



## Causal Analysis

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## Conflict of Interest Disclosure

David Marx reported no relevant financial relationships or relationships he has with ineligible companies of any amount during the past 24 months.



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## Presenter

**David Marx**  
**CEO**  
**Just Culture**

Formerly a Boeing aircraft design engineer, Mr. Marx won the International Federation of Airworthiness's Whittle Safety Award for developing a human error investigation process used by airlines worldwide. In the health care sector, Mr. Marx continues to help health care institutions and regulatory agencies reduce the risk of iatrogenic patient harm.



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Why did this occur?

It's no easy question.



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Why did this occur?

It's also not an easy question.



## Design of Systems



## Design of Systems

	Error Selection, Retrieval, or Stocking Error	Error Visually Confirm at ADC	Error Visually Confirm at Bedside	Error Barcode Scan at Bedside		Risk/Dose	Interval	
Selection, retrieval, or stocking error, plus errors at every step	.001	.001	.001	.0001		$1 \times 10^{-13}$	1 in 10T doses	Mitigation
Errors at each step, plus <b>one</b> at-risk behavior	.001	1	.001	.0001		$1 \times 10^{-10}$	1 in 10B doses	Mitigation
Errors at each step, plus <b>two</b> at-risk behaviors	.001	1	1	.0001		$1 \times 10^{-7}$	1 in 10M doses	Mitigation
Selection, retrieval, or stocking error, plus <b>three</b> at-risk behaviors	.001	1	1	1		$1 \times 10^{-3}$	1 in 1,000 doses	Mitigation
Selection, retrieval, or stocking error, plus <b>three</b> at-risk behaviors	.001	1	1	1		$1 \times 10^{-3}$	1 in 1,000 doses	No Mitigation

The Charlene Murphey Event

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## Event Learning

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## Stop Signs in our Way

- I don't have control to change that
- His actions were "intentional"
- We've been taught to make no inferences (just the facts)
- We been taught to stay on the outside (systems)
- We been taught to look at the offender (not others)



## Steps to an Adequate RCA

- Outside
- Inside
- Outside
- Interventions



## Outside Looking In

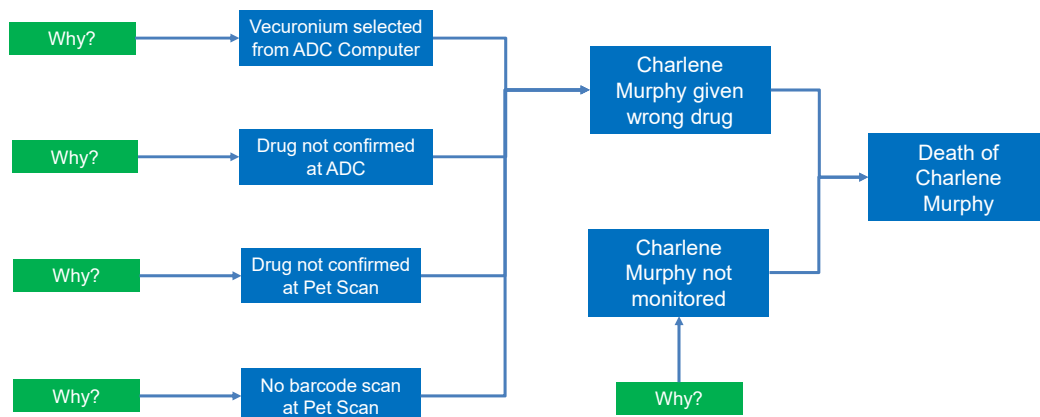
- Identifying the Undesired outcome or conduct
- Identifying / Describing the “system” designed to prevent that outcome or conduct
  - Expectations? Policies?
  - Barriers? Recovery? Redundancy?
  - Natural Mappings? Forcing Functions?
  - Signage/Placards?
- Identifying those actions/events were “less than desired” that led to the adverse outcome or conduct
- Make a first attempt at mapping “causality”



