Breaking the spell of the CURSE OF KNOWLEDGE

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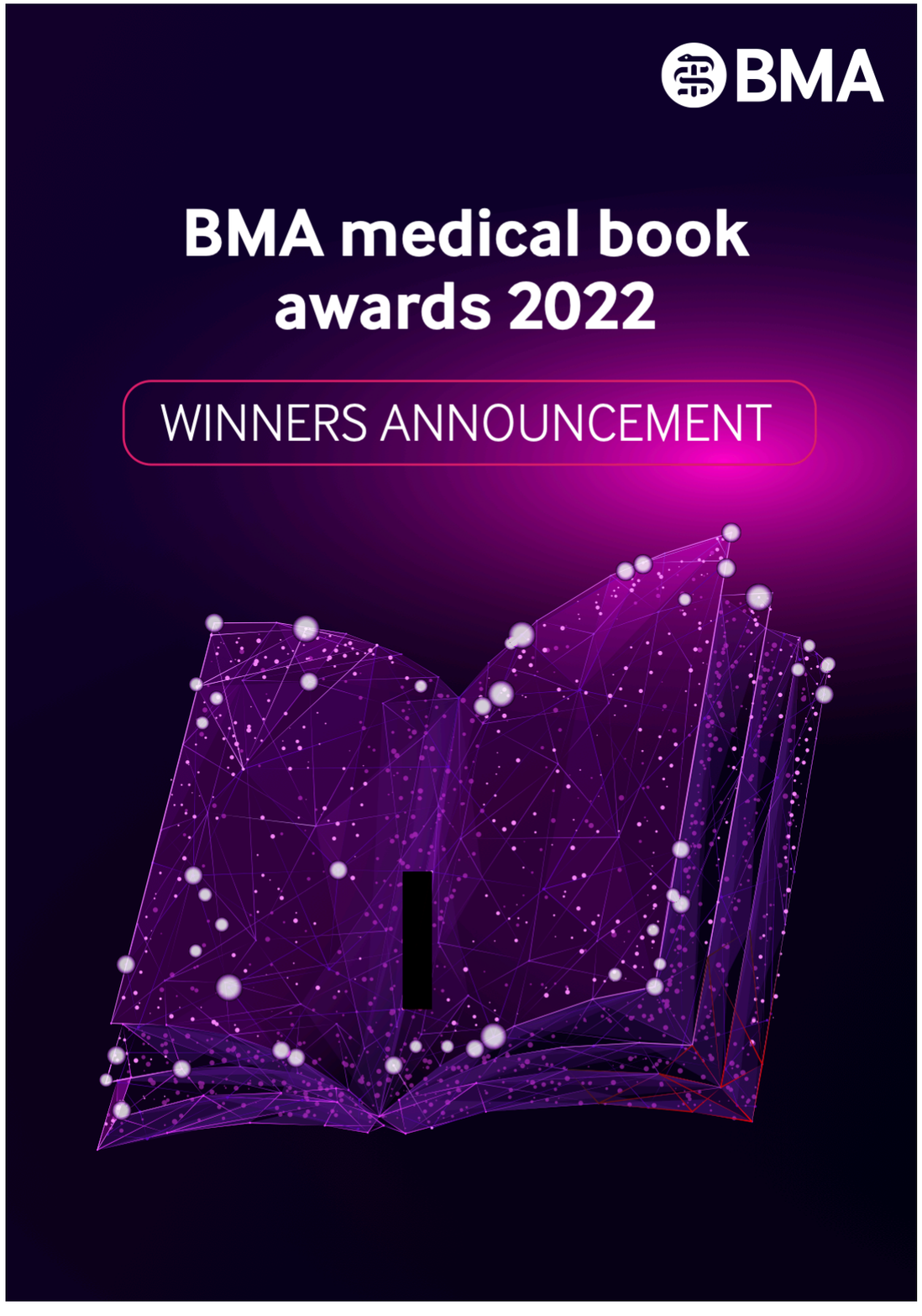
OXFORD

Fix IT

How to see and solve the problems of digital healthcare

HAROLD THIMBLEBY



“It is such an important book. Our ability to help patients is so reliant on IT and digital solutions.

