

Semana
27
de la **Salud**
Ocupacional
Cómo hemos cambiado:
Medio ambiente, trabajo, casa, empresa y familia



MODELOS DE INVESTIGACIÓN DE INCIDENTES

Patricia Canney

Organiza:

CSOA
CORPORACIÓN DE SALUD
OCUPACIONAL Y AMBIENTAL



La Causalidad

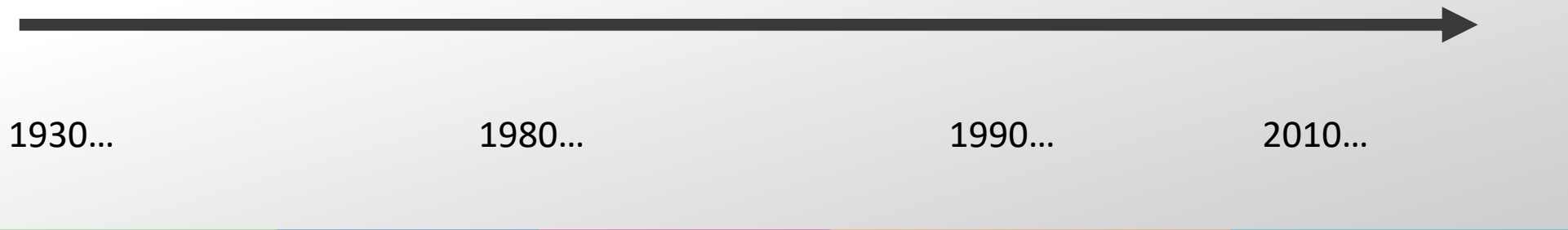


Los modelos de Investigación

Los métodos de investigación necesariamente incorporan o representan un modelo, es decir, un conjunto de suposiciones sobre cómo ocurren los accidentes y cuáles son los factores importantes.

Las prácticas siempre hacen algunas suposiciones sobre cómo ocurren los accidentes y qué se debe hacer para prevenirlos

Han cambiado en el tiempo



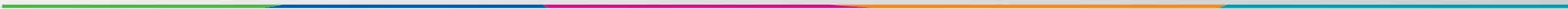
Modelos de sistemas lineales simples (modelos de causa-efecto)

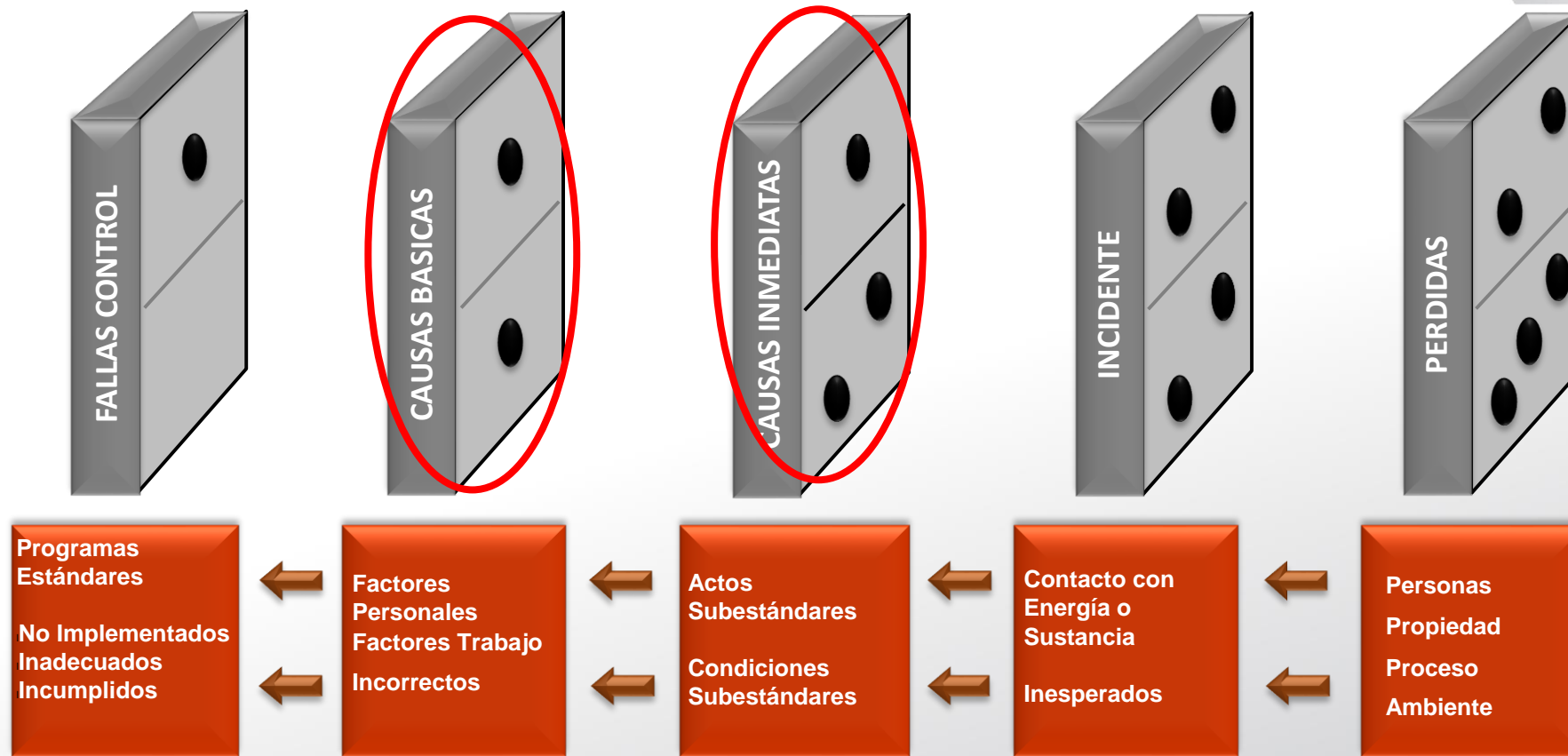


Heinrich - Bird
(1929 – 1960)

