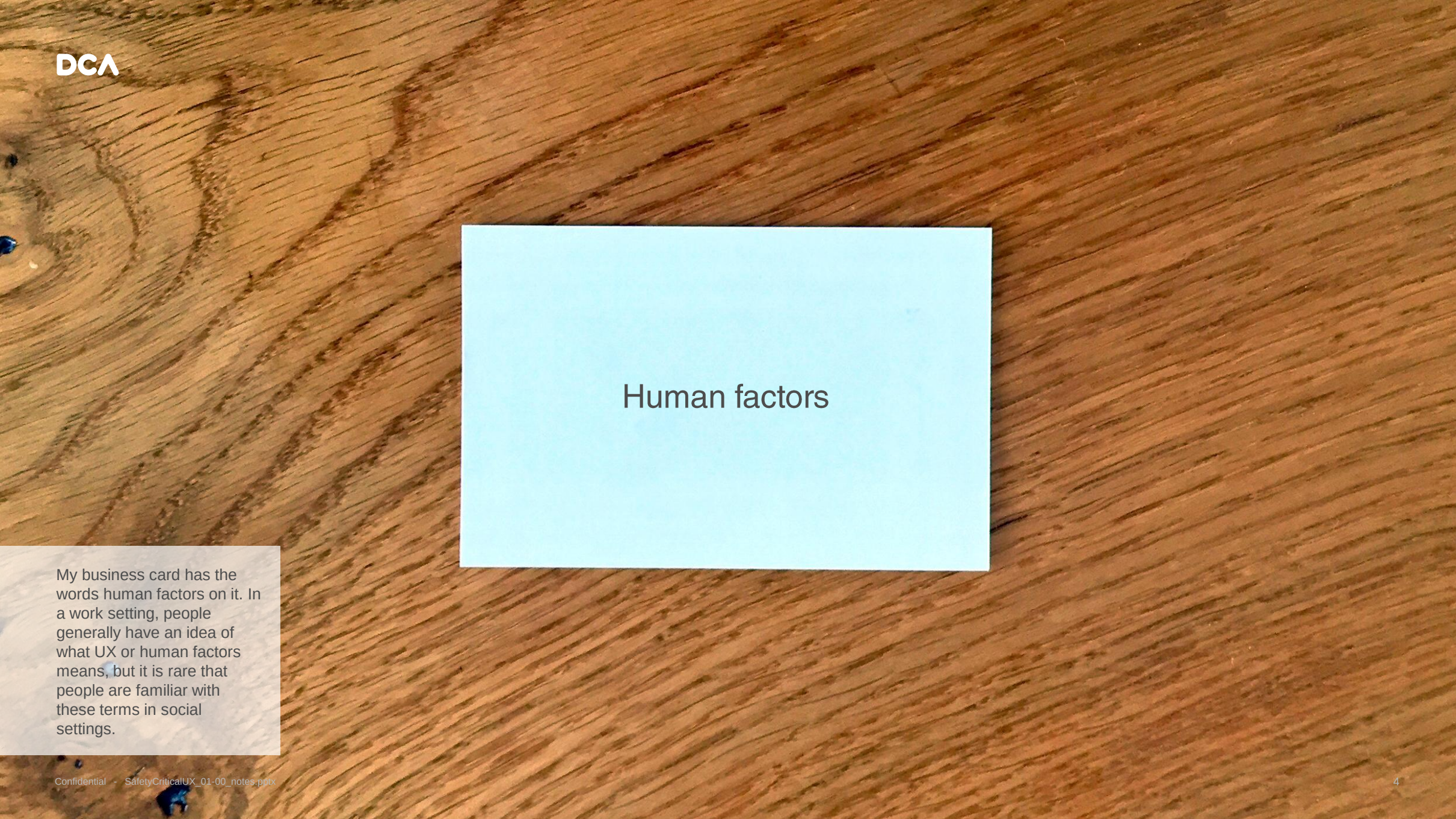
DCA

This is an annotated version of a slide deck presented at UX Oxford on the 16th March 2017.

More info here.

When we meet people in social situations, it's only a mater of time before the question arises "so what do you do?"

And, if you are anything like me, it's a question that you might find difficult to answer.



My business card has the words human factors on it. In a work setting, people generally have an idea of what UX or human factors means, but it is rare that people are familiar with these terms in social settings.

One option we have it to say that we are designers,

Which is a pretty good option as designers are really cool, right.

But the next question always seems to be “what kind of designer are you?”

This is one definition that I find really great because it sums up my view of what I am striving to achieve on a daily basis.

For me, this is what my job is all about – designing for people.

It's a quote from one of my heroes, Henry Dreyfuss, and it was written in 1955

DESIGNING FOR PEOPLE

We bear in mind that the object being worked on is going to be ridden in, sat upon, looked at, talked into, activated, operated, or in some other way used by people individually or en masse.

When the point of contact between the product and the people becomes a point of friction, then the industrial designer has failed.

On the other hand if people are made safer, more comfortable, more eager to purchase, more efficient—or just plain happier—by contact with the product, then the designer has succeeded.

Simon and Schuster, New York, 1955

by HENRY DREYFUSS

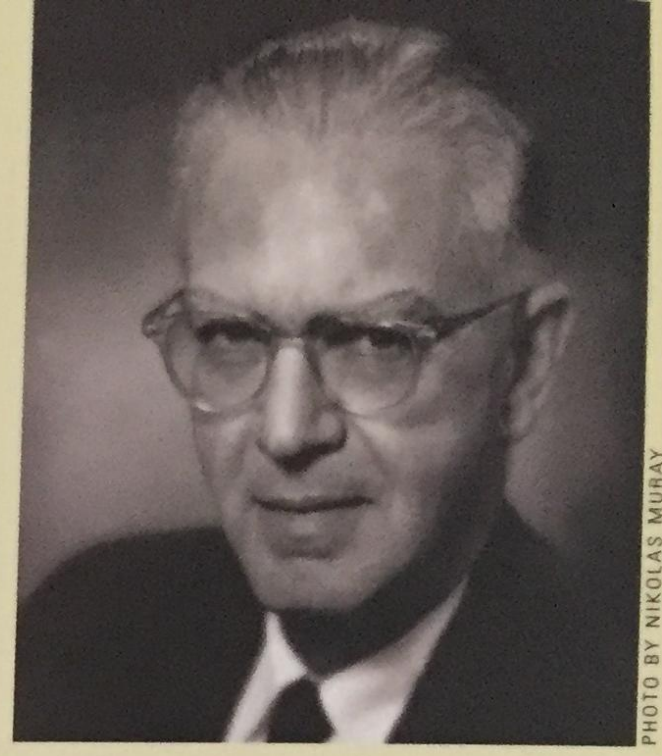


PHOTO BY NIKOLAS MURAY

HENRY S. DREYFUSS

is considered the founding father of industrial design in the United States and one of the most prolific designers of the past century. During his forty years of design practice, he authored or inspired countless American design landmarks, including the model 300 Bell telephone, the Twentieth Century Limited locomotive, Hoover appliances, RCA televisions,

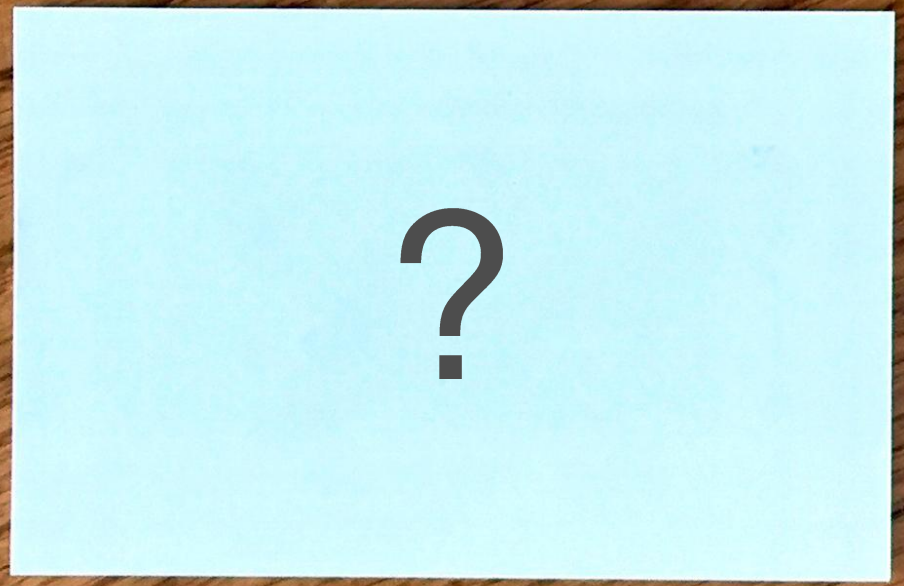
But I'm also very aware, that neither human factors, nor UX, has a monopoly on designing for people.

If fact, the book that the quote was taken from wasn't written by someone calling themselves a human factors expert, someone calling themselves an industrial designer.

Today, there are a lot of people with that same vision. Some are called Human factors (HF), others User experience (UX) or service design (SD).

I did a quick search on LinkedIn job adverts to get some kind of sense of the scale of opportunities for each job title and we see that UX massively outstrips HF, as does service design.

