

# Developing ITeMS (IT-enabled MindSet)

## Video 6.4

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*Having ITeMS helps in all domains*

# *Outline*

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## Overview:

- **What is ITeMS**
- **CT skills: Abstraction, Decomposition...**
- **Leveraging on CT skills**

# What is ITeMS

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## □ Having IT-enabled MindSet means...

- ❖ Leverage on knowledge of CT – namely, decomposition, abstraction, pattern recognition, algorithm design
- ❖ To apply to problems across all domains
- ❖ To ask new questions, solve new problems and seek new solution,

# CT at Google (real world PS)

## Solving Problems at Google using CT

(A 4-min video from Google exploringCT)

<https://www.youtube.com/watch?v=SVVB5RQfYxk>



### Google Earth, Google Maps, Making Pegman Smart

- 0:10 Decomposition,
- 0:16 Pattern Recognition;
- 0:20 Algorithm Design;

# Problem for YOU!

You are the CEO (not CTO) of e-CT.com. You want to have *its own e-greeting card web service*. You are not a software engineer, but you have ITeMS (IT-enabled MindSet) – you know about CT, like abstraction, decomposition, pattern recognition, etc.

Write down *the requirements* you want for your intended e-greeting card web service. Namely, specifying what *features* it will provide, what it will *look like* (look-and-feel), and how you want *users to interact with it* (human-computer interface), *how much it will cost*, etc.

# Problem for YOU!

**Sample features are:**

- “ability to send reminder if the recipient has not viewed the card in 3 days”
- “convenient way for recipient to reply to sender upon viewing the card”.
- “can choose card based on occasions, special events, special relationships, etc”

Focus on *the what*, and don’t worry about *the how*.  
Assume you can/will hire people with the right expertise later to do it.

# ITeMS: IT-enabled MindSet

## Summary:

- Seem to be a daunting challenge, especially when you are not a software engineer.
- However, with ITeMS, anyone can work through the process of decomposition to work out what the app will do, what it will look like, and so on.
- And anyone with CT and ITeMS can do it. And will get *better and better* with practice.

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# Computational Thinking

## Some key elements in CT:

- **Decomposition:** breaking down complex problem, data, or system into smaller, more manageable parts
- **Pattern Recognition:** observing patterns, trends, and regularities among and within problems
- **Abstraction:** focusing on the important information only, ignoring irrelevant detail
- **Algorithm design:** developing the step-by-step instructions for solving this and similar problems

# Abstraction...

focusing on the important information only, ignoring irrelevant detail

## Abstraction in CT

(A 2.5-min video from CMU Robotics Academy)

<https://www.youtube.com/watch?v=jV-7Hy-PF2Q>



Abstraction - Computational Thinking



1,956 views

**Finding the best bus route between A and B in a city (like Pittsburgh)**

Remove unnecessary info/data;  
Keeping only essential info/data;

In Physics:  $F = ma$ ,  $v = ut + at^2$

In Music: ?? In History: ??

# Abstraction: helps to identify minimal input required in apps



NUS WebMail

Student Email

The Freedom to access your NUSmail *anytime* and *anywhere*.

- This is a shared computer
- This computer is only used by me

Note:

- nusstflUserID for NUS Staff
- nusstu\UserID for NUS Student
- nusext\UserID for NUS Visitors

- Login to AlumMAIL for NUS Alumni
- firstname\_lastname@nuhs.edu.sg for NUHS

Password

Sign in

[I forgot my password!](#)

# Abstraction: helps to identify minimal input required in apps

## Currency Converter

Currency Converter      Historical Exchange Rates      Live Exchange Rates      [print](#)