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## Build a Causal Diagram



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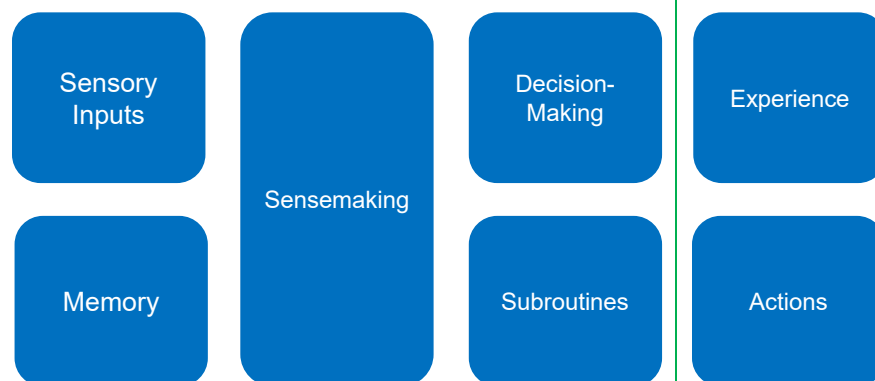
## Looking Inside

- It is not very helpful to see human behavior or human choices as being produced by a “black box”
- If we’re attempting to learn, when we do see less-than-desired conduct, we should attempt to understand it from the inside (the individual’s theatre of consciousness)

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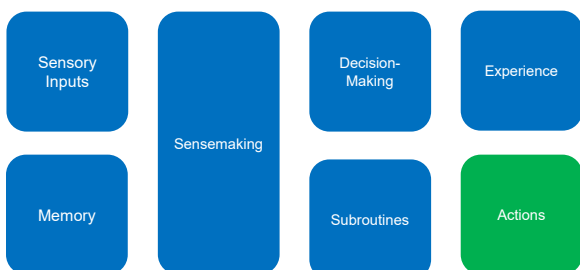
## Look Inside



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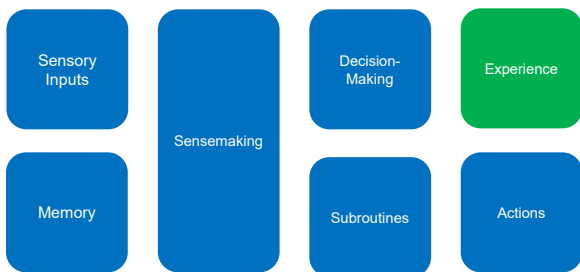
## Actions



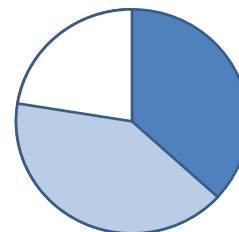
- It's our physical movement
- It's language we use
- All directed by subconscious mechanisms, many which take the form of "subroutines"
- Sometimes it's not what we wanted, but most often it works
- It's no place for "judgement"



## The Theatre of Consciousness

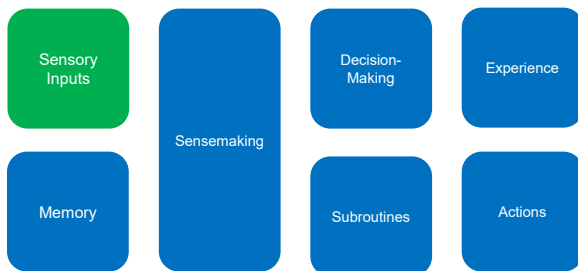


- It's where we see "us"
- Sequential, multi-tasking
- Filled with reflection and imagination, experiencing pleasure and pain





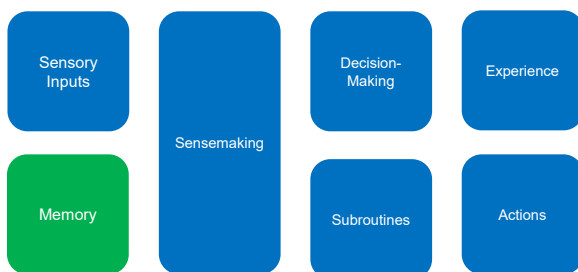
## Sensory Input



- Internal and External Sensors
  - ✓ Vision
  - ✓ Hearing
  - ✓ Touch
  - ✓ Taste
  - ✓ Smell
  - ✓ Internal Sensors
- Extensive Filtering