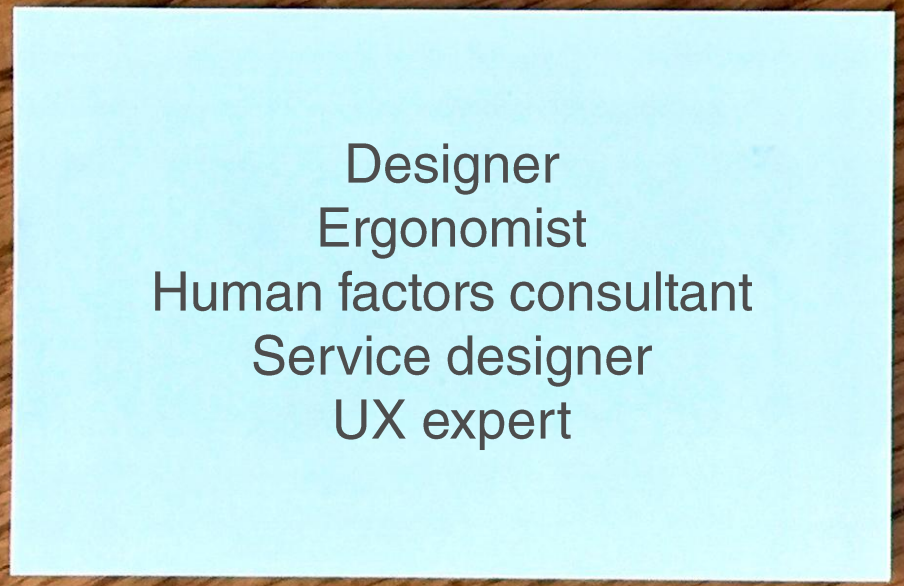
So in 2017, what should the business card say for someone with a passion for designing for people?



Should it say Designer, Ergonomist, Human factors consultant, Service designer, or UX expert

And does it even matter?

I would argue that it does, as the title we choose sets initial expectations about who we are, what we are capable of doing, and where we are focusing our attention.



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DESIGNING FOR PEOPLE

Our attention can be defined by what we seek to measure when we think about designing for people – what are the things that we are focusing on to assess the design?

Returning to Dreyfuss' definition, we can see that he is starting to introduce some metrics, or key performance indicators (KPIs), about how well the designer, or design team, is doing.

Dreyffuss uses terms like safer, comfortable, eager to purchase, efficient, and happier.

We bear in mind that the object being worked on is going to be ridden in, sat upon, looked at, talked into, activated, operated, or in some other way used by people individually or en masse.

When the point of contact between the product and the people becomes a point of friction, then the industrial designer has failed.

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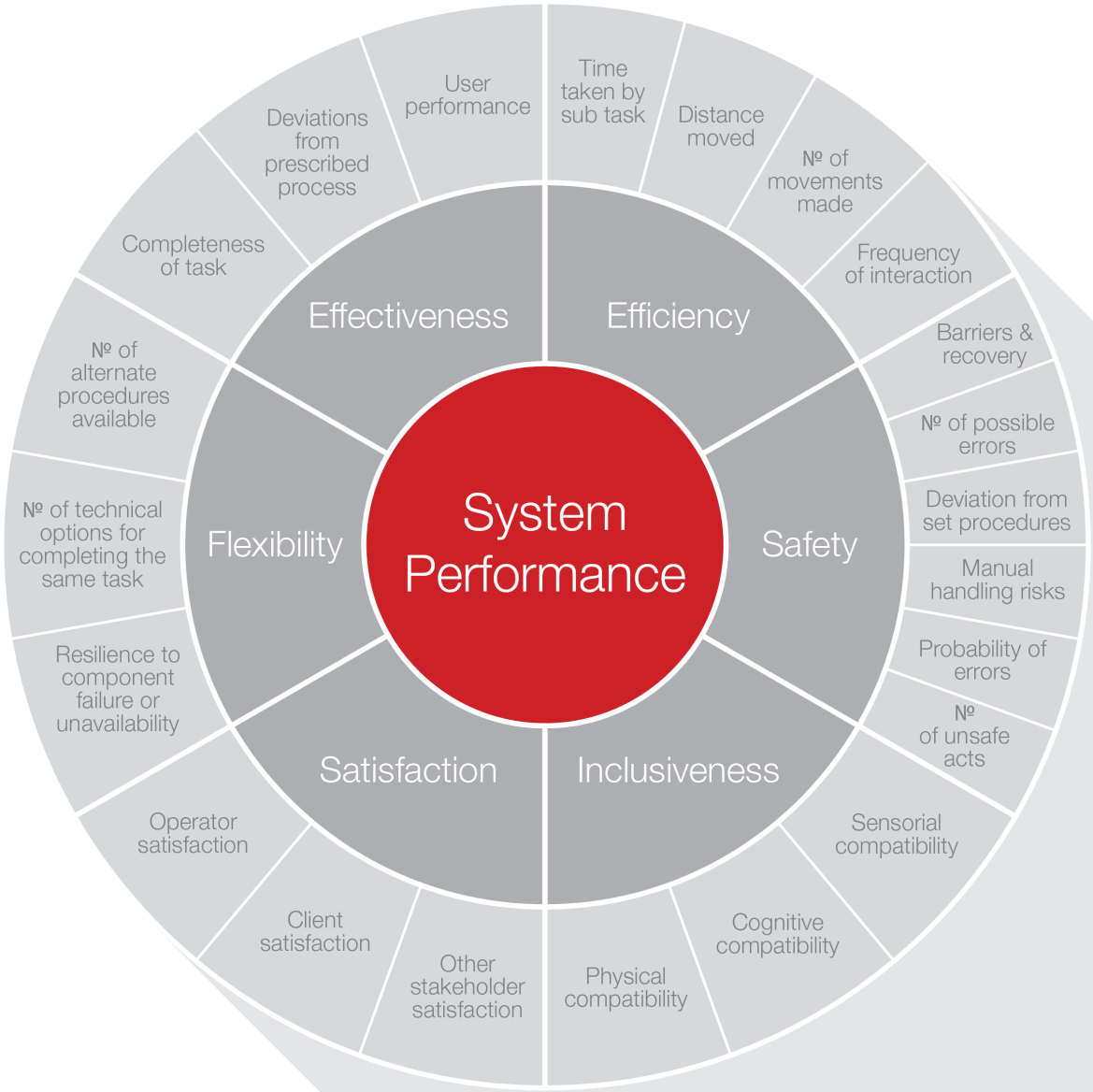
Simon and Schuster, New York, 1955

by HENRY DREYFUSS

I like to use a similar set of metrics today. While these may change with context, the same core things, effectiveness, efficiency, safety inclusiveness, satisfaction and flexibility, tend to remain true.

And I think they apply to every discipline that is designing for people.



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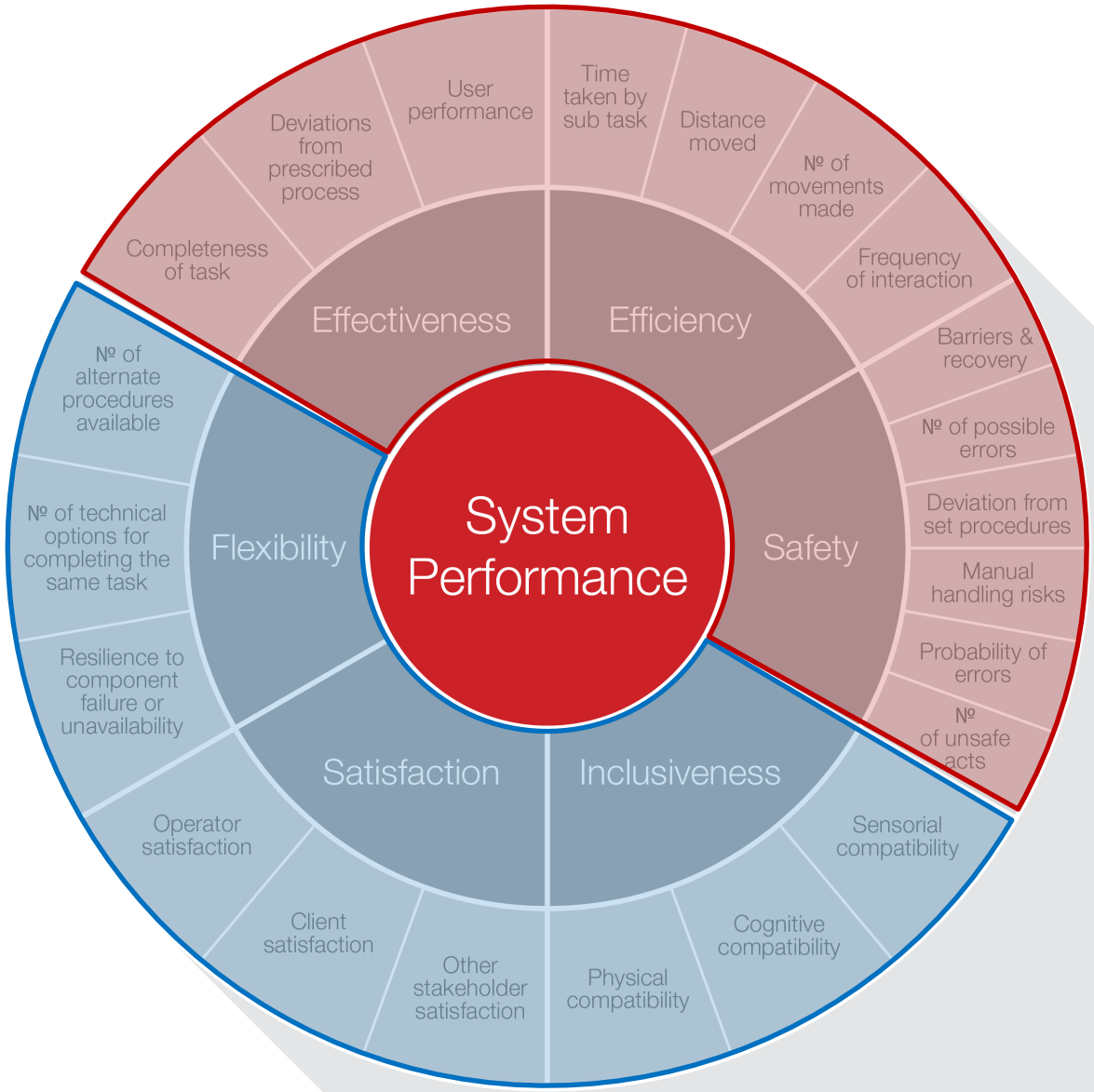
However, while we may all focus on each of these pieces of pie to some extent, I think at least part of the difference between HF and UX is the emphasis that is placed on each segment.

