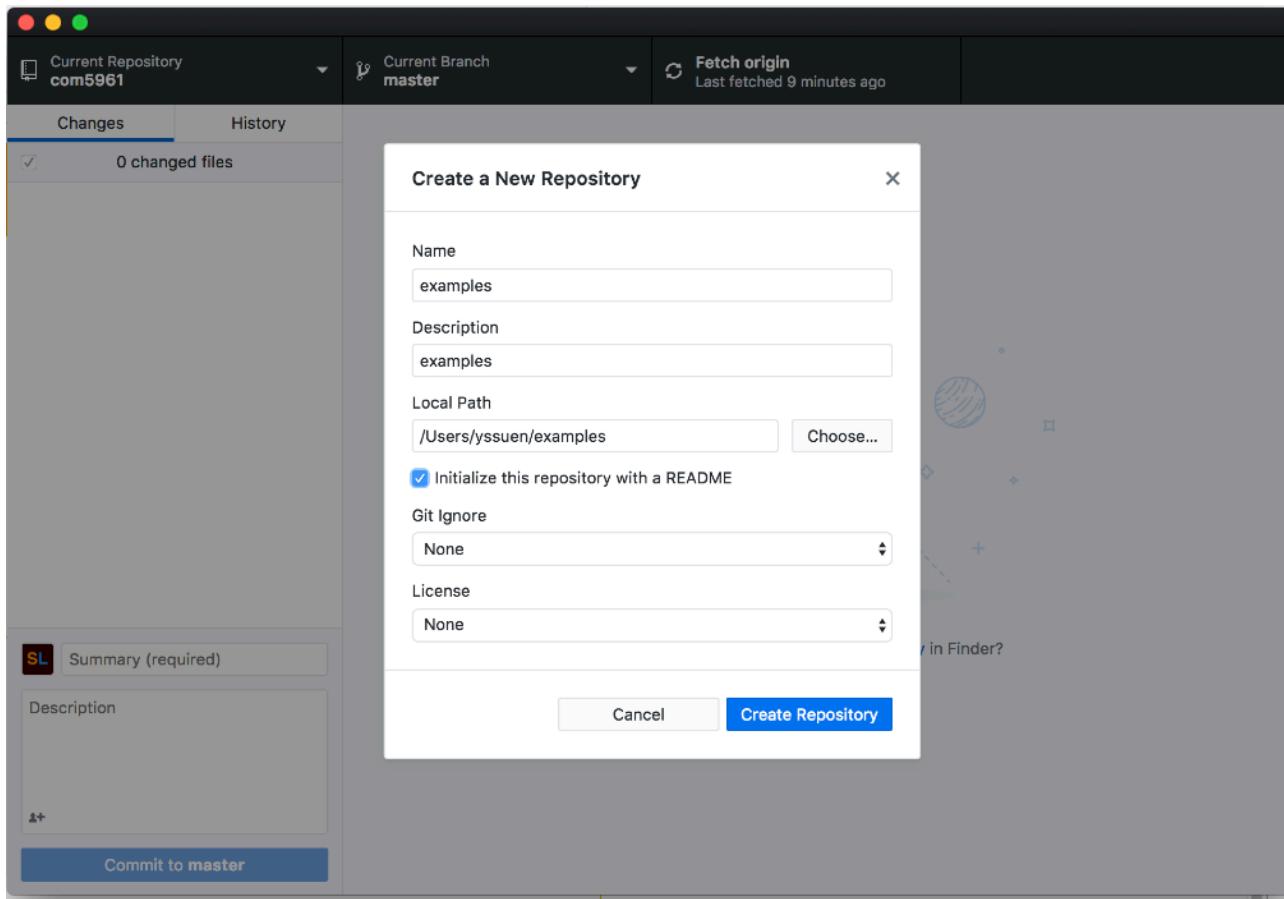
[Sign up for GitHub](#)

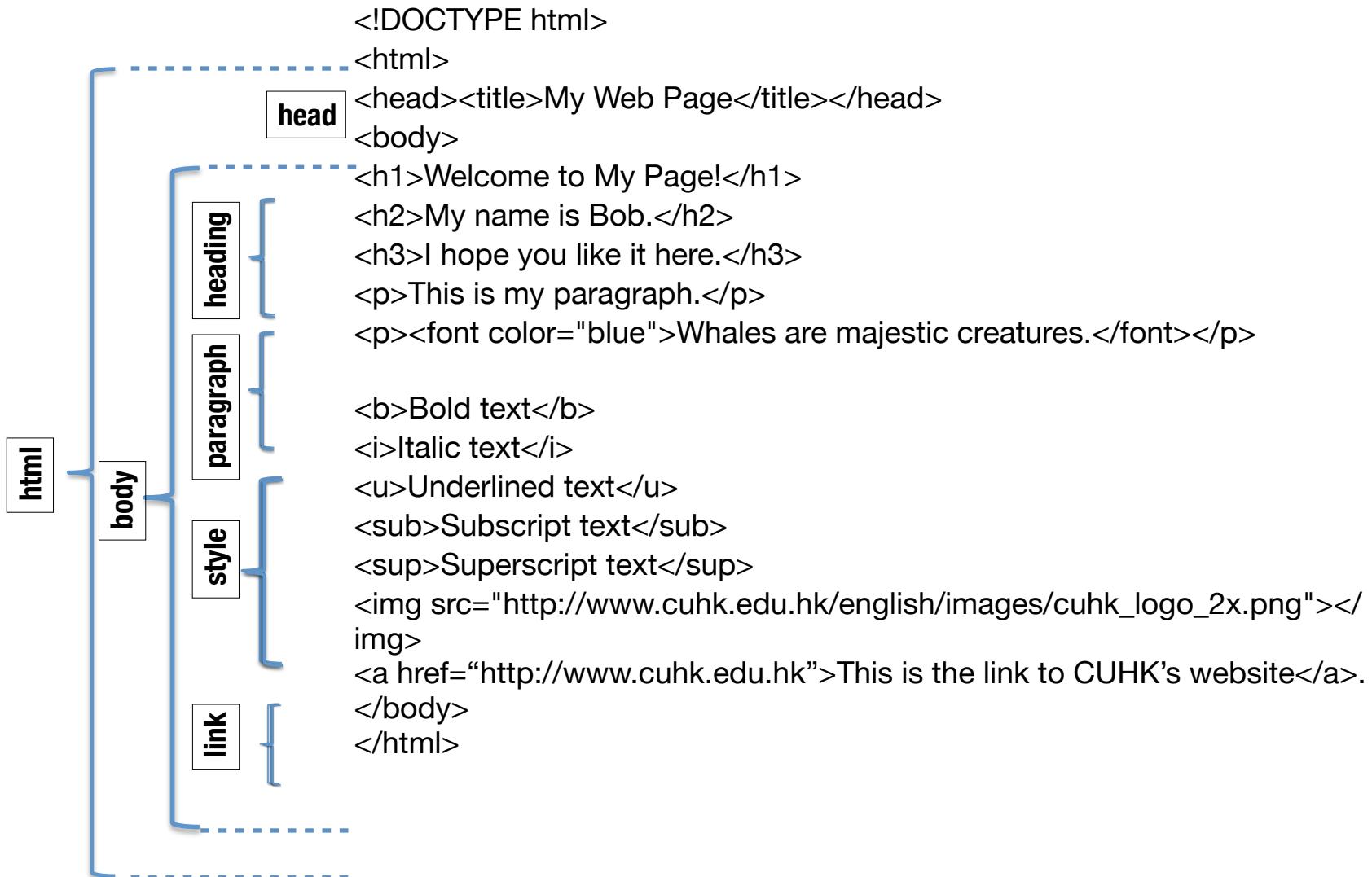
By clicking "Sign up for GitHub", you agree to our [Terms of Service](#) and [Privacy Statement](#). We'll occasionally send you account related emails.

<https://github.com/>

1. Sign-up for a **Github** account (the free account)
2. Install **Github Desktop** and create a new repository
(You can treat the repository as a folder) by creating a new folder associated with it.







Browser View

Welcome to My Page!

My name is Bob.

I hope you like it here.

This is my paragraph.