La Teoría Dominó

El modelo propuesto por Heinrich es lineal, considerando solo el entorno inmediato, incluida la gestión de línea





SCAT Chart – Systematic Cause Analysis Technique

DESCRIPTION OF ACCIDENT OR INCIDENT		EVALUATION OF LOSS POTENTIAL IF NOT CONTROLLED	
Loss Severity Potential <input type="checkbox"/> Major (A) <input type="checkbox"/> Serious (B) <input type="checkbox"/> Minor (C)		Probability of Occurrence <input type="checkbox"/> High (A) <input type="checkbox"/> Moderate (B) <input type="checkbox"/> Low (C)	
		Frequency of Exposure <input type="checkbox"/> Extensive (A) <input type="checkbox"/> Moderate (B) <input type="checkbox"/> Low (C)	
TYPE OF CONTACT OR NEAR CONTACT WITH ENERGY OR SUBSTANCE			
1. Slack Apparel (Slipping or Bumping) (See I.C.'s 1, 2, 4, 5, 12, 14, 15, 17, 19, 20)	3. Fall to Lower Level (See I.C.'s 3, 5, 6, 11, 12, 13, 14, 15, 16, 17, 20)	5. Caught in Pinch/Trap/Hang (See I.C.'s 5, 6, 11, 13, 14, 15, 16, 19)	7. Caught Between or Under (See I.C.'s 5, 6, 9, 11, 12, 13, 14, 15, 16, 22, 29)
2. Slack By Ability (Slipping, Bumping, or Falling) (See I.C.'s 1, 2, 4, 5, 6, 8, 10, 12, 14, 15, 16, 19, 20)	4. Fall on Same Level (Slip and Fall, Trip Over) (See I.C.'s 4, 9, 13, 14, 15, 16, 19, 20, 21)	6. Caught On (Slippage, Hang, or Catch) (See I.C.'s 5, 6, 11, 12, 13, 14, 15, 16, 19)	8. Caught Between or Under (See I.C.'s 5, 6, 9, 11, 12, 13, 14, 15, 16, 22, 29)
(I.C.'s) IMMEDIATE CAUSES			
STANDARDS VIOLATIONS 1. Operating Equipment Without Authority (See I.C.'s 2, 4, 5, 7, 8, 12, 13, 15) 2. Failure to Warn (See I.C.'s 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 15) 3. Failure to Secure (See I.C.'s 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 15) 4. Operating at Excessive Speed (See I.C.'s 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 15) 5. Making Safety Devices Inoperative (See I.C.'s 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 15)			
STANDARDS VIOLATIONS 6. Using Unsafe Equipment (See I.C.'s 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15) 7. Falling to Low PPE Property (See I.C.'s 2, 3, 4, 5, 7, 8, 9, 12, 13, 15) 8. Improper Locking (See I.C.'s 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 15) 9. Improper Placement (See I.C.'s 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 15) 10. Improper Lifting (See I.C.'s 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 15)			
STANDARDS VIOLATIONS 11. Improper Position for Task (See I.C.'s 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15) 12. Swinging Equipment in Operation (See I.C.'s 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 15) 13. Handling (See I.C.'s 2, 3, 4, 5, 7, 8, 13, 15) 14. Under Influence of Alcohol and/or Other Drugs (See I.C.'s 2, 3, 4, 5, 7, 8, 10, 11, 12, 13, 15) 15. Using Equipment Improperly (See I.C.'s 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 15) 16. Failure to Follow Procedure (See I.C.'s 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 15)			
STANDARDS VIOLATIONS 17. Inadequate Guarding Barriers (See I.C.'s 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15) 18. Inadequate or Improper Protective Equipment (See I.C.'s 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15) 19. Defective Tools, Equipment or Materials (See I.C.'s 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15) 20. Completion of Restricted Action (See I.C.'s 8, 9, 13) 21. Inadequate Warning Systems (See I.C.'s 8, 9, 10, 11, 12, 13, 15) 22. Fire & Explosion Hazards (See I.C.'s 5, 6, 7, 8, 9, 10, 11, 12, 13, 15)			
STANDARDS VIOLATIONS 23. Poor Housekeeping Practices (See I.C.'s 5, 6, 7, 8, 9, 10, 11, 12, 13, 15) 24. Noise Exposure (See I.C.'s 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15) 25. Radiation Exposure (See I.C.'s 5, 6, 7, 8, 9, 10, 11, 12, 13, 14) 26. Temperature Extremes (See I.C.'s 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13) 27. Inadequate or Excess Illumination (See I.C.'s 8, 9, 10, 11, 12, 13) 28. Inadequate Ventilation (See I.C.'s 8, 9, 10, 11, 12, 13, 14) 29. Hazardous Environmental Conditions (See I.C.'s 8, 9, 10, 11, 12, 13)			
(B.C.'s) BASIC/UNDERLYING CAUSES			
