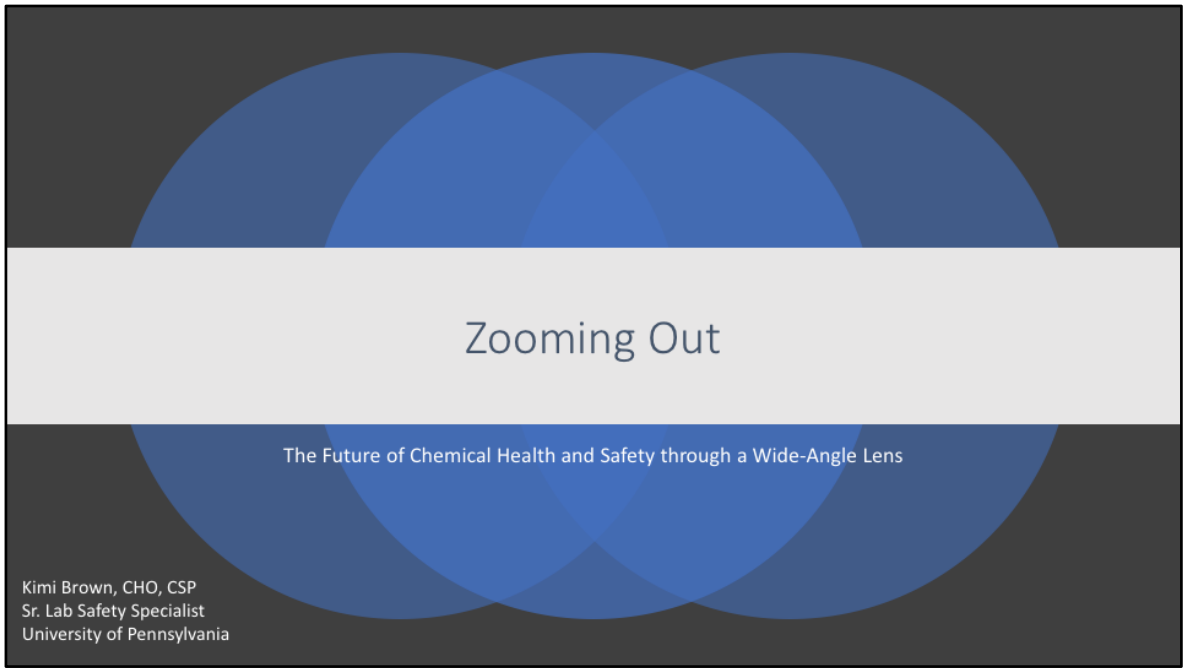


Earlier this year I got an email from Neal: He said that he'd be **delivering** a **retrospective** on his **lifetime achievements** at this **symposium** and he asked me if I could do a **talk** to **complement** his.

He **suggested** that I **do something on** the **future** of Chemical Health and Safety. Which I **agreed** to do –
But the **abstract deadline was coming up quick**, and it's **not like I already** had a **presentation ready to go on this topic**,

so I **submitted** the title: "Zooming out: The Future of Chemical Health and Safety through a Wide-Angle Lens".

Here's why this is the title:
First, It's a **nod** to Neal's **notorious passion** for **photography** (**Sorry**, **I couldn't come up with a good *scuba metaphor***)
But also the **title** needed to be **vague** enough to **buy** me **time** till I could **better solidify** my **idea**.

And - **Thankfully**, in the **weeks** that **followed**, as I was **going about life**, I got **bolt** of

inspiration . . . So I'll start out with this **decidedly non-chemistry anecdote**

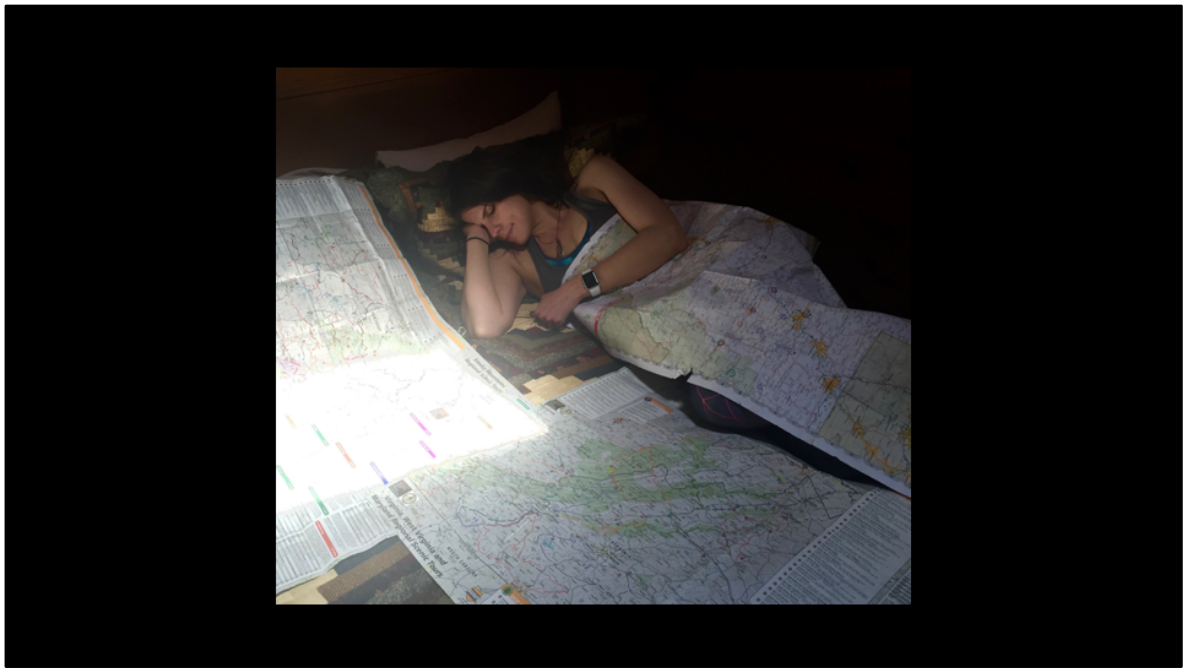
A **few of you** may **know** this about me **already**,

but my **husband**, **Bobby**, and I are **avid adventure motorcyclists**.
And on one of our **recent trips**---after a **long day** on the road---
we checked into a **cabin** in **West Virginia** for the **night**,
and we started **planning** our **route** for the next day.

Bobby was **studying the map**, trying to find one of these nice, **small** dirt or gravel **trails** to cut across a **mountain**.

And **as he zooms in** for a closer look,
I **watch** him do one of these "**pinch and pull**" maneuvers to **expand** the map . . .

Yeah . . . it was a **paper** map – not an **iPhone** screen. ***THIS* doesn't work** on a paper map.



Granted. . . . this WAS a **punishing** day on the road, so I can't **fault** him for being a little **spacey**, but when I was done **laughing** at him, I had this **realization**:

If we want to **peer** into the **future**—say—of our **profession** (or of most professions, **for that matter**), we need to **acknowledge** that . . .

