

**8<sup>th</sup> Annual CCPS Canadian Regional Meeting**

Meeting Hosted by Keyera

Thursday September 7, 2023, at 08:30-16:30

<b>12:00</b>	<b>Lunch</b>	
13:00	AI-PSM: Where are we today?	Rainer Hoff (Gateway Group)
13:30	The Rise of the Chatbots: Is there a place for AI in PHA Facilitation?	Will Sharpe (Kent)
14:00	Application of Machine Learning for Root Cause Analysis and Fuzzy Logic in Barrier Assessment (slides not shared)	Mohammadreza Dehkordi (University of Alberta)
<b>14:15</b>	<b>Break</b>	

# AI-PSM: Where are we today?

- Rainer Hoff – President, Gateway Group



**G A T E W A Y**

# 8<sup>th</sup> Annual CCPS Canadian Regional Meeting



## AI-PSM: Where Are We Today?

---

Rainer Hoff, Ph.D., P.Eng  
President, Gateway Group

Sep. 7, 2023

# Intellectual Property Rights

Copyright © 2023, Gateway Consulting Group, Inc.—ALL RIGHTS RESERVED

FACILEX® is a registered trademark of Gateway Group Solutions LLC

AI-Powered PSM™ is a trademark of Gateway Group Solutions LLC

Other marks, including ChatGPT® are trademarks of their respective owners

---

# Outline

- Introduction
  - Malone's "Four Roles of AI"
  - The 4 Roles Applied to MOC
  - Interpreting AI-PSM Posts
  - What Can You Do Today?
-

# Introduction

---

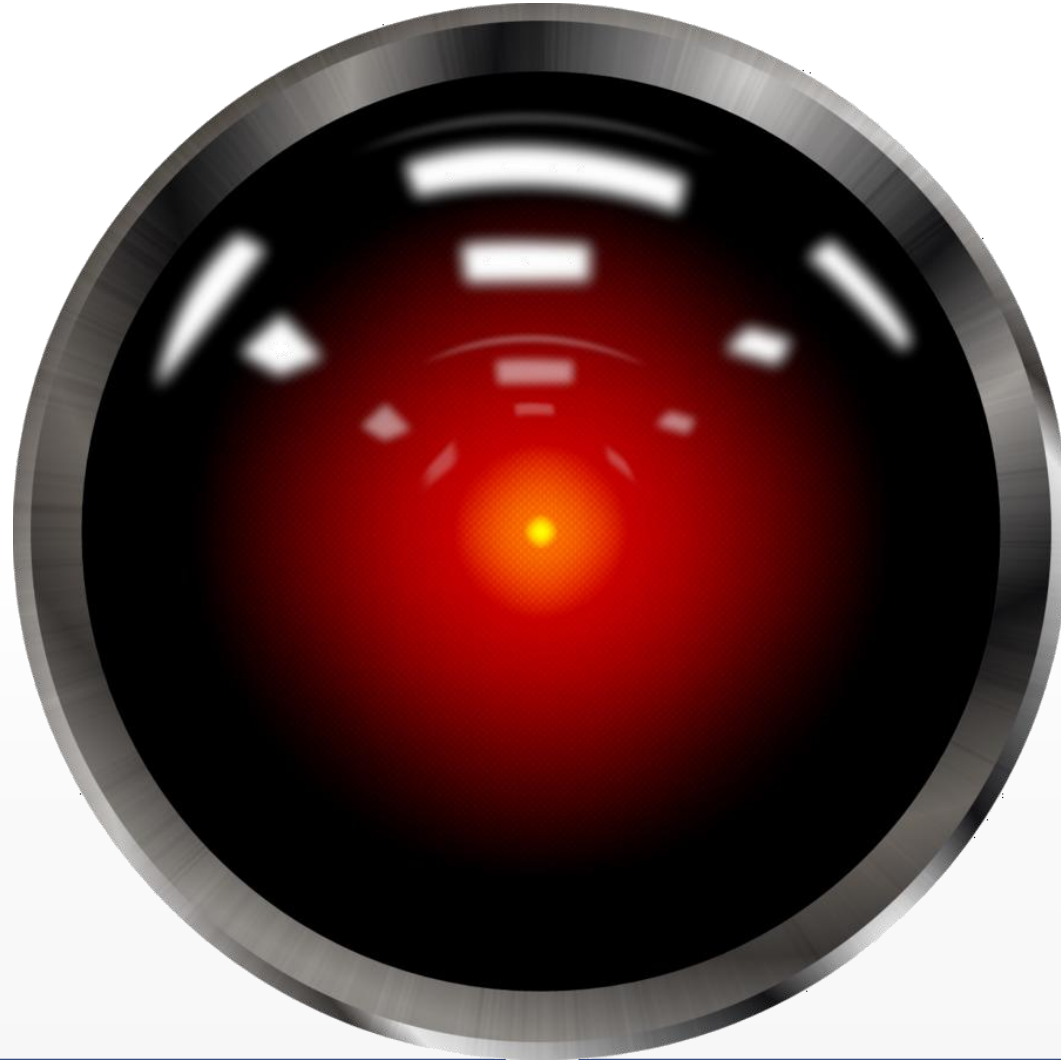
**“Open the pod bay doors HAL”**



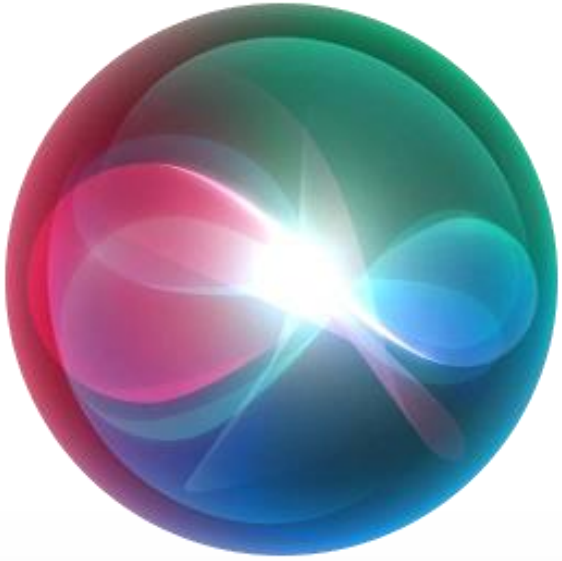
Open the Pod bay doors, HAL.