PERSONAL FACTORS 1. Inadequate Physical/Physiological Capability 1.1 Inappropriate height, weight, sex, strength, reach, etc. 1.2 Restricted range of body movement 1.3 Limited ability to sustain body posture 1.4 Substrate wear/tear or damage 1.5 Sensitivity to sensory stimulus (temperature, sound, etc.) 1.6 Vision deficiency 1.7 Hearing deficiency 1.8 Other sensory deficiency (touch, taste, smell, balance) 1.9 Respiratory incapacity 1.10 Other personal (physical) capabilities 1.11 Temporary disability 2. Inadequate Mental/Psychological Capability 2.1 Fear and phobias 2.2 Emotional disturbances 2.3 Mental stress 2.4 Intelligence level 2.5 Ability to comprehend 2.6 Poor judgment 2.7 Poor coordination 2.8 Slow reaction time 2.9 Low mental alertness 2.10 Low hearing aptitude 2.11 Memory failure 3. Physical or Psychological Stress 3.1 Injury or illness 3.2 Fatigue due to lack of or irregular sleep 3.3 Fatigue due to lack of rest 3.4 Fatigue due to sensory overload 3.5 Exposure to health hazards 3.6 Exposure to temperature extremes 3.7 Oxygen deficiency 3.8 Alcohol and/or drug use 3.9 Carpal tunnel syndrome			
3.10 Inappropriate footwear 3.11 Inappropriate clothing 3.12 Inappropriate work posture 3.13 Inadequate rest and recovery 3.14 Inadequate nutrition and hydration 3.15 Inadequate sleep 3.16 Inadequate exercise 3.17 Inadequate social support 3.18 Inadequate financial resources 3.19 Inadequate work-life balance 3.20 Inadequate family support 3.21 Inadequate community support 3.22 Inadequate social skills 3.23 Inadequate communication skills 3.24 Inadequate conflict resolution skills 3.25 Inadequate decision-making skills 3.26 Inadequate problem-solving skills 3.27 Inadequate time management skills 3.28 Inadequate organizational skills 3.29 Inadequate leadership skills 3.30 Inadequate team-building skills 3.31 Inadequate negotiation skills 3.32 Inadequate persuasion skills 3.33 Inadequate influence skills 3.34 Inadequate networking skills 3.35 Inadequate mentorship skills 3.36 Inadequate coaching skills 3.37 Inadequate supervision skills 3.38 Inadequate delegation skills 3.39 Inadequate accountability skills 3.40 Inadequate feedback skills 3.41 Inadequate performance management skills 3.42 Inadequate reward and recognition skills 3.43 Inadequate discipline skills 3.44 Inadequate conflict resolution skills 3.45 Inadequate decision-making skills 3.46 Inadequate problem-solving skills 3.47 Inadequate time management skills 3.48 Inadequate organizational skills 3.49 Inadequate leadership skills 3.50 Inadequate team-building skills 3.51 Inadequate negotiation skills 3.52 Inadequate persuasion skills 3.53 Inadequate influence skills 3.54 Inadequate networking skills 3.55 Inadequate mentorship skills 3.56 Inadequate coaching skills 3.57 Inadequate supervision skills 3.58 Inadequate delegation skills 3.59 Inadequate accountability skills 3.60 Inadequate feedback skills 3.61 Inadequate performance management skills 3.62 Inadequate reward and recognition skills 3.63 Inadequate discipline skills 3.64 Inadequate conflict resolution skills 3.65 Inadequate decision-making skills 3.66 Inadequate problem-solving skills 3.67 Inadequate time management skills 3.68 Inadequate organizational skills 3.69 Inadequate leadership skills 3.70 Inadequate team-building skills 3.71 Inadequate negotiation skills 3.72 Inadequate persuasion skills 3.73 Inadequate influence skills 3.74 Inadequate networking skills 3.75 Inadequate mentorship skills 3.76 Inadequate coaching skills 3.77 Inadequate supervision skills 3.78 Inadequate delegation skills 3.79 Inadequate accountability skills 3.80 Inadequate feedback skills 3.81 Inadequate performance management skills 3.82 Inadequate reward and recognition skills 3.83 Inadequate discipline skills 3.84 Inadequate conflict resolution skills 3.85 Inadequate decision-making skills 3.86 Inadequate problem-solving skills 3.87 Inadequate time management skills 3.88 Inadequate organizational skills 3.89 Inadequate leadership skills 3.90 Inadequate team-building skills 3.91 Inadequate negotiation skills 3.92 Inadequate persuasion skills 3.93 Inadequate influence skills 3.94 Inadequate networking skills 3.95 Inadequate mentorship skills 3.96 Inadequate coaching skills 3.97 Inadequate supervision skills 3.98 Inadequate delegation skills 3.99 Inadequate accountability skills 4.00 Inadequate feedback skills			
JOB FACTORS 4.1 Inadequate Leadership and/or Supervision (See I.C.'s 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19) 4.2 Under or conflicting reporting relationships 4.3 Inadequate assignment of responsibility 4.4 Inadequate communication of safety and health data 4.5 Inadequate training and/or supervision 4.6 Inadequate resources 4.7 Inadequate information 4.8 Inadequate feedback 4.9 Inadequate recognition 4.10 Inadequate incentives 4.11 Inadequate consequences 4.12 Inadequate discipline 4.13 Inadequate rewards 4.14 Inadequate support 4.15 Inadequate encouragement 4.16 Inadequate motivation 4.17 Inadequate inspiration 4.18 Inadequate stimulation 4.19 Inadequate challenge 4.20 Inadequate variety 4.21 Inadequate responsibility 4.22 Inadequate autonomy 