This book has the broadest appeal and has achieved something quite impressive. It is not just medically-focused in presenting solutions. A real strength is that it takes examples from outside of healthcare and translates them into healthcare.

It should be read by all healthcare staff.”

Patient Safety

Stories for a digital world

HAROLD THIMBLEBY with PRUE THIMBLEBY

www.harold.thimbleby.net/booklet.pdf

Deaths and illness around childbirth had always been a fact of life until 1847, when Dr Ignaz Semmelweis noticed that his hospital wards had a higher rate than the nearby convent hospital. He set out to find out why. What was he doing wrong?

Semmelweis started collecting statistics. He noticed that his wards had fewer sick patients in the summer. But why? He realised that in winter his doctors attended autopsies to learn about anatomy, then went straight back to the wards. In summer they didn't do this so often.

Semmelweis speculated something was getting back to the wards from diseased bodies in the morgue. He instituted hand washing. His intervention soon reduced maternal death from around 20% to 2%.

Unfortunately, Semmelweis met a lot of resistance to his ideas. Doctors didn't like being told they might be the cause of illness. After all, Semmelweis had no real theory why his ideas worked.

A real explanation had to wait until Louis Pasteur developed germ theory, which at first only explained fermentation. The Scottish surgeon Joseph Lister then connected germ theory to putrefaction and disease. Lister realised that antiseptics would destroy germs causing disease, and his success as a surgeon soon became famous. Healthcare was persuaded.

Antiseptics prevent but don't cure disease. Effective cures had to wait for antibiotics, which Alexander Fleming discovered when he identified penicillin in 1928.

Antibiotics are now widely used to treat infections. But in turn, using antibiotics is creating new problems in this invisible world of bugs. Bacteria evolve, and become resistant to antibiotics. Some antibiotics are thus losing their power, which can be catastrophic for infected patients — it's a new global health threat. Guidelines are being developed so antibiotics are only used when they are effective and don't increase antibiotic resistance.

Bugs that cause disease are invisible, and for thousands of years, people could only speculate about illness. Most people just accepted disease.

Eventually, Ignaz Semmelweis worked out a cause of disease, but he met considerable resistance from his colleagues.

Digital healthcare is a new intervention, affecting all areas of healthcare. Digital health has hidden bugs.

Managing digital bugs doesn't require antiseptic procedures, it requires computational thinking. Unfortunately, just like theories of infection in the nineteenth century, computational thinking meets resistance.

Like Semmelweis's colleagues, we resist being told we may be wrong. Moreover, as cat thinking shows, the excitement about digital itself makes it much harder to think about its limitations and weaknesses. Why would we have bought that expensive AI system if it wasn't going to be an effective system?

Just like early ignorance of bacteria, antiseptics, and antibiotics meant that curing disease was almost impossible, ignorance of computational thinking makes it almost impossible to recognise, talk about, or to address the problems of digital bugs.

What does **computational thinking** mean?

We haven't defined computational thinking in this booklet. We haven't defined antibiotic either.

You take for granted that to understand antibiotics you need some medical training. It's the same with computational thinking: to understand computational thinking you need computer science and software engineering training.

Chapter 13 in *Fix IT* is all about computational thinking.

There are parallels between antibiotic resistance and digital failure.

Just like the discovery of antibiotics was revolutionary, and antibiotics were first seen as a "magic cure," so, too, people promote digital as a cure-all solution to many of today's healthcare problems. But it's counter-productive to try to solve problems by getting more or newer digital systems — digital transformation — without stopping to ask: Will it be better? Will it be safe and effective? When is enough enough? We won't know unless we understand the underlying computer science.

Think! Computational thinking is the right approach to understand digital.

Dr Semmelweis's students washing their hands in his ward *Fix IT* page 15

Medical device and system manufacturers often complain about regulatory burden — the cost to them of complying with even the current regulations around digital healthcare.

I remember a manufacturer saying that if they followed regulations to the letter, their innovative systems would be so delayed they'd be obsolete by the time they reached the market. I wondered, if things are going to get obsolete so quickly, why would anybody want to spend any money on them?

We wouldn't generally go along with such arguments for drugs — we'd first want to know drugs are safe and mostly free of side effects before they are marketed.