The stereotypical view of HF is that it is biased towards the area highlighted in red, safety, efficiency and efficacy. It also tends to be more prevalent in Business to Business (B2B) services, where the end user is not always the purchaser.

Sticking with stereotypical views, UX is often seen as being more consumer focused and concerned with satisfaction, inclusiveness, and flexibility.



At the risk of over-simplifying things, despite a common shared goal, I think we would all agree that there differences between the disciplines.

HF tends to be more biased to safety critical situations, whereas UX and Service design tend to be more focused on consumer-facing services.

HF tends to be more thorough and meticulous, whereas UX and service design tend to be more agile.

For HF, we expect a comprehensive evidence-base before we commit to a design, whereas Beta-testing in the field is often a common tool for UX and service design.

And finally, there are very different perceptions of safety.

Common perceptions

Biased towards safety-critical domains
Thorough and meticulous
A comprehensive evidence-base prior to implementation
In-use failure viewed negatively

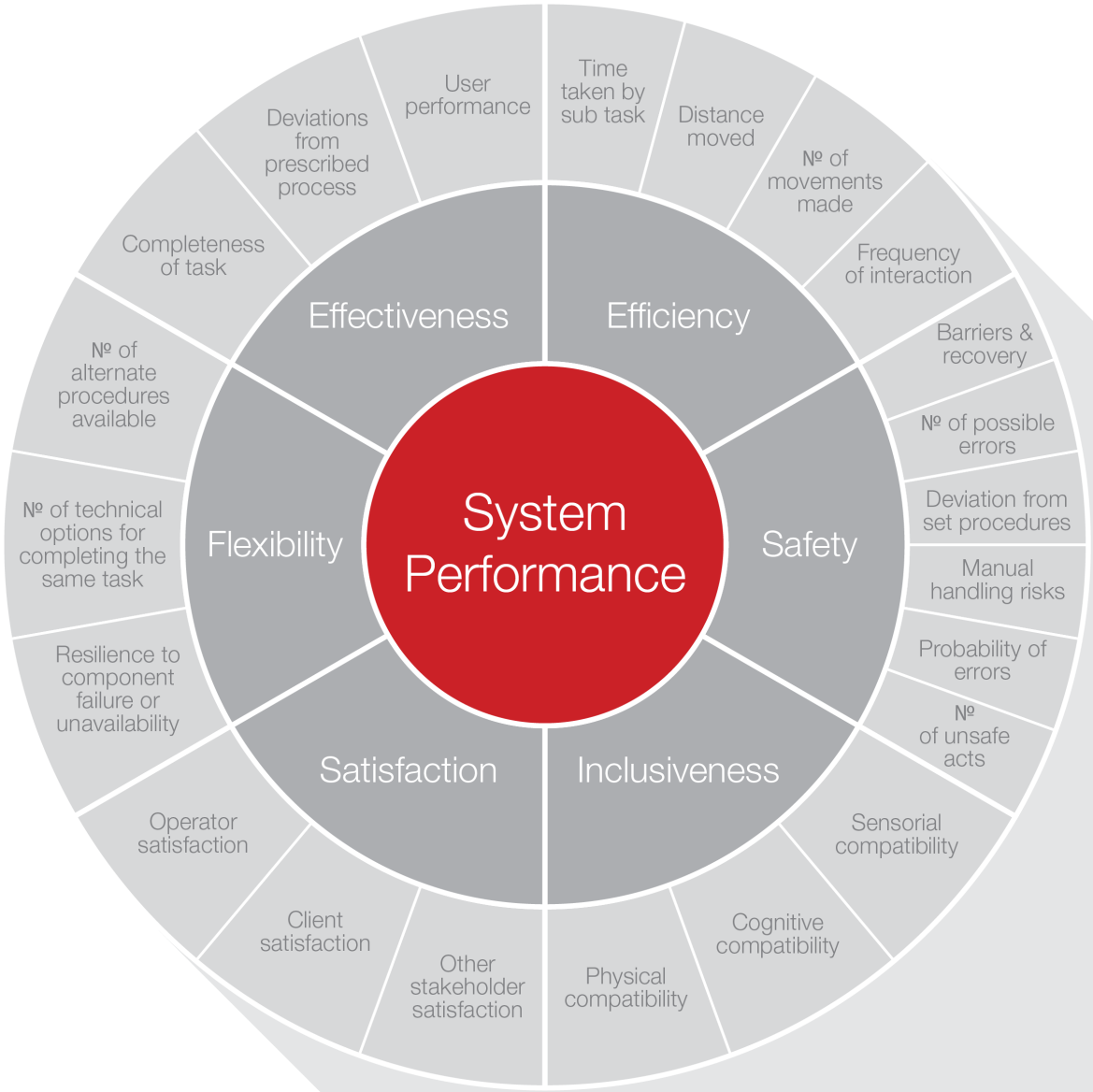
Common perceptions

Biased towards consumer-facing services
Fast and iterative
Beta testing as a critical tool for evaluation & development
In-use failure often celebrated

But my view is that designing for people must be about all these things.

So I am keen to learn as much as possible about what UX is doing, that I could be doing better.

And in return, I am happy to share some of the things that are done under the umbrella of HF that might be of use to others.



And that is a very roundabout introduction to my title slide!

Because, one definition of HF might be UX for safety critical situations.

UX for

Situations

So to dispel a couple of myths, HF is certainly about anthropometrics and human fit, but that's only one small part of it.

Another source of confusion surrounding HF is that there are two quite different job roles for HF practitioners: design and assurance.

Design tends to be about working as a team and creating better things. And assurance is more about policing this, independently checking that the design is safe and effective.

Both are, of course, critical, but it's the design side that has the most in common with UX.

Design

Working as part of a team to identify, refine and implement better ways of doing things

Assurance

Independently checking that the product or service complies with regulations, standards and design intent

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And for us the design covers
everything from toothbrushes…

… to trains

And quite a lot of medical devices.

Core FDA focus

When it comes to designing medical devices one of the things that shapes the design process is the need for regulatory approval.

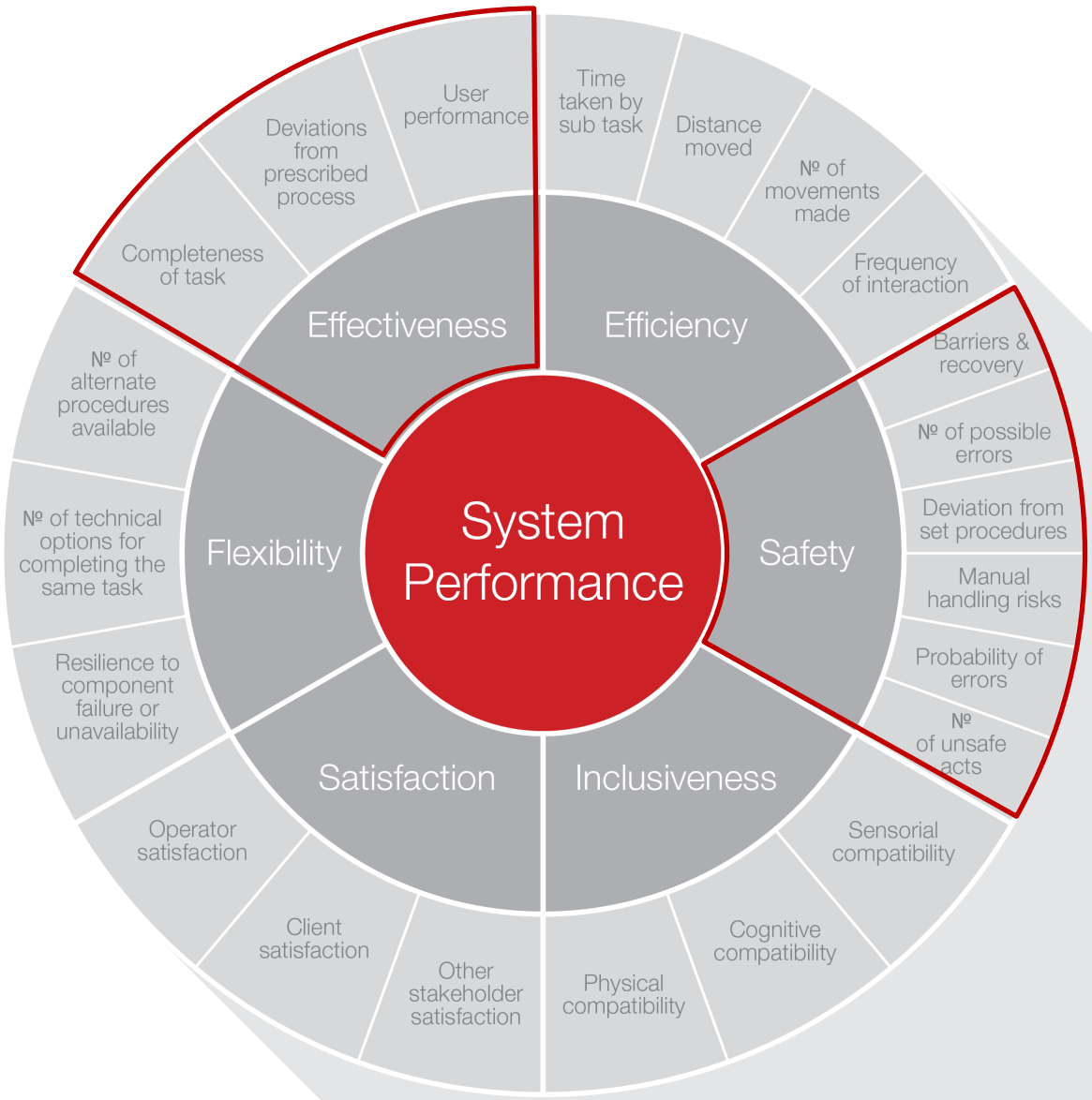
The US Food and Drug Administration, the FDA, have an almost exclusive focus on safe and efficacious uses. This is fairly common for regulators in other safety-critical domains such as nuclear, or oil and gas.