There is a **shift** happening in our **society**, our **culture**, and in our **very own minds**
WE –and this will **include researchers** and other **chemical workers**—we all EXPECT to access **vital** information
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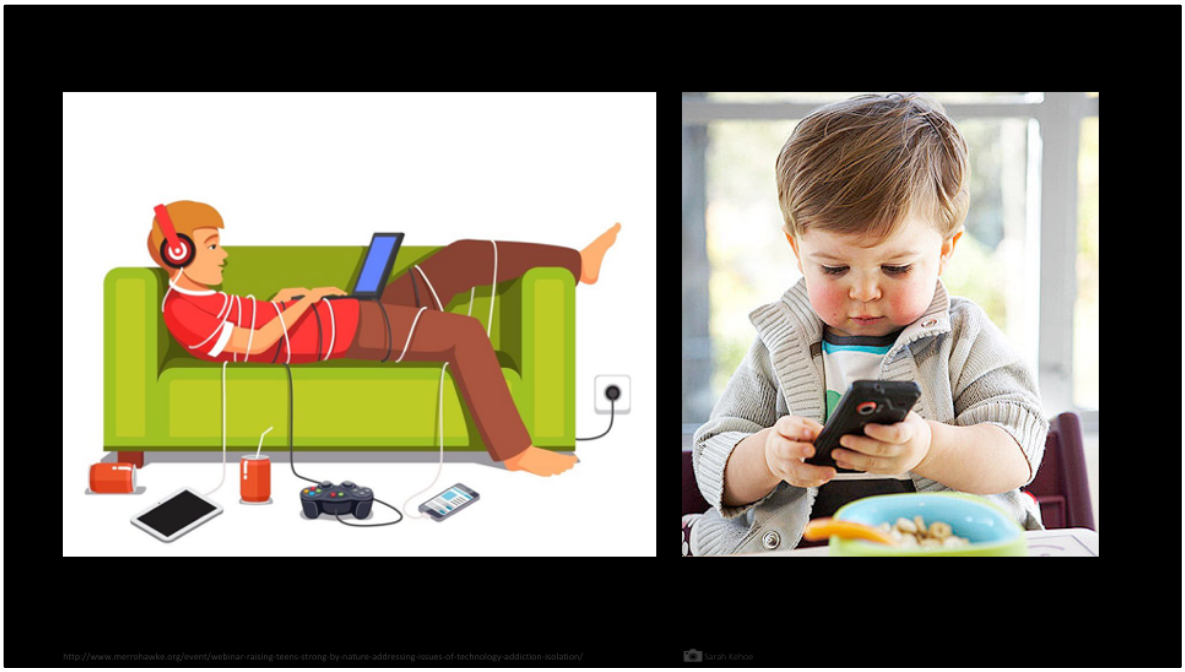
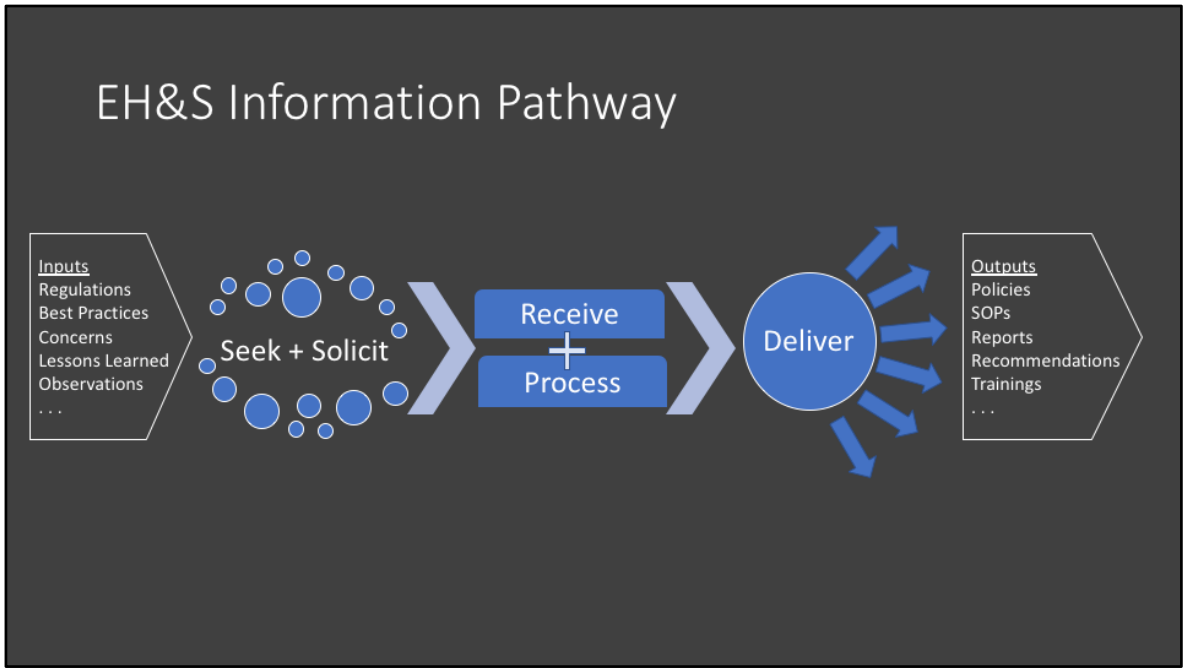


(and **trivial** information, for that matter) with a certain ***immediacy***
and then to **INTERACT** with that **information**
---
with an experience that is **familiar** and **intuitive**.

This is a **rapidly growing expectation**.
It's a sub-conscious demand. Things should just WORK the way **we** think they should.

And the reason that **information access and interface** should be important to you and me is because, well, this is actually a huge part of what we DO, right?

Not to over simplify our important work, but —



we are essentially **brokers of information**.
We **solicit**, **receive**, **process**, and **deliver** information

And WHY do we do this? What is the **goal** of our **information pathway**?
Ultimately – we're trying to **keep chemical workers HEALTHY** and **SAFE**, but we do that by
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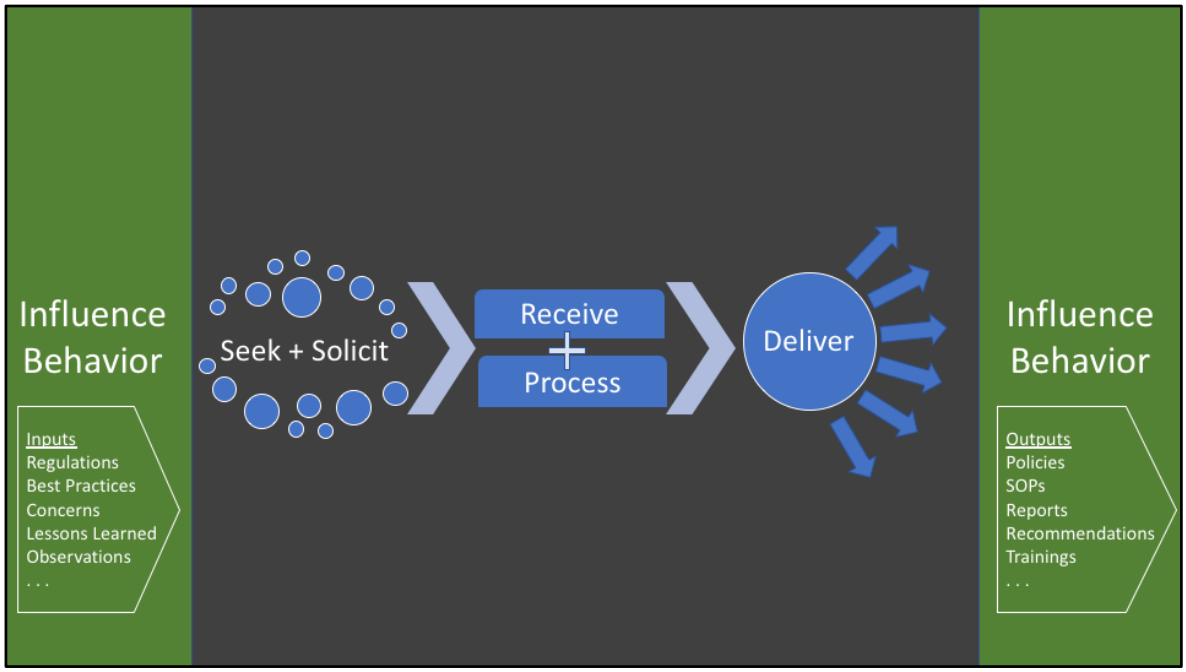
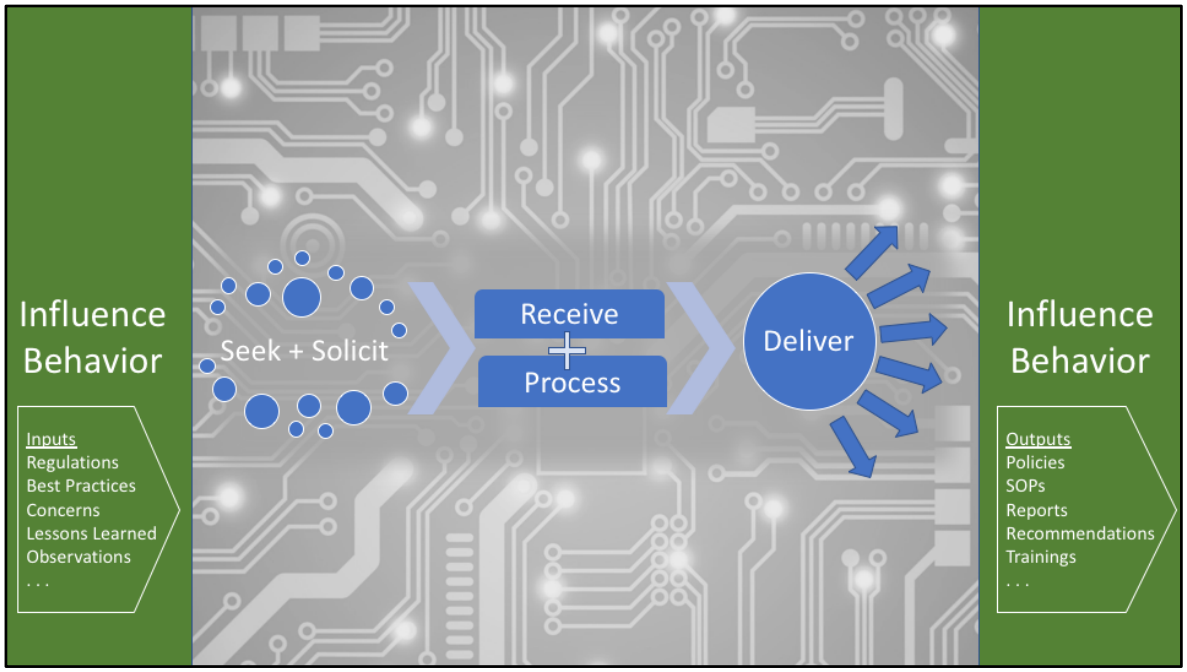


INFLUENCING BEHAVIOR
and information *is our* tool for doing it.
So We **set up these programs** where we **expect**
---
the **chemists** to
tell us their concerns,
report the near misses,
reach out to us for help with a hazard assessment.