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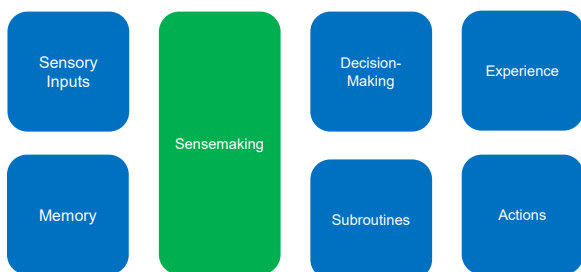
## Look Inside



- Storage for:
  - ✓ Semantic Memories
  - ✓ Episodic Memories
  - ✓ Pain and Pleasure Tags
  - ✓ Associations
  - ✓ Subroutines
- Most of our memories are not “real”
- Considerable associated garbage comes up

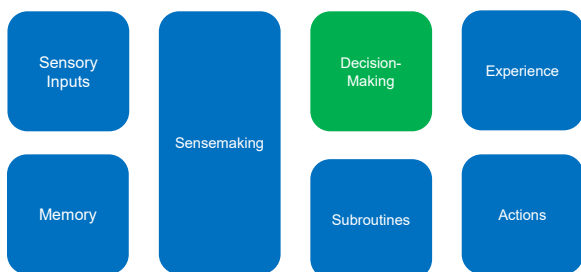
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## Look Inside (cont.)



- Where we process information
- Comparing sensory inputs with memory
- Creating the feed for the Theatre of Consciousness
- Calculating Pleasures and Pains
- Calculating Asset Change
- Feeding Decision-Making

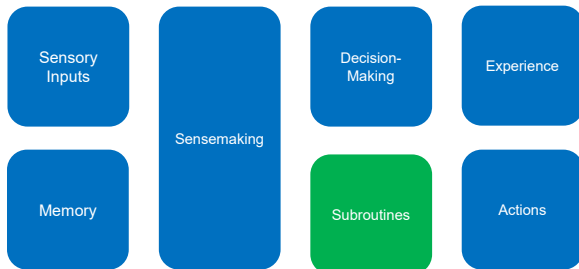
## Look Inside (cont.)



- Where the human decision-making calculator resides
- Choice = function of pleasure, pain, and assets
- Arguably, we all have the same formula
- Memory is largely what makes us unique



## Look Inside (cont.)

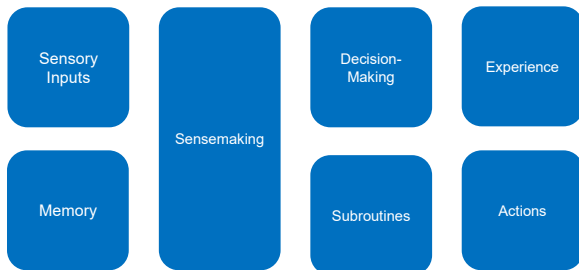


- Programmed instruction sets
- Conscious effort driving human actions is way too slow
- Susceptible to mis-selection
- Hard to re-program

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## Salad vs. Burger?



\$19.00

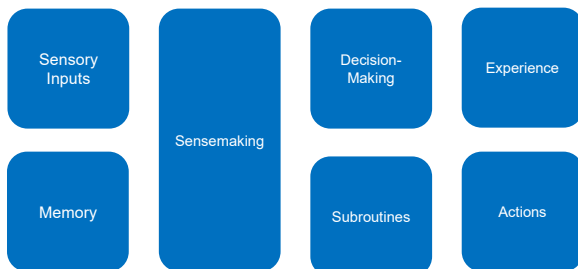


\$9.00



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## The ADC



## Conclusion

- Causal analysis is a specialized skill
  - ✓ Human performance / decision-making
  - ✓ Design of systems
- We need not shy away from going “inside”
- We need not shy away from intentional acts
- We need not shy away from investigative inference
- We need to do our best to understand why it happened



# Questions



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Thank you

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