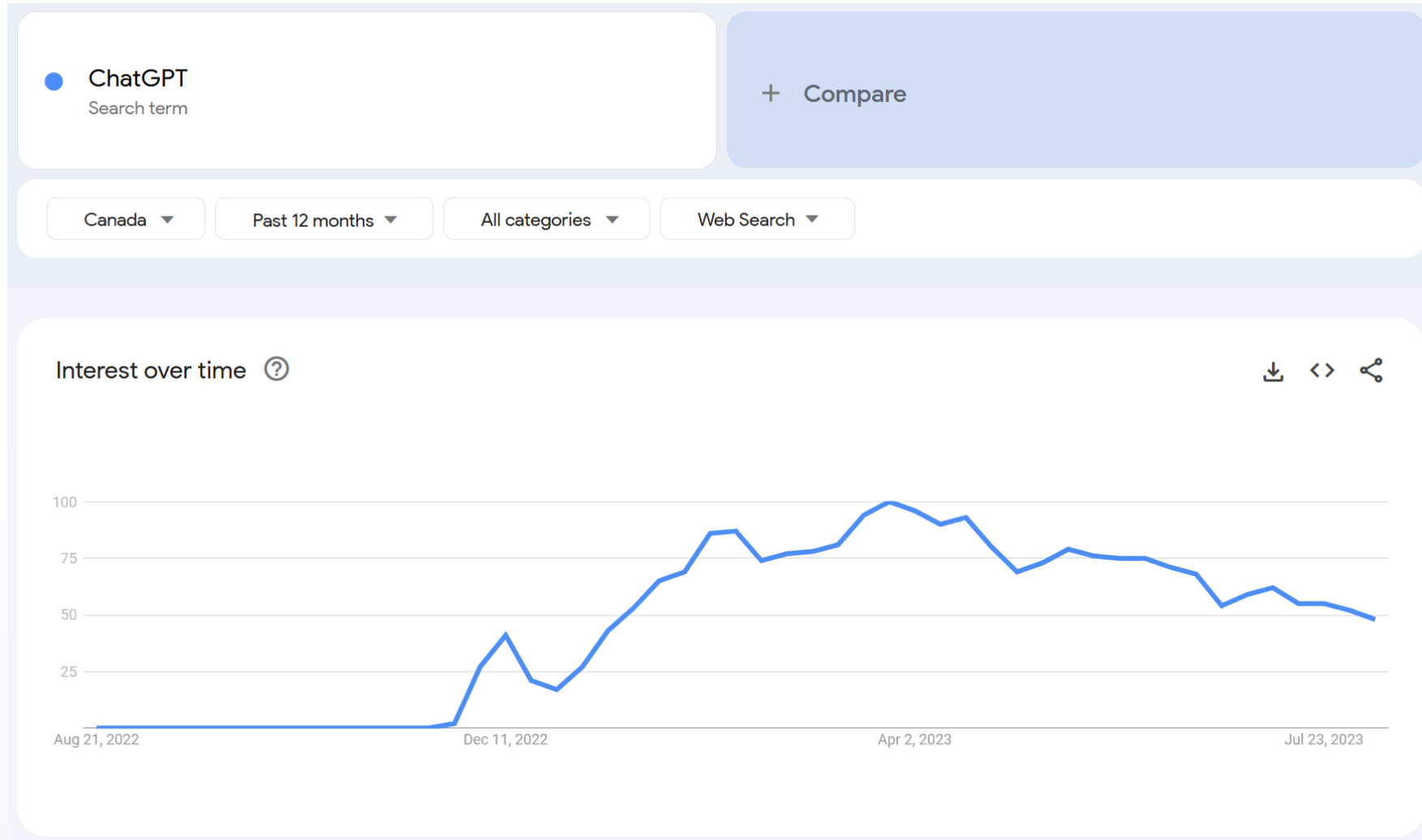
**“I’m sorry Dave. I’m afraid I can’t do that.”**



# AI Creeping Into Our Lives

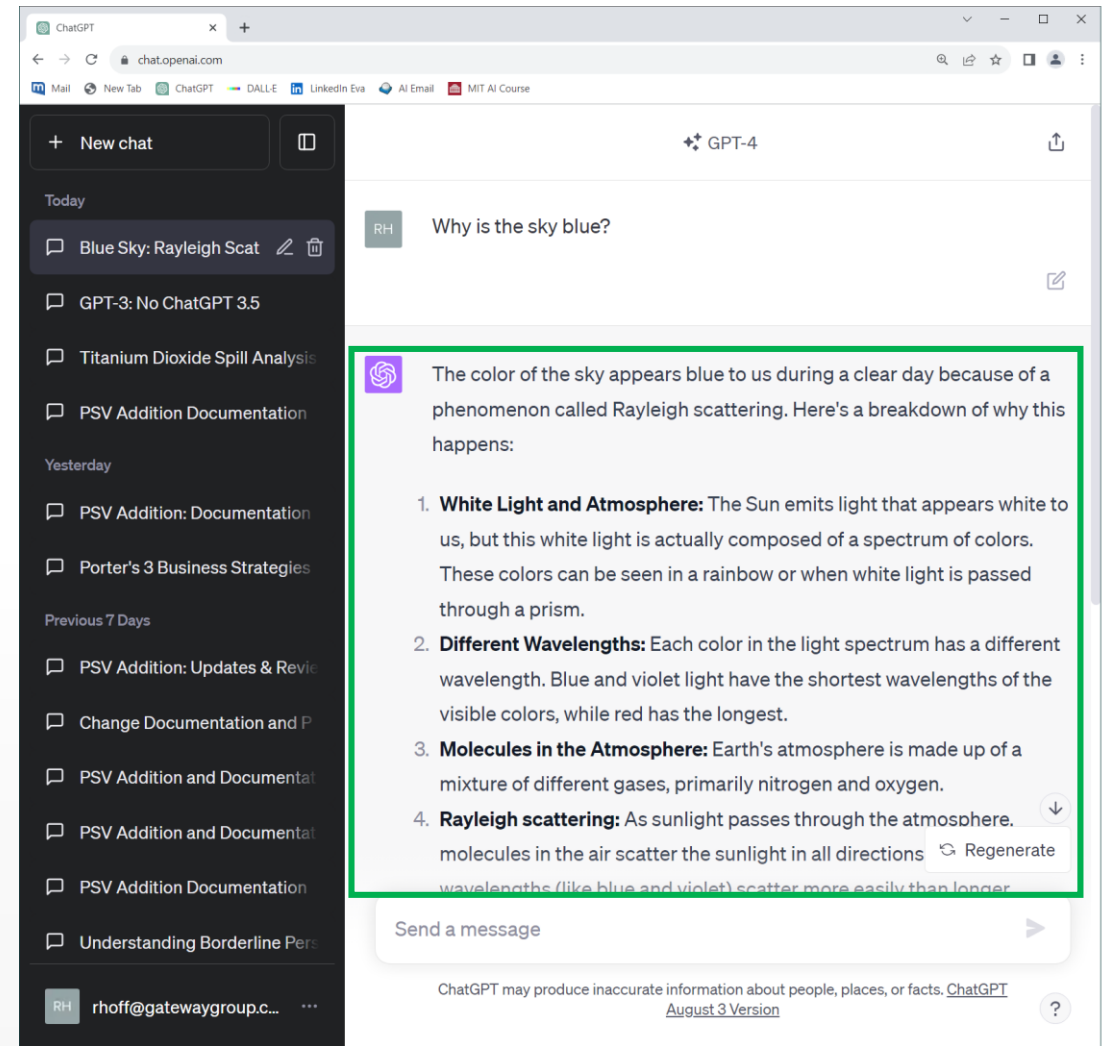
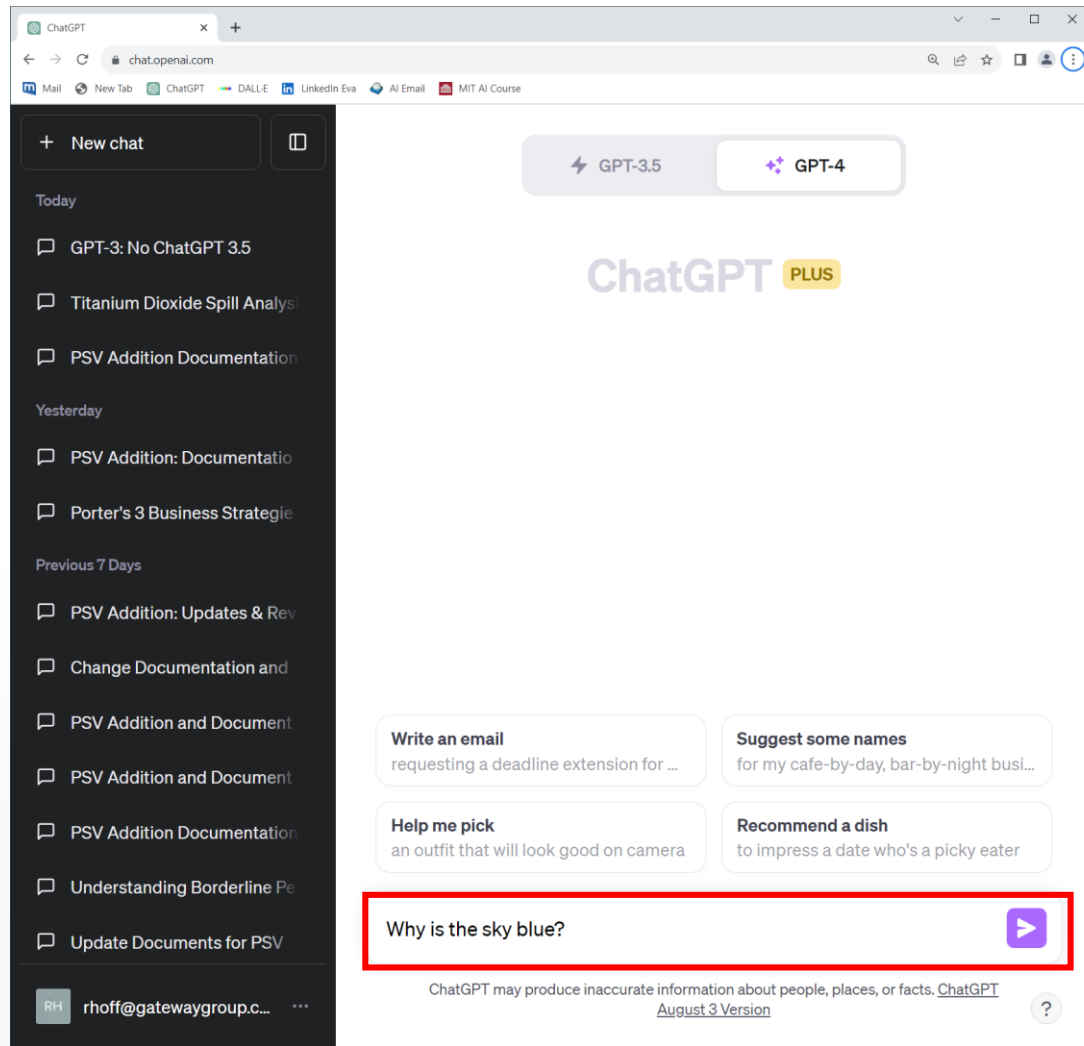