Pharmaceutical companies rarely complain about regulatory burden. They employ highly qualified chemists, often post doctoral, and microbiologists to develop and test new drugs. They take regulation in their stride.

Inexperienced developers use what's called a "happy path" to test their systems. They simply check that things work as they are supposed to work. They can now tell everyone that it works exactly as it's supposed to work — implying any problems are your fault. But the happy path means they didn't check for possible failures.

Competent developers instead test all possible paths where their systems are and aren't used as they are supposed to be. This is very hard, as there are an overwhelming exponential number of ways of using things in unexpected ways. Developers who want to do thorough testing therefore use sophisticated computer tools.

AI, of course, makes safe development **very** much harder — so at least carefully check contracts to ensure manufacturers don't deflect responsibility for safety.

In response to the serious problems of quack doctors, the UK Medical Act of 1858 requires doctors to be formally registered to practice. Similarly, after deaths from accidental poisonings, the Pharmacy Act of 1868, requires drugs to be appropriately labelled, requires keeping written records, and restricts the sale of drugs to qualified pharmacists.

So, when we read about digital health failures in this booklet, why don't we see the bad digital systems as likely developed by "quacks" and "adulterated" with bugs? Digital has become so fundamental to all healthcare, it's time for it to be regulated in much the same way as pharmacy is.

Think! We should accept regulating digital — systems, developers, and support — just like we accept healthcare regulation.

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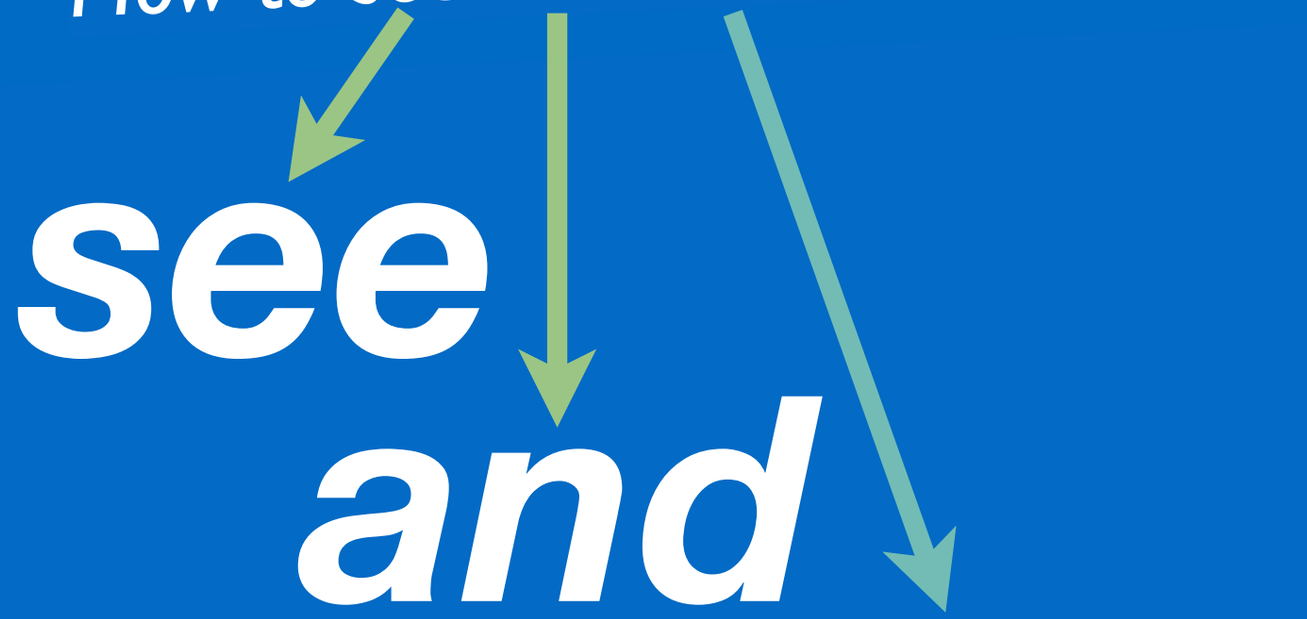