4.23 Inadequate control 4.24 Inadequate influence 4.25 Inadequate power 4.26 Inadequate prestige 4.27 Inadequate respect 4.28 Inadequate status 4.29 Inadequate honor 4.30 Inadequate glory 4.31 Inadequate admiration 4.32 Inadequate approval 4.33 Inadequate confidence 4.34 Inadequate esteem 4.35 Inadequate honor 4.36 Inadequate respect 4.37 Inadequate status 4.38 Inadequate honor 4.39 Inadequate glory 4.40 Inadequate admiration 4.41 Inadequate approval 4.42 Inadequate confidence 4.43 Inadequate esteem 4.44 Inadequate honor 4.45 Inadequate respect 4.46 Inadequate status 4.47 Inadequate honor 4.48 Inadequate glory 4.49 Inadequate admiration 4.50 Inadequate approval 4.51 Inadequate confidence 4.52 Inadequate esteem 4.53 Inadequate honor 4.54 Inadequate respect 4.55 Inadequate status 4.56 Inadequate honor 4.57 Inadequate glory 4.58 Inadequate admiration 4.59 Inadequate approval 4.60 Inadequate confidence 4.61 Inadequate esteem 4.62 Inadequate honor 4.63 Inadequate respect 4.64 Inadequate status 4.65 Inadequate honor 4.66 Inadequate glory 4.67 Inadequate admiration 4.68 Inadequate approval 4.69 Inadequate confidence 4.70 Inadequate esteem 4.71 Inadequate honor 4.72 Inadequate respect 4.73 Inadequate status 4.74 Inadequate honor 4.75 Inadequate glory 4.76 Inadequate admiration 4.77 Inadequate approval 4.78 Inadequate confidence 4.79 Inadequate esteem 4.80 Inadequate honor 4.81 Inadequate respect 4.82 Inadequate status 4.83 Inadequate honor 4.84 Inadequate glory 4.85 Inadequate admiration 4.86 Inadequate approval 4.87 Inadequate confidence 4.88 Inadequate esteem 4.89 Inadequate honor 4.90 Inadequate respect 4.91 Inadequate status 4.92 Inadequate honor 4.93 Inadequate glory 4.94 Inadequate admiration 4.95 Inadequate approval 4.96 Inadequate confidence 4.97 Inadequate esteem 4.98 Inadequate honor 4.99 Inadequate respect 5.00 Inadequate status			
ORGANIZATIONAL FACTORS 5.1 Inadequate Design 5.2 Inadequate Planning 5.3 Inadequate Scheduling 5.4 Inadequate Sequencing 5.5 Inadequate Prioritization 5.6 Inadequate Resource Allocation 5.7 Inadequate Information Flow 5.8 Inadequate Communication 5.9 Inadequate Coordination 5.10 Inadequate Collaboration 5.11 Inadequate Teamwork 5.12 Inadequate Leadership 5.13 Inadequate Supervision 5.14 Inadequate Training 5.15 Inadequate Education 5.16 Inadequate Development 5.17 Inadequate Career Advancement 5.18 Inadequate Compensation 5.19 Inadequate Incentives 5.20 Inadequate Consequences 5.21 Inadequate Discipline 5.22 Inadequate Rewards 5.23 Inadequate Support 5.24 Inadequate Encouragement 5.25 Inadequate Motivation 5.26 Inadequate Inspiration 5.27 Inadequate Stimulation 5.28 Inadequate Challenge 5.29 Inadequate Variety 5.30 Inadequate Responsibility 5.31 Inadequate Autonomy 5.32 Inadequate Control 5.33 Inadequate Influence 5.34 Inadequate Power 5.35 Inadequate Prestige 5.36 Inadequate Respect 5.37 Inadequate Status 5.38 Inadequate Honor 5.39 Inadequate Glory 5.40 Inadequate Admiration 5.41 Inadequate Approval 5.42 Inadequate Confidence 5.43 Inadequate Esteem 5.44 Inadequate Honor 5.45 Inadequate Respect 5.46 Inadequate Status 5.47 Inadequate Honor 5.48 Inadequate Glory 5.49 Inadequate Admiration 5.50 Inadequate Approval 5.51 Inadequate Confidence 5.52 Inadequate Esteem 5.53 Inadequate Honor 5.54 Inadequate Respect 5.55 Inadequate Status 5.56 Inadequate Honor 5.57 Inadequate Glory 5.58 Inadequate Admiration 5.59 Inadequate Approval 5.60 Inadequate Confidence 5.61 Inadequate Esteem 5.62 Inadequate Honor 5.63 Inadequate Respect 5.64 Inadequate Status 5.65 Inadequate Honor 5.66 Inadequate Glory 5.67 Inadequate Admiration 5.68 Inadequate Approval 5.69 Inadequate Confidence 5.70 Inadequate Esteem 5.71 Inadequate Honor 5.72 Inadequate Respect 5.73 Inadequate Status 5.74 Inadequate Honor 5.75 Inadequate Glory 5.76 Inadequate Admiration 5.77 Inadequate Approval 5.78 Inadequate Confidence 5.79 Inadequate Esteem 5.80 Inadequate Honor 5.81 Inadequate Respect 5.82 Inadequate Status 5.83 Inadequate Honor 5.84 Inadequate Glory 5.85 Inadequate Admiration 5.86 Inadequate Approval 5.87 Inadequate Confidence 5.88 Inadequate Esteem 5.89 Inadequate Honor 5.90 Inadequate Respect 5.91 Inadequate Status 5.92 Inadequate Honor 5.93 Inadequate Glory 5.94 Inadequate Admiration 5.95 Inadequate Approval 5.96 Inadequate Confidence 5.97 Inadequate Esteem 5.98 Inadequate Honor 5.99 Inadequate Respect 6.00 Inadequate Status			