# Suddenly! Everyone's Interested in AI



Google searches for the term “ChatGPT”

# What Does “Chat” “G” “P” “T” Stand For?



The “Chat” part is the conversational nature of the user interface

# What Does “Chat” “G” “P” “T” Stand For?

- Generative AI Models:
    - Learn patterns and structure from input training
    - Then, generate new data with similar characteristics
  - Pre-trained:
    - The model is (pre-)trained on a large volume of data
    - It learns to predict the next word in a sentence by modelling the statistical properties of the language
  - Transformer:
    - A specific type of neural network architecture, introduced by Vaswani et al in 2017
    - Really popular in natural language processing models
    - Key elements are weighting and positional encoding (to sequence words)
-

# Feel Free to Join the AI-PSM Group on LinkedIn

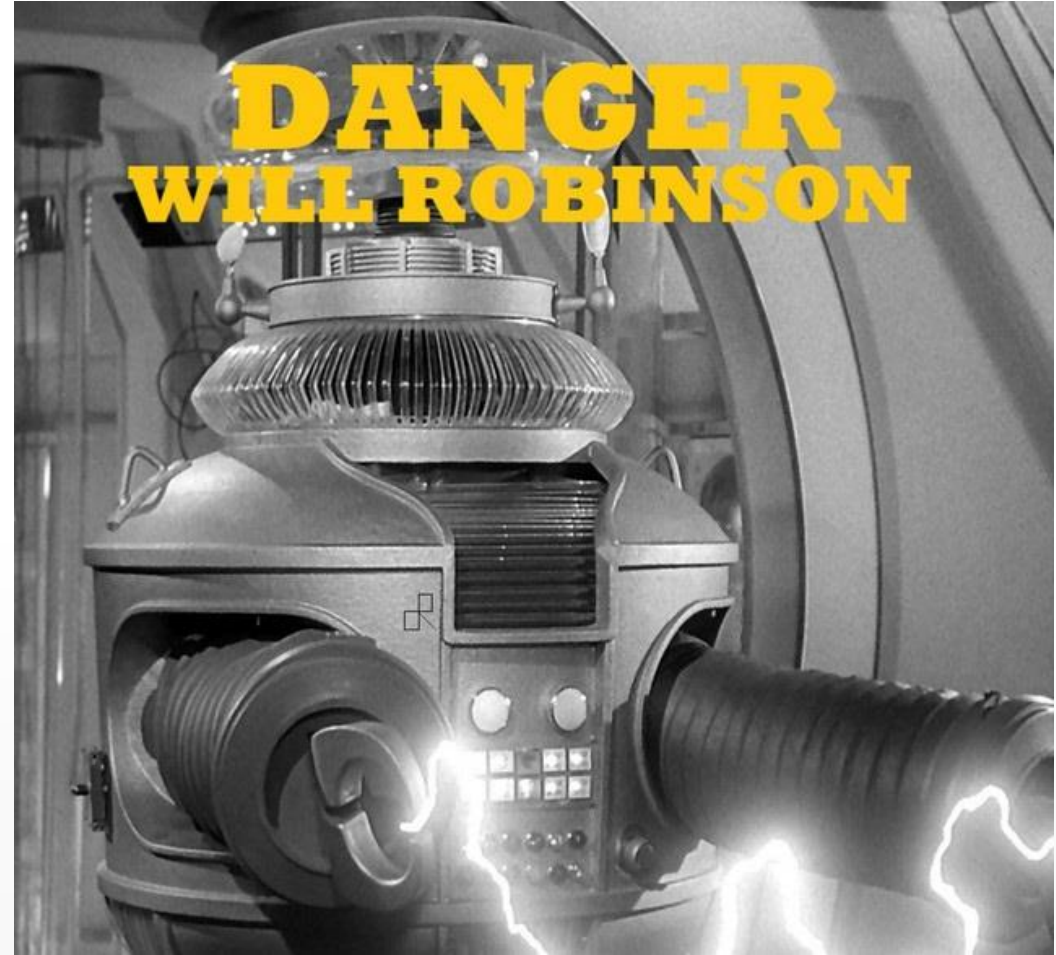




# Opportunities Abound...



*What Came First: Canadian Version*

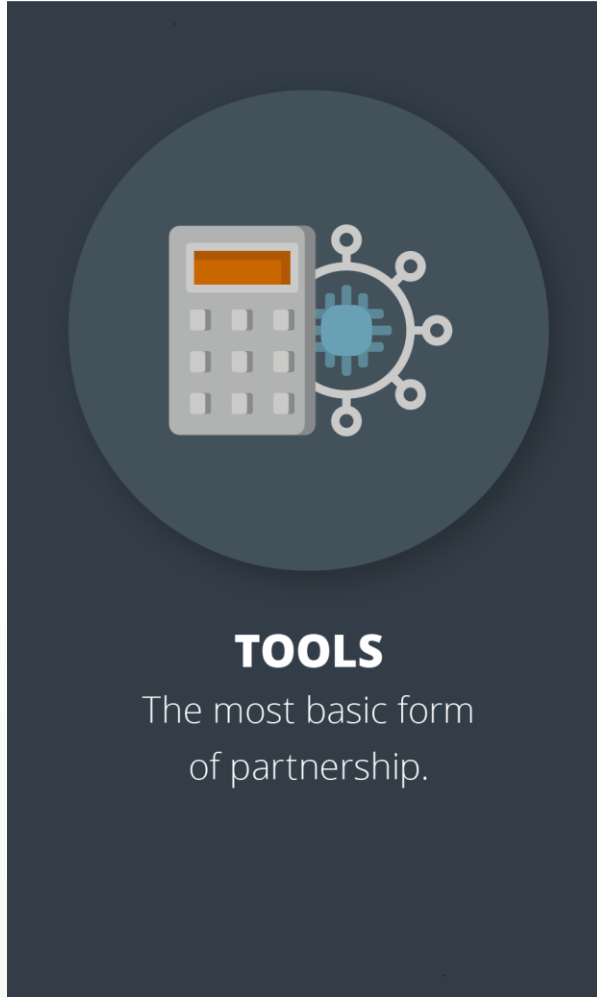


# Malone's “Four Roles of AI”

---

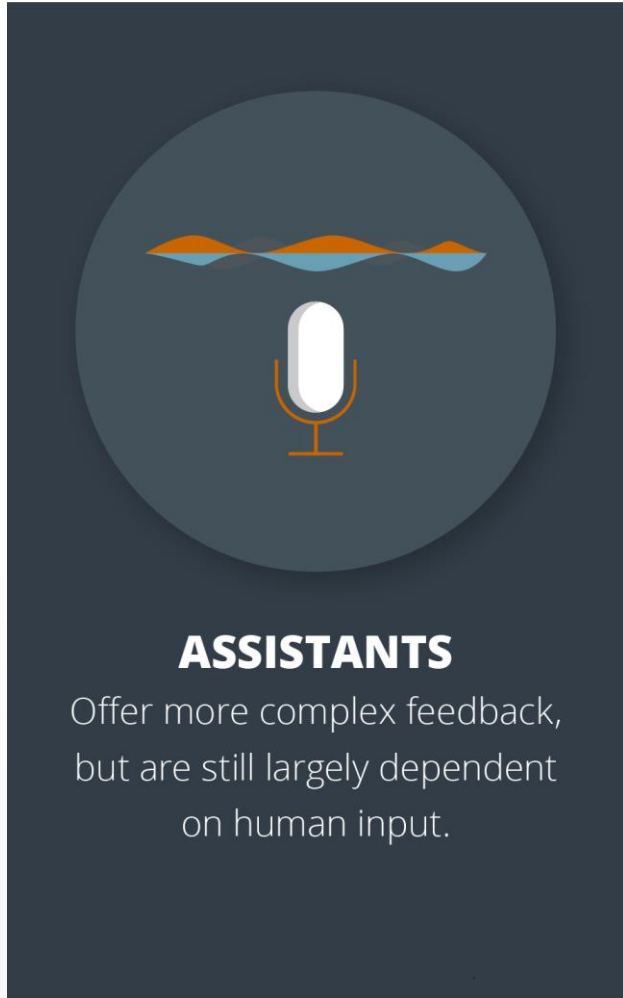


# The Role of Tool



- Computers perform a task
- Humans monitor the computer
  
- E.g. “autocomplete”
- E.g. complex data analytics software

# The Role of Assistant



- Computers take more initiative
- Humans still monitor the computer
- E.g. Siri, Alexa and other assistants

# The Role of Peer



## **PEERS**

Able to complete some tasks independently.

- Computers perform similar tasks to people
- People have to solve some of the cases
- E.g. medical x-ray evaluation

# The Role of Manager



## **MANAGERS**

The most complex example, where AI is able to break down and direct the completion of complicated tasks.

- Computers perform tasks
- Computers assign tasks (to people)
- E.g. traffic lights
- E.g. Amazon warehouse picker robots

# **The 4 Roles Applied to MOC**

---

# AI as a Tool



## **TOOLS**

The most basic form  
of partnership.

- All the steps are manual

# AI as a Tool: Create an MOC

Initiation

Scoping

Change Design

Impact Analysis

Approvals

Implementation

PSSR

Close-out

Permanent MOC

MOC Details

✓	Icon	MOC Number	* Title	Area	Unit	Discussions	MOC Folders	Created	Target Date	Risk Level	Description of the Change...	Reason for Change...	ID
		MOC-23-0120	Add a pressure safety valve - AI Tool Mode	Area 1	Crude Unit			About a minute ago	9/13/2023	Medium	A pressure safety valve shall be added to tank ...	A comprehensive relief system study was perform...	199

My Active Tasks

✓	Express!	Type	* Title	Action Type	Tools	Reference Links	Status	Due Date	Role	Additional Information	ID
Count= 2											
			Run AI Tool Role	Perform First			Not Started	8/18/2023	OWNER		213
			Paste AI Tool Results	Perform First			Not Started	8/18/2023	OWNER		214

A pressure safety valve shall be added to tank TK-2303. The valve shall be mounted on the north side of the tank because, in the event that the PSV discharges, it is necessary for the effluent to vent AWAY from where workers would be located.

A comprehensive relief system study was performed on the tank. It appears that the tank is not protected from overpressure conditions, especially pressure transients.

# AI as a Tool: Copy From the MOC

MANAGEMENT OF CHANGE

Participants Portal

All MOCs

Create

Permanent MOC

Temporary MOC

Short Form MOC

Document Configuration Items

Training Videos

01 Getting Started

02 Create a Permanent MOC

03 Working an MOC

04 Additional Topics

Reports

FACILEX<sup>®</sup>

AI-Powered PSM<sup>™</sup>

MOC

APPs

Data and Document Vault

AA

AM

CA

CAPA

CM

CN

CP

FSM

IM

IR

JS

LL

MOC

OMOC

PHA

PM

PR

PS

PSI

RISK

SD

TR

TX

ZZ

Search th

MOC Number

MOC-23-0120

\* Title

Add a pressure safety valve - AI Tool Mode

Area:

Area 1

Unit:

Crude Unit

Created

8/15/2023 5:54 PM

Target Date

9/12/2023

Copy the data between the two colored bands

In the context of a chemical plant, subject to Process Safety Management regulations, provide is a list of drawings and other documents that need to be updated, when making the following change:

Description of the Change

A pressure safety valve shall be added to tank TK-2303. The valve shall be mounted on the north side of the tank because, in the event that the PSV discharges, it is necessary for the effluent to vent AWAY from where workers would be located.