The big picture …

1. The world has problems
   (including many we don't yet know about)
2. Thinking is the only way to find answers
3. Computers help us think
4. Using
5. Almost every step introduces more problems
6. Why? And what can we do about it?
7. Here at ICT4AWE, we will explore problems together …

The Curse of Knowledge

Designers don't know things users do know

Designers think they know things they don’t know

UNCONSCIOUS **ARROGANCE**

Designers know things users don’t know

GARE D'ANGERS SAINT-LAUD


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DO NOT SWIM HERE

!!! CROCODILES !!!
DO NOT SWIM HERE


CROCODILES
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To: Huawei Tu >

Cc: Harold THIMBLEBY >

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Cancel | Repair

A new paper was assigned to you this morning and the last remaining paper was returned to the author for correction. I have sent the author (Soboczenski) a reminder regarding this.

STEP | ÉTAPE
2

English

Español

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United States - N

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Algeria - 7T

Andorra - C3

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FULL THROTTLE
MÁXIMA POTENCIA

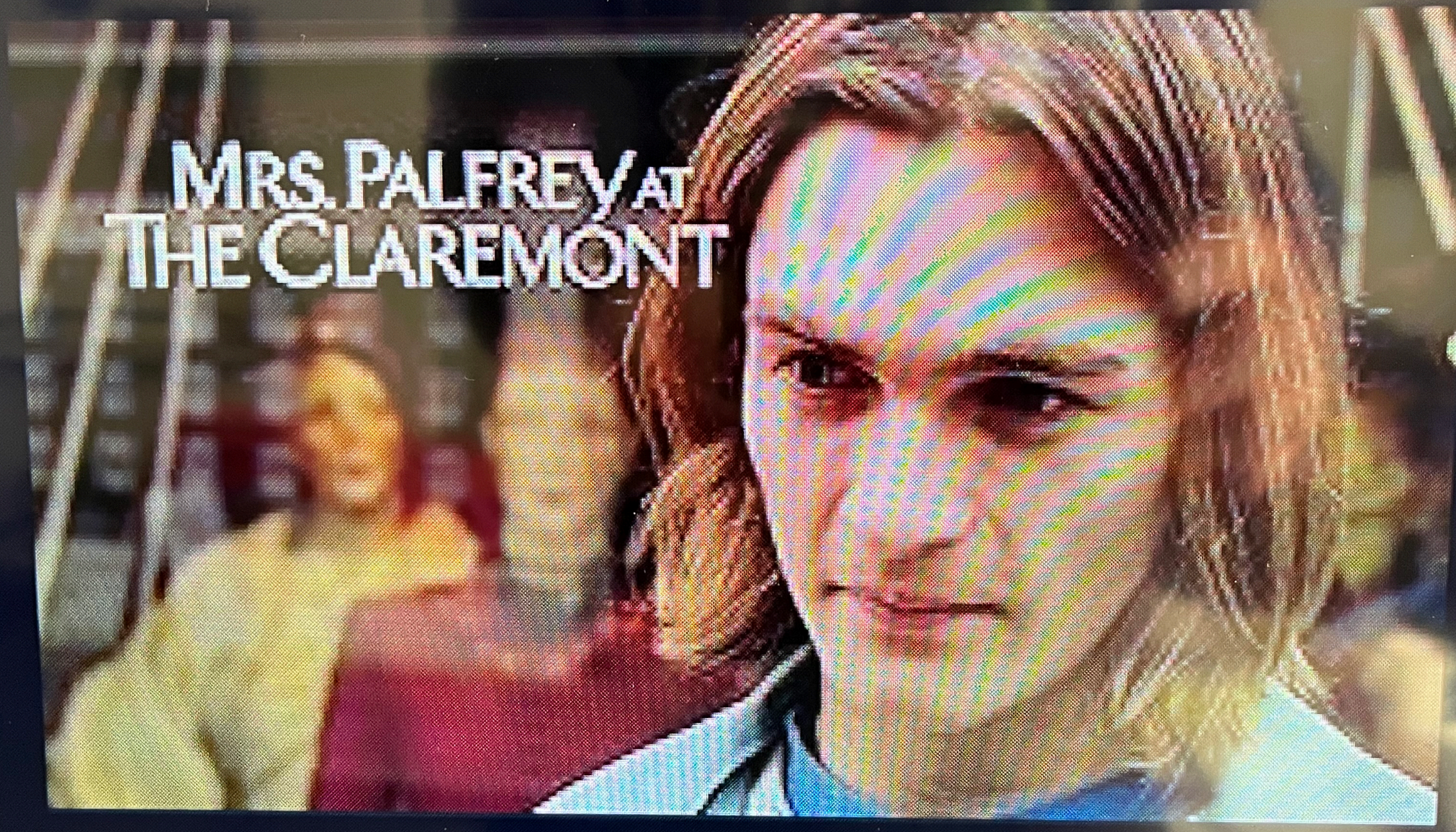
STEP | ÉTAPE 1 DESIGN | CONCEPTION STEP | ÉTAPE 1

