

11:00 am – 12:00 pm

HUMAN ERROR, and the concept of controls and error proofing in the light that errors are ever-present –

Guest Speaker Dr. Matt Hallowell

9

9

Human Error

Dr. Matthew Hallowell

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10

Agenda



Defining Error



Classifying Error



Addressing Error



11



Anna Davis
@radscientist_

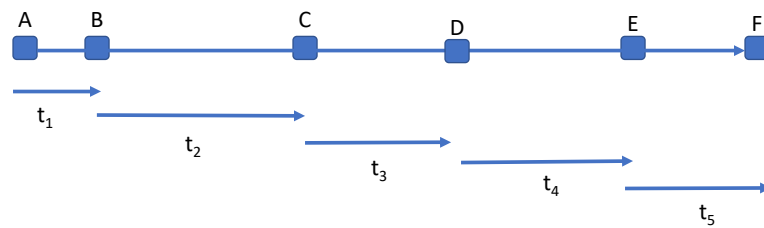


I just walked into my room holding the remote and a glass of chocolate milk and I meant to toss the remote into my bed but instead I tossed the glass of chocolate milk onto my bed

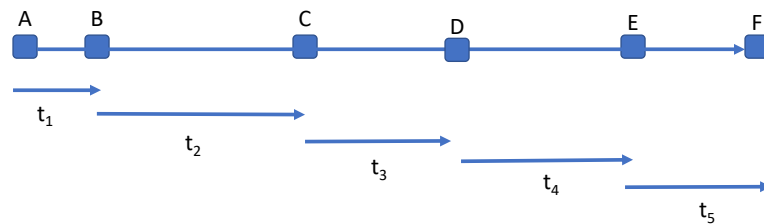


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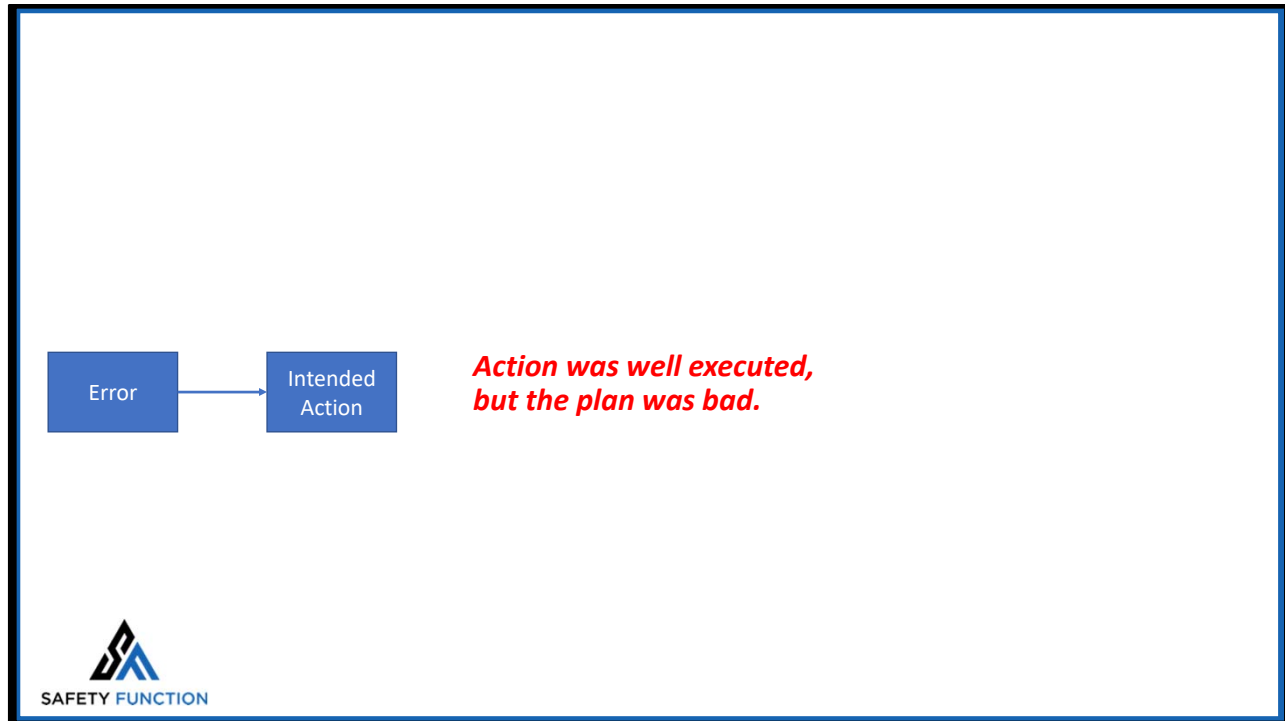
Human error is a deviation from intention, expectation, or desirability.