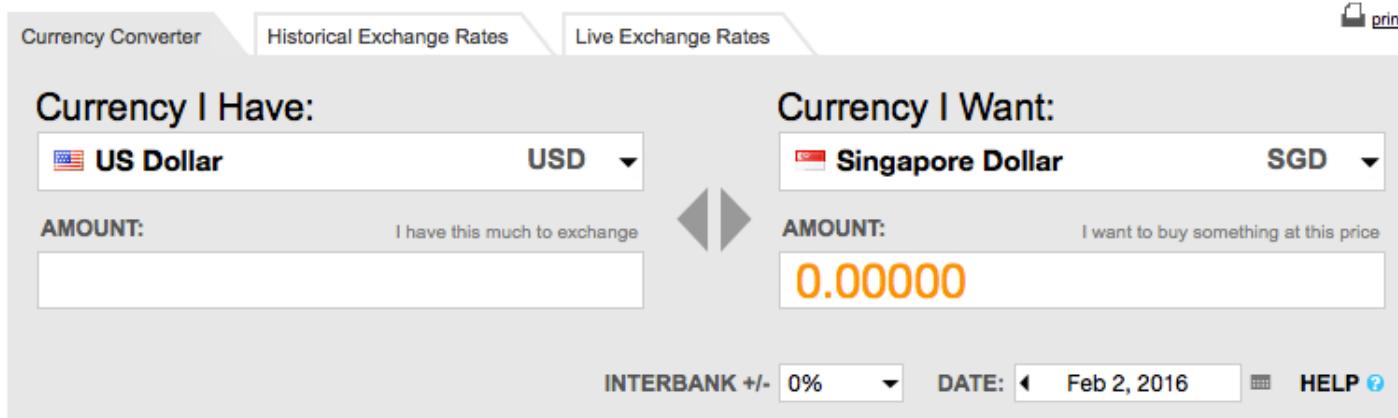
**Currency I Have:**  
US Dollar      USD     

AMOUNT: I have this much to exchange

**Currency I Want:**  
Singapore Dollar      SGD     

AMOUNT: I want to buy something at this price

INTERBANK +/- 0%      DATE: Feb 2, 2016      [HELP ?](#)



This screenshot shows the initial state of a currency converter. In the 'Currency I Have' section, 'US Dollar' is selected as the source currency and 'USD' is the unit. The 'AMOUNT' field contains an empty text input. In the 'Currency I Want' section, 'Singapore Dollar' is selected as the target currency and 'SGD' is the unit. The 'AMOUNT' field contains the placeholder text 'I want to buy something at this price'. Below the sections are buttons for 'INTERBANK +/- 0%', a date selector set to 'Feb 2, 2016', and a 'HELP ?' link.

## Currency Converter

Currency Converter      Historical Exchange Rates      Live Exchange Rates      [print](#)

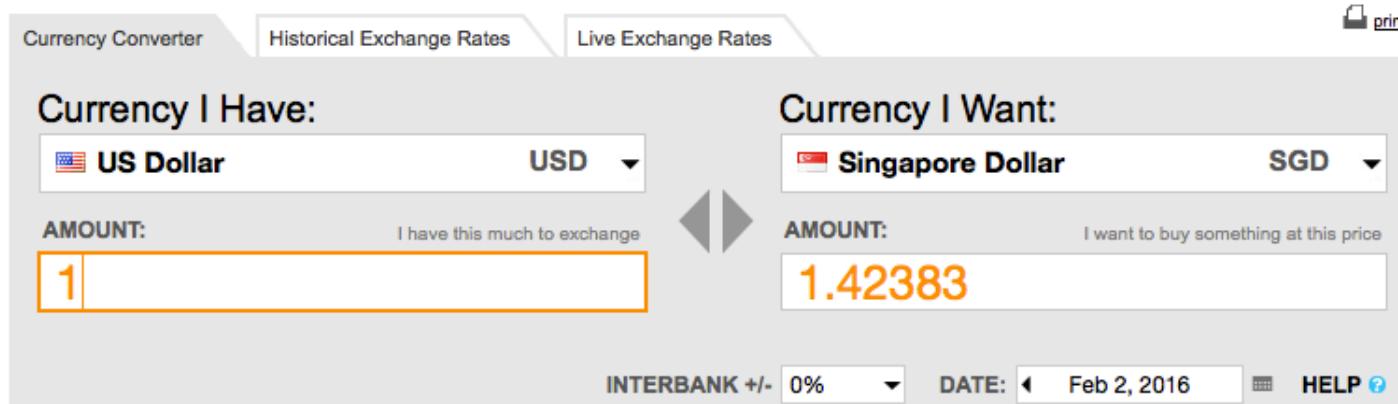
**Currency I Have:**  
US Dollar      USD     

AMOUNT: I have this much to exchange

**Currency I Want:**  
Singapore Dollar      SGD     

AMOUNT: I want to buy something at this price

INTERBANK +/- 0%      DATE: Feb 2, 2016      [HELP ?](#)



This screenshot shows the state of the currency converter after inputting values. The 'AMOUNT' field under 'Currency I Have' now contains the number '1'. The 'AMOUNT' field under 'Currency I Want' now contains the result '1.42383', which is highlighted with a yellow border. All other UI elements remain the same as in the first screenshot.