STEP | ÉTAPE 2 FLY | VOL STEP | ÉTAPE 2

FASTER
MÁS RÁPIDO

prime video

Movies we think you'll like



Mrs. Palfrey At The Claremont

643 107 min 2008 Comedy • Drama 13+

All but abandoned by her family in a London retirement hotel, an elderly woman strikes up a curious friendship with a young writer.

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47 buttons ...

7 buttons ...


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button

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EXIT

But *whose* KNOWLEDGE?

- Designer's?
- Computer's?
- User's?

HAROLD THIMBLEBY
62 CYNCOED ROAD
CARDIFF
CF23 5SH

Payment QR:

Date: 31/03/2024

Amount Due **54.90** GBP

004235

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All outstanding transactions are detailed below. Unless payment of all overdue invoices is received within 7 calendar days, we may commence immediate legal action without further notice.

COUNTRY/TERRITORY

United Kingdom

CREDIT CARD ADDRESS

62 Cyncoed Road, CARDIFF, CF23 5SH

APT/SUITE (OPTIONAL)

CITY

Cardiff

POSTCODE

CF23 5SH

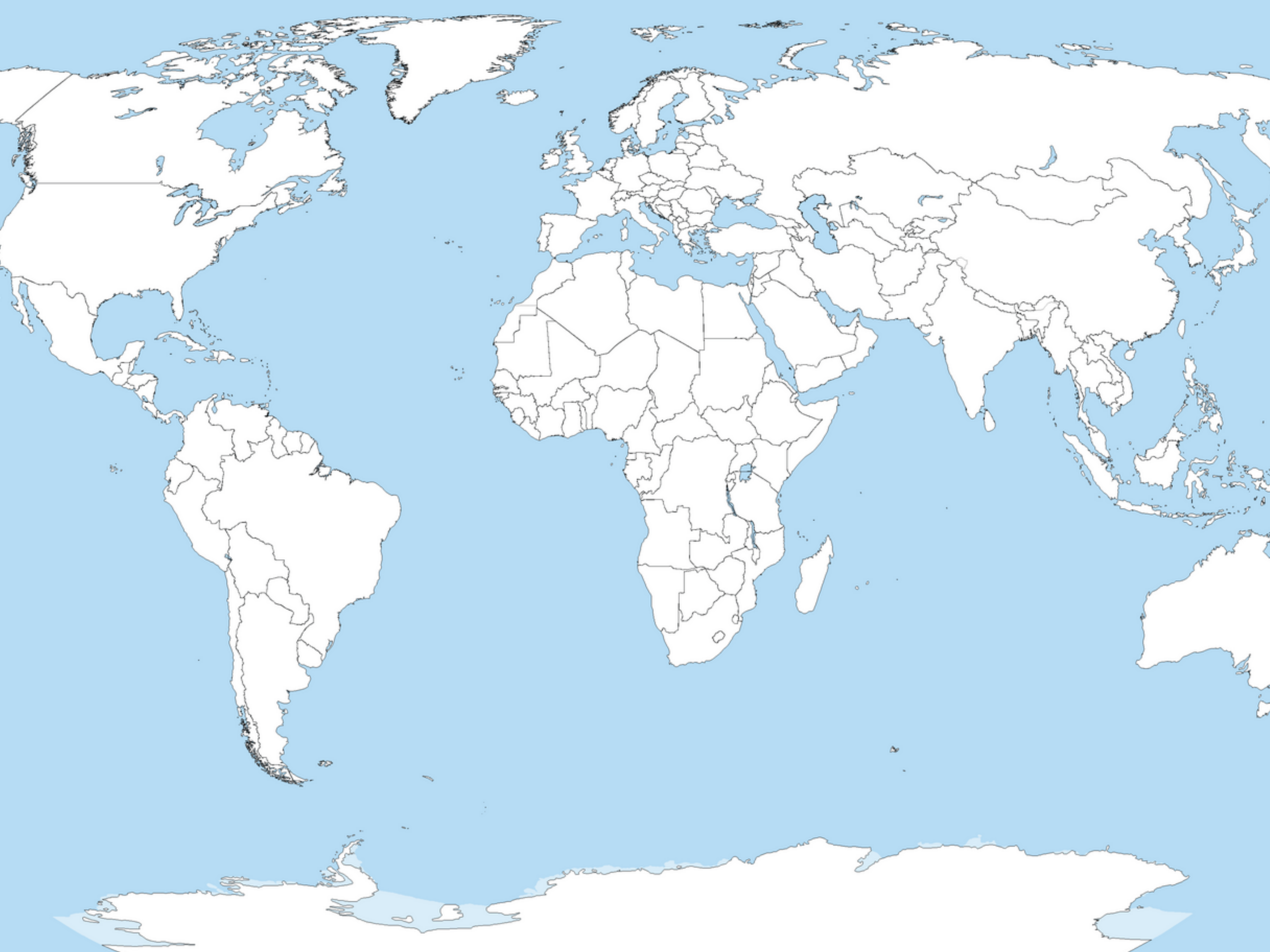
Please enter a valid ZIP/Postcode.