Then on the **other end**

We **want** them to
Read and respond to the inspection report,
integrate what they've learned in training,
seek more information when they need it.

Increasingly,



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we rely on **technology solutions** for **most** of this.

The integration of *technology* into everything we do, it **changes how we manage information**, it **accelerates processes**,

but it doesn't **automatically** make us any better at **influencing** behavior.

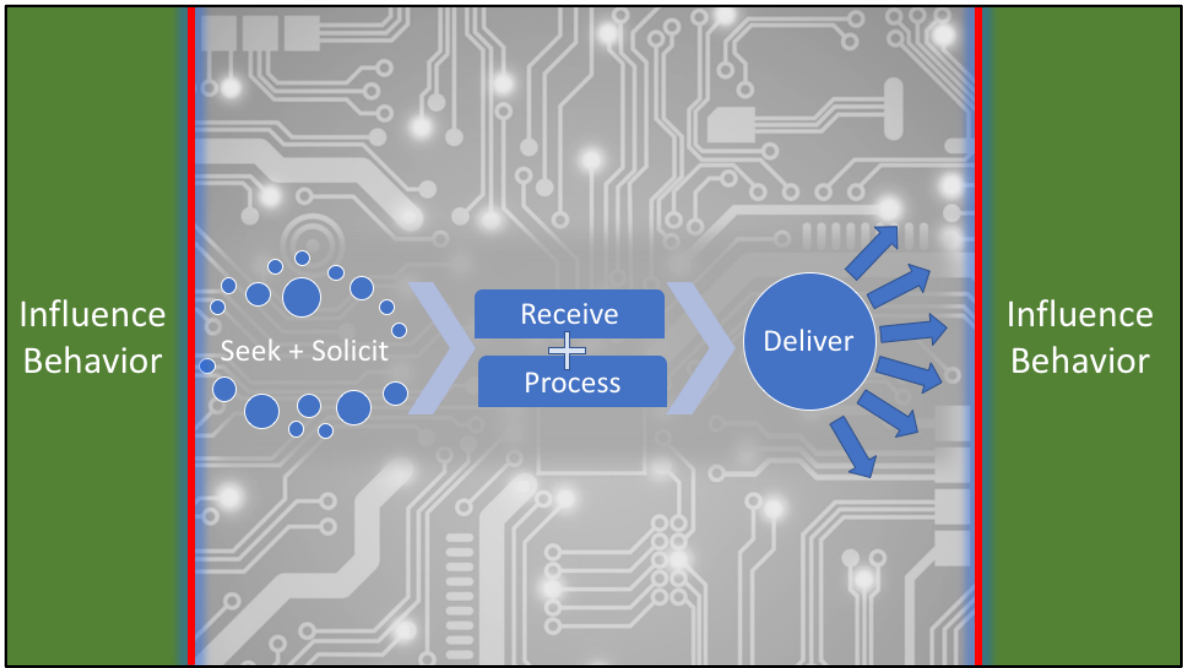
So when we THINK ABOUT THE **FUTURE**, we need need to be thinking about …

How *humans* will <u>use **technology**</u> to ***push*** and ***pull*** and ***act on*** **information**.

And IF WE WANT TO influence THAT, IT'S GOING TO REQUIRE

And that is good DESIGN.

Because we may think we have all the **components** in place (we can be "**compliant**" with the "**requirements**"),
but we aren't **necessarily** going to **<u>influence</u>** **<u>behavior</u>**



if there's ***poor design*** at the ---
junction between the **client** and **EHS** on **either end** of this **pathway**.

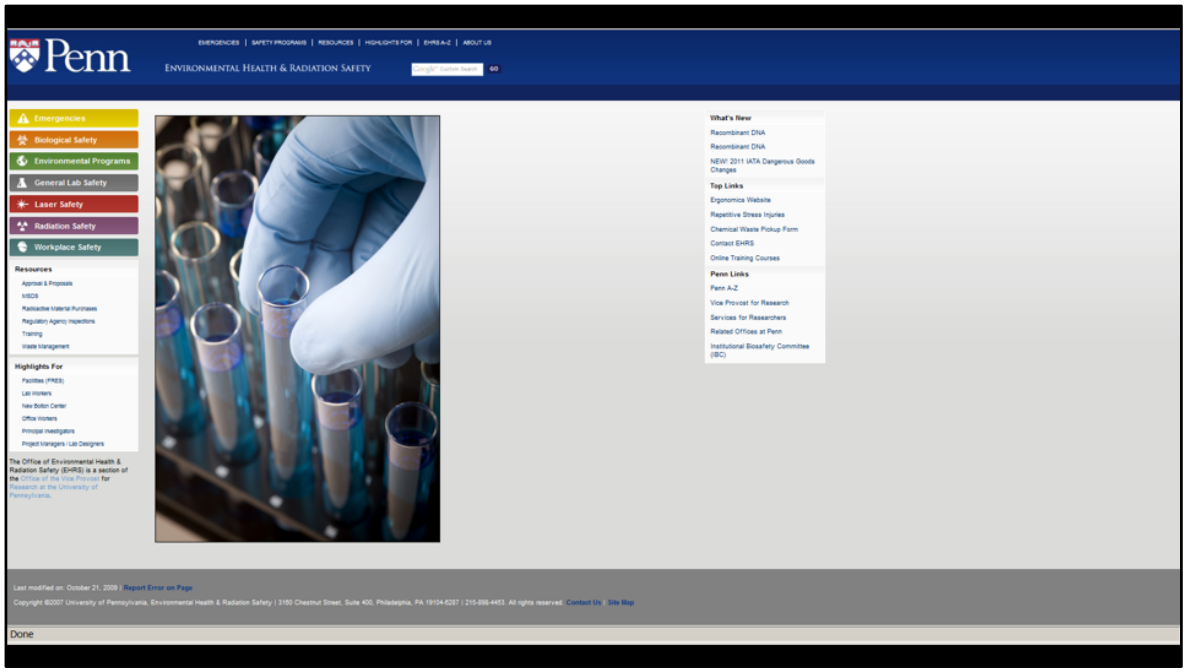
(so what makes for a good design)

So what makes for a GOOD design?
This is my own **suggestion** (and I swear I didn't force this **acronym**! It just worked out this way).
GOOD DESIGN is

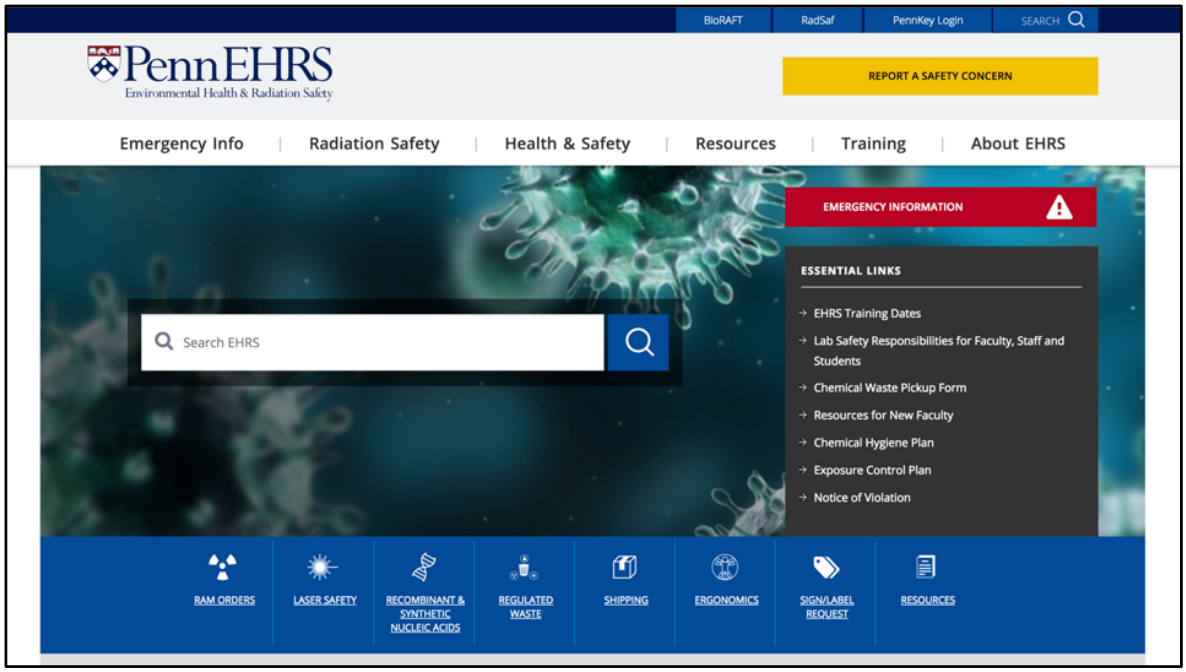
Sustainable: It's flexible enough to change over time and work for different instances
It's **Accessible**: easy to get to, low energy barrier,
It's **Familiar**: intuitive and easy to navigate,
And it's got to be **Efficient**: So that it won't be seen as a burden or waste of time,
but there ya go . . .
a **good design** is …. A **SAFE** design

If you put all these **together**, you can **condense** them to : USABILITY and UNDERSTANDING. . . or . . . it WORKS and it MAKES SENSE!