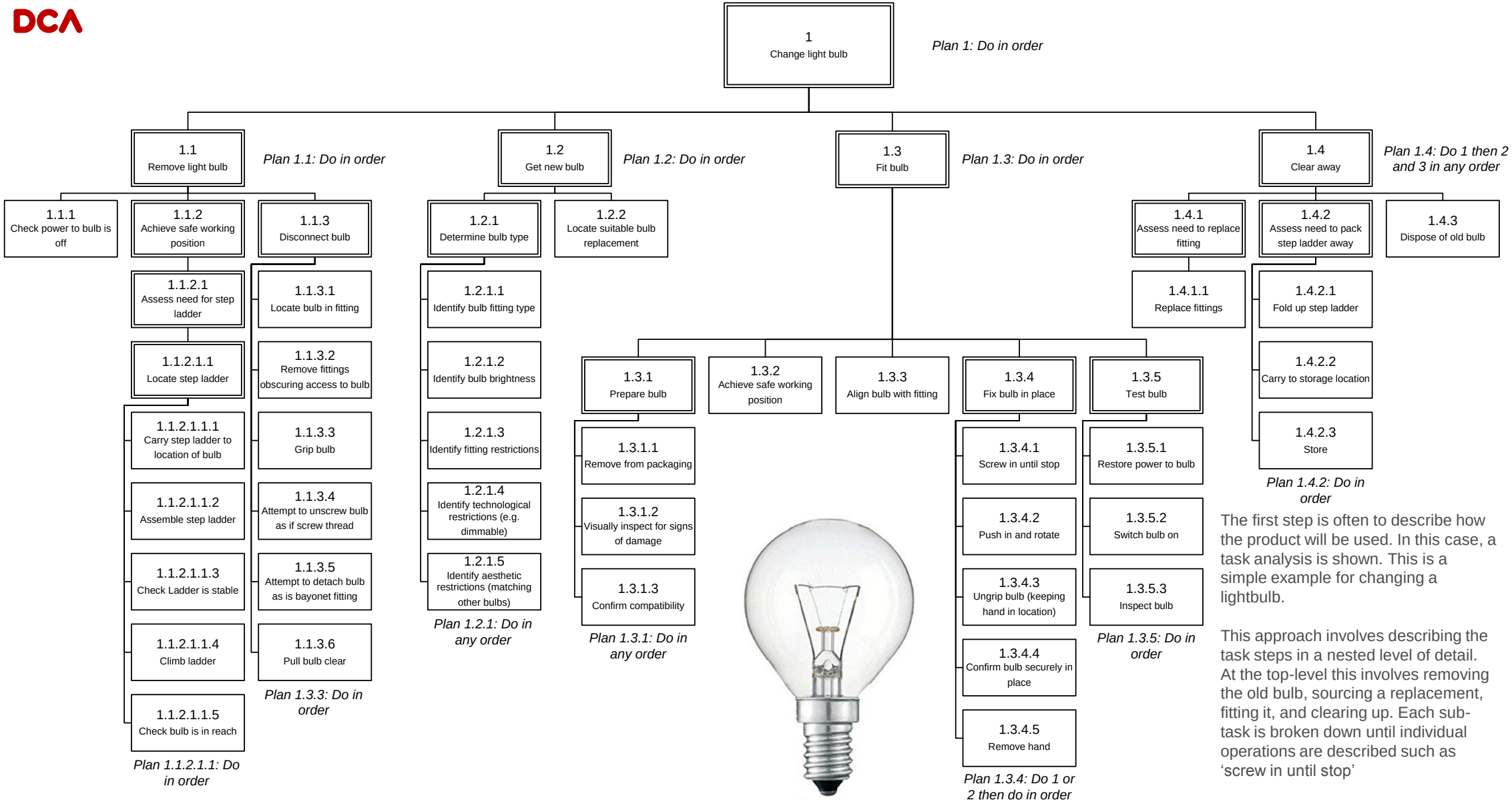
Thus, much of the work of the HF engineer is about demonstrating that the product is safe and effective before it gets in the hand of users.

Simulated use trials, where users are observed interacting with the devices, are the cornerstone of this proof.

But before we get to that point, we tend to use a number of more theoretical approaches, that I wanted to share.

These aim to provide a predication of system performance before even early user testing takes place.





The first step is often to describe how the product will be used. In this case, a task analysis is shown. This is a simple example for changing a lightbulb.

This approach involves describing the task steps in a nested level of detail. At the top-level this involves removing the old bulb, sourcing a replacement, fitting it, and clearing up. Each sub-task is broken down until individual operations are described such as ‘screw in until stop’

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- 1 Change light bulb — *Plan 1: Do in order*
  - 1.1 Remove light bulb — *Plan 1.1: Do in order*
    - 1.1.1 Check power to bulb is off
    - 1.1.2 Achieve safe working position
      - 1.1.2.1 Assess need for step ladder
        - 1.1.2.1.1 Locate step ladder
          - 1.1.2.1.1.1 Carry step ladder to location of bulb
          - 1.1.2.1.1.2 Assemble step ladder
          - 1.1.2.1.1.3 Check Ladder is stable
          - 1.1.2.1.1.4 Climb ladder
          - 1.1.2.1.1.5 Check bulb is in reach

      Plan 1.1.2.1.1: Do in order
    - 1.1.3 Disconnect bulb
      - 1.1.3.1 Locate bulb in fitting
      - 1.1.3.2 Remove fittings obscuring access to bulb
      - 1.1.3.3 Grip bulb
      - 1.1.3.4 Attempt to unscrew bulb as if screw thread
      - 1.1.3.5 Attempt to detach bulb as is bayonet fitting
      - 1.1.3.6 Pull bulb clear

      Plan 1.3.3: Do in order
  - 1.2 Get new bulb — *Plan 1.2: Do in order*
    - 1.2.1 Determine bulb type
      - 1.2.1.1 Identify bulb fitting type
      - 1.2.1.2 Identify bulb brightness
      - 1.2.1.3 Identify fitting restrictions
      - 1.2.1.4 Identify technological restrictions (e.g. dimmable)
      - 1.2.1.5 Identify aesthetic restrictions (matching other bulbs)

      Plan 1.2.1: Do in any order
    - 1.2.2 Locate suitable bulb replacement
  - 1.3 Fit bulb — *Plan 1.3: Do in order*
    - 1.3.1 Prepare bulb
      - 1.3.1.1 Remove from packaging
      - 1.3.1.2 Visually inspect for signs of damage
      - 1.3.1.3 Confirm compatibility

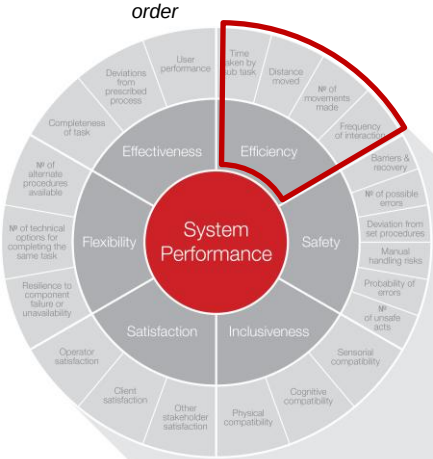
      Plan 1.3.1: Do in any order
    - 1.3.2 Achieve safe working position
    - 1.3.3 Align bulb with fitting
    - 1.3.4 Fix bulb in place
      - 1.3.4.1 Screw in until stop
      - 1.3.4.2 Push in and rotate
      - 1.3.4.3 Ungrip bulb (keeping hand in location)
      - 1.3.4.4 Confirm bulb securely in place
      - 1.3.4.5 Remove hand

      Plan 1.3.4: Do 1 or 2 then do in order
    - 1.3.5 Test bulb
      - 1.3.5.1 Restore power to bulb
      - 1.3.5.2 Switch bulb on
      - 1.3.5.3 Inspect bulb

      Plan 1.3.5: Do in order
  - 1.4 Clear away — *Plan 1.4: Do 1 then 2 and 3 in any order*
    - 1.4.1 Assess need to replace fitting
      - 1.4.1.1 Replace fittings
    - 1.4.2 Assess need to pack step ladder away
      - 1.4.2.1 Fold up step ladder
      - 1.4.2.2 Carry to storage location
      - 1.4.2.3 Store

      Plan 1.4.2: Do in order
    - 1.4.3 Dispose of old bulb

In terms of efficiency, it's useful to step though the model and question each box.
For example is there a way to isolate the light locally to change the bulb. A concealed button to press perhaps?



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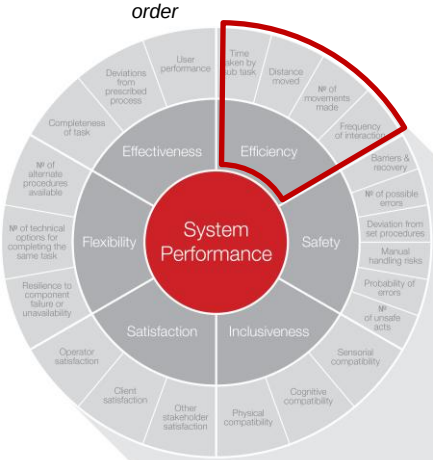
      - 1.4.2.3 Store

      Plan 1.4.2: Do in order
    - 1.4.3 Dispose of old bulb

Taking the next set of boxes, is there a way of changing a light bulb without the need for a step ladder. This would help with safety as well as efficiency and manual handling.



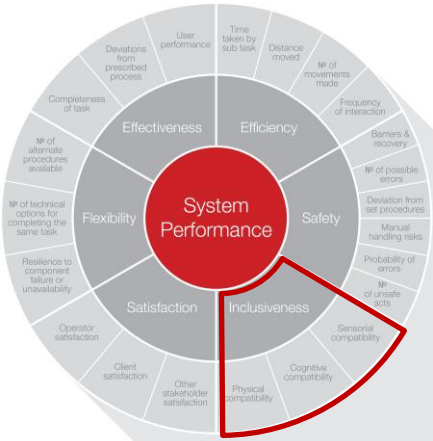
These kind of products have been on the market for sometime. The light fitting is on a retractable cable than can be pulled, or driven, down to a safe working height.