Reason for the Change

A comprehensive relief system study was performed on the tank. It appears that the tank is not protected from overpressure conditions, especially pressure transients.

Risk Level

Medium

Based on the Risk Level and the nature of the change, select the appropriate PHA methodology, given the options: 1) Simple PHA checklist, 2) What-If analysis, or, 3) Hazards and Operability Study (HAZOP). Also, recommend whether a Pre-Startup Safety Review is needed or not.

Click "Next" and paste the data into the AI chat window.

Next



# AI as a Tool: Paste into ChatGPT

The screenshot shows the ChatGPT web interface. On the left is a dark sidebar with a chat history. The main area on the right is white and contains the ChatGPT logo, model selection buttons (GPT-3.5 and GPT-4), and a chat window. The chat window has a red border and contains a user prompt and a GPT-3.5 response. At the bottom of the chat window is a green send button. Below the chat window is a disclaimer.

**Chat History (Left Sidebar):**

- Today
  - PSV Addition: Documentatio
  - Porter's 3 Business Strategie
- Yesterday
  - PSV Addition: Updates & Rev
  - Change Documentation and
  - PSV Addition and Document
  - PSV Addition and Document
  - PSV Addition Documentation
- Previous 7 Days
  - Understanding Borderline Pe
  - Update Documents for PSV
  - Updating Documents for PSV
  - PSV Addition Documentation
  - HTML <div> Element Expla
  - Chemical Plant Change Cons
  - Max tokens: 4096

**Chat Window (Right):**

Model selection: GPT-3.5 (selected), GPT-4

ChatGPT PLUS

**Prompts:**

- Write a spreadsheet formula to convert a date to the weekday
- Suggest some names for my cafe-by-day, bar-by-night business
- Explain options trading if I'm familiar with buying and selling stocks
- Come up with concepts for a retro-style arcade game

**Chat Window Content:**

In the context of a chemical plant, subject to Process Safety Management regulations, provide is a list of drawings and other documents that need to be updated, when making the following change:

Description of the Change A pressure safety valve shall be added to tank TK-2303. The valve shall be mounted on the north side of the tank because, in the event that the PSV discharges, it is necessary for the effluent to vent AWAY from where workers would be located.

Reason for the Change A comprehensive relief system study was performed on the tank. It appears that the tank is not protected from overpressure conditions, especially pressure

**Disclaimer:** ChatGPT may produce inaccurate information about people, places, or facts. [ChatGPT August 3 Version](#)

# AI as a Tool: Copy Results From ChatGPT



In the context of a chemical plant subject to Process Safety Management (PSM) regulations, here is a list of drawings and documents that need to be updated when making the described change:



1. **P&ID (Piping and Instrumentation Diagram):** Update the P&ID for tank TK-2303 to include the newly added pressure safety valve (PSV) and its associated piping. Indicate the location of the PSV on the north side of the tank.
2. **PFD (Process Flow Diagram):** If the change impacts the overall process flow, update the PFD to reflect the addition of the pressure safety valve and the associated changes in flow paths.
3. **Instrumentation and Control Drawings:** Update any relevant control system and instrumentation drawings to reflect the addition of the PSV. This includes specifying the control logic, interlocks, and alarm points related to the new valve.
4. **Equipment Data Sheets:** Create a new equipment data sheet for the added pressure safety valve. Include information such as design specifications, operating parameters, set pressure, relieving capacity, and manufacturer details.
5. **Relief System Design Documentation:** Update documentation related to the relief system design study performed on tank TK-2303. This includes any calculations, analyses, and documentation of the need for the added PSV.
6. **Operating Procedures:** Revise the operating procedures for tank TK-2303 to include the correct procedures for operating and maintaining the newly added pressure safety valve. This ensures that operators are aware of its presence and understand its function.