[Whales are majestic creatures.](#)

[Bold text](#) [Italic text](#) [Underlined text](#) [Subscript text](#)



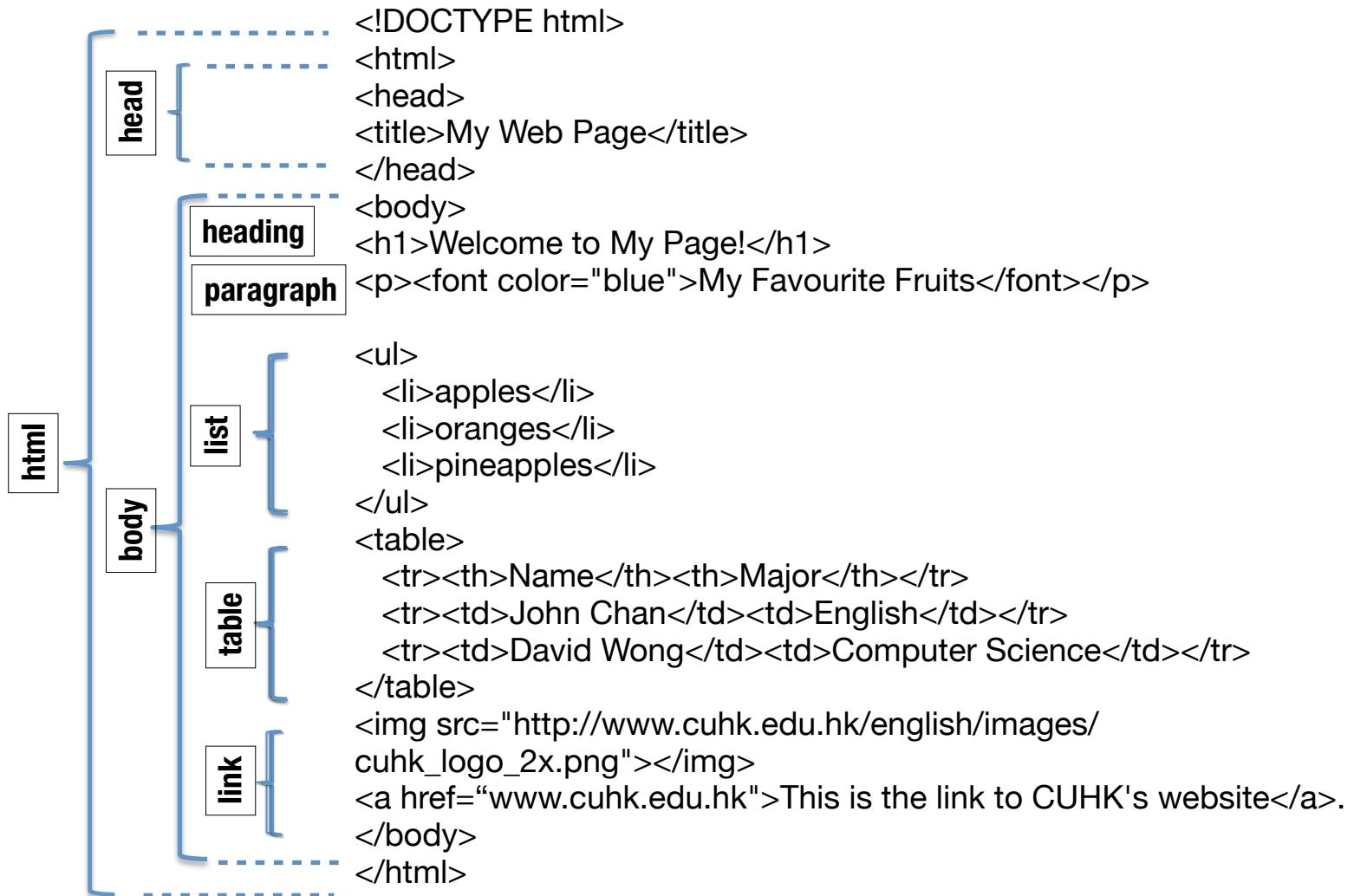
[Superscript text](#)

香港中文大學
The Chinese University of Hong Kong

[This is the link to CUHK's website.](#)

Second hands-on exercise:

<https://coder-coder.com/how-to-make-simple-website-html/> (Add the list and table codes into example2.html)



```
<meta charset="UTF-8">
```

Browser View

Welcome to My Page!

My Favourite Fruits

- apples
- oranges
- pineapples

Name Major

John Chan English

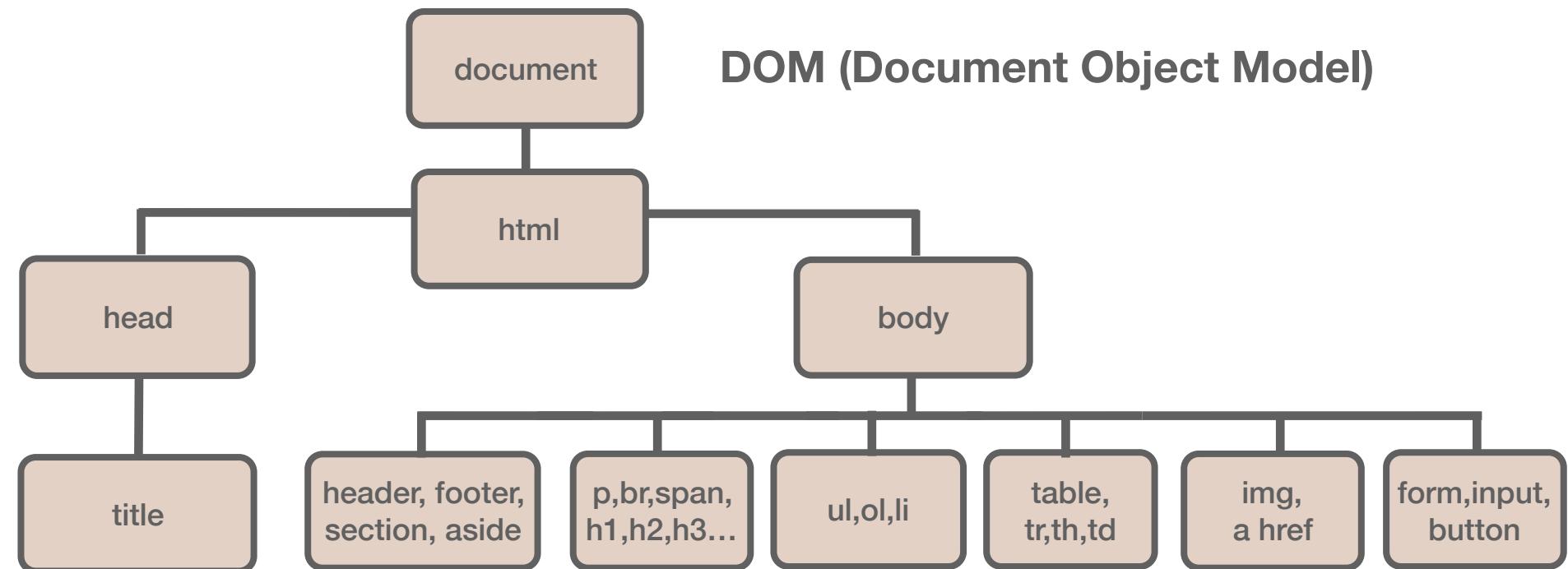
David Wong Computer Science



香港中文大學
The Chinese University of Hong Kong

[This is the link to CUHK's website.](#)

DOM (Document Object Model)



Decomposition

Break a problem down into smaller parts.

The Grammar of HTML Elements

- Starts with a start tag (e.g. <p>)
- End with an end tag (e.g. </p>)
- Elements content is everything between the start and end tags
- Some elements have empty content and no end tag (e.g.
)
- Most elements have attributes

What does CSS stand for?

(C)ascading (S)tyle (S)heet

CSS Demonstration:

https://www.w3schools.com/css/css_intro.asp

Browser View

Welcome to My Page!

My name is Bob.

I hope you like it here.

This is my paragraph.