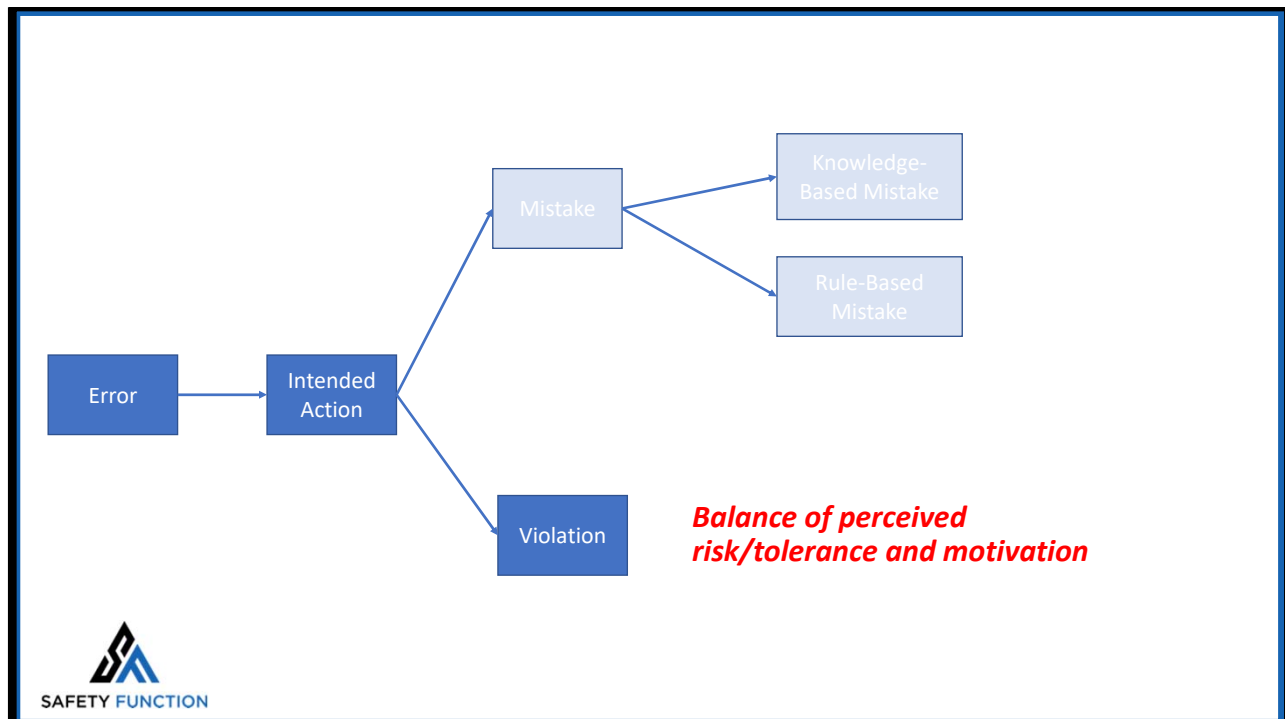
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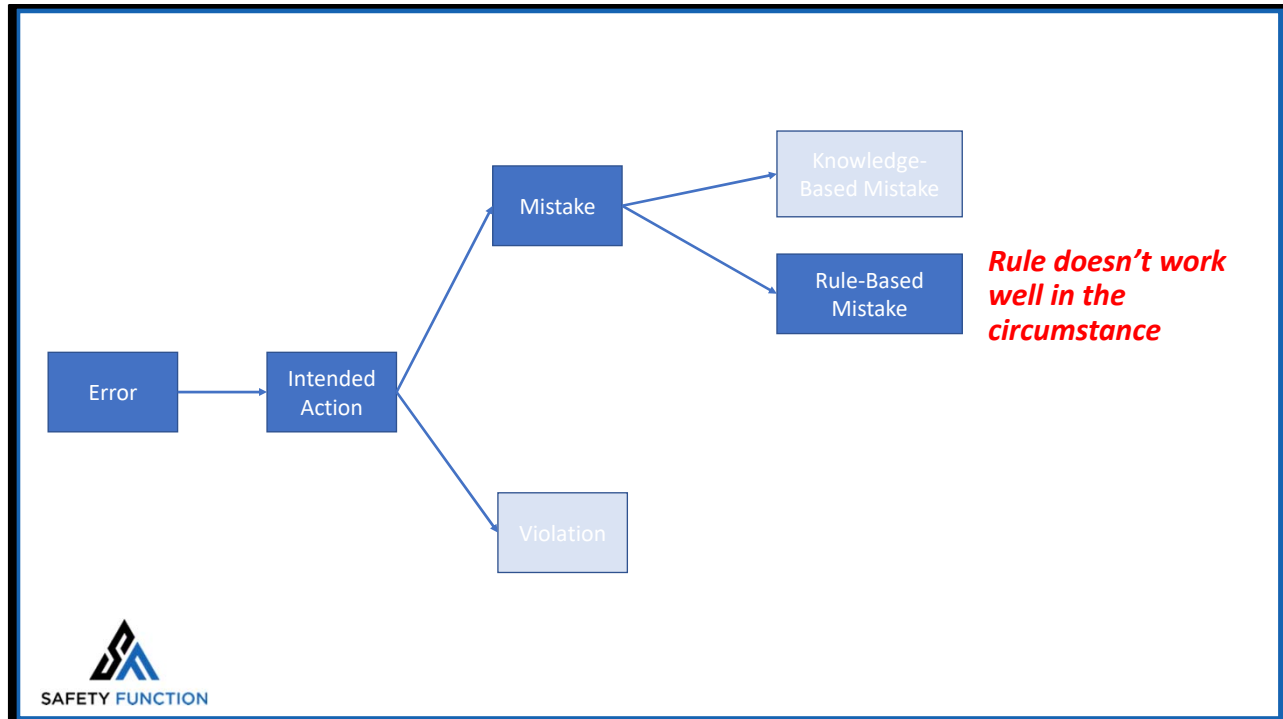