If a system is **well designed** people **<u>want</u>** to use it.



We are **less likely** to use a **website** that is **cluttered**, **awkward**, **cramped**, and **disorganized**,
(Like Penn's EHRS website was for a long time), and more likely **to go to a resource**

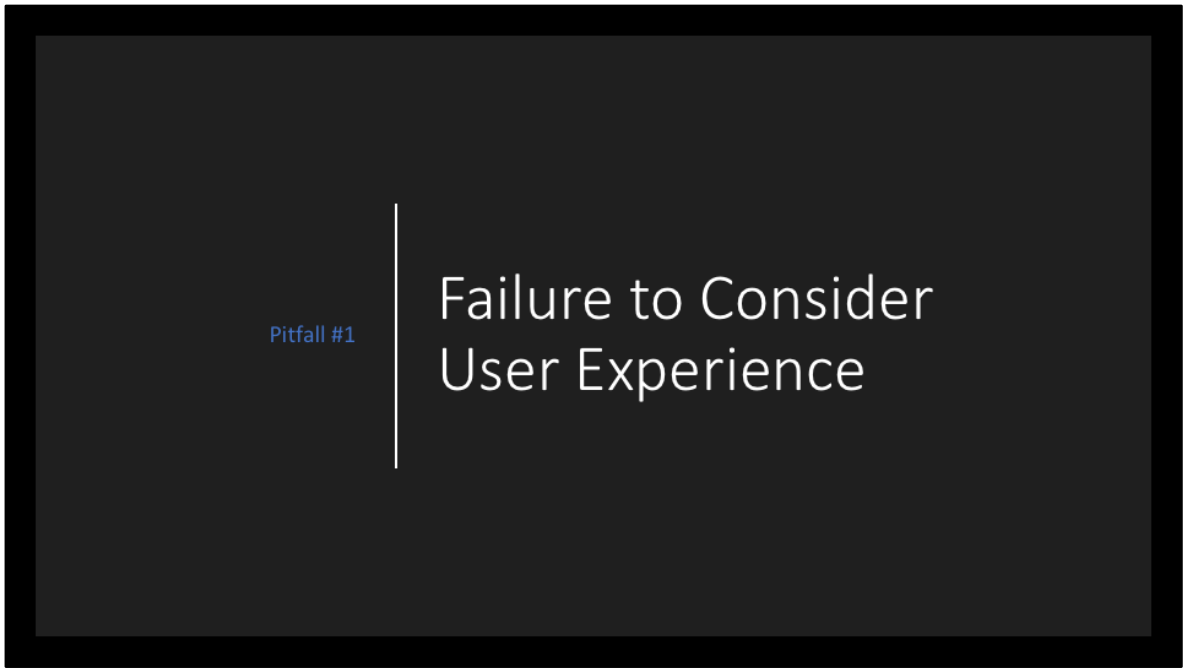


where we **know** we can *find* the **answer** to our **questions** *in less time* because the **interface** is **clean** and is **logical**.

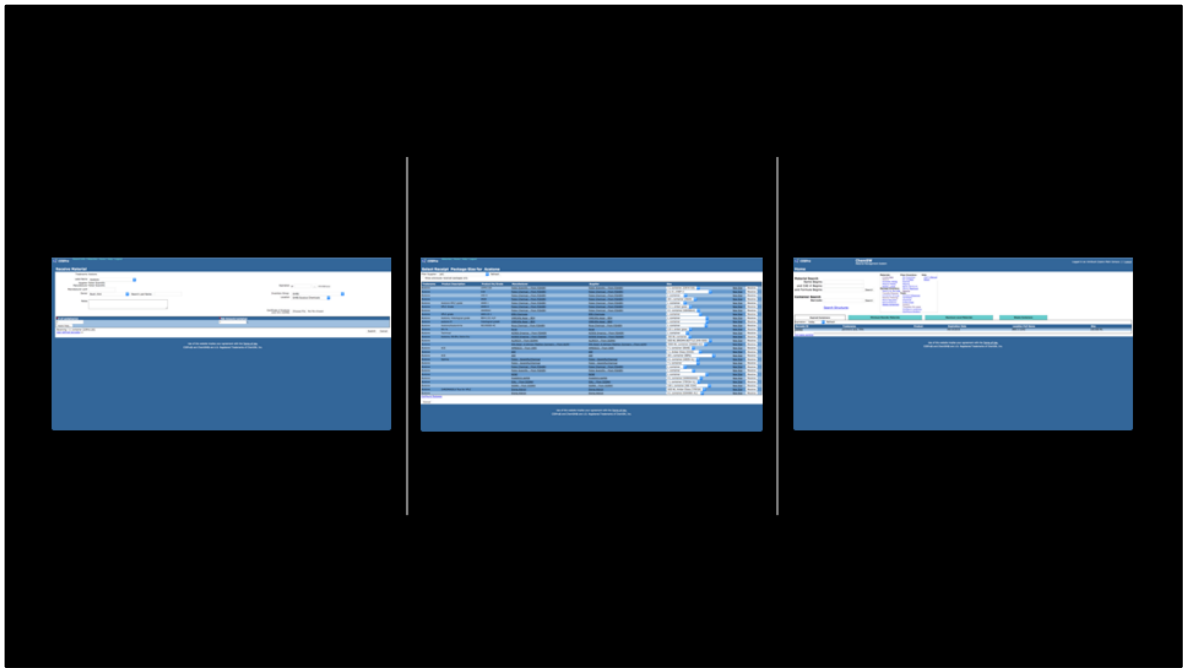
This idea **should** seem **insultingly obvious** to you. Like - Why did we give this **lady 20 minutes** of our **time** to tell us this?

And yet, poor design **persists** in our **world**, and in our **work**.

So before we even talk about how we can **achieve** good design, let's look at some of the ways we go **wrong**.



Pitfall #1: Failure to consider the importance of user experience (or **UX**, as the **techy** kids are calling it these days)



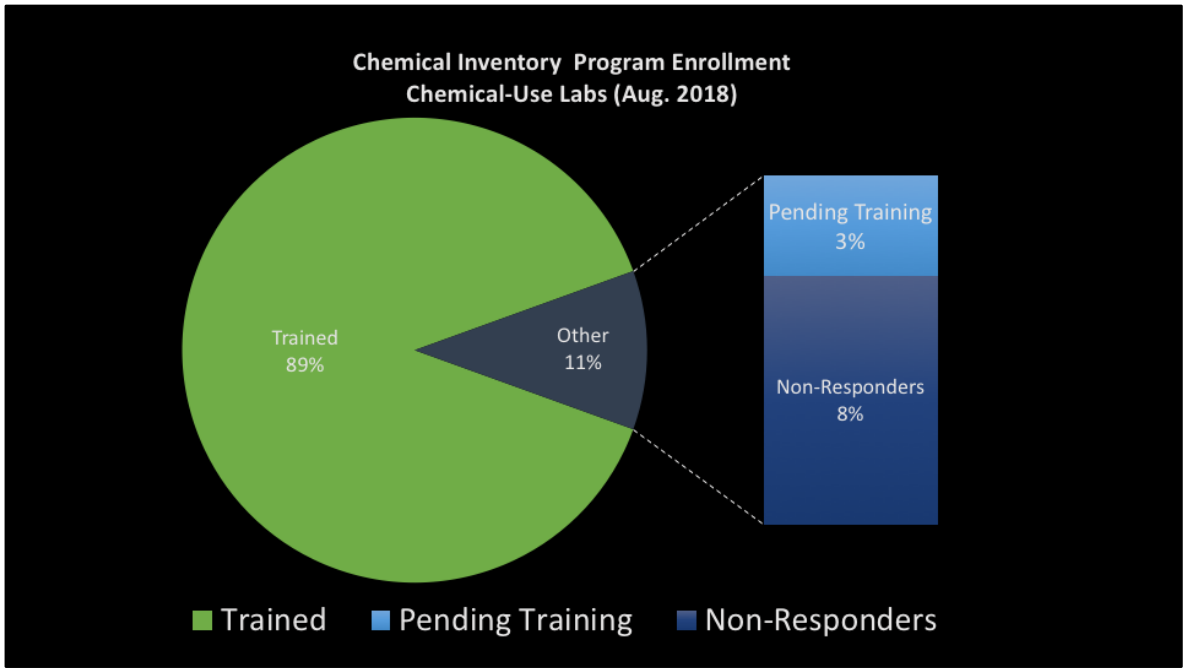
These are **screenshots** of our **current** chemical inventory software – we did not design it **ourselves**, but we did **ADOPT** (what we **discovered** to be) a poor design and then we **foisted** it on our researchers.