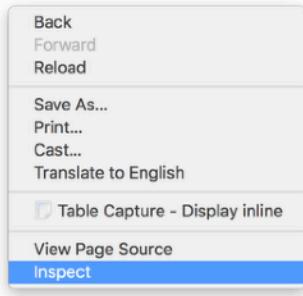
Whales are majestic creatures.



香港中文大學
The Chinese University of Hong Kong

[This is the link to CUHK's website.](#)

[Bold text](#) [Italic text](#) [Underlined text](#) [Subscript text](#) [Superscript text](#)



Use right mouse click to trigger pop-up window

Browser View

Welcome to My Page!

My name is Bob.

I hope you like it here.

This is my paragraph.

Whales are majestic creatures.



香港中文大學
The Chinese University of Hong Kong

[Bold text](#) [Italic text](#) [Underlined text](#) [Subscript text](#) [Superscript text](#)

[This is the link to CUHK's website.](#)

The screenshot shows the Chrome DevTools interface with the 'Elements' tab selected. The left panel displays the HTML structure:

```
<!doctype html>
...<html> == $0
▶ <head>...
▶ <body>...
</html>
```

The right panel shows the 'Styles' tab of the element inspector for the `html` element. The computed styles include:

```
element.style {
}
html { user agent stylesheet
    display: block;
}
```

A specific element in the page is highlighted with a dashed box, and its style properties are shown in the bottom right of the inspector:

margin	-
border	-
padding	-
1679 x 351.500	
-	
-	

Browser View

Welcome to My Page!

My name is Bob.

I hope you like it here.

This is my paragraph.

Whales are majestic creatures.



香港中文大學
The Chinese University of Hong Kong

This is the link to CUHK's website.

Bold text Italic text Underlined text Subscript text Superscript text

Screenshot of a browser developer tools interface showing the Element tab and the Styles panel.

The Element tab displays the HTML structure of the page:

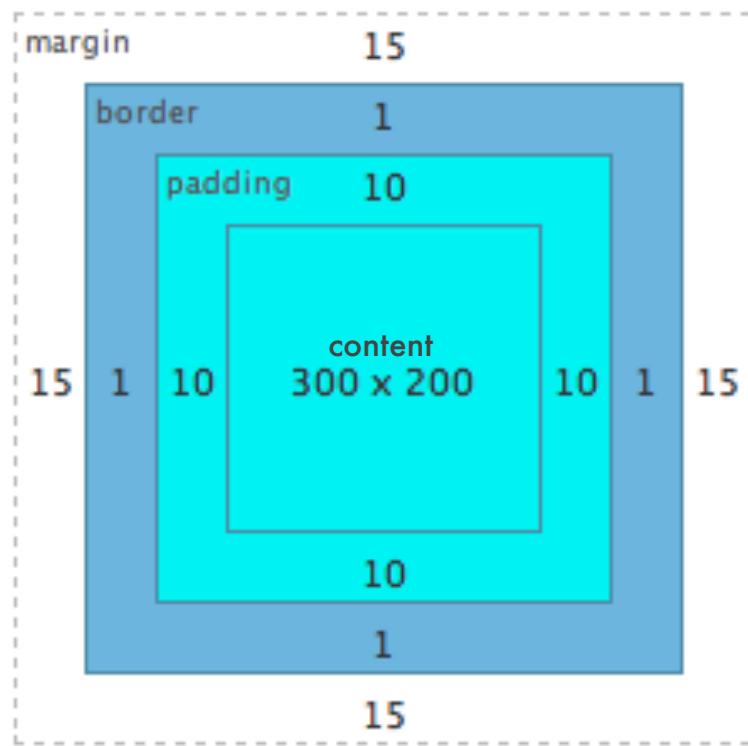
```
<!doctype html>
<html>
  <head>
    <title>My Web Page</title>
  </head>
  <body>
    <h1 style="background-color: #CA4D4C; color: #fefdff; ">Welcome to My Page!</h1>
    <h2 style="border-style: solid; border-width: 1px;">My name is Bob.</h2> == $0
    <h3>I hope you like it here.</h3>
    <p>This is my paragraph.</p>
    ><p>...</p>
    <b>Bold text</b>
    <i>Italic text</i>
  </body>
</html>
```

The Styles panel shows the CSS styles applied to the selected element (the second h2 element). It includes both inline styles and user agent styles.

```
element.style {
  border-style: solid;
  border-width: 1px;
}

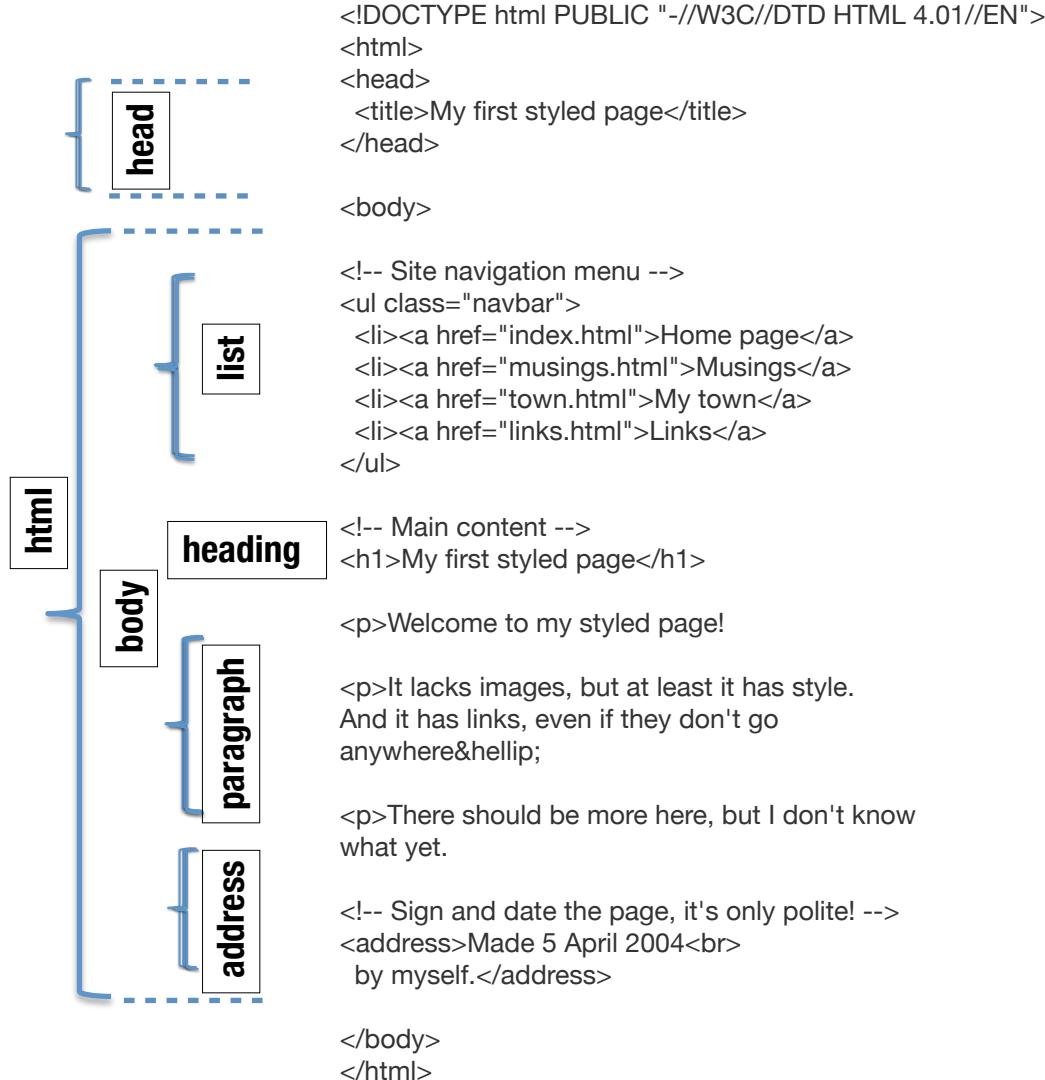
h2 {
  user agent stylesheet
  display: block;
  font-size: 1.5em;
  -webkit-margin-before: 0.83em;
  -webkit-margin-after: 0.83em;
  -webkit-margin-start: 0px;
  -webkit-margin-end: 0px;
  font-weight: bold;
}
```

The Box Model



Third hands-on exercise:

<https://www.w3.org/Style/Examples/011/firstcss.en.html>



Browser View

- [Home page](#)
- [Musings](#)
- [My town](#)
- [Links](#)

My first styled page

Welcome to my styled page!