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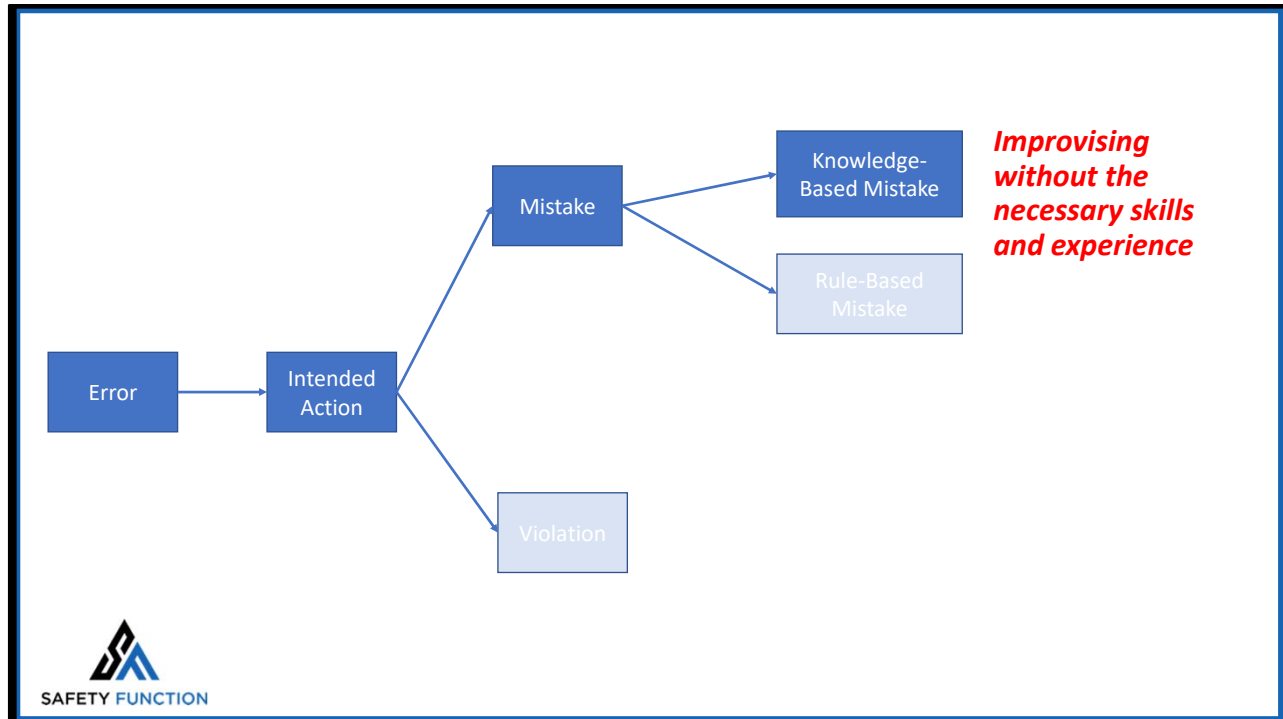
Rule-Based Mistakes