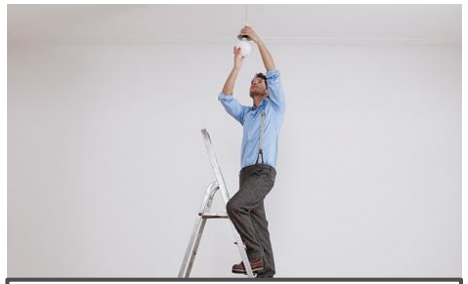
These are perhaps rather niche and less of an issue with long life LED bulbs. But a clever solution.

Effectively, these solutions do not necessarily remove tasks but they change them or allocate them to technical solutions rather than humans.

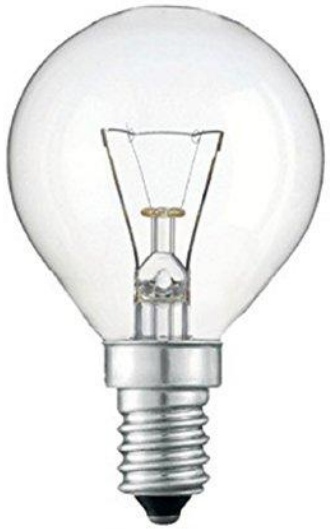
One way of thinking about inclusion and usability is by considering the demands placed on users in terms of their sensory, cognitive and physical capabilities.

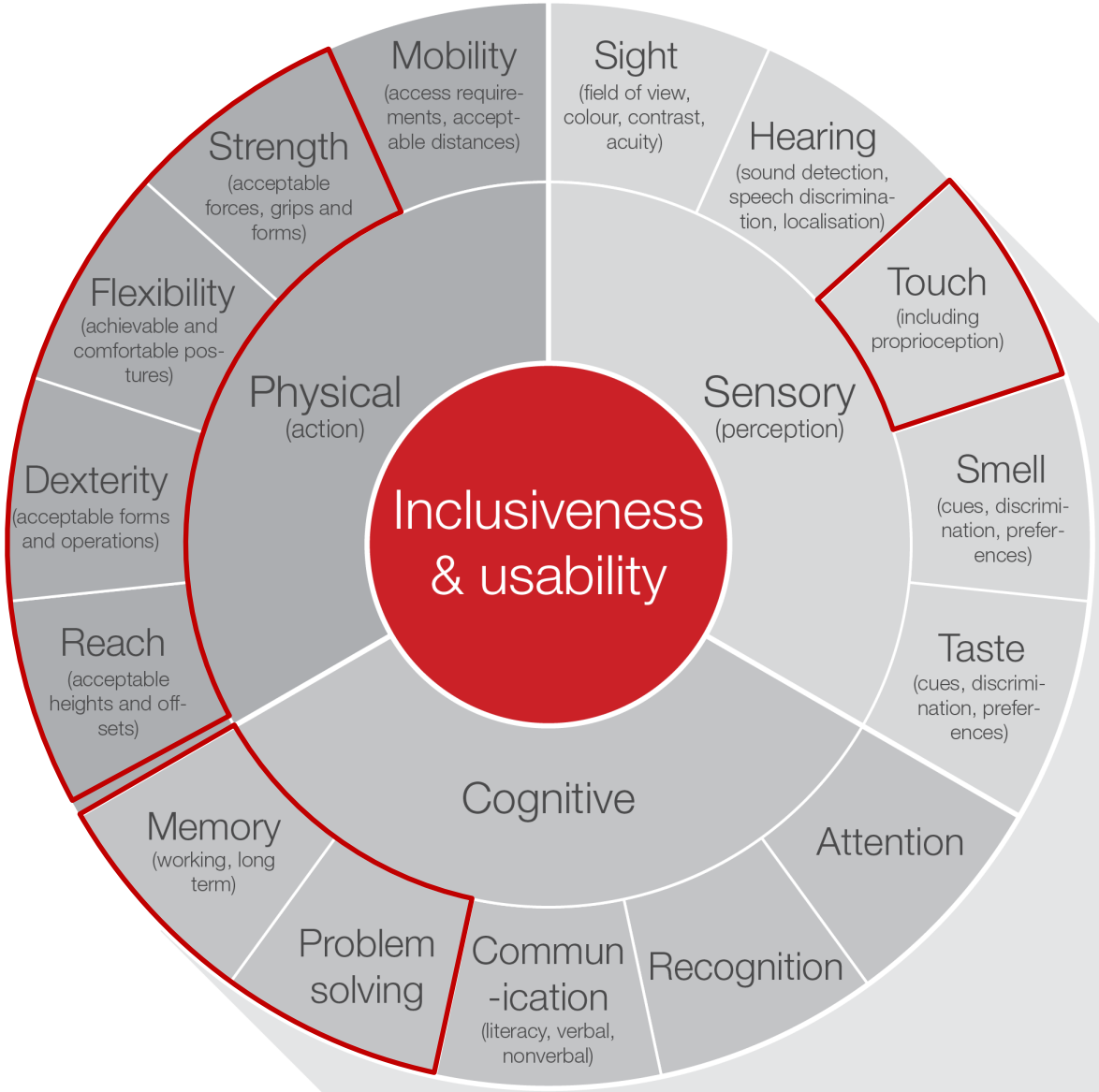
We can take each base-level task in the model and consider it against each of the words in the outer layer of the wheel.

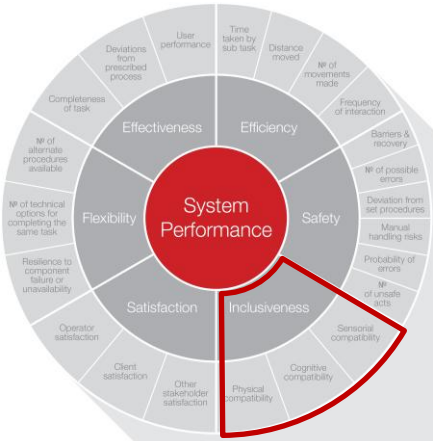




1.3.4.1
Screw in until stop





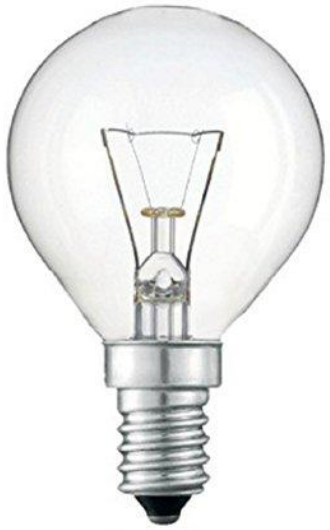


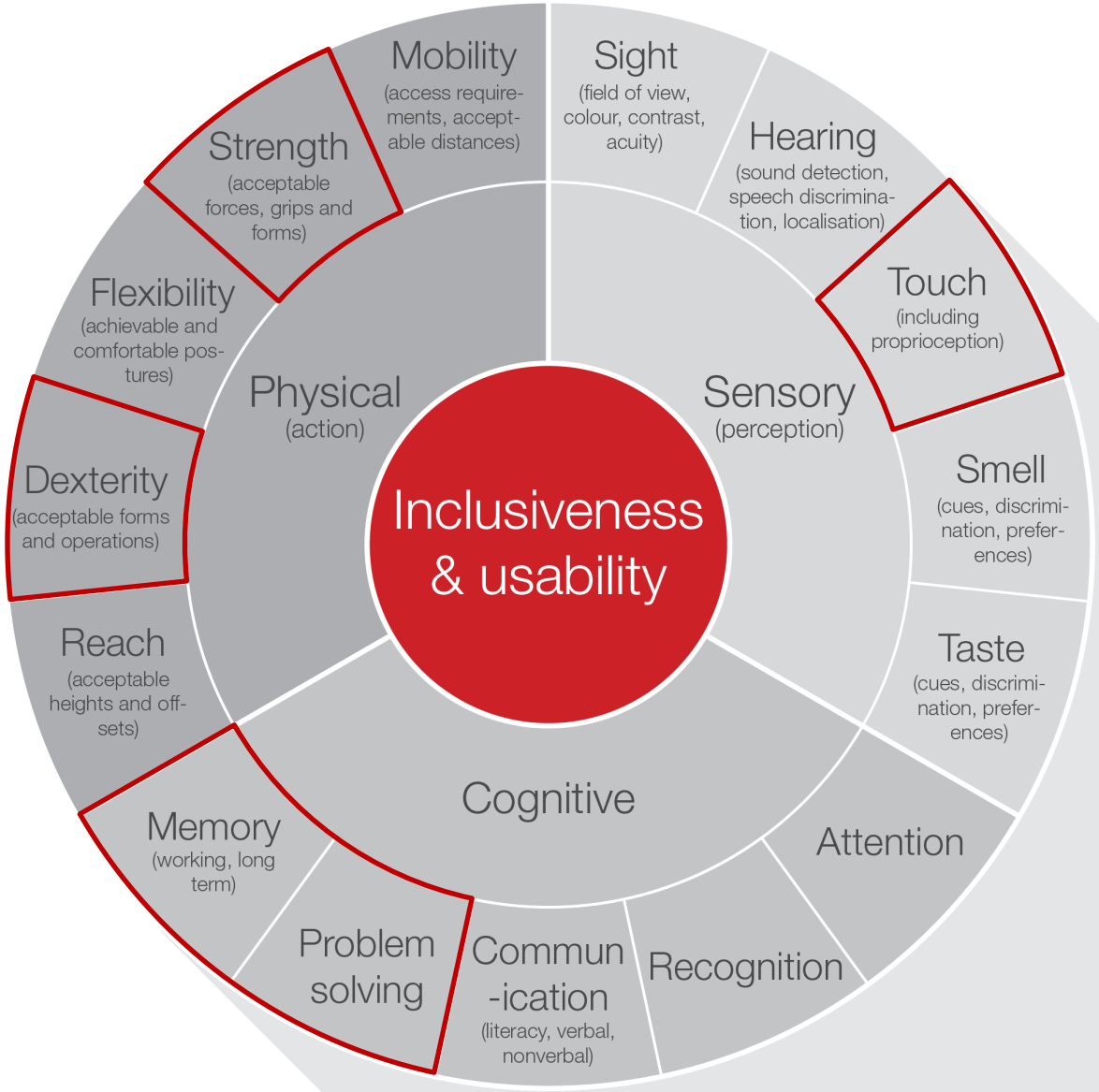
Taking the example of screwing in the lightbulb, once it is aligned, from a sensory perspective, it's primarily about the feel of the bulb. In most cases, it doesn't really help if you can see it, and there are limited cues from sound.