I don't know if these screens are even **recognizable** to anyone,
but I'm not trying to **bad mouth** any company here: This software has all the **functionality** and **capacity** we could possibly need to run a **campus-wide, container-by-container** chemical inventory program. That's what we were looking for when we signed the **contract**.

But when we **implemented** it, we quickly discovered that (icky **graphical interface** aside) the **workflow** was so **steppy** and **branched**, and the **commands** so **confusing** (especially by today's smartphone app standards), that we couldn't possibly expect 700 individual laboratories to train themselves how to use it.

We did not have the **Efficiency** and **Familiarity** parts of the design in place.

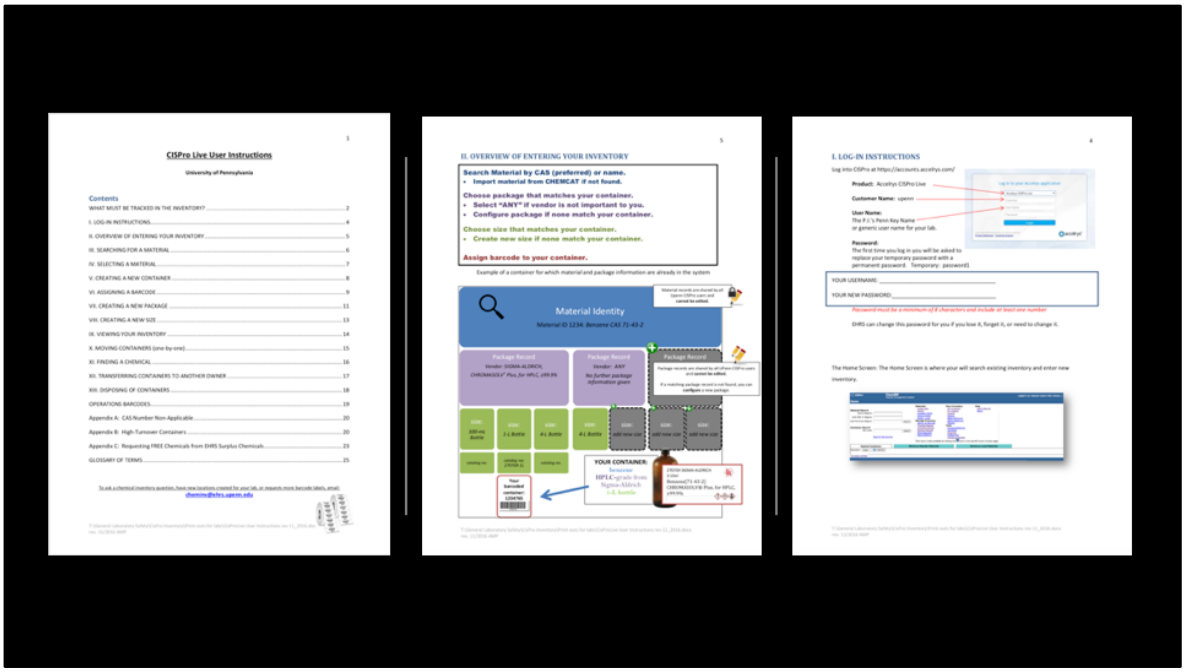
Now, **some 5 years later**, I'm happy to report,



that nearly every **chemical-use lab** on our campus is now **enrolled** in the program and **trained**; AND we have **data** to suggest that most them are at least **reasonably compliant** with maintaining their inventories.

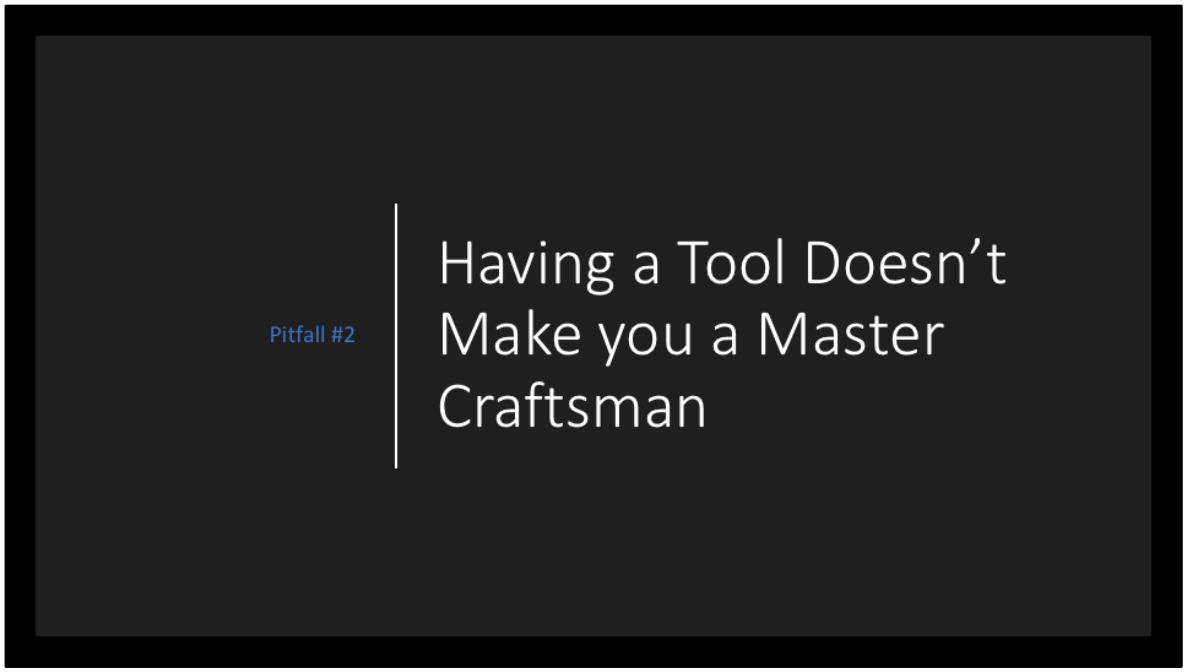
How we **accomplished** this is the **subject** of an entirely **separate talk**, which I **promise** we will **present** another **year**,

but I can tell you that it involved **1,000s of hours of our staff's time**,
in-person training for each lab that enrolled,



We **even** had to **create** our own **instruction manuals**, and hire additional **temporary staff**.

We did **not anticipate that kind of investment** when we started, but I can tell you, had we not done all that, **the poorly designed program we licensed** would be **worthless**, because no one would be using it.



Here's another pitfall:
(Pitfall#2) Having a tool doesn't **automatically** make you a master craftsman

Remember when **online training**

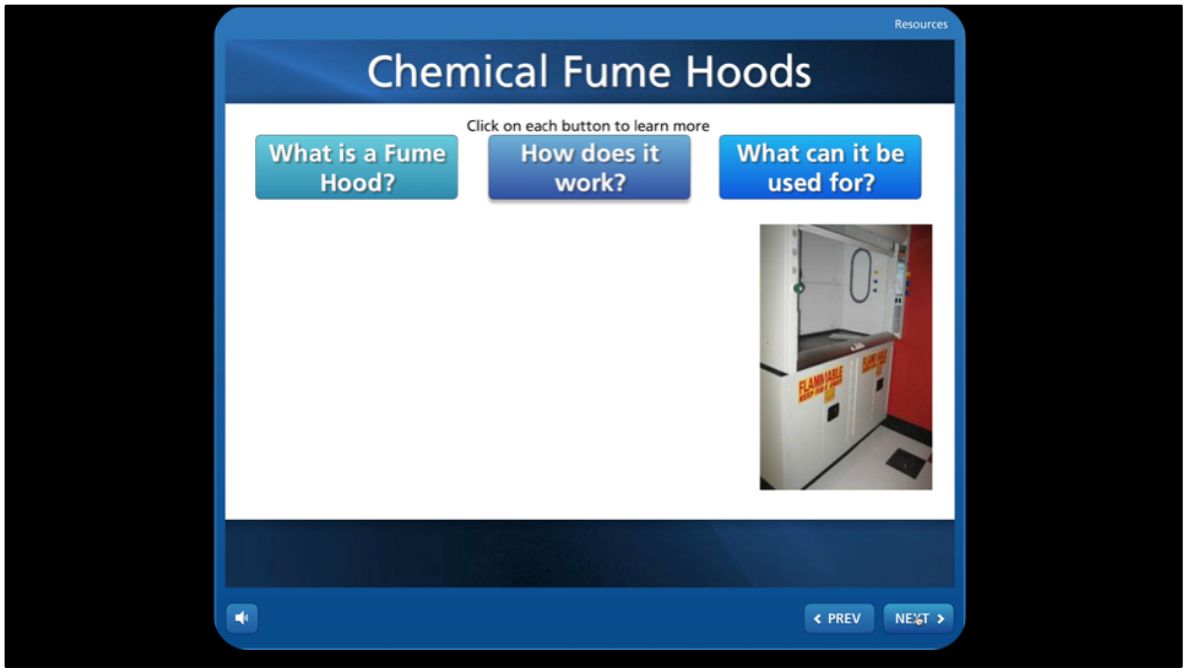
first became **possible** for us? What did we do **right away**?