ENVIRONMENTAL FACTORS 6.1 Inadequate Work Environment 6.2 Inadequate Workstation Design 6.3 Inadequate Workstation Ergonomics 6.4 Inadequate Workstation Layout 6.5 Inadequate Workstation Lighting 6.6 Inadequate Workstation Noise 6.7 Inadequate Workstation Temperature 6.8 Inadequate Workstation Humidity 6.9 Inadequate Workstation Air Quality 6.10 Inadequate Workstation Vibration 6.11 Inadequate Workstation Electromagnetic Interference 6.12 Inadequate Workstation Radio Frequency Interference 6.13 Inadequate Workstation Acoustic Noise 6.14 Inadequate Workstation Thermal Radiation 6.15 Inadequate Workstation Ionizing Radiation 6.16 Inadequate Workstation Non-ionizing Radiation 6.17 Inadequate Workstation Air Pollution 6.18 Inadequate Workstation Water Pollution 6.19 Inadequate Workstation Soil Pollution 6.20 Inadequate Workstation Noise Pollution 6.21 Inadequate Workstation Light Pollution 6.22 Inadequate Workstation Heat Pollution 6.23 Inadequate Workstation Cold Pollution 6.24 Inadequate Workstation Humidity Pollution 6.25 Inadequate Workstation Air Quality Pollution 6.26 Inadequate Workstation Vibration Pollution 6.27 Inadequate Workstation Electromagnetic Interference Pollution 6.28 Inadequate Workstation Radio Frequency Interference Pollution 6.29 Inadequate Workstation Acoustic Noise Pollution 6.30 Inadequate Workstation Thermal Radiation Pollution 6.31 Inadequate Workstation Ionizing Radiation Pollution 6.32 Inadequate Workstation Non-ionizing Radiation Pollution 6.33 Inadequate Workstation Air Pollution 6.34 Inadequate Workstation Water Pollution 6.35 Inadequate Workstation Soil Pollution 6.36 Inadequate Workstation Noise Pollution 6.37 Inadequate Workstation Light Pollution 6.38 Inadequate Workstation Heat Pollution 6.39 Inadequate Workstation Cold Pollution 6.40 Inadequate Workstation Humidity Pollution 6.41 Inadequate Workstation Air Quality Pollution 6.42 Inadequate Workstation Vibration Pollution 6.43 Inadequate Workstation Electromagnetic Interference Pollution 6.44 Inadequate Workstation Radio Frequency Interference Pollution 6.45 Inadequate Workstation Acoustic Noise Pollution 6.46 Inadequate Workstation Thermal Radiation Pollution 6.47 Inadequate Workstation Ionizing Radiation Pollution 6.48 Inadequate Workstation Non-ionizing Radiation Pollution 6.49 Inadequate Workstation Air Pollution 6.50 Inadequate Workstation Water Pollution 6.51 Inadequate Workstation Soil Pollution 6.52 Inadequate Workstation Noise Pollution 6.53 Inadequate Workstation Light Pollution 6.54 Inadequate Workstation Heat Pollution 6.55 Inadequate Workstation Cold Pollution 6.56 Inadequate Workstation Humidity Pollution 6.57 Inadequate Workstation Air Quality Pollution 6.58 Inadequate Workstation Vibration Pollution 6.59 Inadequate Workstation Electromagnetic Interference Pollution 6.60 Inadequate Workstation Radio Frequency Interference Pollution 6.61 Inadequate Workstation Acoustic Noise Pollution 6.62 Inadequate Workstation Thermal Radiation Pollution 6.63 Inadequate Workstation Ionizing Radiation Pollution 6.64 Inadequate Workstation Non-ionizing Radiation Pollution 6.65 Inadequate Workstation Air Pollution 6.66 Inadequate Workstation Water Pollution 6.67 Inadequate Workstation Soil Pollution 6.68 Inadequate Workstation Noise Pollution 6.69 Inadequate Workstation Light Pollution 6.70 Inadequate Workstation Heat Pollution 6.71 Inadequate Workstation Cold Pollution 6.72 Inadequate Workstation Humidity Pollution 6.73 Inadequate Workstation Air Quality Pollution 6.74 Inadequate Workstation Vibration Pollution 6.75 Inadequate Workstation Electromagnetic Interference Pollution 6.76 Inadequate Workstation Radio Frequency Interference Pollution 6.77 Inadequate Workstation Acoustic Noise Pollution 6.78 Inadequate Workstation Thermal Radiation Pollution 6.79 Inadequate Workstation Ionizing Radiation Pollution 6.80 Inadequate Workstation Non-ionizing Radiation Pollution 6.81 Inadequate Workstation Air Pollution 6.82 Inadequate Workstation Water Pollution 6.83 Inadequate Workstation Soil Pollution 6.84 Inadequate Workstation Noise Pollution 6.85 Inadequate Workstation Light Pollution 6.86 Inadequate Workstation Heat Pollution 6.87 Inadequate Workstation Cold Pollution 6.88 Inadequate Workstation Humidity Pollution 6.89 Inadequate Workstation Air Quality Pollution 6.90 Inadequate Workstation Vibration Pollution 6.91 Inadequate Workstation Electromagnetic Interference Pollution 6.92 Inadequate Workstation Radio Frequency Interference Pollution 6.93 Inadequate Workstation Acoustic Noise Pollution 6.94 Inadequate Workstation Thermal Radiation Pollution 6.95 Inadequate Workstation Ionizing Radiation Pollution 6.96 Inadequate Workstation Non-ionizing Radiation Pollution 6.97 Inadequate Workstation Air Pollution 6.98 Inadequate Workstation Water Pollution 6.99 Inadequate Workstation Soil Pollution 7.00 Inadequate Workstation Noise Pollution			