[S] Page 12

# Decomposition...

breaking down problem, data, or system into smaller, more manageable parts

## Decomposition in CT

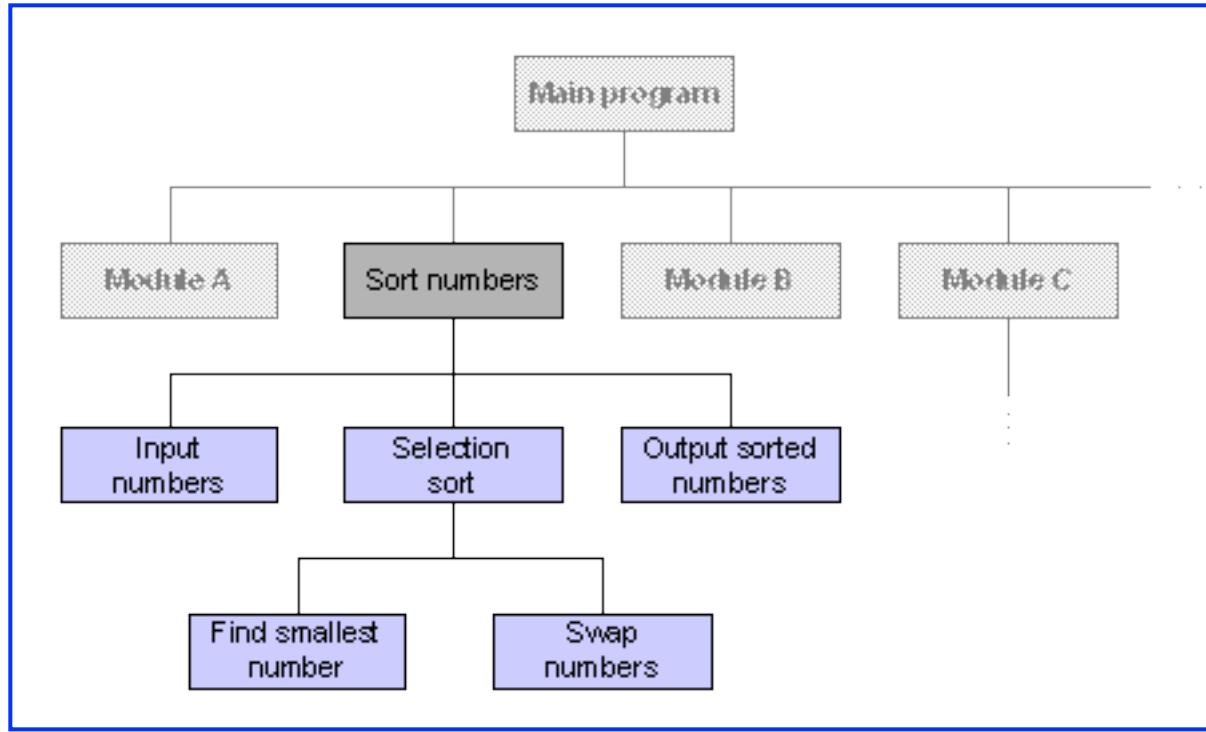
(11min video from Curriki)

<https://www.youtube.com/watch?v=yQVTijX437c>



0:08 Polya problem solving  
0:24 Eating an elephant;  
0:45 Decomposition  
1:38 Example: Total cost of beads  
  
and examples from all areas...