It lacks images, but at least it has style. And it has links, even if they don't go anywhere...

There should be more here, but I don't know what yet.

*Made 5 April 2004
by myself.*

Browser View

My first styled page

Welcome to my styled page!

It lacks images, but at least it has style. And it has links, even if they don't go anywhere...

There should be more here, but I don't know what yet.

*Made 5 April 2004
by myself.*

The screenshot shows a browser developer tools window with the following tabs:

- Elements
- Console
- Sources
- Network
- Performance
- Memory
- Application
- Security
- Audits
- JavaScript Profiler

The **Elements** tab displays the HTML structure:

```
<!doctype html PUBLIC "-//W3C//DTD HTML 4.01//EN">
<html>
  <head>...</head>
  <body>
    <!-- Site navigation menu -->
    <ul class="navbar">...</ul>
    <!-- Main content -->
    ... <h1 style="border-style: solid; border-width: 7px; border-color: black; padding: 20px; text-align: center; background-color: cadetblue; color: white;">My first styled page</h1> == $0
    <p>Welcome to my styled page!</p>
  </body>
</html>
```

The **Styles** tab shows the CSS rules applied to the page, with the **element.style** rule expanded:

```
element.style {
  border-style: solid;
  border-width: 7px;
  border-color: black;
  padding: 20px;
  text-align: center;
  background-color: cadetblue;
  color: white;
}
```

The **Computed** tab shows the final computed styles for the **h1** element:

```
h1 { user agent stylesheet
  display: block;
  font-size: 2em;
  -webkit-margin-before: 0.67em;
  -webkit-margin-after: 0.67em;
}
```

```
<body>
<!-- Site navigation menu -->
<ul class="navbar">
<li><a href="index.html">Home page</a>
<li><a href="musings.html">Musings</a>
<li><a href="town.html">My town</a>
<li><a href="links.html">Links</a>
</ul>
<!-- Main content -->
<h1 style="
    border-style: solid;
    border-width: 7px;
    border-color: black;
    padding: 20px;
    text-align: center;
    background-color: cadetblue;
    color: white;
">My first styled page</h1>
<p>Welcome to my styled page!
<p>It lacks images, but at least it has style.
And it has links, even if they don't go
anywhere&hellip;
<p>There should be more here, but I don't know
what yet.
<!-- Sign and date the page, it's only polite! -->
<address>Made 5 April 2004<br>
    by myself.</address>
</body>
</html>
```

In-line style definition

Browser View

My first styled page

Welcome to my styled page!

It lacks images, but at least it has style. And it has links, even if they don't go anywhere...

There should be more here, but I don't know what yet.

*Made 5 April 2004
by myself.*

The screenshot shows the Chrome DevTools interface with the 'Elements' tab selected. On the left, the DOM tree displays the structure of the page, including the root `<html>`, `<head>`, `<body>` section, and various `<p>` and `<address>` elements. The right side of the interface features the 'Styles' panel, which lists the styles applied to the `<h1>` element. The `element.style` section shows the following CSS rules:

```
h1 { border-style: solid; border-width: 7px; border-color: black; padding: 20px; text-align: center; background-color: cadetblue; color: white; }
```

Below this, the 'user agent stylesheet' section shows the standard browser styles for `h1`:

```
h1 { display: block; font-size: 2em; }
```

```
<head><title>Example 3</title>
<style type="text/css">
border-style: solid;
border-width: 7px;
border-color: black;
padding: 20px;
text-align: center;
background-color: cadetblue;
color: white;
</style>
</head>
<body>
<!-- Site navigation menu --&gt;
&lt;ul class="navbar"&gt;
&lt;li&gt;&lt;a href="index.html"&gt;Home page&lt;/a&gt;
&lt;li&gt;&lt;a href="musings.html"&gt;Musings&lt;/a&gt;
&lt;li&gt;&lt;a href="town.html"&gt;My town&lt;/a&gt;
&lt;li&gt;&lt;a href="links.html"&gt;Links&lt;/a&gt;
&lt;/ul&gt;
<!-- Main content --&gt;
&lt;h1&gt;My first styled page&lt;/h1&gt;
&lt;p&gt;Welcome to my styled page!
&lt;p&gt;It lacks images, but at least it has style.
And it has links, even if they don't go anywhere&amp;hellip;
&lt;p&gt;There should be more here, but I don't know what yet.
<!-- Sign and date the page, it's only polite! --&gt;
&lt;address&gt;Made 5 April 2004&lt;br&gt;by myself.&lt;/address&gt;
&lt;/body&gt;
&lt;/html&gt;</pre>
```

Internal style-sheet definition

Browser View

- [Home page](#)
- [Musings](#)
- [My town](#)
- [Links](#)

My first styled page

Welcome to my styled page!

It lacks images, but at least it has style. And it has links, even if they don't go anywhere...

There should be more here, but I don't know what yet.

*Made 5 April 2004
by myself.*

The screenshot shows a browser developer tools window with the "Elements" tab selected. The left pane displays the HTML structure of the page, including the head and body sections. A dashed red box highlights the link element in the head. The right pane shows the "Styles" panel with the CSS rules for the h1 element. The first rule is from "style.css" and defines a solid black border, padding, and white text on a cadetblue background. The second rule is from the "user agent stylesheet" and sets the display to block and a font size of 2em.

```
<html>
  <head>
    <title>My first styled page</title>
    <link rel="stylesheet" type="text/css" href="style.css">
  </head>
  <body>
    <!-- Site navigation menu -->
    <ul class="navbar">...</ul>
    <!-- Main content -->
    ... <h1>My first styled page</h1> == $0
    <p>Welcome to my styled page!
    </p>
    > <p>...</p>
    > <p>...</p>
    > <address>...</address>
  </body>
```

Styles Computed >>
Filter :hover .cls +
element.style {
}
h1 { style.css:1
border-style: solid;
border-width: 7px;
border-color: black;
padding: 20px;
text-align: center;
background-color: cadetblue;
color: white;
}
h1 { user agent stylesheet
display: block;
font-size: 2em;

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01//EN">
<html>
<head>
  <title>My first styled page</title>
  <link rel="stylesheet" type="text/css" href="style.css">
</head>
<body>
  <!-- Site navigation menu -->
  <ul class="navbar">
    <li><a href="index.html">Home page</a>
    <li><a href="musings.html">Musings</a>
    <li><a href="town.html">My town</a>
    <li><a href="links.html">Links</a>
  </ul>
  <!-- Main content -->
  <h1>My first styled page</h1>
  <p>Welcome to my styled page!
  <p>It lacks images, but at least it has style.
  And it has links, even if they don't go
  anywhere&hellip;
  <p>There should be more here, but I don't know what yet.
  <!-- Sign and date the page, it's only polite! -->
  <address>Made 5 April 2004<br> by myself.</address>
</body>
</html>
```

External style definition

3 Ways of Style Definition + Cascading Rule

- Inline style definition (Highest priority)
- Internal style definition (Middle priority)
- External style definition (Lowest priority)
- Style defined last has priority over style defined earlier

Base

Selector

body

ADJECTIVE

CSS

Declaration

Declaration

{ color:purple; font-size:12px; }

Property

Value

Property

Value

Diagram illustrating the components of a CSS rule:

- Base:** body
- ADJECTIVE:** CSS
- Declaration:** { color:purple; font-size:12px; }
- Property:** color, font-size
- Value:** purple, 12px

The diagram shows the hierarchical structure of a CSS rule, where the base selector "body" is followed by the adjective "CSS", and then the declaration block containing properties and values.

Third hands-on exercise:

<https://www.w3.org/Style/Examples/011/firstcss.en.html>
(Step 1 to 5)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01//EN">
<html>
<head>
  <title>My first styled page</title>
</head>
<body>
  <!-- Site navigation menu -->
  <ul class="navbar">
    <li><a href="index.html">Home page</a>
    <li><a href="musings.html">Musings</a>
    <li><a href="town.html">My town</a>
    <li><a href="links.html">Links</a>
  </ul>
  <!-- Main content -->
  <h1>My first styled page</h1>

  <p>Welcome to my styled page!
  <p>It lacks images, but at least it has style. And it has links, even if they don't go anywhere&hellip;
  <p>There should be more here, but I don't know what yet.

  <!-- Sign and date the page, it's only polite! -->
  <address>Made 5 April 2004<br>
    by myself.</address>
</body>
</html>
```