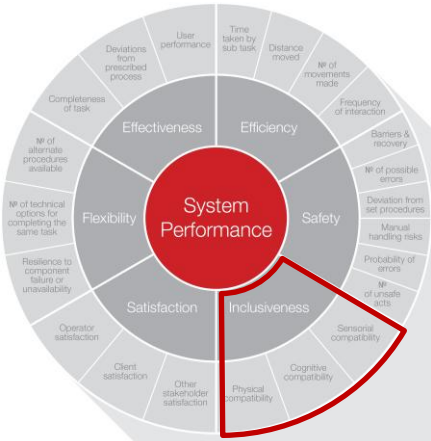
At a cognitive level, users need to know which way to turn it and have some idea of what it should feel like. Much of this will be done from memory, but it could also draw on problem solving.

Finally, at a physical level, we can see that the task is quite demanding, it requires reach, as well as strength and dexterity. In some cases, it may require flexibility if the bulb is over the stairs for example.

1.3.4.1
Screw in until stop







Again a solution like a retractable light would reduce the demands on reach and flexibility.

Thus, this approach provides a useful way of evaluating competing concepts.
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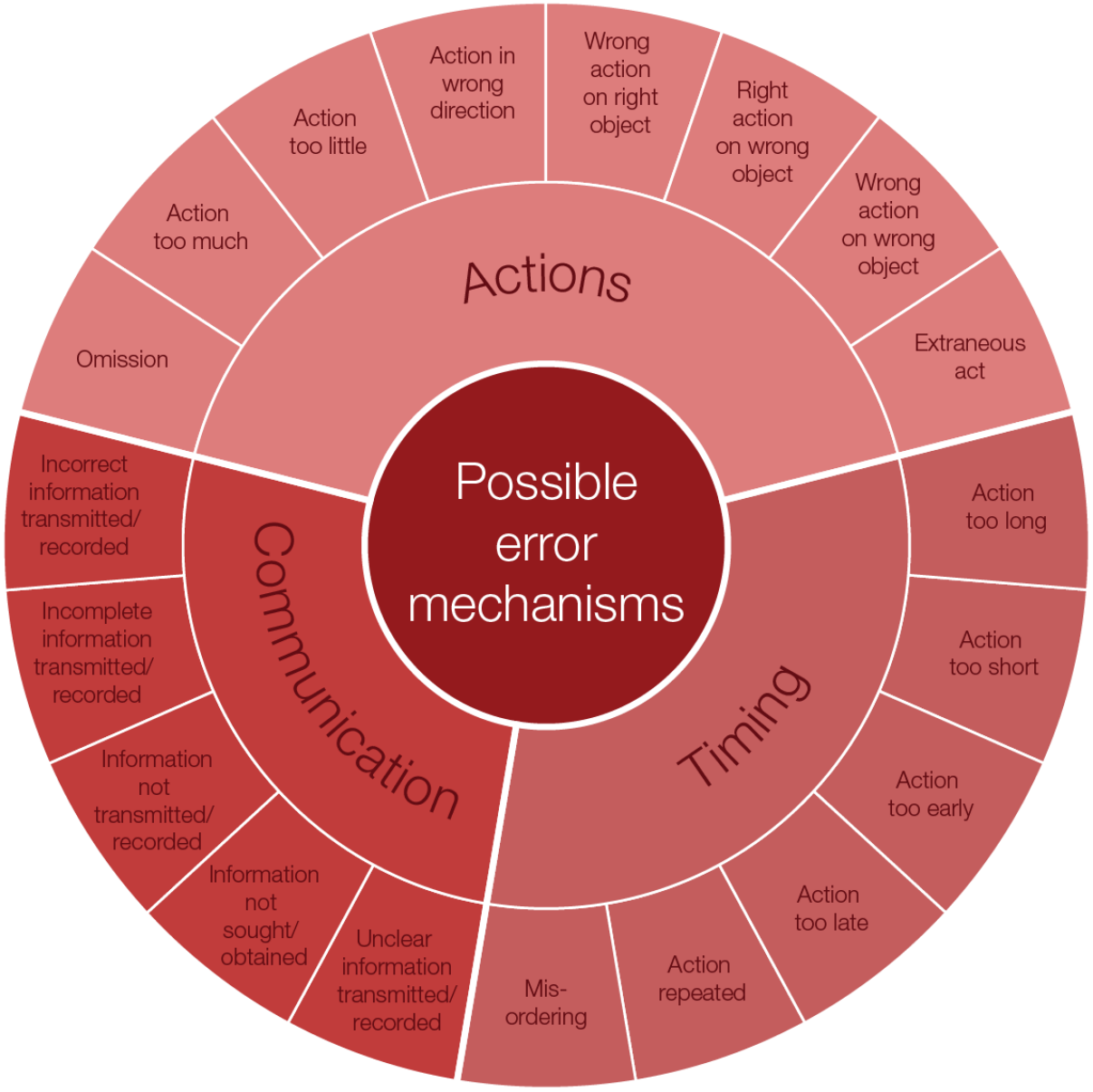

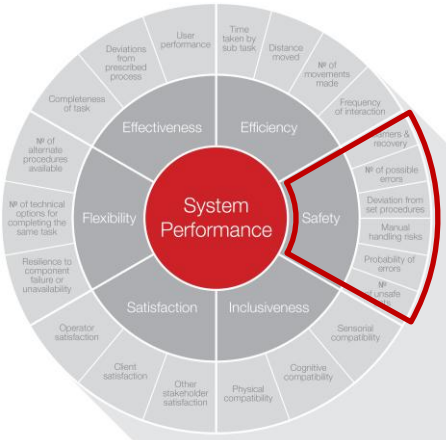

We can also consider safety (or error) in the same way, assessing if the keywords in the outer ring (in this case from a method called TRACEr) apply at each task step…

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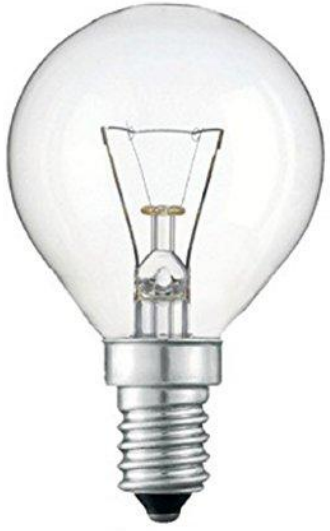
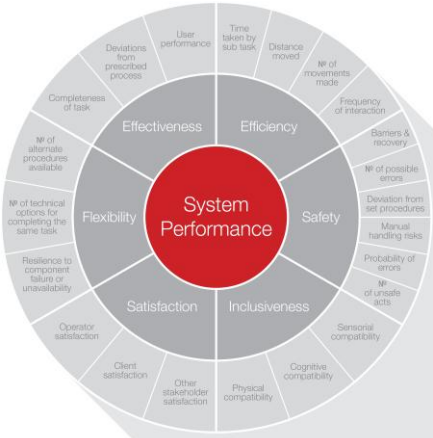
1.3.4.1
Screw in until stop





Returning to the lightbulb example and the task of screwing it in, we can see that a range of errors may apply.

Users could forget the task-step altogether, they could over-tighten it, perhaps cracking the fitting. They may under-tighten it, leading to a poor electrical connection. They could attempt to turn it the wrong way, or try to push the bulb in as it were a bayonet fitting .

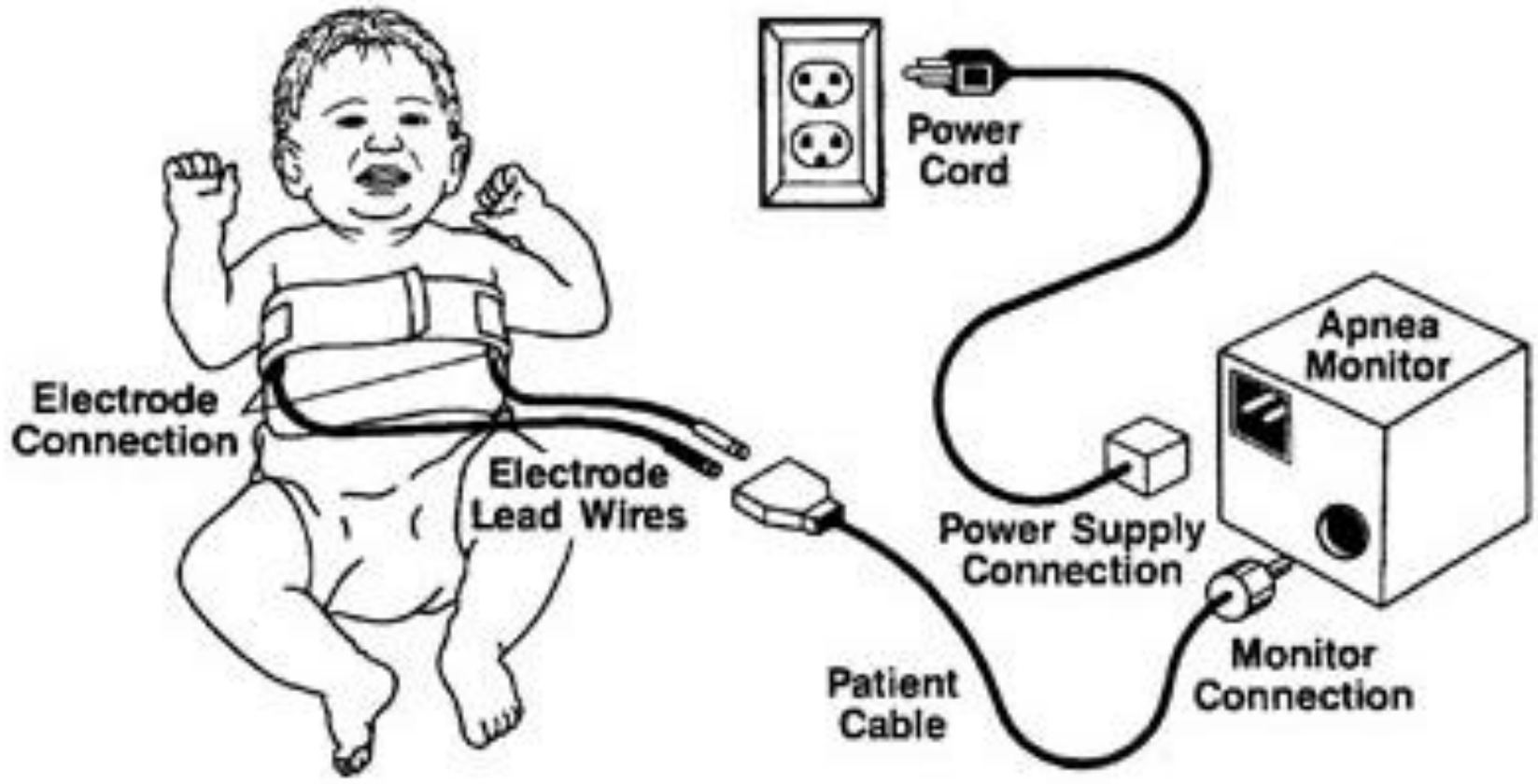
Other errors include dropping the bulb, or attempting to fit before the power were isolated.