# Decomposition (2)



A program that requires sorting...  
(a possible decomposition)

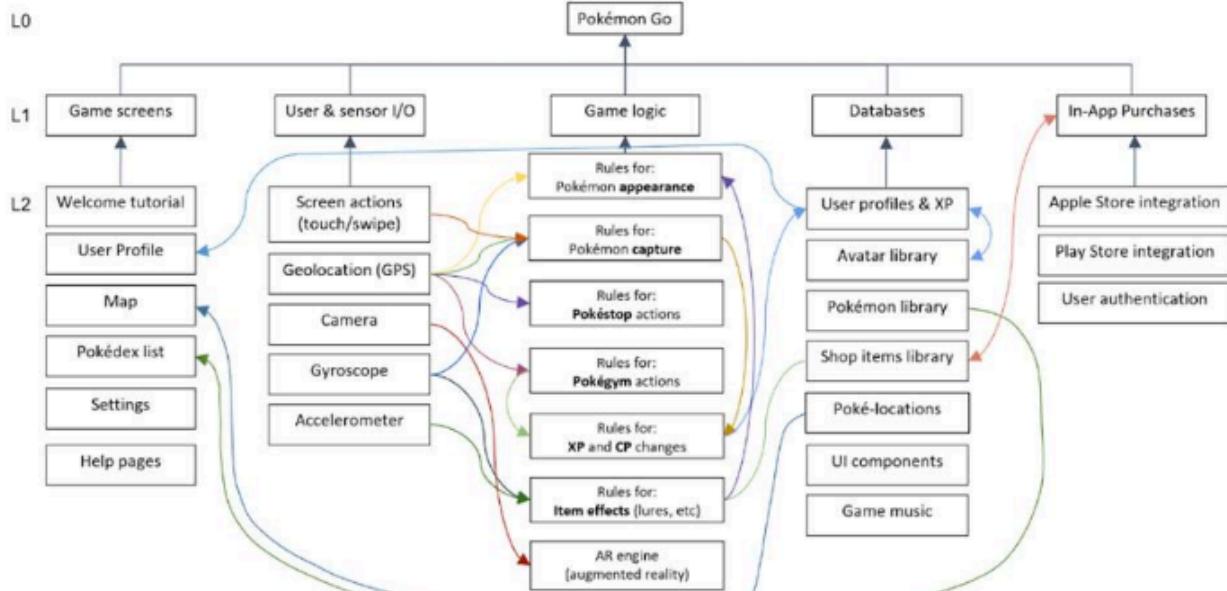
# Decomposition (4)



**Doing the Shopping  
(a possible decomposition)**

# Shamir's Pokemon-Go...

### 3. Decompositional and Structural Views



Shamir Rahim

September 13 near Singapore · 0

Because actually playing the game is too mainstream. Also, we had to make our homework more... inspiring #ie5407 #PokémonGO #industrialsystemsengineering

Like Comment Share

Eric Feng and 16 others

Arly Khalessy Can i share this w my students from nus? Yes am teaching them pokémon go

Like · Reply · 22 hrs · Edited

Shamir Rahim replied · 9 Replies · 8 hrs

Hon Wai Leong @Shamir: I will show this to my UIT2201 class (happening this semester). Can? --hon-wai

Like · Reply · 5 hrs

Shamir Rahim Hi Prof Leong, of course! Please go ahead - it'd be an honour as an 'old boy' 😊