Code View - Step 1

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01//EN">
<html>
<head>
<title>My first styled page</title>
<style type="text/css">
body {
    color: purple;
    background-color: #d8da3d }
</style>
</head>
<body>
<!-- Site navigation menu --&gt;
<ul class="navbar">
- <a href="index.html">Home page</a>
- <a href="musings.html">Musings</a>
- <a href="town.html">My town</a>
- <a href="links.html">Links</a>


<!-- Main content --&gt;
:
:
&lt;/body&gt;
&lt;/html&gt;</pre>
```

Code View - Step 2 (Add colours)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01//EN">
<html>
<head>
<title>My first styled page</title>
<style type="text/css">
body {
    color: purple;
    background-color: #d8da3d }
h1 {
    font-family: Helvetica, Geneva, Arial,
    SunSans-Regular, sans-serif }
</style>
</head>
<body>
<!-- Site navigation menu --&gt;
&lt;ul class="navbar"&gt;
    &lt;li&gt;&lt;a href="index.html"&gt;Home page&lt;/a&gt;
    &lt;li&gt;&lt;a href="musings.html"&gt;Musings&lt;/a&gt;
    &lt;li&gt;&lt;a href="town.html"&gt;My town&lt;/a&gt;
    &lt;li&gt;&lt;a href="links.html"&gt;Links&lt;/a&gt;
&lt;/ul&gt;
<!-- Main content --&gt;
    :
    :
&lt;/body&gt;
&lt;/html&gt;</pre>
```

Code View - Step 3 (Add fonts)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01//EN">
<html>
<head>
<title>My first styled page</title>
<style type="text/css">
body {
    color: purple;
    background-color: #d8da3d }
ul.navbar {
    position: absolute;
    top: 2em;
    left: 1em;
    width: 9em }
h1 {
    font-family: Helvetica, Geneva, Arial,
    SunSans-Regular, sans-serif }
</style>
</head>
<body>
<!-- Site navigation menu --&gt;
&lt;ul class="navbar"&gt;
    &lt;li&gt;&lt;a href="index.html"&gt;Home page&lt;/a&gt;
    &lt;li&gt;&lt;a href="musings.html"&gt;Musings&lt;/a&gt;
    &lt;li&gt;&lt;a href="town.html"&gt;My town&lt;/a&gt;
    &lt;li&gt;&lt;a href="links.html"&gt;Links&lt;/a&gt;
&lt;/ul&gt;
<!-- Main content --&gt;
:
:</pre>
```

Code View - Step 4 (Add navbar)