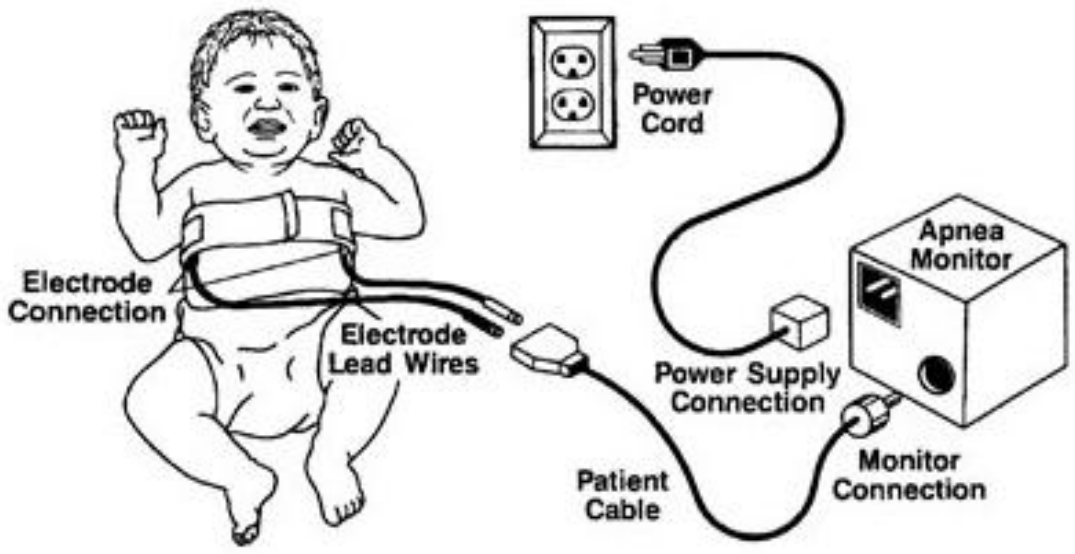
I have been using the light bulb example to explain these methods as it's hopefully something that you are all familiar with and it tends to fit on a slide.

The example I want to share now is a real product example. It's an old product, that some of you may have heard of as its used a case study quite often.

The product is an an infant apnea monitor. The product is design to measure a baby's breathing and alert carers if breathing stops.

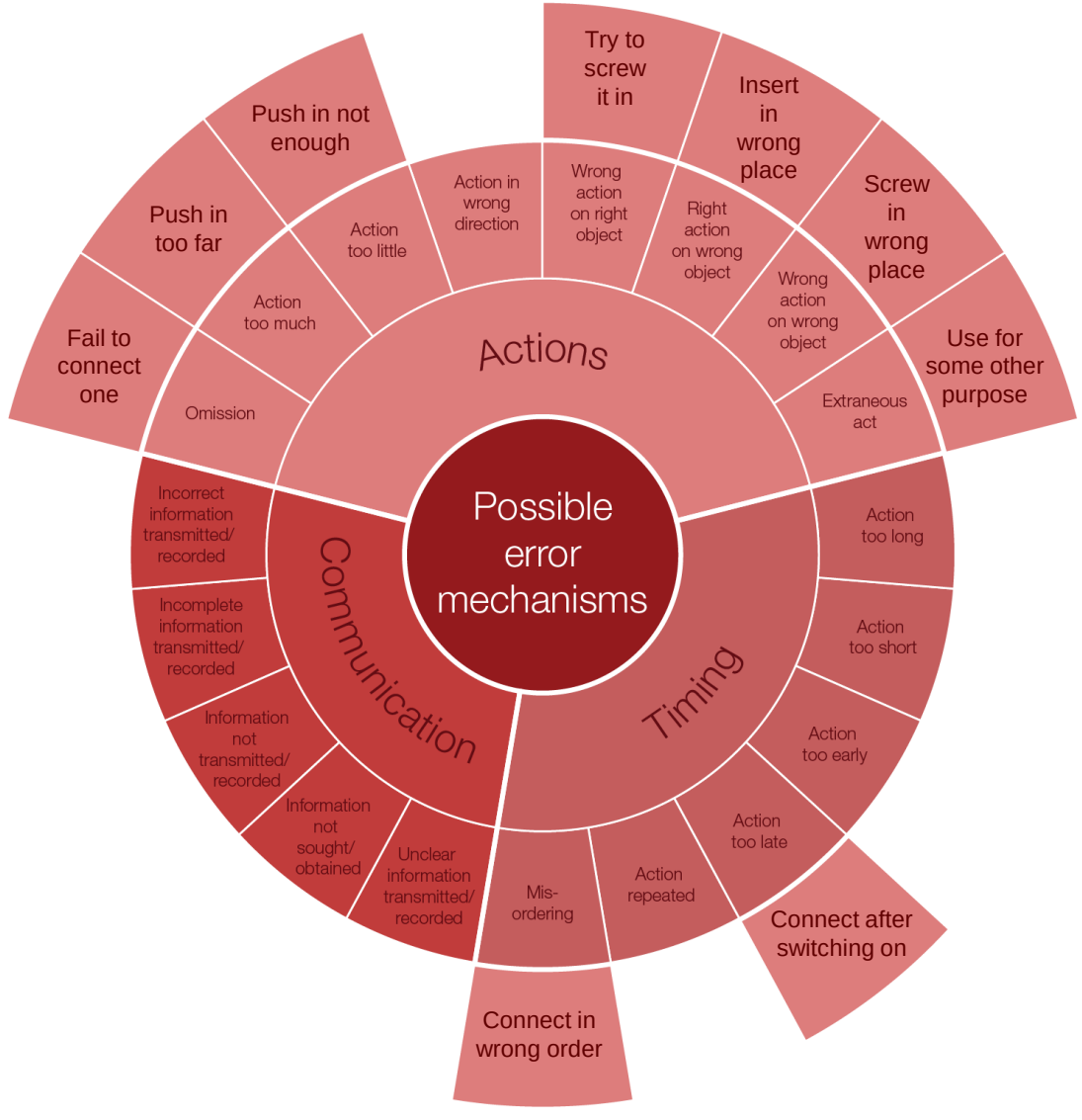
Here is a image of the setup process that shows how the electrodes are connected to the monitor, and how the monitor is connected to the mains power supply.





If we take the task step of connecting the electrodes to the monitor, we can consider this against the same set of key words that we just applied to the light bulb.

Here we can see that its possible to fail to connect the electrodes, push them in too far (perhaps damaging them or the monitor), or not far enough (so they don't form a connection or fall out), try to screw them in, insert them in the wrong place, screw them in the wrong place or use them for some other purpose (maybe use them to open a battery cover).