NTC 3701 1995

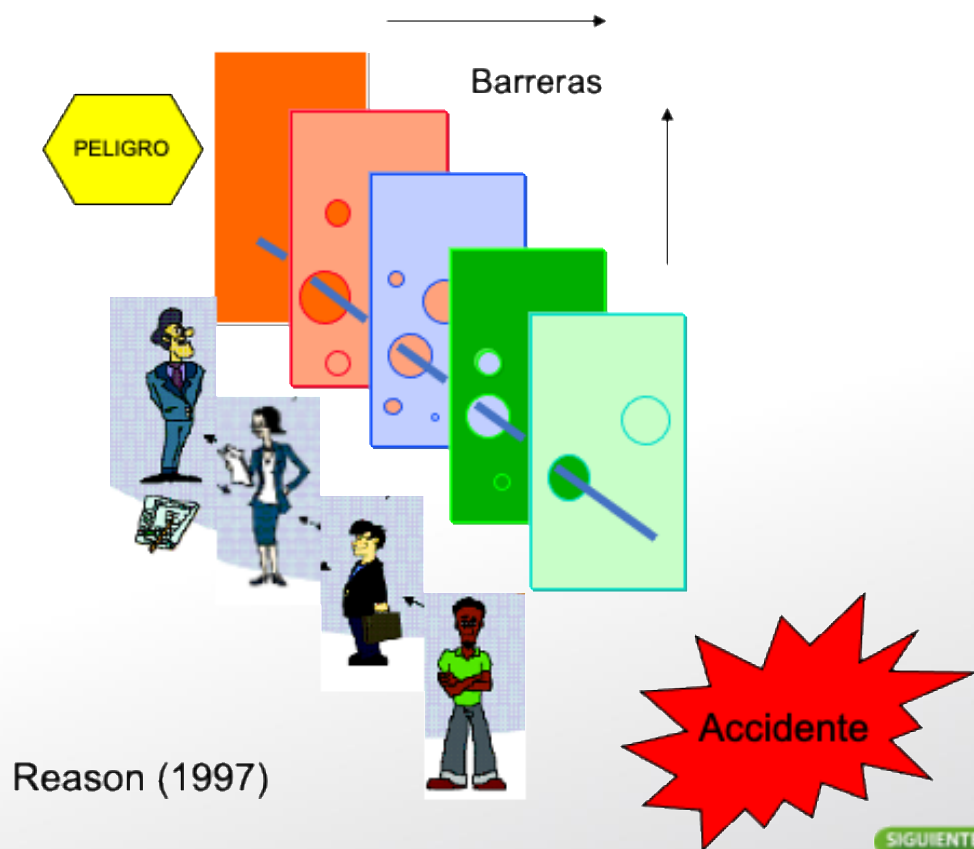


Modelos de sistemas lineales complejos (modelos epidemiológicos)

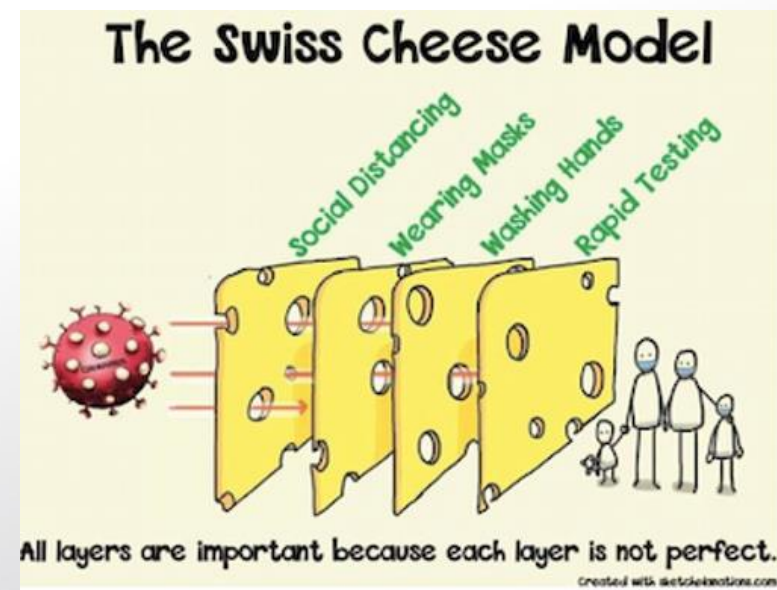
“Se ha visto que los factores causales de los accidentes residen en el **agente**, en el **huésped** y en el **medio ambiente**. El mecanismo de la ocurrencia del accidente es el proceso por el cual los tres componentes interactúan para producir un resultado, el accidente: no es el causa del accidente”. (**Gordon, 1949**, op. Cit., Pág.509)

“Turner en relación con los accidentes graves definió el período de incubación como "la acumulación de un conjunto de eventos inadvertidos que están en desacuerdo con lo aceptado creencias sobre los peligros y las normas para evitarlos". (**Turner, 1978**, pág. 85).

Modelos de sistemas lineales complejos (modelos epidemiológicos)



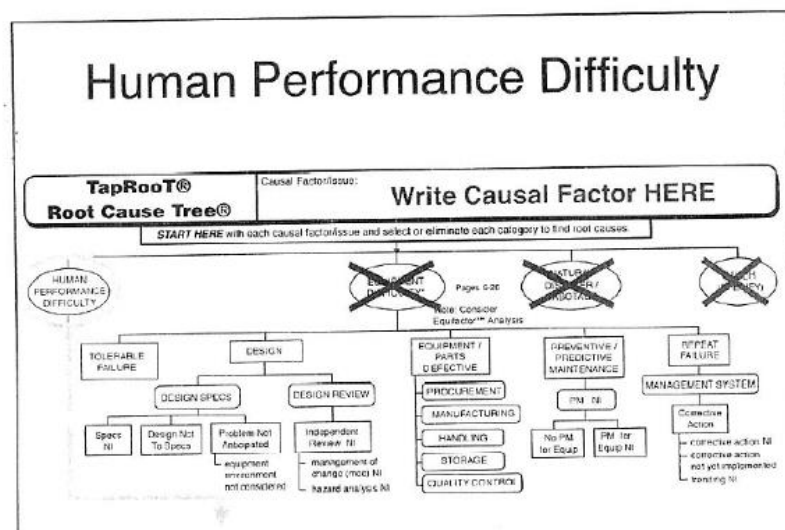
Modelo del "queso suizo"