Application of a bad rule: The company sets a rule that is never ideal (rare).

Misapplication of a good rule: A rule that does not apply in all situations (relatively common).



18



19

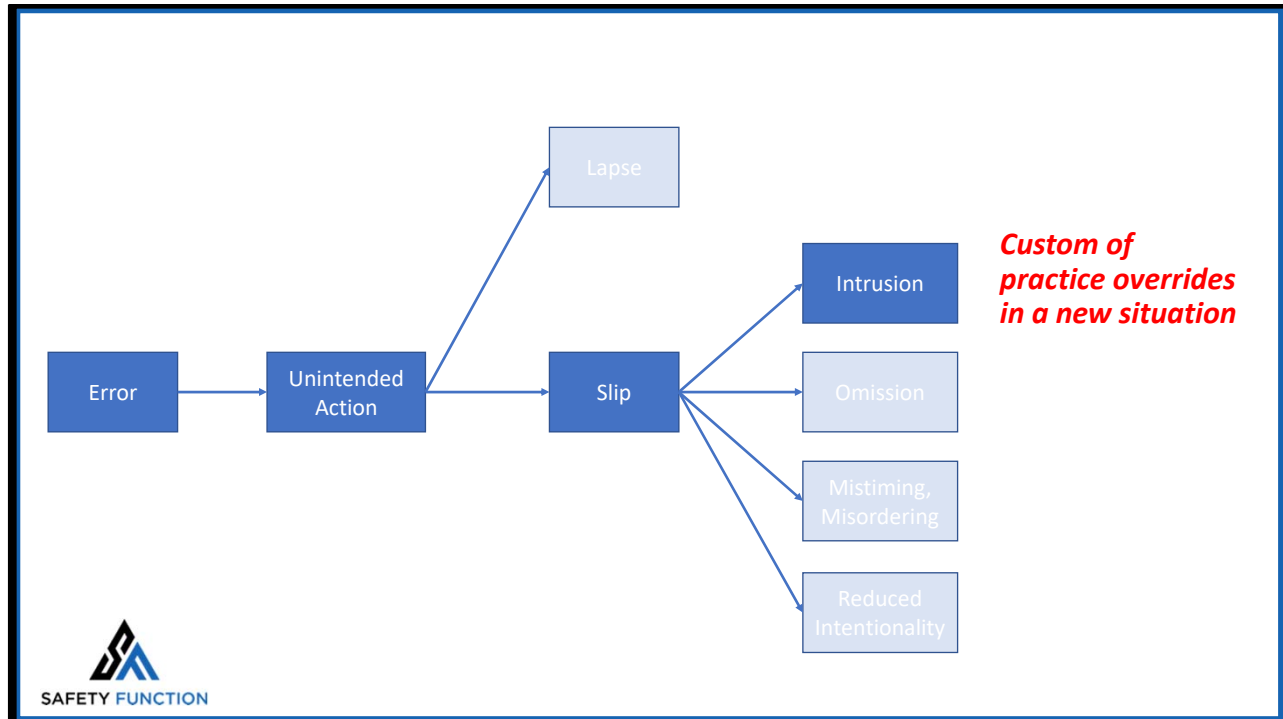
Knowledge-Based Mistakes

The individual doesn't know the safe action, but they proceed anyway (improvise).

- We make decisions in an error-driven process:
 1. Have a goal and sequentially initiate actions
 2. Observe the extent to which we are successful
 3. Modify our actions to minimize the difference between our actual state and our desired state

- ***Common and Preventable: We should design processes so that we are NEVER in this situation***

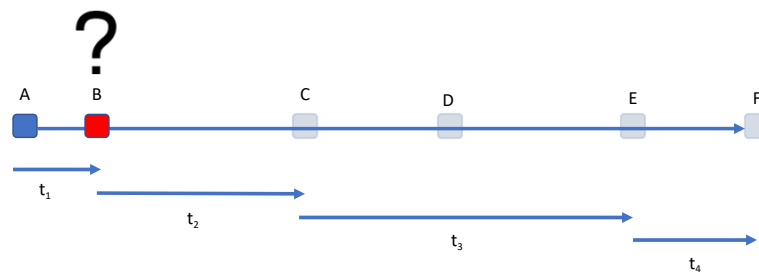
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21

Lapse (Memory Failure)

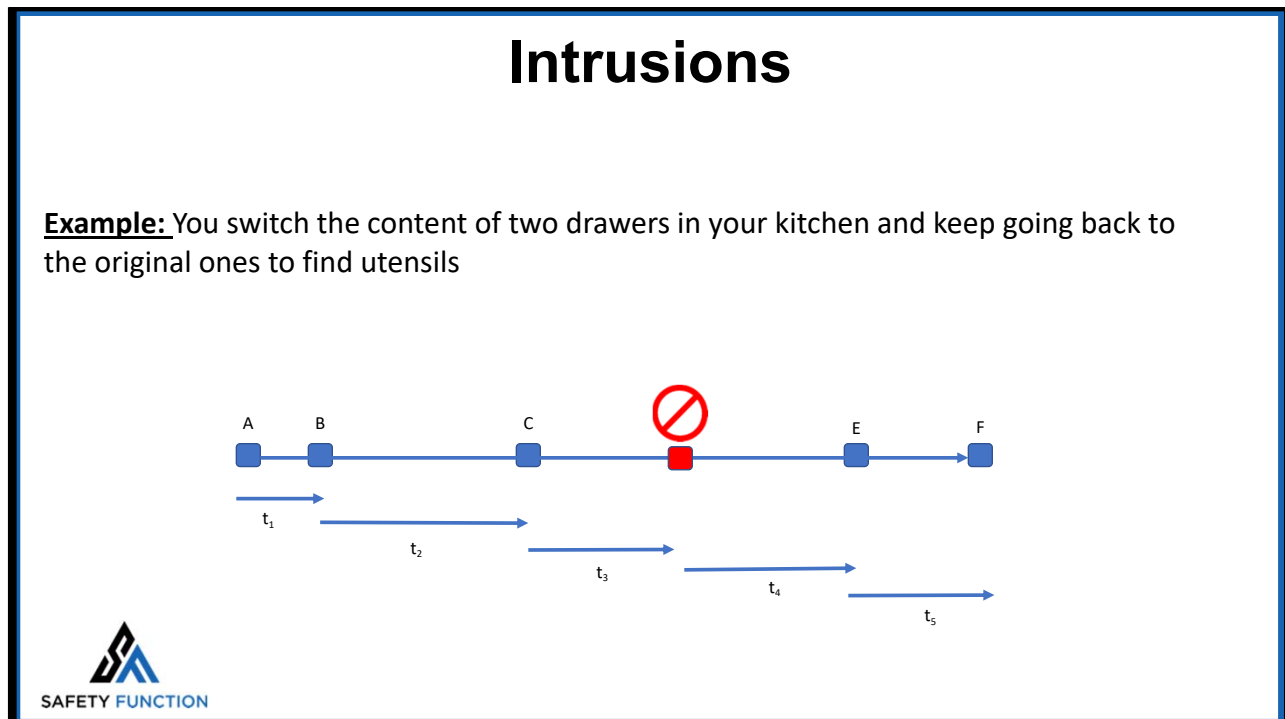
Example: A worker has a red control for lowering, a blue control to swing left, and a green control to swing right. The worker intends to swing right but purposely uses the blue control. There were no distractions. In retrospect, the worker knows the correct action and can take proper action.