```
<html>
<head>
    <title>My first styled page</title>
    <style type="text/css">
        :
        ul.navbar {
            position: absolute;
            top: 2em;
            left: 1em;
            width: 9em }
        h1 {
            font-family: Helvetica, Geneva, Arial,
            SunSans-Regular, sans-serif }
        ul.navbar li {
            background: white;
            margin: 0.5em 0;
            padding: 0.3em;
            border-right: 1em solid black }
        ul.navbar a {
            text-decoration: none }
        a:link {
            color: blue }
        a:visited {
            color: purple }
    </style>
    :
```

Code View - Step 5 (Styling the navbar)

Pattern

Discover similarities between things.

Custom (e.g. class or id)
Selector

ADJECTIVE

CSS

Declaration

Declaration

.box

#nav

{ color:blue; font-size:12px; }

class

id

Property

Value

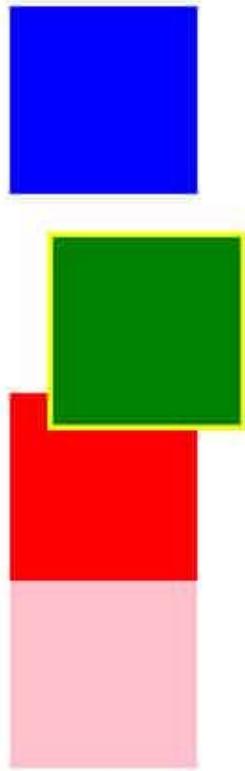
Property

Value

Put the Internal Style Definition into an External File

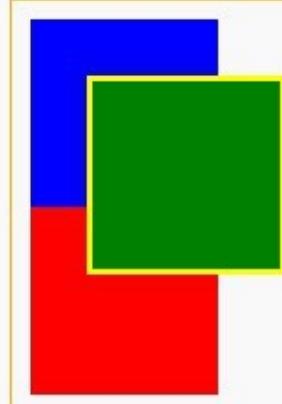
4 Ways of Positioning Display Box

- Static - default position of a box following the normal document flow (not affected by top, left, right, bottom pos.)
- Fixed - it always stay on the same location as defined by the positions (top and left or bottom or right) even the page is scrolled. Unlike absolute, its parent is the viewport.
- Relative - relative when used with top and left position pair or bottom and right position pair will allow the object box to be moved to a new location relative to its current position (not container).
- Absolute - take the positioning out of the document flow and place it at a location (top and left position) as defined in relationship to its containing (or parent) element (context). The container/parent should be set to relative.



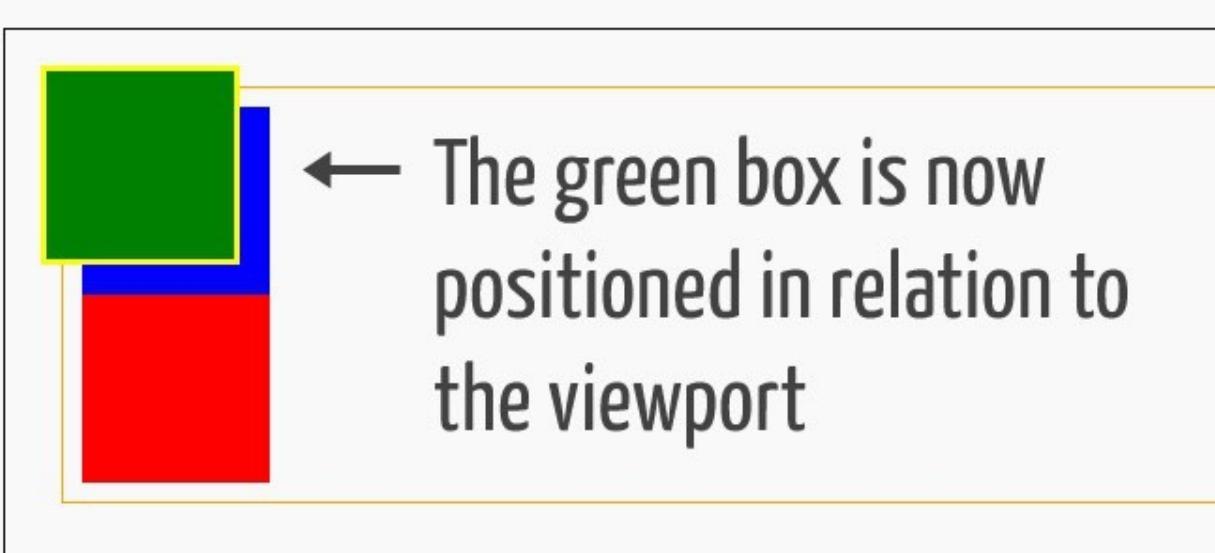
The second box is set to “position: relative” and is offset using top and left values.

Source: CSS Positioning: A Comprehensive Look
(<http://blog.teamtreehouse.com/css-positioning>)

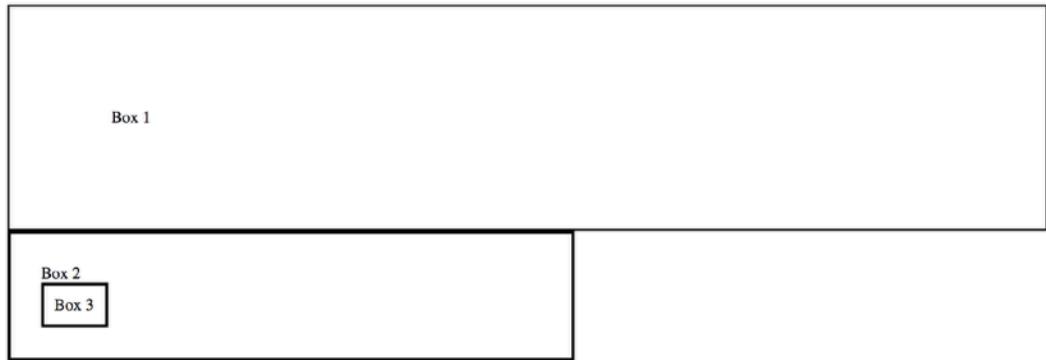


The second box is set to “position: absolute” and is offset in relation to the “.container” element

Source: CSS Positioning: A Comprehensive Look
(<http://blog.teamtreehouse.com/css-positioning>)



Source: CSS Positioning: A Comprehensive Look
(<http://blog.teamtreehouse.com/css-positioning>)



A Simple Example

The Grammar of CSS

- Styles define how to display HTML elements
- Each style description is made up of a Selector and Declaration
- Selector defines which HTML element should be used for display and the declaration defines how
- Each declaration contains properties and values
- There are base and custom selectors (ID and CLASS are custom selectors)
- Style definition can be placed inline, in the head section or in an external file (e.g. style.css)

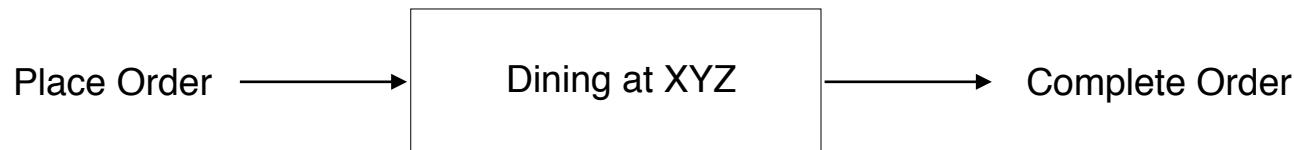
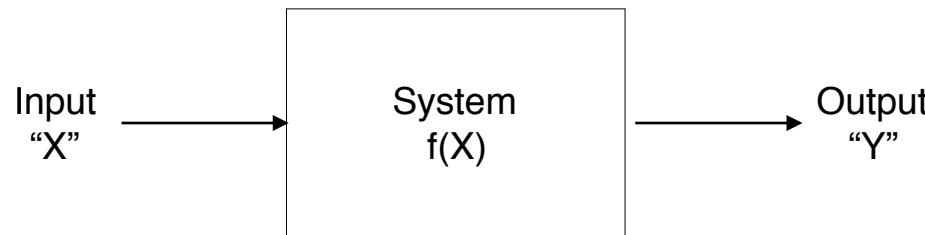
VERB

JS

JavaScript = act on a HTML tag, CSS property or respond to an event triggered by user action

What is JavaScript? How does it fit into computational thinking?

$$Y = f(X)$$



Example: Cell manipulation in Excel with some cells controlling inputs while others outputs.

**JavaScript provides us with the capabilities
to build system and transform data.**

Learning JavaScript with Google Blockly:

**[https://blockly-demo.appspot.com/static/demos/code/
index.html](https://blockly-demo.appspot.com/static/demos/code/index.html)**

Data Types in JavaScript

Declaring a variable and its data type:

- **String** - e.g. **var str_var = “This is a string.”;**
- **Numeric** - e.g. **var num_var = 3.2;**
- **Boolean** - e.g. **var bol_var = true;**

Basic Input/Output Commands

- **Entering a variable** - e.g. `var x = prompt("Enter x value");`
- **Displaying a variable** - e.g. `alert("x = " + x_var);`

JavaScript Functions that Transform Input into Output

Basic Structure of a JavaScript Function

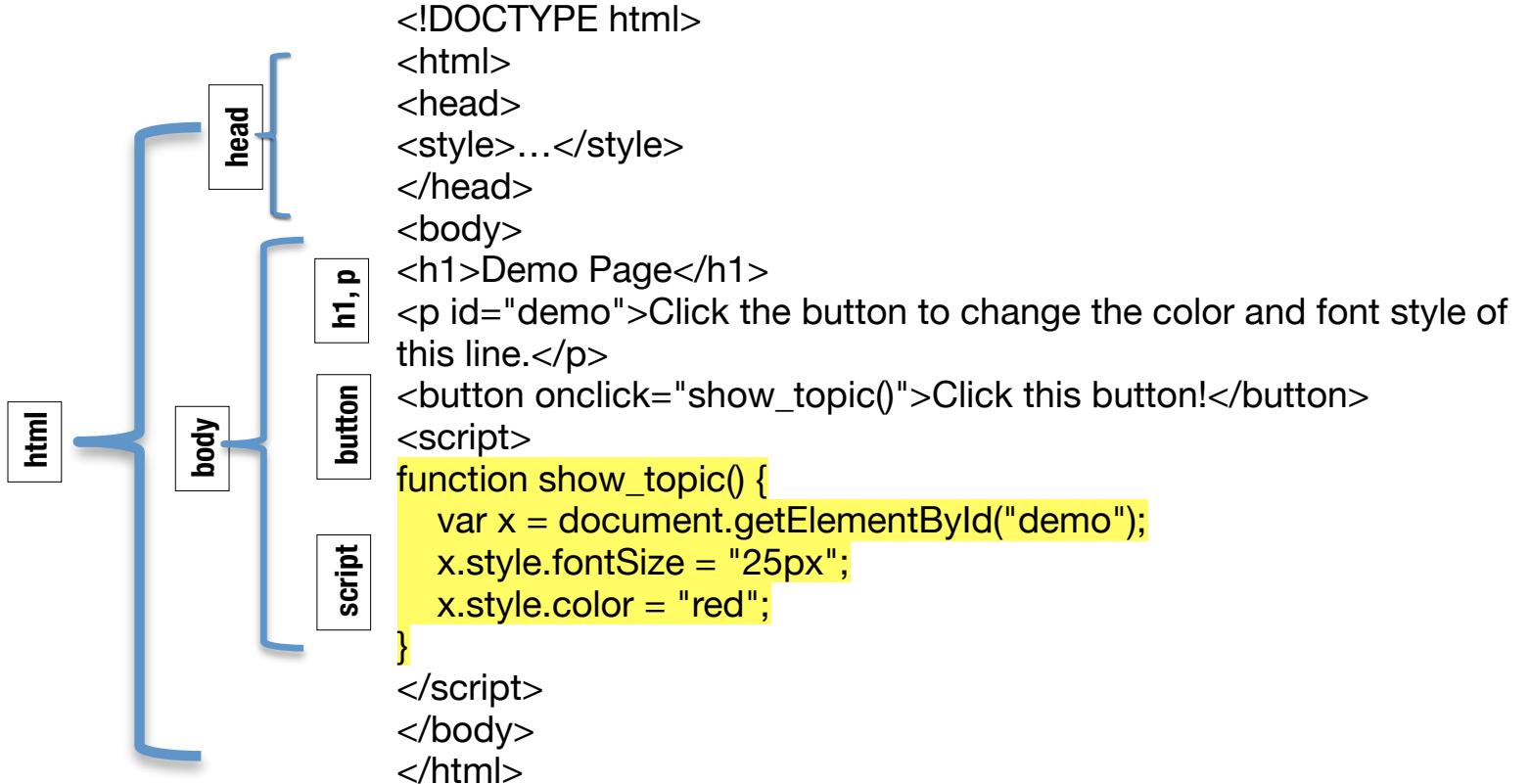
```
<script>
    function function_name(parameter1, parameter 2...) {
        Embed data type variables, input/output commands and
        logical and mathematical operators in the function to
        compute and return values.