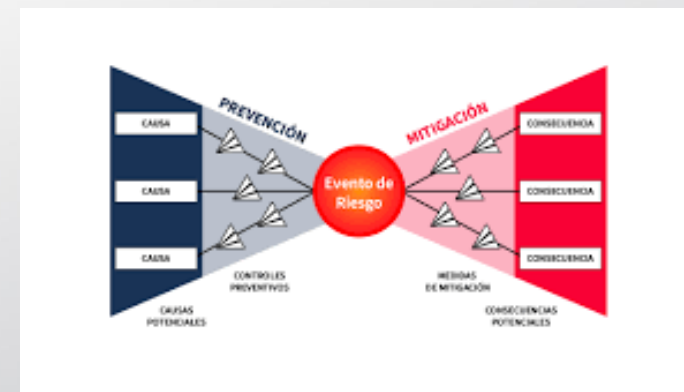
Tripod Beta

“Para comprender por qué sucedió el incidente, se determinan qué barreras existen para evitar que esos objetos y agentes actúen de la manera en que lo hicieron y por qué fallaron. Tripod Beta nos enseña a mirar las causas inmediatas del acto que condujo al incidente, los precursores psicológicos y, en última instancia, las deficiencias organizativas subyacentes”.

Tap Root



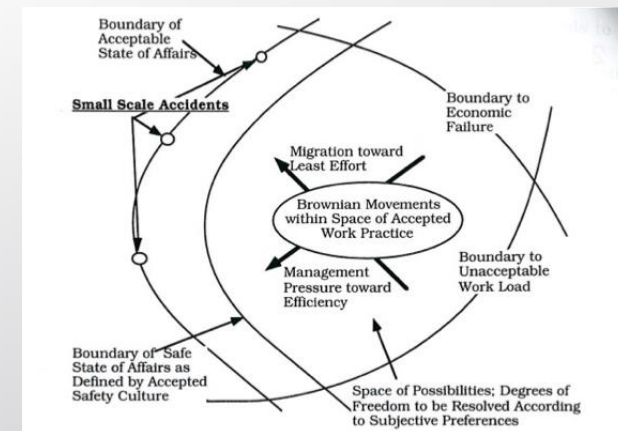
Bow Tie



Modelos sistémicos

“En vez de tratar los incidentes como causa efecto, describe las pérdidas como el comportamiento inesperado de un sistema en el que se dan relaciones no controladas entre sus partes constituyentes. En otras palabras, los incidentes no son creados por una combinación de fallas activas y latentes, son el resultado del funcionamiento humano y de la tecnología que parecen racionales a nivel local, pero que sin saberlo crean condiciones inseguras dentro del sistema que permanecen sin corregir.”

Perrow (1999) discutió la inevitabilidad de los desastres, en lo que él llamó "**Normal Accidents**". Perrow se centró en dos propiedades del sistema, llamados **acoplamiento** e **interacción**,



Rassmusen 1997

Variabilidad del desempeño (resiliencia)

“La variabilidad del funcionamiento normal, puede, de vez en cuando combinarse de formas imprevistas, conduciendo a eventos inesperados. Para evitar los efectos negativos de tales eventos inesperados, el enfoque no debe estar solo en mantener un equilibrio o estado estacionario, sino también en las transiciones entre los estados y la creación de nuevos estados estables para recuperarse de una inestabilidad”

(Sundström y Hollnagel, 2006)

“Un accidente es el resultado de combinaciones inesperadas de variabilidad del funcionamiento normal”. Hollnagel 2016

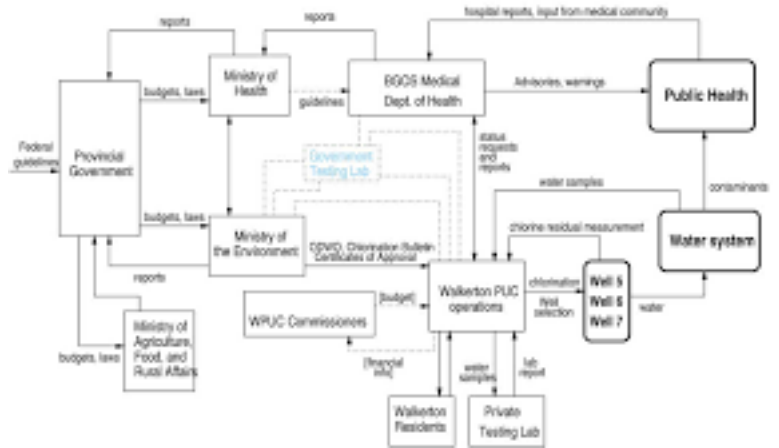


Variabilidad del desempeño (resiliencia)

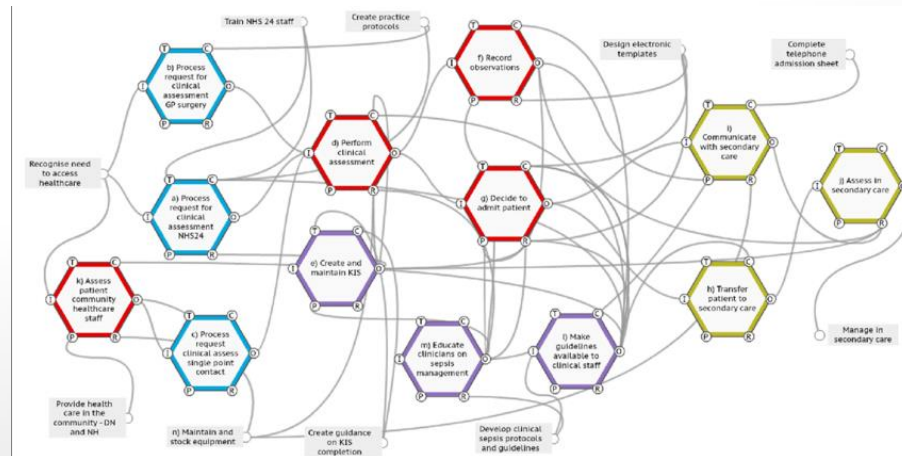
Requiere de la habilidad para analizar, medir y monitorear la resiliencia de las organizaciones en su entorno operativo, herramientas y métodos para mejorar la resiliencia de una organización frente al medio ambiente, y finalmente técnicas para modelar y predecir los efectos a corto y largo plazo del cambio y decisiones sobre riesgo. Es una consecuencia de esta perspectiva que el objetivo principal de la gestión de la seguridad es aumentar la capacidad de la organización en todos los niveles para adaptar su funcionamiento frente a cambios y perturbaciones, más bien que reducir riesgos y eventos negativos limitando el desempeño a través de actividades más rígidamente definidas (Hollnagel et al., 2006).