Of course, the **software probably** didn't give us **many options anyway**, but: we just **uploaded** the existing **Powerpoint** slides to be read **in sequence, bullet-by-bullet** by the trainee!

Sure, it made the training **more Accessible** than—say--a **monthly** or **annual lecture**,

it **freed up our time**,
it was **cheap**,
it was **quick**,
it was **BORING**,
and it was **embarrassingly ineffective** at conveying the information.

(By the way, you are **all now qualified** to **dispose** of **hazardous lab waste** on our campus, congratulations)



So I was pretty excited when, at Penn, we **got our hands** on a program called **Articulate Storyline**. **I don't know if you've ever used it, but it's a fun tool.**

It let us get really **fancy with slide design**,

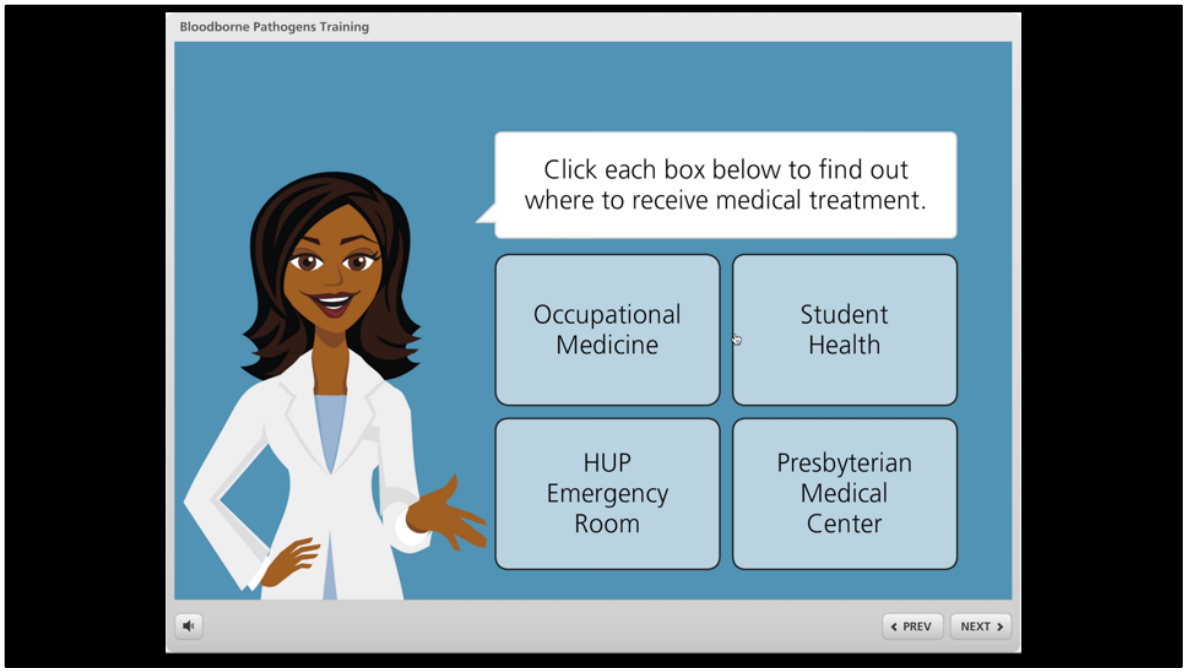
interactive features,
branching logic,
quizzes,
modules within modules.

I loved this. I also sunk a **crap ton** of time into learning how to use it and **making** these **elaborate** trainings.

The modules were **more engaging**, but this **ate up a lot of my time**,
and TBH, I'm **not an e-learning expert**.
I had the **tool**, but I was pretty much **faking the essential skill** here.

Not to mention, every time we wanted to **fix** one of my mistakes or **update** the slides,

there was a **surprisingly arduous** process to getting the **content revised** and **posted** in our **learning management system**. So—not particularly **sustainable** either.



Since then, we've **contracted a vendor** to create any of our new online trainings in Storyline.

These people are **actually professionals in designing this stuff.**
So our new modules might seem to cost us **more dollars out of pocket**, but the result is something that is

more **professional**,
less **glitchy**,
easier to modify,
and probably **more effective** at delivering the message,

but **best of all – frees up a lot of my time** to do other things that I am **actually qualified** to do.

So more and more we're getting access to these **exciting**, **new**, **relatively low-cost**, **technology tools**, I but **caution** you
---

Not to just put that in the hands of an **enthusiastic millennial** staff member and hope for the best.

We need **consider whether *that is really* the <u>right</u>** use of our **resources**.

What's the key then to **avoiding** or **overcoming** these pitfalls, especially when you maybe don't have the **resources** to just **hire** some **expert** to just ***hand you*** the **well-designed solution**?

Well, So far I've been referring to DESIGN the **NOUN**. The **look** and **feel** of the **product** or the **work flow**.

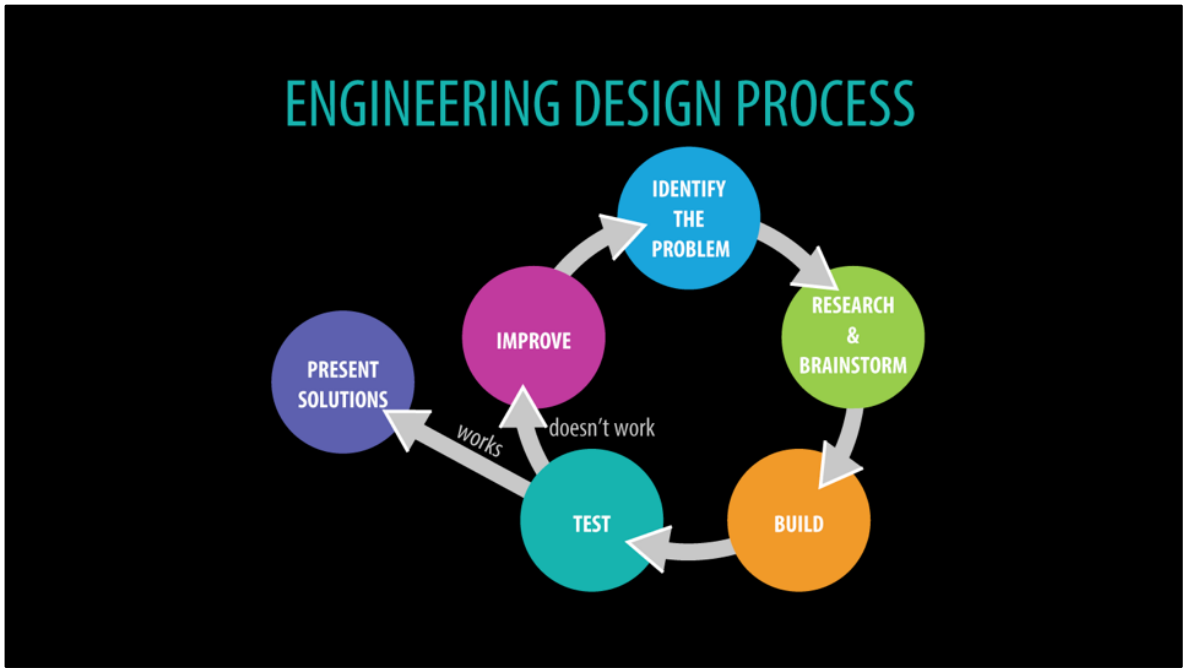
But Design is also a **verb**.

And a **synonym** for that verb "to Design", could be "to **Engineer**" something, right?

Design is about more than just **aesthetics**, after all.