HAROLD THIMBLEBY
62 CYNCOED ROAD
CARDIFF
CF23 5SH

004235

Payment

Reminder: Your outstanding account balance



Fire door keep shut

Fire door keep shut

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INSPIRATION

SHOW ME THE BODIES

WINNER: THE ORWELL PRIZE FOR POLITICAL WRITING 2023

HOW WE LET GRENFELL HAPPEN

'Never before, in years of reviewing books about buildings, has one brought me to tears. This one did.'
Rowan Moore, *Observer*

PETER APPS

London 14 June 2017

24 floor **Grenfell Tower**
burned for nearly 3 days

72 people died,
223 escaped

— 70 with burns and
smoke inhalation injury

What went wrong?

- Deregulation
- Cost-saving for industry
- Corruption
- Building failed → so standard fire brigade policies failed

AND

- **Both IT and HCI failed repeatedly**
- Interestingly, unlike other problems, the book *How we let Grenfell happen* just says IT failed **and doesn’t explore it**

Insights...

We don’t know the user

1. Multidisciplinary teams
2. Use them **before** finishing the design!
3. Use different people:
   skills, gender, nationality, age — users
4. Use an ethnologist:
   someone who thinks about different people
5. Become two people:
   review your own work next week
6. Be two people now:
   use maths or formal methods
7. Be two people:
   program in a serious language
   (like SPARK

User problems

- Users don’t understand computers or expect bugs
- Users are busy doing their jobs
- Users think computers are wonderful
- “A new computer or digital innovation solves your problems!”
- **This is the user’s curse of knowledge**

Why is it a CURSE ?

- Users don’t understand computers or expect bugs
- Users are busy doing their jobs
- They think that computers are wonderful
- Digital innovation solves problems!
- So they just want a new system …
- This is the **user’s** curse of knowledge

But why is it a

So what do we do?

Ideas

1. What users do is hard work
2. What developers do is hard work
3. We all lose situational awareness
4. **But we are intermediaries**
5. We have to understand both
6. We need multidisciplinary teams
   to avoid “curse of knowledge” and “curse of ignorance”
7. We need to use analytical methods (maths, assurance cases…)
8. **And** iterative design