7. **Maintenance Procedures:** Develop new maintenance procedures specific to the added pressure safety valve. Outline the inspection, testing, and maintenance tasks required to ensure the valve's proper functioning.
8. **Training Materials:** Update training materials for operators and maintenance personnel to include information about the new pressure safety valve, its purpose, and how to handle it safely.
9. **Emergency Response Plan:** Incorporate the addition of the pressure safety valve into the plant's emergency response plan. Include procedures for responding to PSV discharges and ensuring worker safety in case of such events.

**PHA Methodology:** Based on the provided information and the medium risk level, the appropriate PHA methodology is likely the **Hazards and Operability Study (HAZOP)**. HAZOP is a systematic and thorough analysis that can identify potential hazards, deviations from design intent, and operational issues associated with the change.

**Pre-Startup Safety Review:** A **Pre-Startup Safety Review (PSSR)** is recommended for this change. Since the risk level is medium and the addition of a pressure safety valve involves a new safety-critical element, conducting a PSSR will ensure that all necessary checks are performed before the change is implemented. The PSSR helps to verify that the new equipment is installed correctly, functions as intended, and that all necessary documentation, training, and procedures are in place before the startup of the modified process.

# AI as a Tool: Paste Results Back into MOC App

MANAGEMENT OF CHANGE

Participants Portal

All MOCs

Create

Permanent MOC

Temporary MOC

Short Form MOC

Document Configuration Items

Training Videos

01 Getting Started

02 Create a Permanent MOC

03 Working an MOC

04 Additional Topics

Reports

FACILEX<sup>®</sup>

AI-Powered PSM<sup>™</sup>

MOC

MOC Number

\* Title

Area:

Unit:

Created

Target Date

Risk Level

Description of the Change

Reason for the Change

MOC-23-0120

Add a pressure safety valve - AI Tool Mode

Area 1

Crude Unit

8/15/2023 5:54 PM

9/12/2023

Medium

A pressure safety valve shall be added to tank TK-2303. The valve shall be mounted on the north side of the tank because, in the event that the PSV discharges, it is necessary for the effluent to vent AWAY from where workers would be located.

A comprehensive relief system study was performed on the tank. It appears that the tank is not protected from overpressure conditions, especially pressure transients.

Paste into the "AI Results" field.

AI Results

In the context of a chemical plant subject to Process Safety Management (PSM) regulations, here is a list of drawings and documents that need to be updated when making the described change:  
  
P&ID (Piping and Instrumentation Diagram): Update the P&ID for tank TK-2303 to include the newly added pressure safety valve (PSV) and its associated piping. Indicate the location of the PSV on the north side of the tank.  
  
PFD (Process Flow Diagram): If the change impacts the overall process flow, update the PFD to reflect the addition of the pressure safety valve and the associated changes in flow paths.  
  
Instrumentation and Control Drawings: Update any relevant control system and instrumentation drawings to reflect the addition of the PSV. This includes specifying the control logic, interlocks, and alarm points related to the new valve.  
  
Equipment Data Sheets: Create a new equipment data sheet for the added pressure safety valve. Include information such as design specifications, operating parameters, set pressure, relieving capacity, and manufacturer details.  
  
Relief System Design Documentation: Update documentation related to the relief system design study performed on tank TK-2303. This includes any calculations, analyses, and documentation of the need for the added PSV.  
  
Operating Procedures: Revise the operating procedures for tank TK-2303 to include the correct procedures for operating and maintaining the newly added pressure safety valve. This ensures that operators are aware of its presence and understand its function.

Save

Settings

?

alan

SHARE

Apps

Data and Document Vault

AA

AM

CA

CAPA

CM

CN

CP

FSM

IM

IR

JS

LL

MOC

OMOC

PHA

PM

PR

PS

PSI

RISK

SD
























TR

TX

ZZ

Search























# AI as a Tool: Using AI Results in a Checklist

General		MOC Checklist Window		AI Results Window	
Are P&IDs to be changed?		<input type="radio"/> Yes <input checked="" type="radio"/> No	 	Version History  Alert Me	
Is field verification of P&IDs required, prior to design work?		<input type="radio"/> Yes <input checked="" type="radio"/> No	 	Shared With  Workflows	
Does this change introduce any new chemicals to the site?		<input type="radio"/> Yes <input checked="" type="radio"/> No	 	Delete Item  Manage	
What kind of PHA is required?		<input type="radio"/> Simple checklist <input type="radio"/> What-if <input type="radio"/> HAZOP <input type="radio"/> LOPA <input type="radio"/> Other, TBD <input checked="" type="radio"/> None	 	Actions	
Are any operating procedures to be changed?		<input type="radio"/> Yes <input checked="" type="radio"/> No	 	AI Results	
Is operator training required?		<input type="radio"/> Yes <input checked="" type="radio"/> No	 	In the context of a chemical plant subject to Process Safety Management (PSM) regulations, here is a list of drawings and documents that need to be updated when making the described change:	
Does this change require Training Manual updates?		<input type="radio"/> Yes <input checked="" type="radio"/> No	 	P&ID (Piping and Instrumentation Diagram): Update the P&ID for tank TK-2303 to include the newly added pressure safety valve (PSV) and its associated piping. Indicate the location of the PSV on the north side of the tank.	
Will any kind of inspection be needed?		<input type="radio"/> Yes [+] <input checked="" type="radio"/> No	 	PFD (Process Flow Diagram): If the change impacts the overall process flow, update the PFD to reflect the addition of the pressure safety valve and the associated changes in flow paths.	
Does this MOC require multiple "Implementation-Only" MOCs?		<input type="radio"/> Yes <input checked="" type="radio"/> No [+]	 	Instrumentation and Control Drawings: Update any relevant control system and instrumentation drawings to reflect the addition of the PSV. This includes specifying the control logic, interlocks, and alarm points related to the new valve.	
Is a PSSR required?		<input checked="" type="radio"/> Yes, Single PSSR <input type="radio"/> Yes, Multiple PSSRs <input type="radio"/> No	 	Equipment Data Sheets: Create a new equipment data sheet for the added pressure safety valve. Include information such as design specifications, operating parameters, set pressure, relieving capacity, and manufacturer details.	

# AI as a Tool: Using AI Results in a Checklist

## General

### General

Are P&IDs to be changed?	<input checked="" type="radio"/> Yes <input type="radio"/> No	 	P&ID (Piping and Instrumentation Diagram): Update the P&ID for tank TK-2303 to include the newly added pressure safety valve (PSV) and its associated piping.
Is field verification of P&IDs required, prior to design work?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 	
Does this change introduce any new chemicals to the site? 	<input type="radio"/> Yes <input checked="" type="radio"/> No	 	
What kind of PHA is required?	<input type="radio"/> Simple checklist <input type="radio"/> What-if <input checked="" type="radio"/> HAZOP <input type="radio"/> LOPA <input type="radio"/> Other, TBD <input type="radio"/> None	 	Based on the provided information and the medium risk level, the appropriate PHA methodology is likely the Hazards and Operability Study (HAZOP). HAZOP is a systematic and thorough analysis that can identify potential hazards, deviations from design intent, and operational issues associated with the change.
Are any operating procedures to be changed?	<input checked="" type="radio"/> Yes <input type="radio"/> No	 	Revise the operating procedures for tank TK-2303 to include the correct procedures for operating and maintaining the newly added pressure safety valve. This
Is operator training required?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 	
Does this change require Training Manual updates?	<input checked="" type="radio"/> Yes <input type="radio"/> No	 	Update training materials for operators and maintenance personnel to include information about the new pressure safety valve, its purpose, and how to handle it safely.
Will any kind of inspection be needed?	<input type="radio"/> Yes [+] <input checked="" type="radio"/> No	 	
Does this MOC require multiple "Implementation-Only" MOCs? 	<input type="radio"/> Yes <input checked="" type="radio"/> No [ + ]	 	
Is a PSSR required?	<input checked="" type="radio"/> Yes, Single PSSR <input type="radio"/> Yes, Multiple PSSRs <input type="radio"/> No	 	A Pre-Startup Safety Review (PSSR) is recommended for this change. Since the risk level is medium and the addition of a pressure safety valve involves a new safety-critical element, conducting a PSSR will ensure that all necessary checks are performed before the change is implemented. The PSSR helps to verify that the new


### Documents to be Updated


Does this MOC involve any changes to:


BROWSE


VIEW


FACILEX®


 Version History


 Shared With

 Delete Item

 Manage

 Alert Me

 Workflows

 Actions

understand its function.