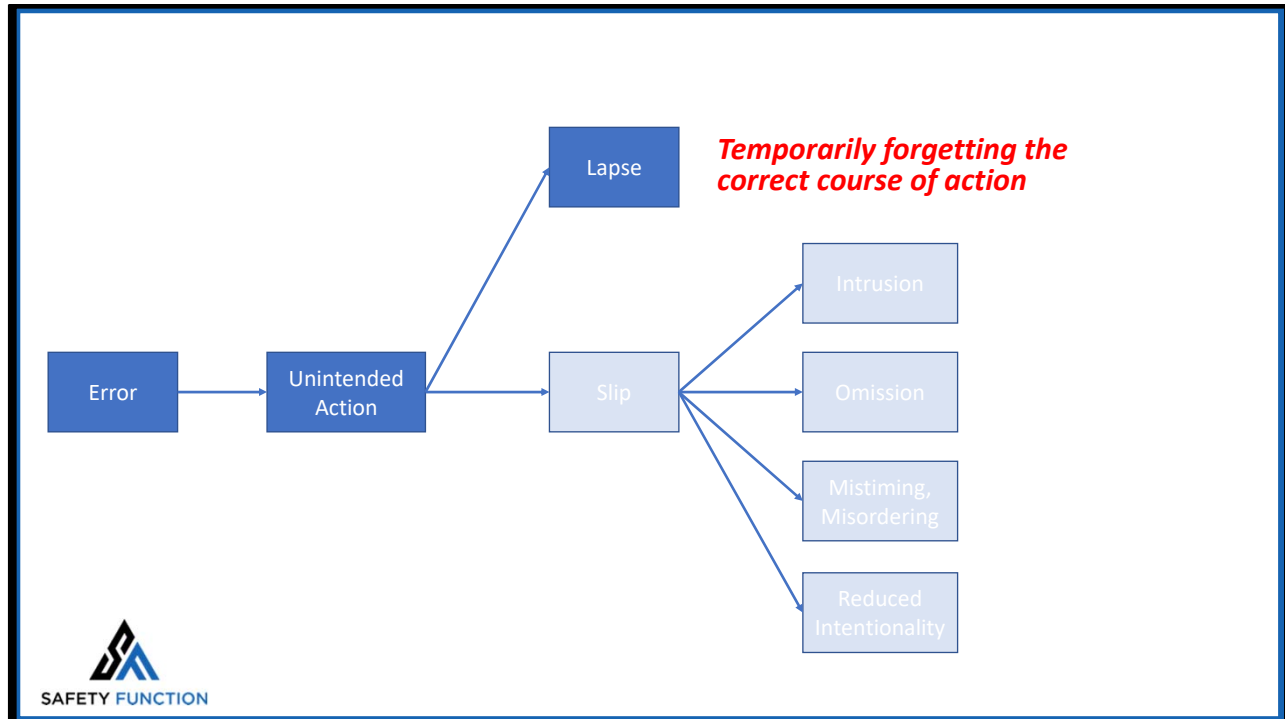
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23