We can ***use engineering principles*** to **guide** us in **developing systems** that are **Sustainable**, **Accessible**, **Familiar**, and **Efficient**.
(*And we can do this **regardless** of whether the solution is a **technological** one or **not**.)*

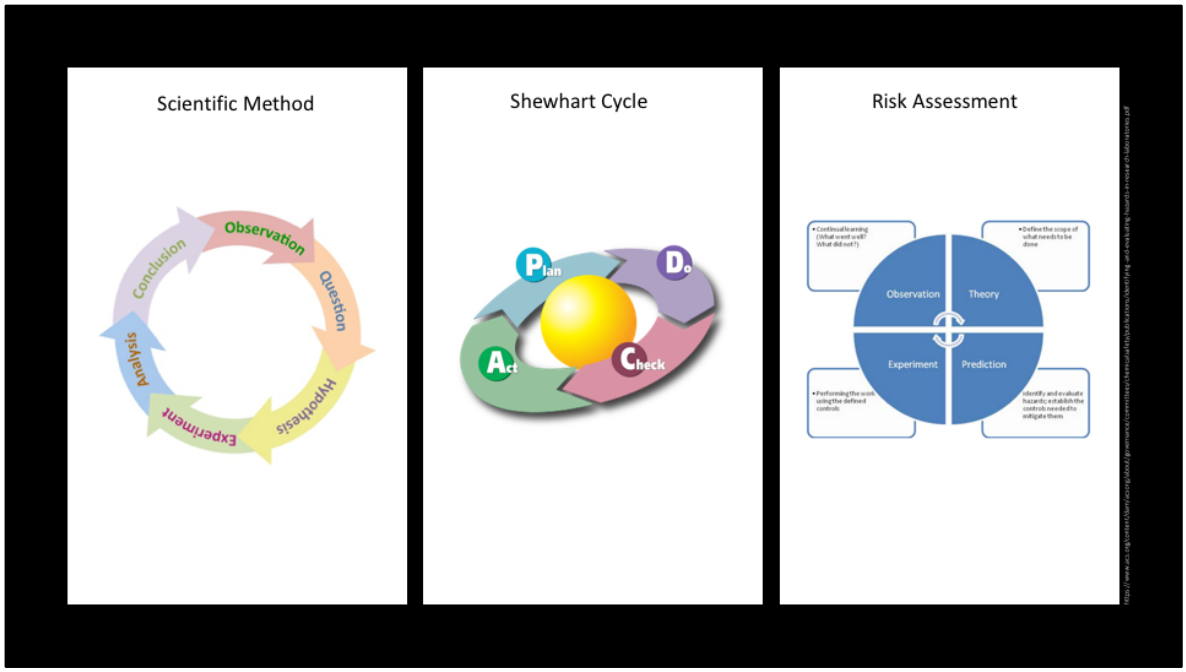
So, I'm **not going** to go through the—**like—10 textbook steps** to the **engineering design process**, but I don't need to.



Because I can summarize it as this:

It's an **intentional** process
that first fully **defines** the problem,
sets **clear goals** for the outcome,
then uses an iterative procedure of **creation**, **testing**, and **redesign**
to make **the thing that WORKS best**.

(Right about now, a **little bell** should be going off in your head saying, "Hmmmmmm. . . . that seems like a familiar concept, where have I heard that before? . . . .)



Yeah - This is a **familiar problem-solving** and **management method**!
It's **not unlike the scientific method**, or the **RAMP** method for **hazard assessment**.

We need to be applying this to the **creation** of the **TOOLS** and **PRODUCTS** we **DELIVER**, (and we must **think of these things AS *TOOLS* and *PRODUCTS***).
Then we must **regularly consider** how we can **improve** them.

Which brings us to our **final pitfall**.

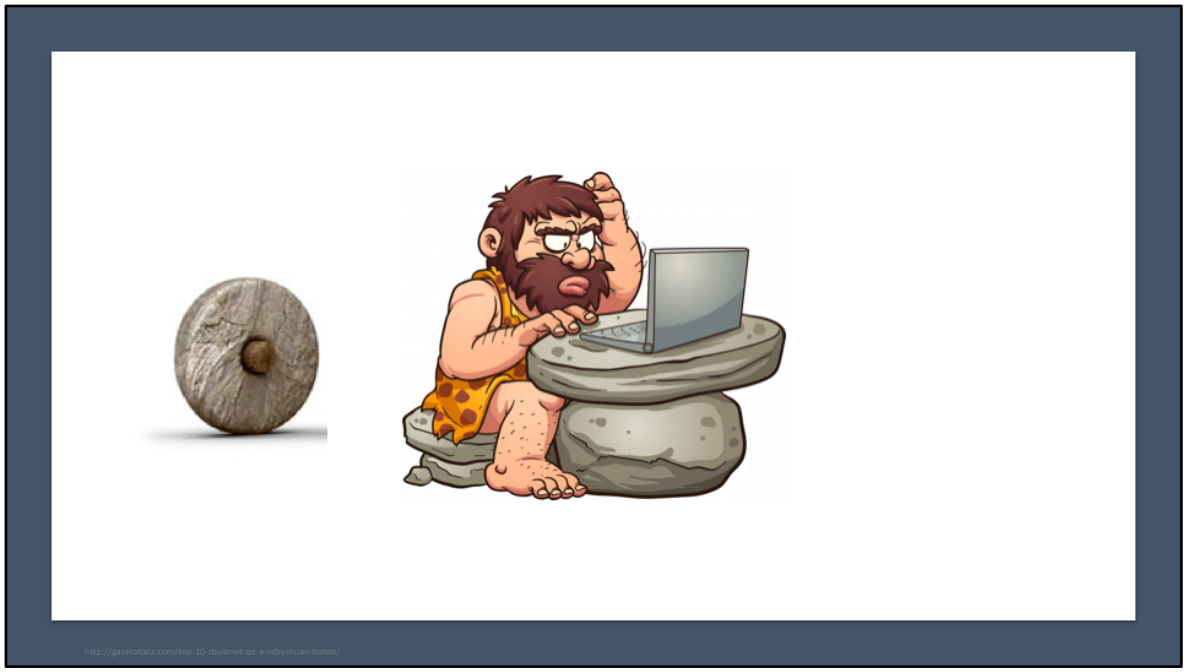
Pitfall#3: Refusing to let go

By our **definition** here, a good design **is what**? It's really just the **latest link in a series of failures**!

We have to be willing to **<u>see</u> what's holding us back**
---
and **<u>let go</u>** of what's **not working**.

Now, **recognizing those things** that maybe *were* the **right solution for their time** but are now **no longer serving** us . . .
I believe that can be the **biggest challenge** for **some** of us.

Understand: As you **try** to make these changes to your **existing programs**, you may well
---



be **accused** of **attempting to "reinvent the wheel".** (*don't ask me how I know this*)

Sometimes <u>it is</u> hard to put energy into **recreating** something that you've **long considered crossed off** the list,

or **maybe** you ***personally remember*** **chipping** away the **rock** to bring the **first incarnation** to life.

But we are **being given new wheel-making materials all the time** and we're **trying to take wheels places they've never gone before**,

so we need to **make peace** with the fact that **wheel *innovation*** and ***re-design*** are **necessary to our future success.**

Now, I just want to POINT OUT here . . .
This is a talk about the ***future of Chemical Health and Safety***
but you'll **notice** that I have **avoided** doing any **prognosticating**
about **exactly *what I think*** *i*s coming our way in **terms of the chemical enterprise** or **health and safety specifically.**

That's **because, all I really** know is (based on history):
Research- it's going to *change*,
manufacturing is going to *change*,
regulations- those will also *change*,
and **technology** <u>will</u> *most definitely change*,

and you **each probably** have some **reasonable predictions** about what those changes **might look like** for your **unique professional situation.**

But ***no matter*** *what changes* --- we will **<u>always</u> need** to both **<u>understand</u>** and **<u>influence</u>** the **worker**.

We will need to find <u>new ways</u> to reach people, especially now

---

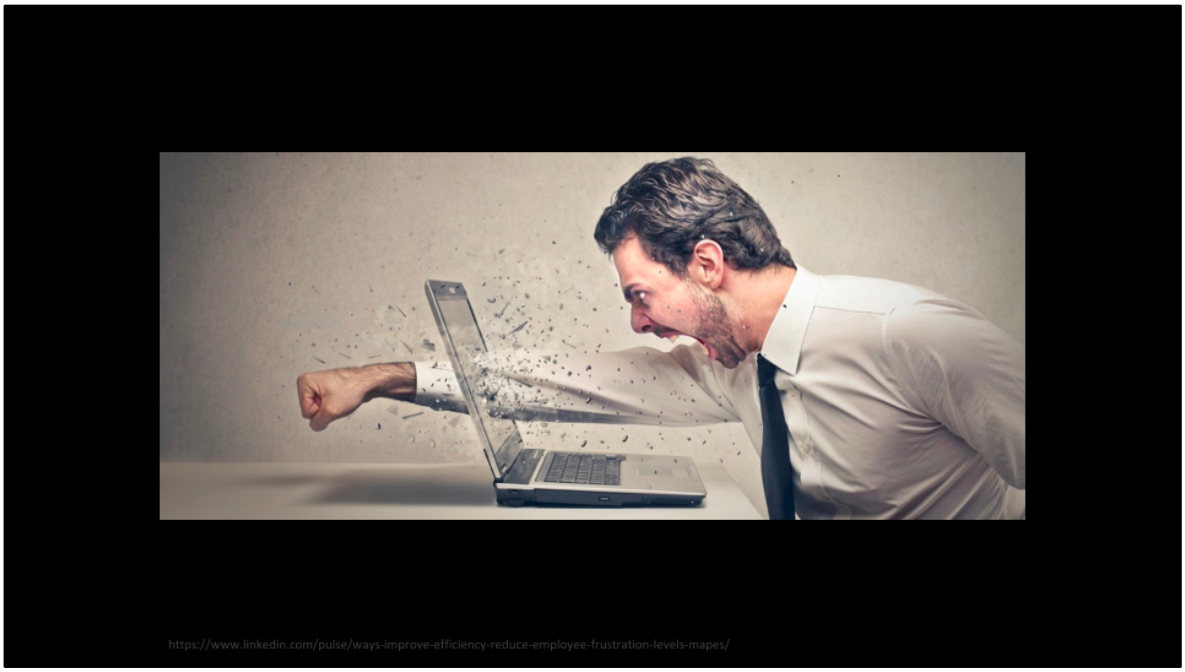
– at time of **constant distraction**, where **attention** is one of our **most precious resources**.