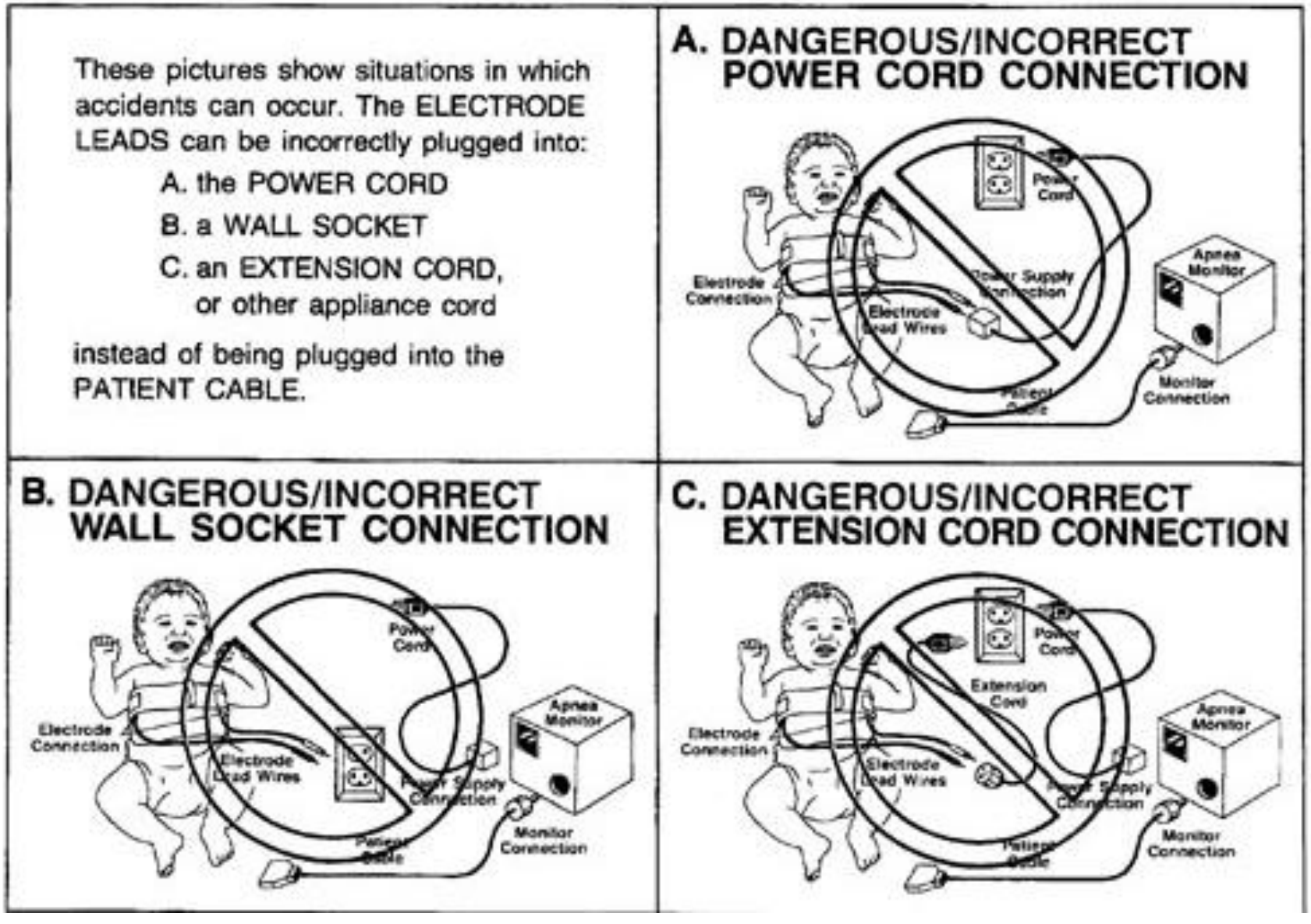
In this case, tragically, the error of inserting the electrodes in the wrong place was credible and there were instances where the electrodes were plugged into the power cord, extension lead, and even directly into the mains.

Given the consequences of connecting your child to mains electricity. It could be argued that this error would not be credible. These kind of things are hard to predict, you may observe a hundred people using the product and never witness it. But that doesn't mean it will not happen. As history shows, it did on numerous occasions.

While, ostensibly, it sounds crazy, and maybe even reckless, when viewed in context, it becomes more credible. For starters, it's often used by the carers of small babies, so they might not have had a lot of sleep. Particularly if they are worrying about their child's breathing. It may also be the middle of night and dark.

So, yes, very low frequency errors, but ones you certainly want to pick up on and mitigate.

In this case it's a simple fix, if caught early enough at no cost, poke-yoke, or error proofing, is central to this.



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Interesting trends

(for me at least)

Emerging market needs

I would like to end with some trends that have interested me over the last year or so.

The first is emerging markets. Emerging markets are an opportunity for growth in the world of pharma.

For HF this brings new challenges in terms of cultural norms and expectations.

More information here

In the past, it has been acceptable to sell last generation products to developing markets. When VW stopped producing beetles in Western Europe, the production line was shipped to Mexico.

This has a number of advantages as it allows production at a much lower cost. Providing affordable transport that's easy to maintain and repair.

However, politically, and perhaps ethically, it's challenging – as it could be perceived as placing different values on health and life. These products simply do not have the crash worthiness of modern cars, either for occupants or pedestrians.

How do we design products for these markets is a big challenge.

Everything connected

The internet of things remains a much-discussed, hot-topic. As this diagram shows, we have now have connected thermostats cars, TVs right through to nappies cows, bins and cutlery that measures how fast we eat.

Security is a big concern for these products, just recently we have heard how some smart TVs can be switched on allowing government agencies to listen in on our conversations.

Despite the risks, the pull is strong and some thing that we should expect to see more of.

More information here

A different approach for safety critical devices

The idea of connected devices that are safety critical, offers some exciting possibilities, most notably for medical in recording compliance and helping patients remember to take drugs and record when taken.

But, it also comes with challenges. While the idea of the government listening to our conversations about the latest soap opera is unpalatable, the idea of someone stealing data about our medical conditions is far worse.

What's more what if they somehow alter the function of these devices.

More information here

Really smart devices

For medical devices, if decisions are to made based on the data that is collected and processes by these devices we need to be very sure that data is correct.

For consumer devices, it's often sensible to create fairly dumb smart device and have all the intelligence in the smart phone or even the cloud. This reduces the cost of devices and leverages the processing power, memory and large screen of the phone.

For smart medical or safety critical devices, however, it is usually best that they are smart themselves.

More information here

Expectations set elsewhere

When it comes to apps and devices to support safety critical devices, we also face a number of unique challenges. As we mentioned previously, the code needs to be highly reliable and auditable.

But user expectations are being set elsewhere, users want, if not demand, smartphone and tablet experiences on all devices they interact with. They want integration with their operating systems and fancy interactions, animations and graphics.

The trouble, of course, is that places a huge burden on demonstrating that it is safe.

I see this is a real opportunity for UX and HF to work together to ensure we get experiences that users are encouraged to engage with while maintaining the safety and efficacy.

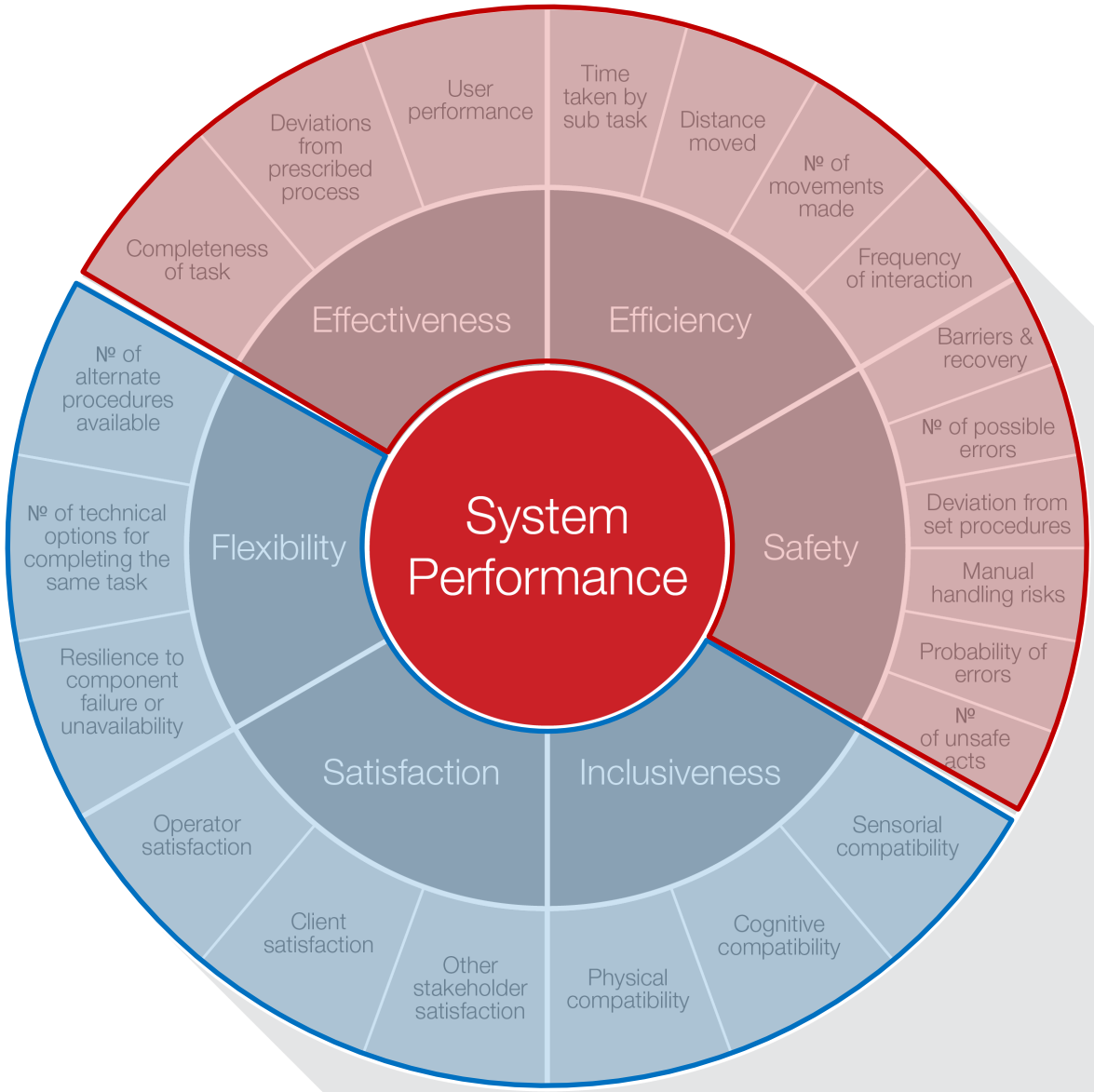
More information here

Digital getting physical

And this blurring of the physical and digital world is happening in both directions. Not only do device manufactures want to make their products smart, once digital-only brands are keen to develop physical devices, understanding that physical objects have a powerful impact on our experiences.

So as the boundaries between the physical and digital world blur, it is imperative that products, services, and experiences are developed that allow people to be safer, more effective and efficient. Likewise, they should also be more inclusive and flexible – making people happier.

I see this is a real opportunity for UX and HF to work together to ensure this.



Questions?

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