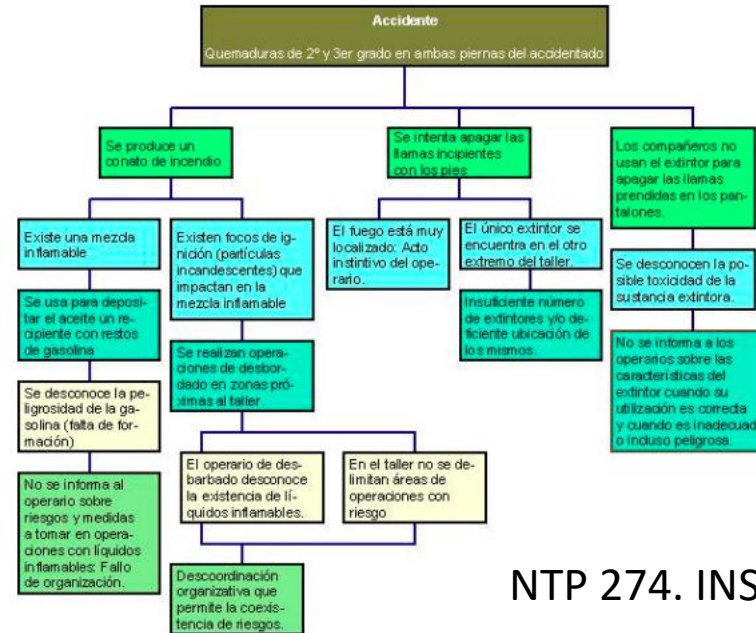
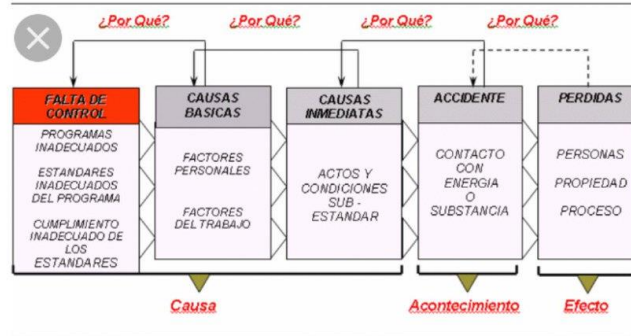
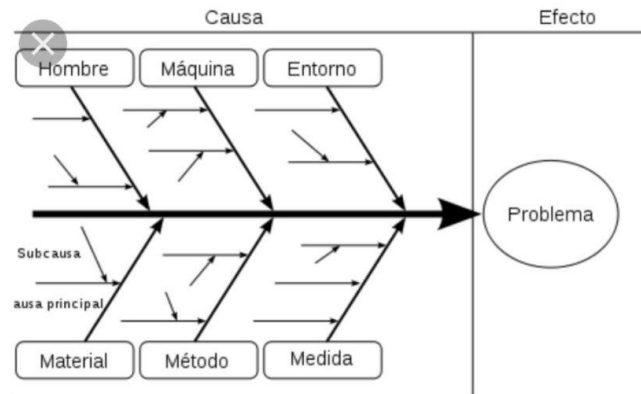
STAMP (Leveson 2004, 2011)



Fram (Hollnagel 2004, 2012)



Herramientas



NTP 274. INSHT

Fig. 1: Desarrollo del árbol de causas

Conclusiones

“Un accidente es una falla organizacional y no una falla individual”

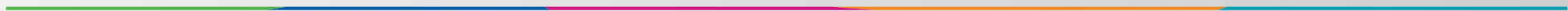
“Ver la falla como un producto de todo el sistema”

“Cada incidente tiene su propia historia”

“Que tan complejo es el proceso que estamos analizando”

”¿Que modelo y que método?”

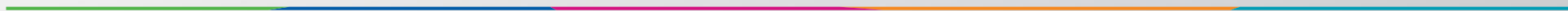
La forma en que se investiga un evento es el resultado directo de darse cuenta de lo que su organización necesita como un esfuerzo de mejora deliberado”. “No debe ser el resultado directo de lo que los líderes quieren saber (What you look is what you find).” **Conklin 2021**



Recomendaciones

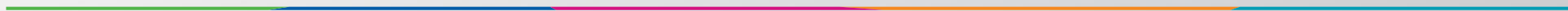
1. Diferenciar los sistemas críticos para la seguridad
2. Ver más allá del error humano
3. Utilizar modelos gráficos de seguridad sistémica
4. Realizar investigación empírica (construir narrativas ricas)
5. Conocer los límites de SBC y de los SG-SST

Le Coze 2017



Usted encuentra... lo que busca

“La práctica de la seguridad y la investigación requieren tomar en cuenta la naturaleza sistémica y compleja de los sistemas sociotécnicos”. Le Coze 2017



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