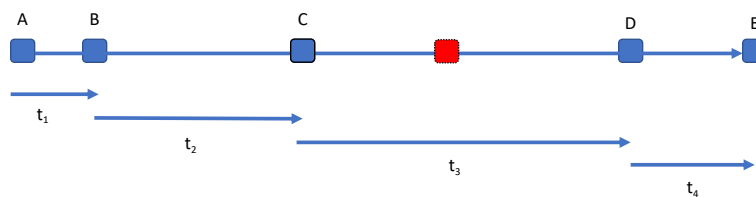
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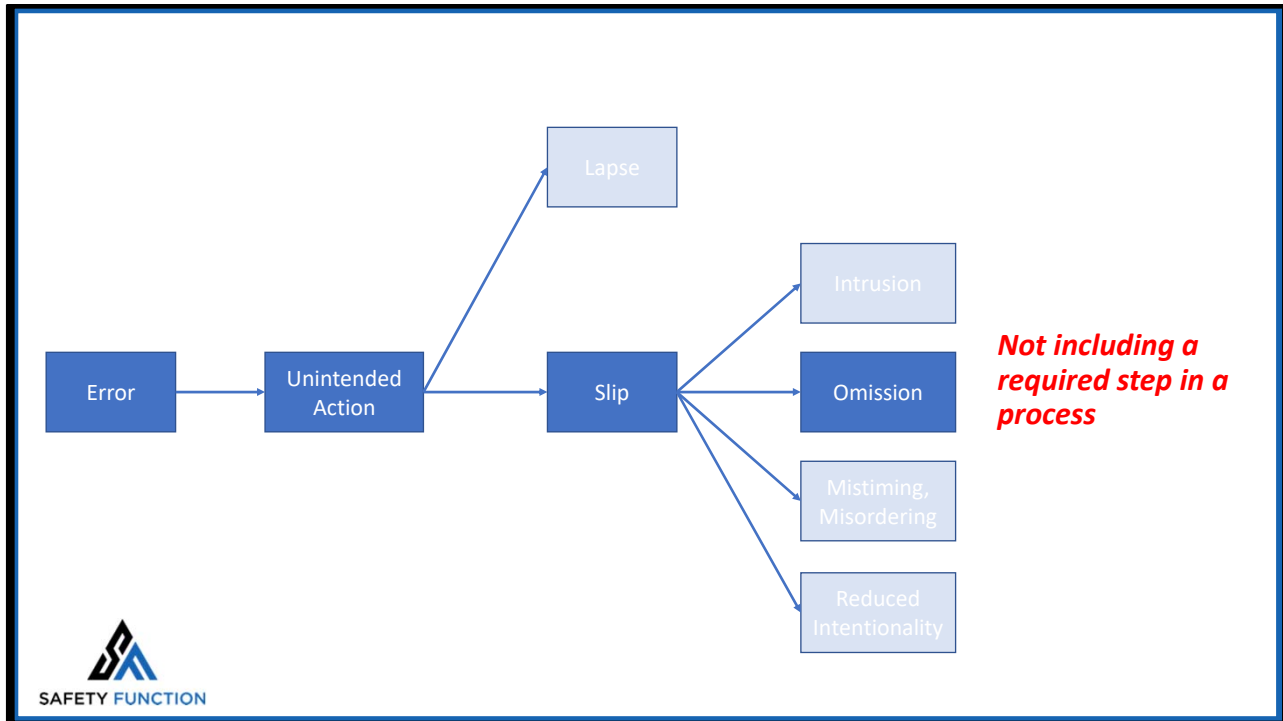
25

Omission

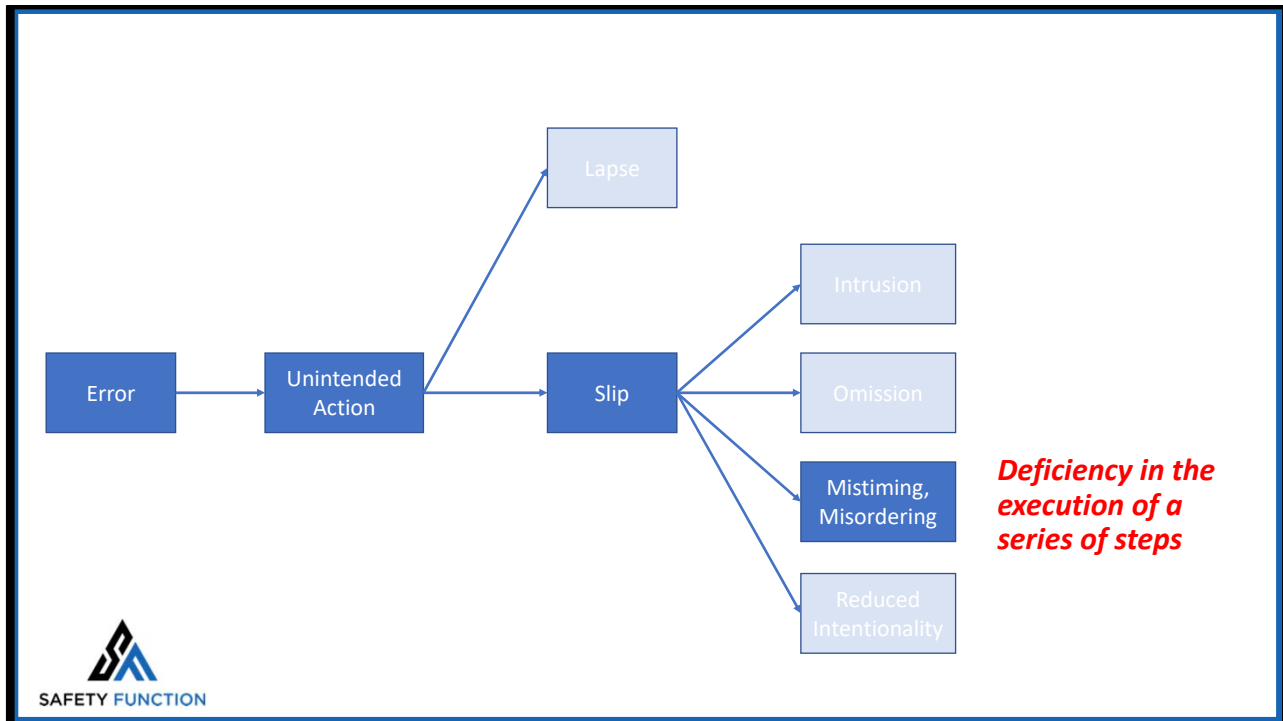
Example: I walked to the bookcase to get a dictionary. When I pulled the dictionary, several books fell to the floor. I put them back and returned to my desk without the dictionary.