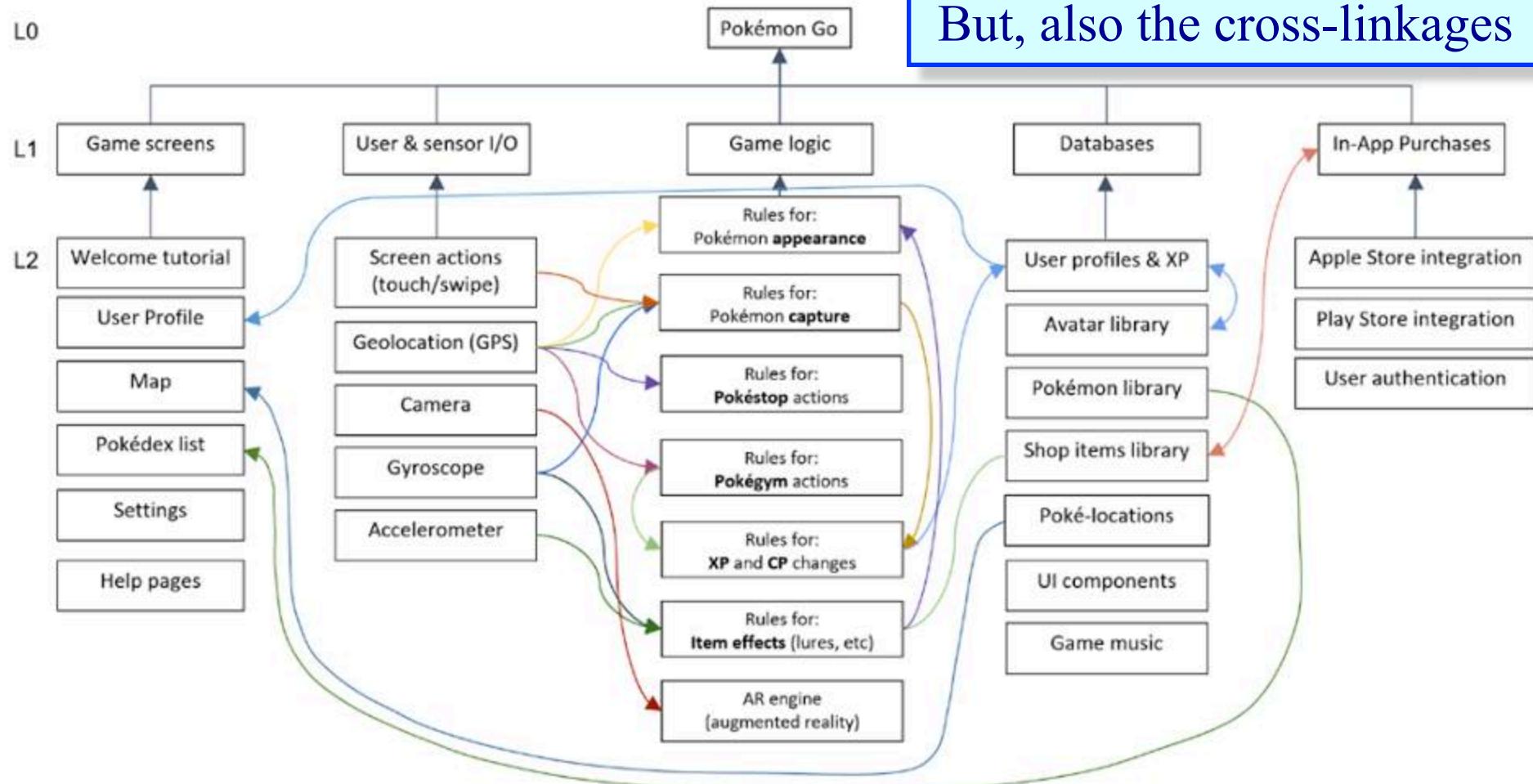
Write a comment...



# Pokemon Go Decomposition

## 3. Decompositional and Structural Views

L0



## WHY COOL?

Not *just* decomposition  
But, also the cross-linkages

# *Outline*

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## Overview:

- What is ITeMS
- CT skills: Abstraction, Decomposition...
- Leveraging on CT skills
  - ❖ Ask new questions,
  - ❖ Solve new problems,
  - ❖ Invent new solutions,

# Asking the CT question...

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**When faced with new problem/situation...**

- Is there CT/algorithim hidden inside?
- Should there be CT/algorithim inside?
- How can CT/algorithim help?

# Why is ITeMS relevant?

## The Singapore NLB Story: Chris Chia and ELiMS

### A Perpetual Problem in all NLB Branches:

Branches closes at 10:00pm.

But there's "long queues at 9:45pm"

Users & Employee go home very late...

# How to solve this Problem?

## A Perpetual Problem in all NLB Branches:

Branches closes at 10:00pm.

But there's "long queues at 9:45pm"

Users & Employee go home very late...

## Possible Solution?

Have more service counters [need more people!]

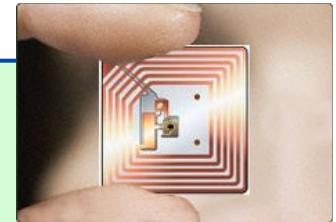
Tell people to borrow (checkout) early [Don't work]

Close a bit earlier [does not solve root prob]

...

# What was Chris Chia's answer?

Leverage on IT/CT solution: ELiMS



The **Electronic Library Management System** (ELiMS), the world's first to use radio frequency technology for lending and returning books, was introduced in 1998 ensuring S\$50 million in savings. It was patented in July 1999.

**“Poster Boy”:** the **RFID chip** on each library book!

It lets CT do all the work of tracking book borrowing/returns, etc.