The big picture …

1. The world has problems
   (including many we don’t yet know about)

2. Thinking is the only way to find answers

3. Computers help us think

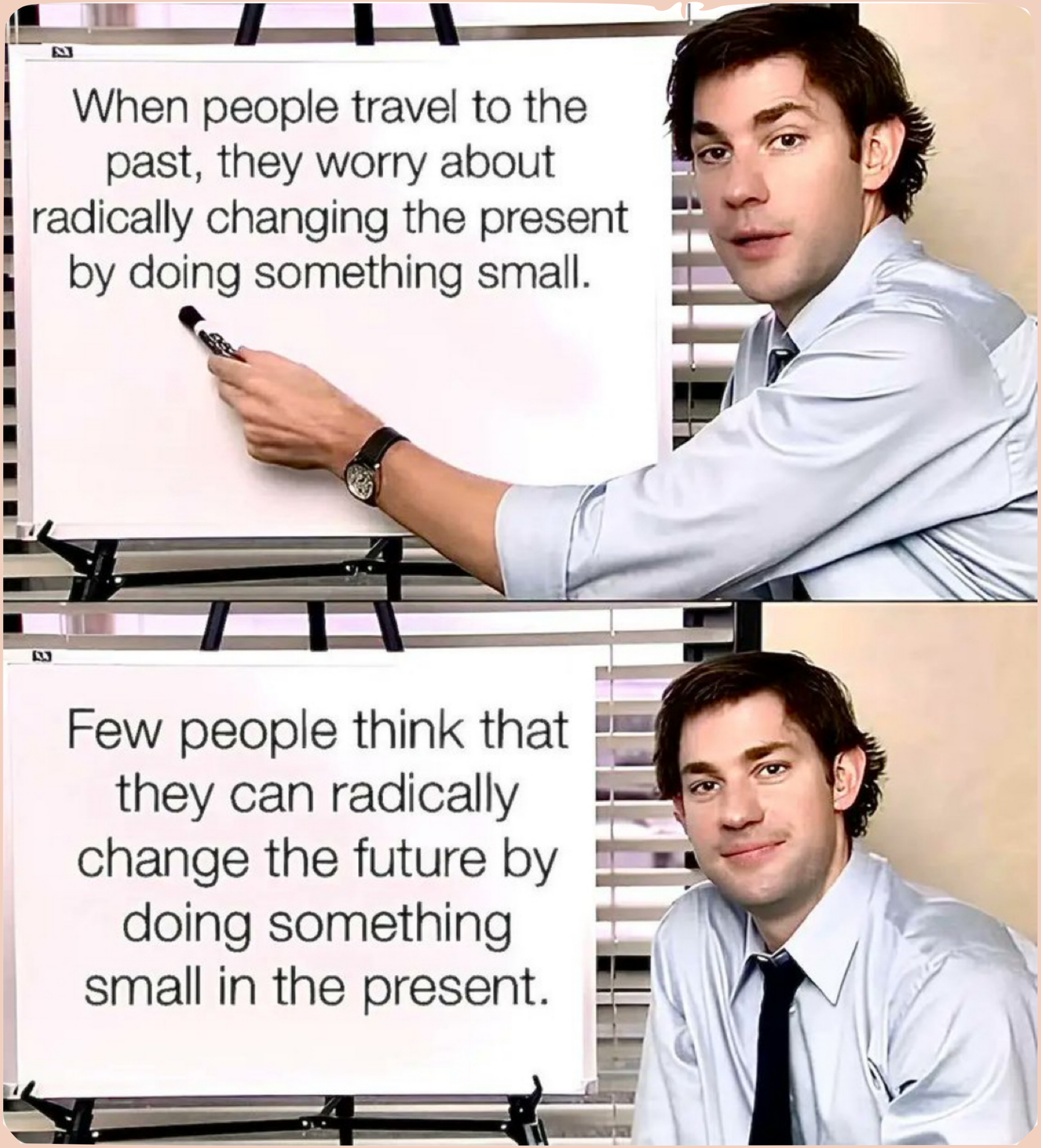
4. Almost all computers have silly problems

5. Why? And what can we do about it?

6. How are we going to use these
   or your better
   ideas throughout the conference?

Donald Rumsfeld, 2002

- “Reports that say that something hasn’t happened are always interesting to me, because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns — the ones we don’t know we don’t know. And if one looks throughout the history of our country and other free countries, it is the latter category that tends to be the difficult ones.”
- Donald Rumsfeld overlooked he didn’t know **there are unknown knowns**


When people travel to the past, they worry about radically changing the present by doing something small.
Few people think that they can radically change the future by doing something small in the present.