26



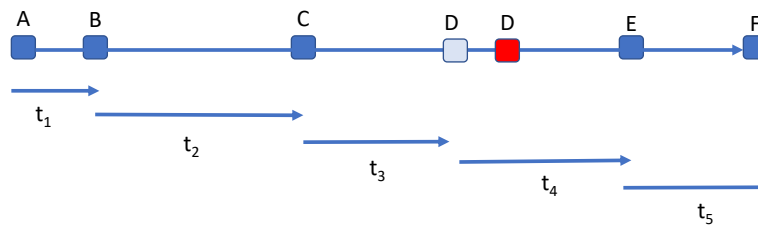
27



28

Misordering and Mistiming

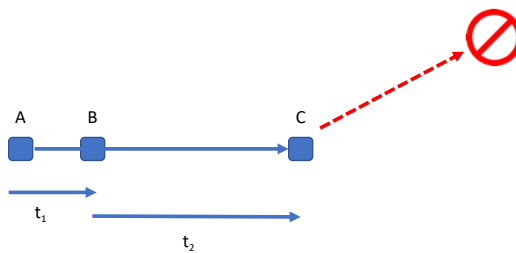
Example: I was making Pad Thai and added eggs before sugar



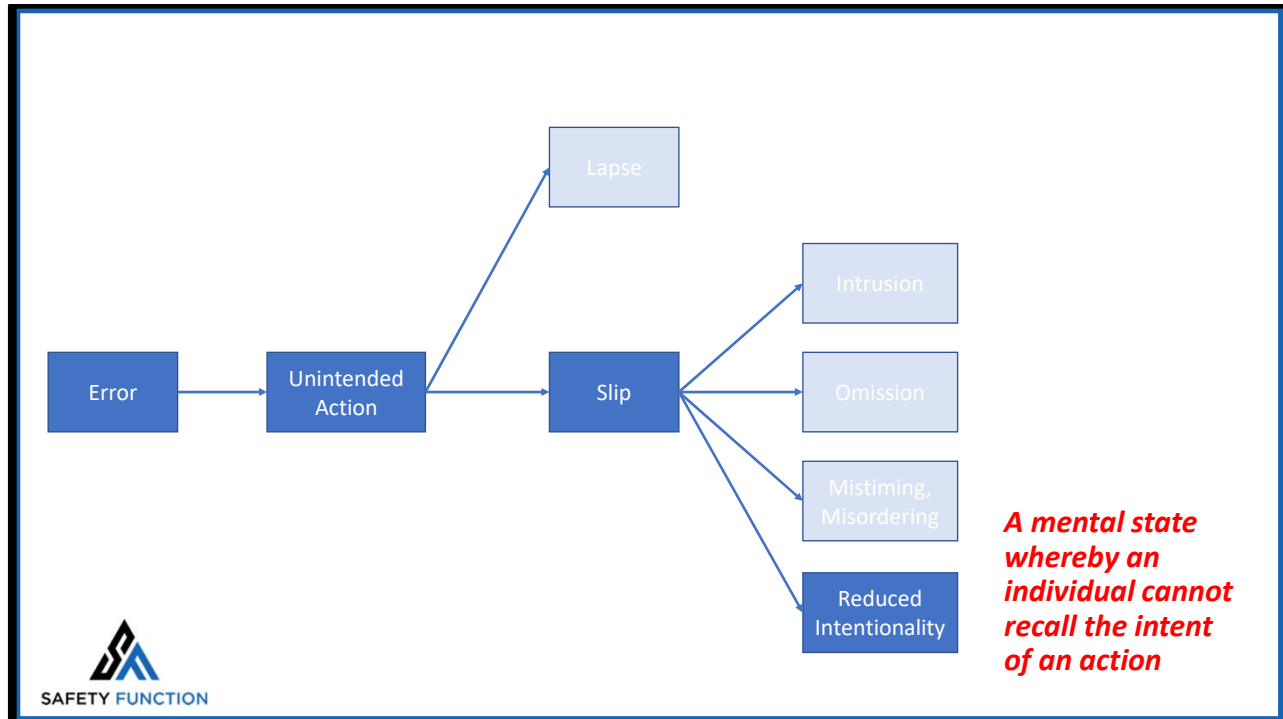
29

Reduced Intentionality

Example: You walk into the kitchen and can't remember why you're there.