<http://www.stlogitrack.com/ELIMS.html>

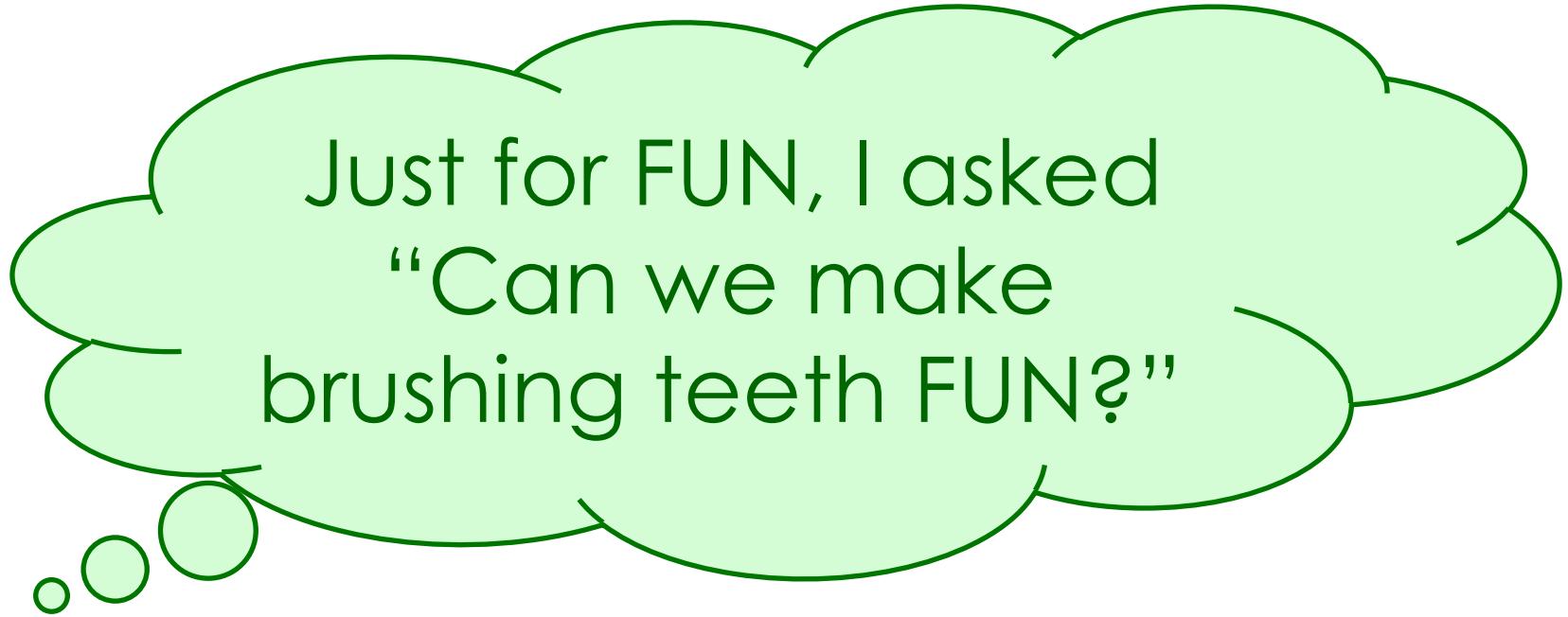
<http://bizfaculty.nus.edu/faculty-profiles/321-christopher-chia>