    }
</script>
```

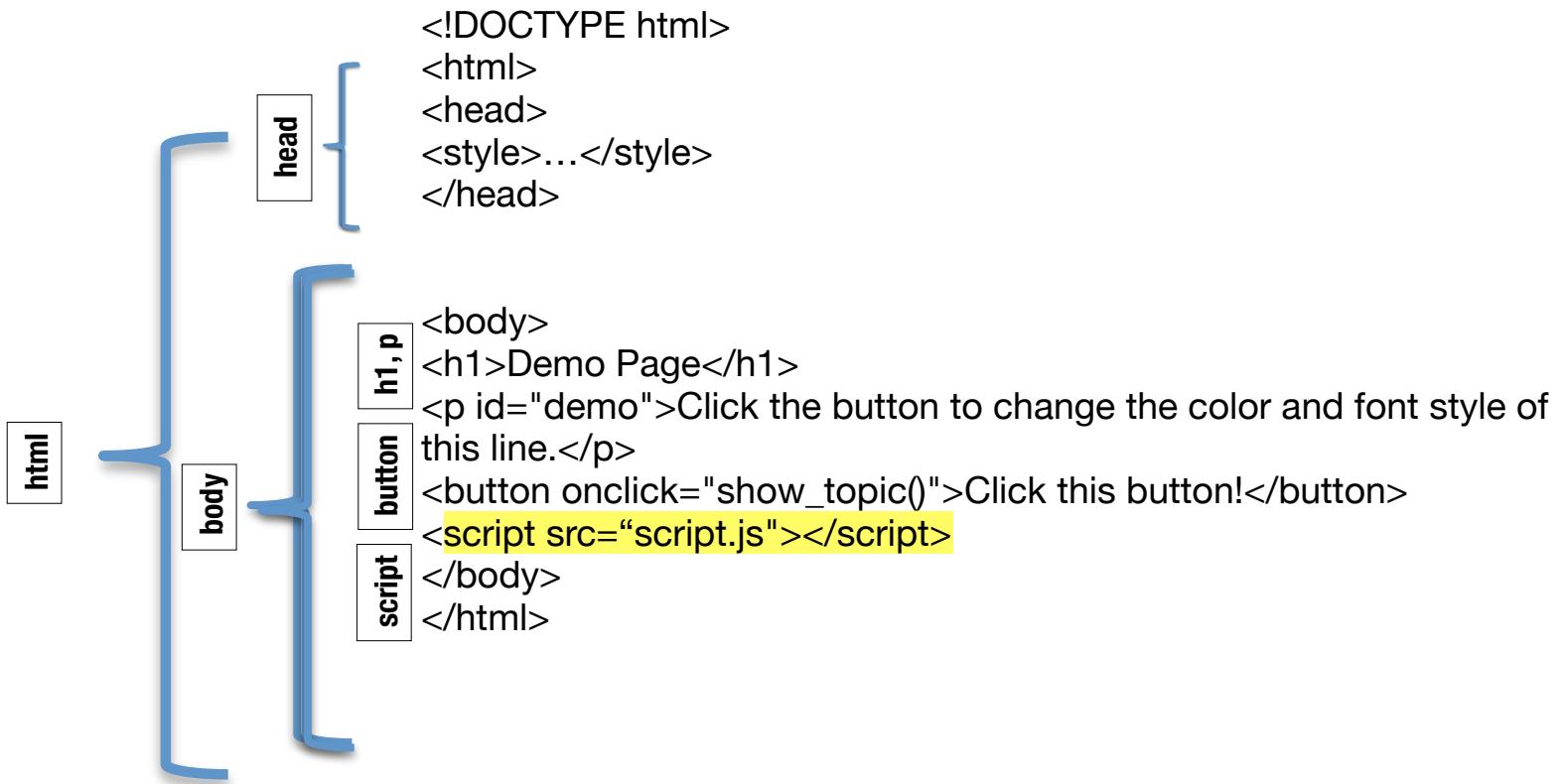
optional parameters

First hands-on exercise on JavaScript:

<https://www.javascript.com/try>



**Similar to CSS, JS can be placed in
an External File**



JavaScript Operations and Commands that Can Enrich the Transformation Process

Abstraction

Ignore irrelevant details to focus on essential features to come up with one solution or classification that works for multiple situations.

Basic Logical and Mathematical Operations

- `==` equal (comparing string and boolean)
- `!=` not equal (comparing string and boolean)
- `=` equal (comparing numerical values)
- `>=` greater than or equal to (comparing numerical values)
- `<=` smaller or equal to (comparing numerical values)
- `+, -, *, /, %, &&, ||, !` (addition, subtraction, multiplication, division, modular, and, or, not)

Basic Structure of JavaScript Functions In a HTML File

```
<!DOCTYPE html>
<html><head>
<style>...</style>
</head>
<body>
  :
  <button onclick="get_values()">Click here</button>
<script>
  function addition(a, b) {
    a = parseInt(a); b = parseInt(b);
    c = a + b;
    return c;
  }
  function get_values() {
    var a = prompt("Enter first number:");
    var b = prompt("Enter second number:");
    var z = addition(a,b), alert("The answer is:" + z);
  }
</script>
</body>
</html>
```

Basic Logical and Mathematical Operations

if (condition) {action} else {action}

Examples:

- `if (boolean_var == true) {alert("That is correct");} else {alert("That is incorrect");}`
- `if (string_var != "David") {alert("Not Peter");}`
- `if (num_var >= 8) {alert("The number is greater than or equal to eight.");} else {alert("The number is smaller than eight.");}`

Input/Output Commands without Pop-up

Entering a variable values through HTML form - e.g.

```
<body>
<form name='guessForm'>
    <input name = "guessValue" class="inputField">
</form>
<button class='button' onclick='guessInteger()>Guess an Integer</button>
<div id='demo'></div>

<script>
function guessInteger() {
    guess = document. forms['guessForm']['guessValue'].value;
    if (guess == "") {
        document.getElementById('demo').innerHTML = "Empty!";
        return;
    } else {
        guess_int = parseInt(guess);
        if (guess_int) == 20)
            {document.getElementById('demo').innerHTML = "Right!";} else
            {document.getElementById('demo').innerHTML = "Wrong!";}
    return;
}
</script>
</body>
```

Introducing JavaScript object, array, and loop

The screenshot shows a web browser window with the Google homepage loaded. The browser's address bar contains "Search Google or type a URL". Below the address bar is a bookmarks bar with links to various categories like Apps, Cyberport Bootca..., Blockchain, NLP and Chatbot, FinTech, E-Commerce, Classes, Development Tools, Data Science, Machine Learning, Music, Drupal, Cloud Providers, and Other Bookmarks. On the right side of the browser are icons for Gmail, Images, and other account settings.

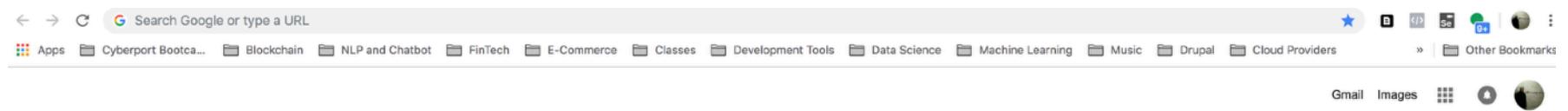
The main content area features the large Google logo. Below it is a search bar with the placeholder "Search Google or type a URL" and a microphone icon for voice search. The browser's toolbar includes icons for back, forward, and refresh, along with tabs for Elements, Console, Sources, Network, Performance, Memory, Application, Security, Audits, and JavaScript Profiler. The "Console" tab is currently selected.

In the developer console, the "Console" tab is active, showing the following log output:

```
newtab?ie=UTF-8:8
17:25:20.426 SW registered
> 17:26:54.913 var student1 = {name:'John',id:1001};
<- 17:26:54.918 undefined
> 17:27:13.330 var student2 = {name:'Mary',id:1002};
<- 17:27:13.335 undefined
> 17:28:15.340 student3 = {name:'David',id:1003};
<- 17:28:15.346 > {name: "David", id: 1003}
> students = [];
```