PHA Methodology: Based on the provided information and the medium risk level, the appropriate PHA methodology is likely the Hazards and Operability Study (HAZOP). HAZOP is a systematic and thorough analysis that can identify potential hazards, deviations from design intent, and operational issues associated with the change.

Training Materials: Update training materials for operators and maintenance personnel to include information about the new pressure safety valve, its purpose, and how to handle it safely.

Pre-Startup Safety Review: A Pre-Startup Safety Review (PSSR) is recommended for this change. Since the risk level is medium and the addition of a pressure safety valve involves a new safety-critical element, conducting a PSSR will ensure that all necessary checks are performed before the change is implemented. The PSSR helps to verify that the new equipment is installed correctly, functions as intended, and that all necessary documentation, training, and procedures are in place before the startup of the modified process.

Maintenance Procedures: Develop new maintenance procedures specific to the added pressure safety valve. Outline the inspection, testing, and maintenance tasks required to ensure the valve's proper functioning.

Emergency Response Plan: Incorporate the addition of the pressure safety valve into the plant's emergency response plan. Include procedures for responding to PSV discharges and ensuring worker safety in case of such events.



# AI as a Tool: AI Suggested Action Items

All Action Items											
✓	Status	Info	* Action Item	Action Type	Tools	Reference Links	State:	Due Date	Role	Assigned To	ID
			Count= 27								
✓			Conduct risk prescreening	...	Screen		Initiation	8/22/2023 9:54 PM	OWNER	<input type="checkbox"/> alan	809
✓			Save supporting documentation in the applicable folders	...	Perform		Initiation	8/16/2023 9:54 PM	EHS Manager	<input type="checkbox"/> alan	808
✓			Run AI Tool Role	...	Perform First		Scoping	8/18/2023 9:54 PM	OWNER	<input type="checkbox"/> alan	811
✓			Paste AI Tool Results	...	Perform First		Scoping	8/18/2023 9:54 PM	OWNER	<input type="checkbox"/> alan	812
✓			Scope the MOC with justification and action comments	...	Checklist		Scoping	8/16/2023 10:02 PM	OWNER	<input type="checkbox"/> alan	810
			Validate MOC scoping	...	Review		Scoping	8/18/2023 10:12 PM	MOC Approver(s)	<input type="checkbox"/> alan	832
			1. Redline/draft the documents described in "Additional Information".	...	Perform		Change Design		Manually Assign		827
			2. Redline/draft the documents described in "Additional Information"	...	Perform		Change Design		Manually Assign		828
			3. Redline/draft the documents described in "Additional Information"	...	Perform		Change Design		Manually Assign		829
			4. Redline/draft the documents described in "Additional Information"	...	Perform		Change Design		Manually Assign		830
			5. Redline/draft the documents described in "Additional Information"	...	Perform		Change Design		Manually Assign		831
			Redline PFD	...	Perform		Change Design		Manually Assign		834
			Redline Piping and Instrumentation Diagrams	...	Perform		Change Design		Manually Assign		814
			Conduct HAZOP analysis	...	Perform		Impact Analysis		OWNER		816
			Approve	...	Sign-off		Approvals		MOC Approver(s)		833
			Notification: An MOC has been approved in your area, and implementation is about to begin	...	Notify		Approvals		Asset Team		821
			Implement the change in the facility. Sign-off when done.	...	Sign-off First		Implementation		OWNER		822
			Redline Operating Procedure	...	Perform		Implementation		Manually Assign		817
			Redline training manual	...	Perform		Implementation		Manually Assign		819
			Conduct PSSR	...	Perform		PSSR		Manually Assign		823
			Create follow-up action items	...	Perform		PSSR		Manually Assign		824
			Approve to start-up	...	Sign-off		PSSR		Operations Manager		825
			Capture the actual startup date. Use the tool provided	...	Perform Last		PSSR		OWNER		826
			Update P&ID	...	Perform		Close-out		Manually Assign		815
			Update Operating Procedure	...	Perform		Close-out		Manually Assign		818
			Update training manual	...	Perform		Close-out		Manually Assign		820
			Close-out the MOC	...	Perform Last		Close-out		INITIATOR		813

# AI as an Assistant



## **ASSISTANTS**

Offer more complex feedback,  
but are still largely dependent  
on human input.

- The data movement is automated
  - The end user makes all the decisions
-

# AI as an Assistant



## MOC Details





















✓	Icon	MOC Number	* Title	Area	Unit	Discussions	MOC Folders	Target Date	Risk Level	Description of the Change. . .	Reason for Change. . .
		MOC-23-0117	Test 2036 - Assistant	... Entire Corporation	Entire Corporation			7/7/2024	High	Qrevent PSM involvings on to adverations. resul...	Xunless, or described to there effor Costem. So...

## My Active Tasks





















✓	Express!	Type	* Title	Action Type	Tools	Reference Links	Status	Due Date	Role	Additional Information	ID
Count= 2											
			Run AI Assistant	... Perform First			Not Started	8/18/2023	OWNER		210
			Scope the MOC with justification and action comments	... Checklist			Not Started	8/16/2023	OWNER		207



# AI as an Assistant

General		
General		
Are P&IDs to be changed?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 
Update the P&ID for tank TK-2303 to include the newly added pressure safety valve (PSV) and its associated piping. Indicate the location of the PSV on the north side		
Is field verification of P&IDs required, prior to design work?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 
Does this change introduce any new chemicals to the site?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 
What kind of PHA is required?	<input type="radio"/> Simple checklist <input type="radio"/> What-if <input type="radio"/> HAZOP <input type="radio"/> LOPA <input type="radio"/> Other, TBD <input checked="" type="radio"/> None	 
PHA Methodology: Based on the provided information and the medium risk level, the appropriate PHA methodology is likely the Hazards and Operability Study (HAZOP). HAZOP is a systematic and thorough analysis that can identify potential hazards, deviations from design intent, and operational issues associated with the change.		
Are any operating procedures to be changed?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 
Operating Procedures: Revise the operating procedures for tank TK-2303 to include the correct procedures for operating and maintaining the newly added pressure		
Is operator training required?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 
Does this change require Training Manual updates?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 
Training Materials: Update training materials for operators and maintenance personnel to include information about the new pressure safety valve, its purpose, and how to		
Will any kind of inspection be needed?	<input type="radio"/> Yes [+] <input checked="" type="radio"/> No	 
Does this MOC require multiple "Implementation-Only" MOCs?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 
Is a PSSR required?	<input checked="" type="radio"/> Yes, Single PSSR <input type="radio"/> Yes, Multiple PSSRs <input type="radio"/> No	 
Pre-Startup Safety Review: A Pre-Startup Safety Review (PSSR) is recommended for this change. Since the risk level is medium and the addition of a pressure safety valve involves a new safety-critical element, conducting a PSSR will ensure that all necessary checks are performed before the change is implemented. The PSSR helps to verify that		

# AI as an Assistant

General			
General			
Are P&IDs to be changed?	<input checked="" type="radio"/> Yes <input type="radio"/> No	 	Update the P&ID for tank TK-2303 to include the newly added pressure safety valve (PSV) and its associated piping. Indicate the location of the PSV on the north side
Is field verification of P&IDs required, prior to design work?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 	
Does this change introduce any new chemicals to the site? ⓘ	<input type="radio"/> Yes <input checked="" type="radio"/> No	 	
What kind of PHA is required?	<input type="radio"/> Simple checklist <input type="radio"/> What-if <input checked="" type="radio"/> HAZOP <input type="radio"/> LOPA <input type="radio"/> Other, TBD <input type="radio"/> None	 	PHA Methodology: Based on the provided information and the medium risk level, the appropriate PHA methodology is likely the Hazards and Operability Study (HAZOP). HAZOP is a systematic and thorough analysis that can identify potential hazards, deviations from design intent, and operational issues associated with the change.
Are any operating procedures to be changed?	<input checked="" type="radio"/> Yes <input type="radio"/> No	 	Operating Procedures: Revise the operating procedures for tank TK-2303 to include the correct procedures for operating and maintaining the newly added pressure
Is operator training required?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 	
Does this change require Training Manual updates?	<input checked="" type="radio"/> Yes <input type="radio"/> No	 	Training Materials: Update training materials for operators and maintenance personnel to include information about the new pressure safety valve, its purpose, and how to
Will any kind of inspection be needed?	<input type="radio"/> Yes [+] <input checked="" type="radio"/> No	 	
Does this MOC require multiple "Implementation-Only" MOCs? ⓘ	<input type="radio"/> Yes <input checked="" type="radio"/> No [ + ]	 	
Is a PSSR required?	<input checked="" type="radio"/> Yes, Single PSSR <input type="radio"/> Yes, Multiple PSSRs <input type="radio"/> No	 	Pre-Startup Safety Review: A Pre-Startup Safety Review (PSSR) is recommended for this change. Since the risk level is medium and the addition of a pressure safety valve involves a new safety-critical element, conducting a PSSR will ensure that all necessary checks are performed before the change is implemented. The PSSR helps to verify that