30



31

“To err is human” – Alexander Pope (1709)

- Even the best people make mistakes
- Taken over enough time, the probability of human error in any circumstance is 1.0
- Therefore, we must treat error as expected and protect against it
- Error is present in success and failure (not a precursor)

SAFETY FUNCTION

32

The best course of action is to add controls that are difficult to defeat by human error.

Let's start by thinking of work as a closed system



33


Driving Examples

Error Proofing – Including physical controls to eliminate (the impact of) human error


- Must press on brake to shift into drive
- Cannot shift into reverse while driving forward
- Key will not remove from ignition without car in park
- Phone Bluetooth will not work while driving
- Speed governor



34



A diagram below the image shows a horizontal line with six points labeled A, B, C, D, E, and F. Below the line, five arrows represent time intervals: t_1 (A to B), t_2 (B to C), t_3 (C to D), t_4 (D to E), and t_5 (E to F).



35

Volvo Case Study



Volvo promises deathproof cars by 2020
by Peter Valdes-Dapena @peterdrives
January 21, 2020 11:04 AM ET

The world's work marketplace.
upwork Find Talent

When will I be a millionaire?
My current savings: \$50,000
Contribution: \$500/month
52% 500,000
Calculate

Volvo's safety goal: No deaths by 2020

Volvo has made a shocking pledge: By 2020, no one will be killed or seriously injured in a new Volvo car or SUV.



Volvo has made a shocking pledge: By 2020, no one will be killed or seriously injured in a new Volvo car or SUV.

Seriously.

"If you meet Swedish engineers, they're pretty genuine," said Lex Korsmorkers, CEO of Volvo Cars North America. "They don't say things when they don't believe in it."

There is one big caveat. If someone really wants to hurt themselves, or is just really, really stupid... well, Volvo can't do anything about that. But, assuming you're not a suicidal maniac or a total idiot, in four years, you'll be safer driving a new Volvo than you are climbing a ladder to screw in a light bulb.

Fatally-free vehicles are not unprecedented. In fact, there already are some, and they're not just Volvos. According to data from the Insurance Institute for Highway Safety, there are nine vehicle models — including the Volvo XC90 — in which no one in the United States died in the four years from 2009 to 2012, the most recent period for which data is available.

Volvo, still based in Sweden but now owned by China's Zhejiang Geely Holding Group (GEELY), wants to make this the case for its entire vehicle line up throughout the world. The automaker already tracks how many people die in its vehicles in order to monitor safety. That way, engineers can tell how much safer their vehicles become each time they roll out a new crash-prevention technology. That also helps Volvo predict how much safer its vehicles will be with each new advancement.

Auto braking was activated

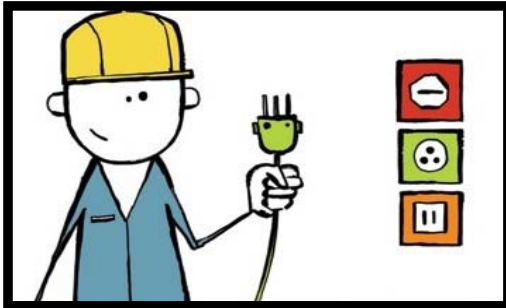
New smart car tech already saving lives

Ultimately, all these new technologies will be tied together to create a car that can, literally, drive itself. In fact, a number of automakers, not just Volvo, have promised to sell autonomous cars by 2020.



36

Design of everyday things...



37

Reminders



38

“Point and Call”
aka
shisa kanko (指差喚呼)



39

The second-best method is to design systems so that errors are less likely.

Consider work to be an open system...



40

Work Examples

Error Proofing – Including physical controls to eliminate (the impact of) human error

- Lock-out tag-out (LOTO)
- De-energize
- Fall protection
- Trench boxes
- Guard rails/barricade



41

**If someone wanted to be severely injured here,
how would they do it?***

***Without purposefully defeating a control**



42



43

Point and Call

Reduced human error by 85% (Railway Tech Research Inst.)

Adopted by the NYC MTA and eliminated serious injuries and fatalities from door openings



44

Redundancy is Key

1. **People will make errors (willfully and unwittingly)**
2. **Machines and technology will malfunction**

Law of probabilities (with redundancy, a 1 in 1,000 chance in error and 1 in 1,000 chance of malfunction becomes a 1 in a million chance).



45



SAFETY FUNCTION

46