```
Elements Console Sources Network Performance Memory Application Security Audits JavaScript Profiler  x 4 ⚠ 4 | ⋮ x
[?] top Default levels ▾ 21 hidden ⌂
▶ 23 messages
▶ 2 user mes...
  ✘ No errors
  ⚠ 4 warnings
  ⓘ 14 info
  ⚡ 5 verbose
▶ 0: {name: "John", id: 1001}
  length: 1
  ▶ __proto__: Array(0)
> 17:45:10.195 students.push(student2);
< 17:45:10.206 2
> 17:45:19.164 students.push(student3);
< 17:45:19.169 3
> 17:45:23.621 students;
< 17:45:23.629 ▾(3) [..., ..., ...] ⓘ
  ▶ 0: {name: "John", id: 1001}
  ▶ 1: {name: "Mary", id: 1002}
  ▶ 2: {name: "David", id: 1003}
  length: 3
  ▶ __proto__: Array(0)
```

A screenshot of the Chrome DevTools interface, specifically the "Console" tab. The left sidebar lists log levels: 6 messages, 1 user mes..., No errors, 2 warnings, 2 info, and 2 verbose. The main pane displays the following log entries:

```
> 17:40:25.934 students.push[student2];
< 17:40:25.939 undefined
> 17:40:28.751 students.push[student3];
< 17:40:28.756 undefined
> 17:40:31.102 students.push[student3];
< 17:40:31.107 undefined
> 17:40:37.113 students
< 17:40:37.116 []
    length: 0
    > __proto__: Array(0)
> 17:41:33.699 students;
< 17:41:33.705 []
> for (i = 0; i<4; i++) {document.write(students[i].name + "/" + students[i].id + "<br>");}
```

More Advanced JS Data Structures: Array and Object

- **Array - a list of elements e.g.**
`var fruits = ["apple","grape","pear"];`
- **Object - a collection of properties represented in name:values pairs**
e.g.
**`var student {
 student_id: 1155115511;
 student_fname: "Bernard";
 student_lname:"Suen";
 student_major: "EPIN";
}`**

Loop

Loop is an iterative programming construct suitable for handling JavaScript array and object.

```
for (initialization; condition; increment) {  
    JavaScript statements  
}
```

Try the following steps:

- 1) var fruits = [];
- 2) for (i=1; i< 10 ;i++) {
 fruits[i] =
 prompt("Enter
 fruit:");
 }
3) alert("fruits contain"
+ fruits);

$$Y = f(a,b)$$

“Ending Number” e.g.
 $b = 200$

Compute next lower
number from the top and
next higher number from
the bottom.
 $200 \rightarrow 199 \rightarrow 198 \rightarrow 197 \dots$
 $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \dots$
Sum the results

Sum of
 $a + b$ where
 $a =$ next lower number from
the top and $b =$ next higher
from the bottom

“Starting Number” e.g.

$a = 1$

“You may need a loop to complete this function.”

Functions in JavaScript Programming

- You can look at a function as a mini-system.
- A function is designed to transform input into output.
- You can execute a function within another function.
- A program can be viewed as a collection of functions decomposed into hierarchy of functions to get things done.
- Good programmer looks for patterns in job to be done and abstract common parameters, algorithms, and outcomes to be placed inside a function for code reuse.

The Grammar of JavaScript

- JavaScript is a programming language that can be used to write functions placed inside html or an external file.
- JavaScript can be placed between the <script> and </script> tags before the end of the </body> tag or link to an external file through the script src link.
- JavaScript codes can be understood as a collection of functions that respond to events triggered by internal browser activities and external user interactions.
- JavaScript can be used to manipulate HTML elements and CSS styles.

JavaScript Has Become the Most Popular Front-end Language with Pre-packaged Framework and Library Support

e.g. jQuery,
AngularJS, React,
Vue

e.g. jQuery
DataTable, D3,
C3D3, Leaflet

Base

Selector

body

ADJECTIVE

CSS

Declaration

Declaration

{ color:purple; font-size:12px; }

Property

Value

Property

Value

Custom (e.g. class or id)
Selector

ADJECTIVE

CSS

Declaration

Declaration

.box

#nav

{ color:blue; font-size:12px; }

class

id

Property

Value

Property

Value

WHAT IS RESPONSIVE DESIGN ?

RESPONSIVE DESIGN = MEDIA QUERY + CONDITIONAL

STYLE.CSS

```
body {  
    background-color: grey;  
}  
  
@media screen and (max-width: 960px) {  
    body {  
        background-color: red;  
    }  
}  
  
@media screen and (max-width: 768px) {  
    body {  
        background-color: orange;  
    }  
}  
  
@media screen and (max-width: 550px) {  
    body {  
        background-color: yellow;  
    }  
}  
  
@media screen and (max-width: 320px) {  
    body {  
        background-color: green;  
    }  
}
```

```
<!DOCTYPE html>
<html>
<head>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0, user-scalable=0">
<title>Workshop</title>
<!--link href='http://fonts.googleapis.com/css?family=Average|Courgette' rel='stylesheet' type='text/css'-->
<!--link href="https://fonts.googleapis.com/css?family=Open+Sans|Oswald" rel="stylesheet"-->
<link href="https://fonts.googleapis.com/css?family=Balo+Khanda+Balo+Paajil+Merriweather" rel="stylesheet">
<link href="mq_demo.css" rel="stylesheet" type="text/css">
</head>
<body>
<div class="showview">
</div>
<script src="https://ajax.googleapis.com/ajax/libs/jquery/1.12.4/jquery.min.js"></script>
<script src="http://maxcdn.bootstrapcdn.com/bootstrap/3.3.7/js/bootstrap.min.js"></script>
<script>
$(document).ready(function() {
    $(window).resize(function() {
        if ($(window).width() >= 960) {
            $(".showview").html('<h1>Higher than 960</h1>');
        }

        if ($(window).width() < 960) {
            $(".showview").html('<h1>960</h1>');
        }

        if ($(window).width() < 768) {
            $(".showview").html('<h1>768</h1>');
        }

        if ($(window).width() < 550) {
            $(".showview").html('<h1>550</h1>');
        }

        if ($(window).width() < 320) {
            $(".showview").html('<h1>320</h1>');
        }
    });
});

</script>
</body>
</html>
```

Putting Everything Together

Using Bootstrap Form and Button to Make Browser UI Look Better

<https://getbootstrap.com/>

Bootstrap

Build responsive, mobile-first projects on the web with the world's most popular front-end component library.

Bootstrap is an open source toolkit for developing with HTML, CSS, and JS. Quickly prototype your ideas or build your entire app with our Sass variables and mixins, responsive grid system, extensive prebuilt components, and powerful plugins built on jQuery.

[Get started](#)

[Download](#)

Currently v4.1.3



Using Bootstrap Form and Button to Make Browser UI Look Better

Source: <https://getbootstrap.com/docs/4.0/components/forms/>

Email address

Enter email

We'll never share your email with anyone else.

Password

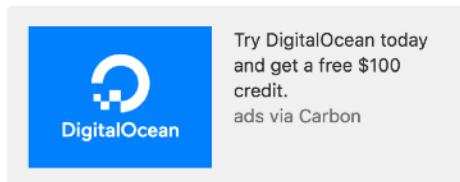
Password

Check me out

Submit

Buttons

Use Bootstrap's custom button styles for actions in forms, dialogs, and more with support for multiple sizes, states, and more.



Examples

<https://getbootstrap.com/docs/4.0/components/buttons/>

Bootstrap includes several predefined button styles, each serving its own semantic purpose, with a few extras thrown in for more control.

Primary Secondary Success Danger Warning Info Light Dark Link

```
<button type="button" class="btn btn-primary">Primary</button>
<button type="button" class="btn btn-secondary">Secondary</button>
<button type="button" class="btn btn-success">Success</button>
<button type="button" class="btn btn-danger">Danger</button>
<button type="button" class="btn btn-warning">Warning</button>
<button type="button" class="btn btn-info">Info</button>
<button type="button" class="btn btn-light">Light</button>
<button type="button" class="btn btn-dark">Dark</button>

<button type="button" class="btn btn-link">Link</button>
```

Thank you for your time!