We need to **find <u>new ways</u> to be** Sustainable, Accessible, Familiar, and Efficient
---

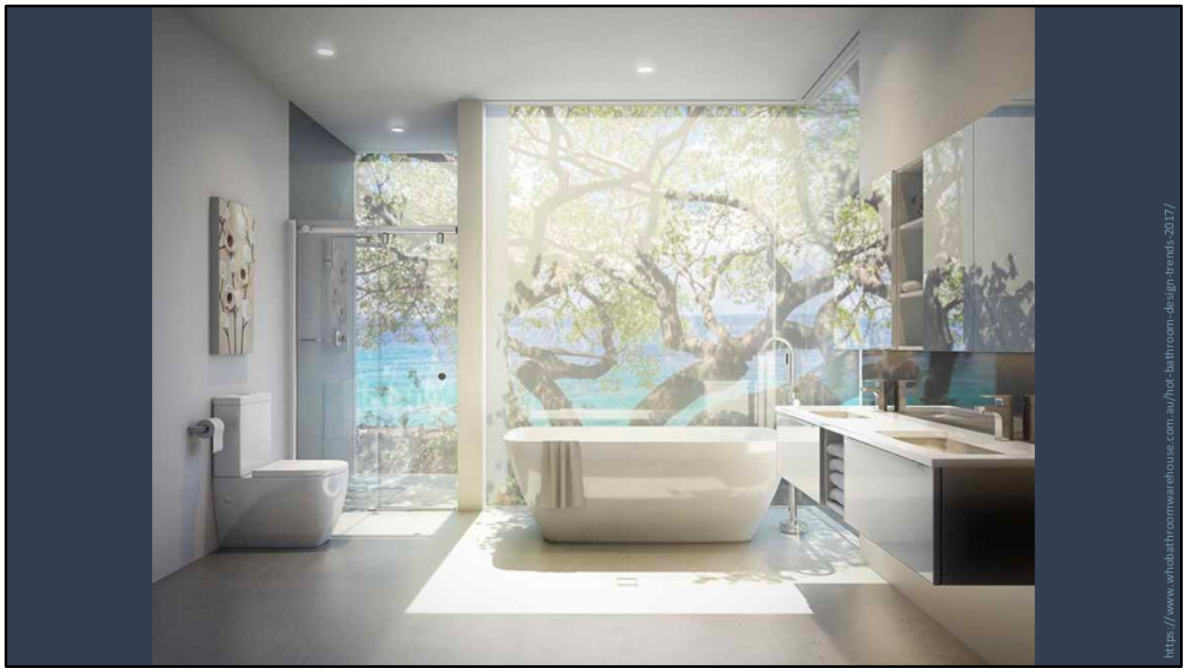
And **DESIGN is the key**, because it **affects** people on a **deeper level** than **information** or **rational decision making** does, it
t affects us **emotionally** and it affects us **instantaneously**.

It is **visceral**.

Ever try to walk through a **push** door that has a **pull** handle? You know that feeling? It's **MADNESS**!

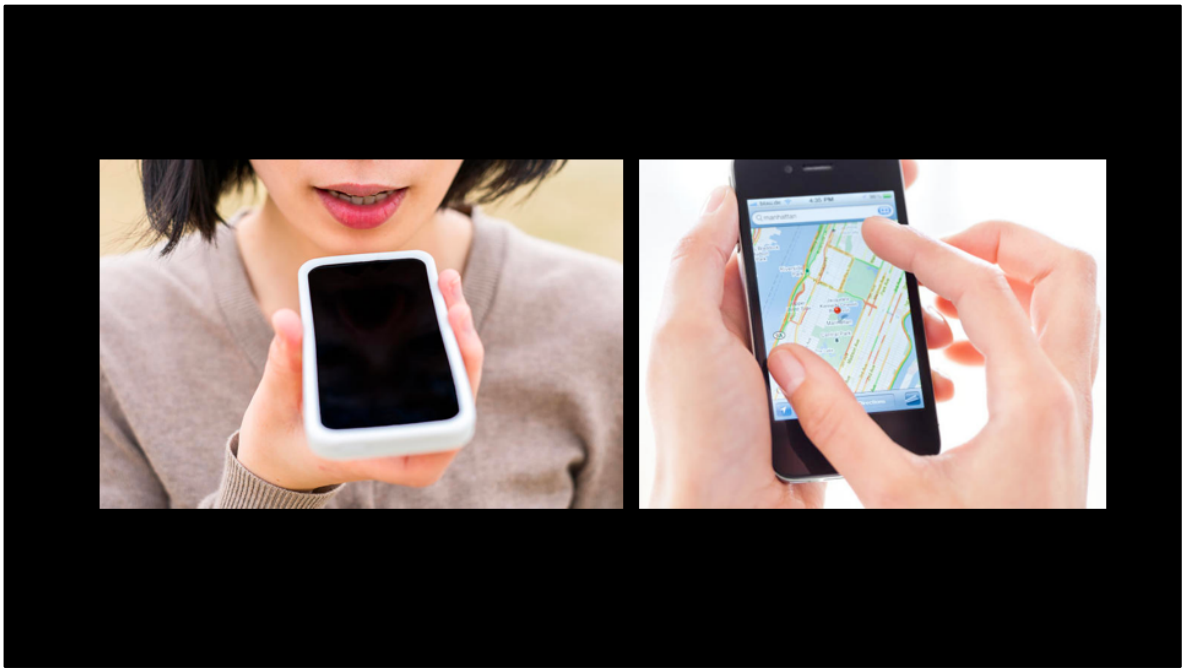


Bad designs make people feel **frustrated** and **negative**,
good designs makes them feel



happy and at **ease**.
Why is that?
It's NOT because they look pretty.

In fact,



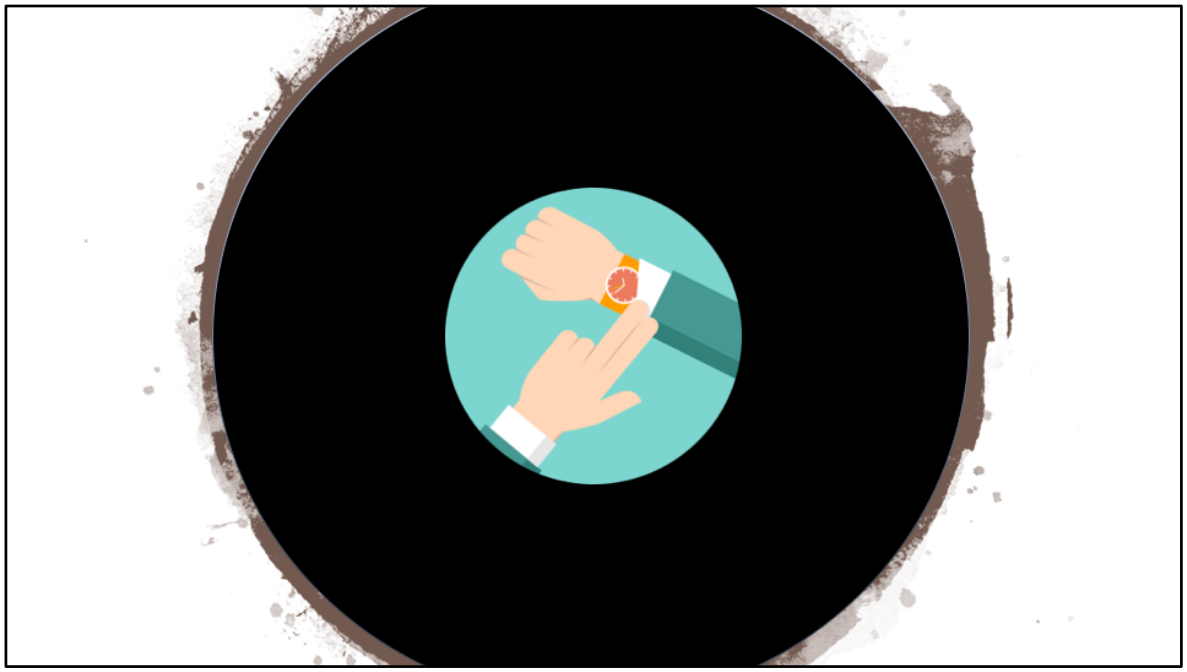
For many people the design itself will go **entirely unnoticed**

After all, the best designs tend to be the things we **instantly** take for **granted**

but when we **zoom out**
we see that, good design is.

intelligent

It makes people feel **comfortable**,
---
and **appreciated**,
and ***understood***.



They feel like their **time is valued** and they **want to engage with well-designed systems** because the **experience** is **pleasant**, they're **useful**, and they **make sense**.

And that's what I **hope** that I've **created** with this **presentation**: something that was **useful** and **made sense** to you.

Thank You