# AI as an Assistant: AI Suggested Action Items

All Action Items											
✓	Status	Info	* Action Item	Action Type	Tools	Reference Links	State:	Due Date	Role	Assigned To	ID
Count= 27											
✓			Conduct risk prescreening ⓘ	... Screen			Initiation	8/22/2023 9:54 PM	OWNER	<input type="checkbox"/> alan	809
✓			Save supporting documentation in the applicable folders ⓘ	... Perform			Initiation	8/16/2023 9:54 PM	EHS Manager	<input type="checkbox"/> alan	808
✓			Run AI Tool Role ⓘ	... Perform First			Scoping	8/18/2023 9:54 PM	OWNER	<input type="checkbox"/> alan	811
✓			Paste AI Tool Results ⓘ	... Perform First			Scoping	8/18/2023 9:54 PM	OWNER	<input type="checkbox"/> alan	812
✓			Scope the MOC with justification and action comments ⓘ	... Checklist			Scoping	8/16/2023 10:02 PM	OWNER	<input type="checkbox"/> alan	810
			Validate MOC scoping ⓘ	... Review			Scoping	8/18/2023 10:12 PM	MOC Approver(s)	<input type="checkbox"/> alan	832
			1. Redline/draft the documents described in "Additional Information". ⓘ	... Perform			Change Design		Manually Assign		827
			2. Redline/draft the documents described in "Additional Information" ⓘ	... Perform			Change Design		Manually Assign		828
			3. Redline/draft the documents described in "Additional Information" ⓘ	... Perform			Change Design		Manually Assign		829
			4. Redline/draft the documents described in "Additional Information" ⓘ	... Perform			Change Design		Manually Assign		830
			5. Redline/draft the documents described in "Additional Information" ⓘ	... Perform			Change Design		Manually Assign		831
			Redline PFD ⓘ	... Perform			Change Design		Manually Assign		834
			Redline Piping and Instrumentation Diagrams ⓘ	... Perform			Change Design		Manually Assign		814
			Conduct HAZOP analysis ⓘ	... Perform			Impact Analysis		OWNER		816
			Approve ⓘ	... Sign-off			Approvals		MOC Approver(s)		833
			Notification: An MOC has been approved in your area, and implementation is about to begin ⓘ	... Notify			Approvals		Asset Team		821
			Implement the change in the facility. Sign-off when done. ⓘ	... Sign-off First			Implementation		OWNER		822
			Redline Operating Procedure ⓘ	... Perform			Implementation		Manually Assign		817
			Redline training manual ⓘ	... Perform			Implementation		Manually Assign		819
			Conduct PSSR ⓘ	... Perform			PSSR		Manually Assign		823
			Create follow-up action items ⓘ	... Perform			PSSR		Manually Assign		824
			Approve to start-up ⓘ	... Sign-off			PSSR		Operations Manager		825
			Capture the actual startup date. Use the tool provided ⓘ	... Perform Last			PSSR		OWNER		826
			Update P&ID ⓘ	... Perform			Close-out		Manually Assign		815
			Update Operating Procedure ⓘ	... Perform			Close-out		Manually Assign		818
			Update training manual ⓘ	... Perform			Close-out		Manually Assign		820
			Close-out the MOC ⓘ	... Perform Last			Close-out		INITIATOR		813

# AI as a Peer



## **PEERS**

Able to complete some tasks independently.

- The data movement is automated
  - The AI integration makes some of the decisions, just like the user would.
  - However, the user can still override the AI
-

# AI as a Peer























## MOC Details

✓	Icon	MOC Number	* Title	Area	Unit	Discussions	MOC Folders	Target Date	Risk Level	Description of the Change. . .	Reason for Change. . .
		MOC-23-0122	Add a pressure safety valve - AI Peer Mode	...	Pecos	<a href="#">Seg-13548</a>		9/18/2023	Medium	A pressure safety valve shall be added to tank ...	A comprehensive relief system study was perform...

## My Active Tasks

✓	Express!	Type	* Title	Action Type	Tools	Reference Links	Status	Due Date	Role	Additional Information	ID
Count= 1											
				Run AI Peer	...	<a href="#">Perform First</a>		Not Started	8/18/2023	OWNER	239

# AI as a Peer

General			
General			
Are P&IDs to be changed?	<input checked="" type="radio"/> Yes <input type="radio"/> No	 	Update the P&ID for tank TK-2303 to include the newly added pressure safety valve (PSV) and its associated piping. Indicate the location of the PSV on the north side
Is field verification of P&IDs required, prior to design work?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 	
Does this change introduce any new chemicals to the site? ⓘ	<input type="radio"/> Yes <input checked="" type="radio"/> No	 	
What kind of PHA is required?	<input type="radio"/> Simple checklist <input type="radio"/> What-if <input checked="" type="radio"/> HAZOP <input type="radio"/> LOPA <input type="radio"/> Other, TBD <input type="radio"/> None	 	PHA Methodology: Based on the provided information and the medium risk level, the appropriate PHA methodology is likely the Hazards and Operability Study (HAZOP). HAZOP is a systematic and thorough analysis that can identify potential hazards, deviations from design intent, and operational issues associated with the change.
Are any operating procedures to be changed?	<input checked="" type="radio"/> Yes <input type="radio"/> No	 	Operating Procedures: Revise the operating procedures for tank TK-2303 to include the correct procedures for operating and maintaining the newly added pressure
Is operator training required?	<input type="radio"/> Yes <input checked="" type="radio"/> No	 	
Does this change require Training Manual updates?	<input checked="" type="radio"/> Yes <input type="radio"/> No	 	Training Materials: Update training materials for operators and maintenance personnel to include information about the new pressure safety valve, its purpose, and how to
Will any kind of inspection be needed?	<input type="radio"/> Yes [+] <input checked="" type="radio"/> No	 	
Does this MOC require multiple "Implementation-Only" MOCs? ⓘ	<input type="radio"/> Yes <input checked="" type="radio"/> No [+]	 	
Is a PSSR required?	<input checked="" type="radio"/> Yes, Single PSSR <input type="radio"/> Yes, Multiple PSSRs <input type="radio"/> No	 	Pre-Startup Safety Review: A Pre-Startup Safety Review (PSSR) is recommended for this change. Since the risk level is medium and the addition of a pressure safety valve involves a new safety-critical element, conducting a PSSR will ensure that all necessary checks are performed before the change is implemented. The PSSR helps to verify that