# Who is Christopher Chia?

## The Singapore NLB ELiMS Story

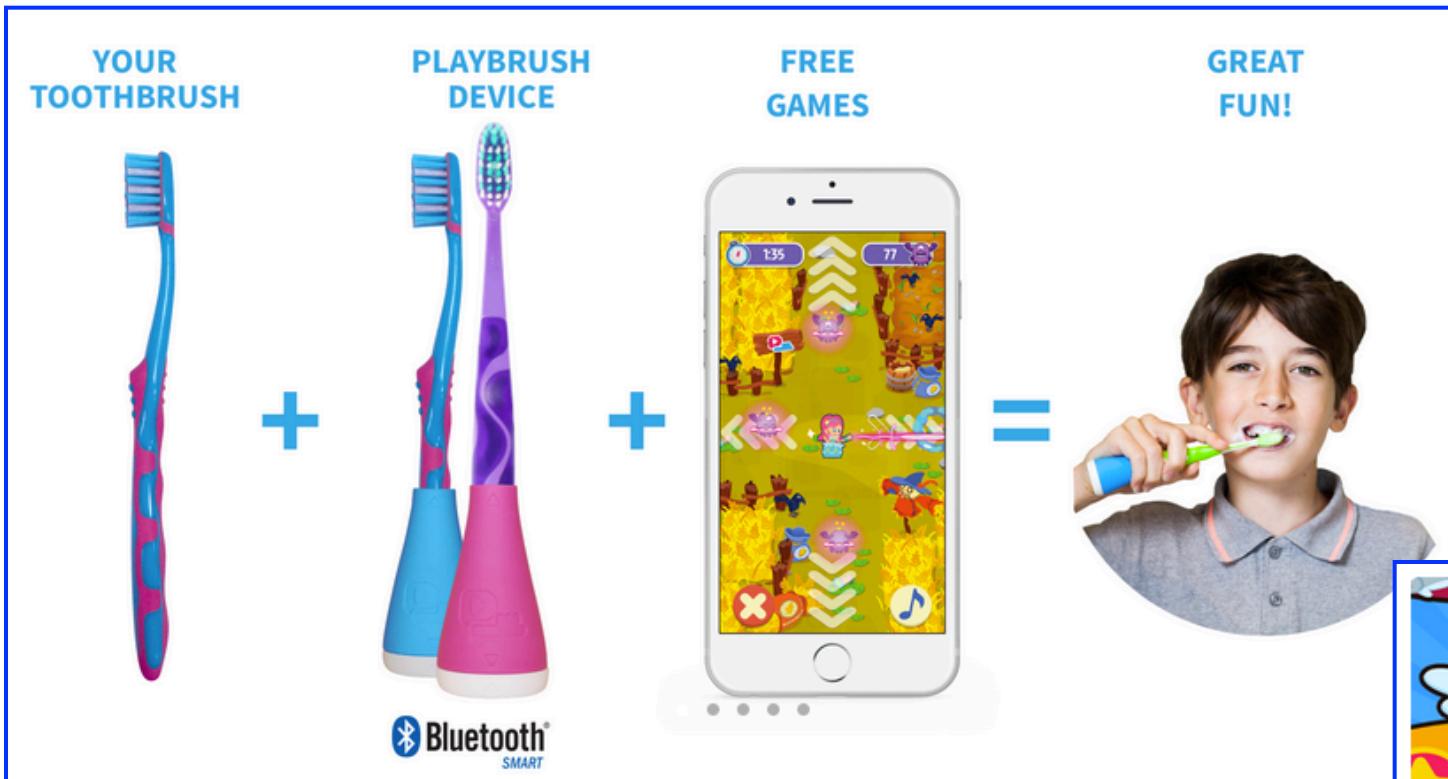
- Christopher Chia, NUS-Biz
- NCB-ICIS, ITI, NLB, MDA, NUS-Biz
- CEO of NLB (1995—2004)

Great success story on leveraging on CT.



**Where to get my answer?**  
YES, Google first.

# Smart toothbrush (Playbrush)



<http://www.playbrush.com/en/>

Many others: Gumplay, Kolibree,... (google them)

Hon Wai Leong, SoC, NUS

(Q-Module: CT Segme



## BRUSHING GAMES

Learn all about  
adventurous brushing  
journeys

# You can apply ITeMS too...

More than 10 years ago, in UIT2201, I ask  
“How to make a *refrigerator* SMART?”



Samsung Family  
Hub Refrigerator

In 2017, in GEQ1000, I ask  
“How to make a *door* SMART?”

# How do Algorithm run my Life?



Sign in

News

Sport

Weather

Shop

Earth

Travel

More

Search



## iWonder

### How do algorithms run my life?



1. Like magic

2. WATCH: Speedy shopping

3. Powering our daily lives

4. The future of algorithms

5. What problems can algorithms solve?

6. Where next?

<http://www.bbc.co.uk/guides/z3sg9qt#orb-banner>

(Q-Module: CT Segment, ITeMS) Page 27

Hon Wai Leong, SoC, NUS

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*(End of video 6.4)*

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School of Computing