# AI as a Peer: AI Suggested Action Items

All Action Items											
✓	Status	Info	* Action Item	Action Type	Tools	Reference Links	State:	Due Date	Role	Assigned To	ID
Count= 27											
✓			Conduct risk prescreening 📄	... Screen			Initiation	8/22/2023 9:54 PM	OWNER	<input type="checkbox"/> alan	809
✓			Save supporting documentation in the applicable folders 📄	... Perform			Initiation	8/16/2023 9:54 PM	EHS Manager	<input type="checkbox"/> alan	808
✓			Run AI Tool Role 📄	... Perform First			Scoping	8/18/2023 9:54 PM	OWNER	<input type="checkbox"/> alan	811
✓			Paste AI Tool Results 📄	... Perform First			Scoping	8/18/2023 9:54 PM	OWNER	<input type="checkbox"/> alan	812
✓			Scope the MOC with justification and action comments 📄	... Checklist			Scoping	8/16/2023 10:02 PM	OWNER	<input type="checkbox"/> alan	810
			Validate MOC scoping 📄	... Review			Scoping	8/18/2023 10:12 PM	MOC Approver(s)	<input type="checkbox"/> alan	832
			1. Redline/draft the documents described in "Additional Information". 📄	... Perform			Change Design		Manually Assign		827
			2. Redline/draft the documents described in "Additional Information" 📄	... Perform			Change Design		Manually Assign		828
			3. Redline/draft the documents described in "Additional Information" 📄	... Perform			Change Design		Manually Assign		829
			4. Redline/draft the documents described in "Additional Information" 📄	... Perform			Change Design		Manually Assign		830
			5. Redline/draft the documents described in "Additional Information" 📄	... Perform			Change Design		Manually Assign		831
			Redline PFD 📄	... Perform			Change Design		Manually Assign		834
			Redline Piping and Instrumentation Diagrams 📄	... Perform			Change Design		Manually Assign		814
			Conduct HAZOP analysis 📄	... Perform			Impact Analysis		OWNER		816
			Approve 📄	... Sign-off			Approvals		MOC Approver(s)		833
			Notification: An MOC has been approved in your area, and implementation is about to begin 📄	... Notify			Approvals		Asset Team		821
			Implement the change in the facility. Sign-off when done. 📄	... Sign-off First			Implementation		OWNER		822
			Redline Operating Procedure 📄	... Perform			Implementation		Manually Assign		817
			Redline training manual 📄	... Perform			Implementation		Manually Assign		819
			Conduct PSSR 📄	... Perform			PSSR		Manually Assign		823
			Create follow-up action items 📄	... Perform			PSSR		Manually Assign		824
			Approve to start-up 📄	... Sign-off			PSSR		Operations Manager		825
			Capture the actual startup date. Use the tool provided 📄	... Perform Last			PSSR		OWNER		826
			Update P&ID 📄	... Perform			Close-out		Manually Assign		815
			Update Operating Procedure 📄	... Perform			Close-out		Manually Assign		818
			Update training manual 📄	... Perform			Close-out		Manually Assign		820
			Close-out the MOC 📄	... Perform Last			Close-out		INITIATOR		813

# AI as a Manager



## **MANAGERS**

The most complex example, where AI is able to break down and direct the completion of complicated tasks.

- This is the most automated approach.
- The AI completes the checklist on behalf of the user, so the user doesn't normally complete any checklist.
- The resulting action items **CANNOT** be overridden by the normal user.



# AI as an Assistant

Initiation

Scoping

Change Design

Impact Analysis

Approvals




Implementation

PSSR






Close-out

Permanent MOC

MOC Details

✓	Icon	MOC Number	* Title	Area	Unit	Discussions	MOC Folders	Target Date	Risk Level	Description of the Change. . .	Reason for Change. . .
		MOC-23-0123	Add a pressure safety valve - AI Manager Mode 	... Area 3	Tank Farm			2/20/2024	Medium	A pressure safety valve shall be added to tank ...	A comprehensive relief system study was perform...

My Active Tasks

✓	Express!	Type	* Title	Action Type	Tools	Reference Links	Status	Due Date	Role	Additional Information	ID
Count= 1											
				Run AI Manager 	...	Perform First		Not Started	8/18/2023	OWNER	259

# AI as a Manager: AI Enforced Action Items

All Action Items											
✓	Status	Info	* Action Item	Action Type	Tools	Reference Links	State:	Due Date	Role	Assigned To	ID
			Count= 28								
▼			Conduct risk prescreening 📄	...	Screen		Initiation	8/22/2023 10:49 PM	OWNER	<input type="checkbox"/> alan	896
▼			Save supporting documentation in the applicable folders 📄	...	Perform		Initiation	8/16/2023 10:49 PM	EHS Manager	<input type="checkbox"/> alan	895
▼			Run AI Manager 📄	...	Perform First		Scoping	8/18/2023 10:50 PM	OWNER	<input type="checkbox"/> alan	898
■	📄		1. Redline/draft the documents described in "Additional Information". 📄	...	Perform		Change Design	8/18/2023 10:54 PM	Manually Assign	<input type="checkbox"/> alan	917
■	📄		2. Redline/draft the documents described in "Additional Information" 📄	...	Perform		Change Design	8/18/2023 10:54 PM	Manually Assign	<input type="checkbox"/> alan	918
■	📄		3. Redline/draft the documents described in "Additional Information" 📄	...	Perform		Change Design	8/18/2023 10:54 PM	Manually Assign	<input type="checkbox"/> alan	919
■	📄		4. Redline/draft the documents described in "Additional Information" 📄	...	Perform		Change Design	8/18/2023 10:54 PM	Manually Assign	<input type="checkbox"/> alan	920
■	📄		Redline Piping and Instrumentation Diagrams 📄	...	Perform		Change Design	8/22/2023 10:54 PM	Manually Assign	<input type="checkbox"/> alan	900
■	📄		Redline PFD 📄	...	Perform		Change Design	8/22/2023 10:54 PM	Manually Assign	<input type="checkbox"/> alan	913
■	📄		Redline Safety Relief Valve Data 📄	...	Perform		Change Design	8/22/2023 10:54 PM	Manually Assign	<input type="checkbox"/> alan	915
■	📄		Conduct HAZOP analysis 📄	...	Perform		Impact Analysis		OWNER		902
■			Approve 📄	...	Sign-off		Approvals		MOC Approver(s)		922
■			Notification: An MOC has been approved in your area, and implementation is about to begin 📄	...	Notify		Approvals		Asset Team		907
■			Implement the change in the facility. Sign-off when done. 📄	...	Sign-off First		Implementation		OWNER		908
■	📄		Redline Operating Procedure 📄	...	Perform		Implementation		Manually Assign		903
■	📄		Redline training manual 📄	...	Perform		Implementation		Manually Assign		905
■	📄		Conduct PSSR 📄	...	Perform		PSSR		Manually Assign		909
■	📄		Create follow-up action items 📄	...	Perform		PSSR		Manually Assign		910
■	📄		Approve to start-up 📄	...	Sign-off		PSSR		Operations Manager		911
■	📄		Capture the actual startup date. Use the tool provided 📄	...	Perform Last		PSSR		OWNER		912
■	📄		Update P&ID 📄	...	Perform		Close-out		Manually Assign		901
■	📄		Update Operating Procedure 📄	...	Perform		Close-out		Manually Assign		904
■	📄		Update training manual 📄	...	Perform		Close-out		Manually Assign		906
■	📄		Update PFD 📄	...	Perform		Close-out		Manually Assign		914
■	📄		Update Safety Relief Valve Data 📄	...	Perform		Close-out		Manually Assign		916
■			Close-out the MOC 📄	...	Perform Last		Close-out		INITIATOR		899

# AI in Multiple Concurrent Roles

All Action Items											
✓	Status	Info	* Action Item	Action Type	Tools	Reference Links	State:	Due Date	Role	Assigned To	ID
Count= 27											
✓			Conduct risk prescreening	Screen			Initiation	8/22/2023 9:54 PM	OWNER	alan	809
✓			Save supporting documentation in the applicable folders	Perform			Initiation	8/16/2023 9:54 PM	EHS Manager	alan	808
✓			Run AI Tool Role	Perform First			Scoping	8/18/2023 9:54 PM	OWNER	alan	811
✓			Paste AI Tool Results	Perform First			Scoping	8/18/2023 9:54 PM	OWNER	alan	812
✓			Scope the MOC with justification and action comments	Checklist			Scoping	8/16/2023 10:02 PM	OWNER	alan	810
			Validate MOC scoping	Review			Scoping	8/18/2023 10:12 PM	MOC Approver(s)	alan	832
			1. Redline/draft the documents described in "Additional Information".	Perform			Change Design		Manually Assign		827
			2. Redline/draft the documents described in "Additional Information"	Perform			Change Design		Manually Assign		828
			3. Redline/draft the documents described in "Additional Information"	Perform			Change Design		Manually Assign		829
			4. Redline/draft the documents described in "Additional Information"	Perform			Change Design		Manually Assign		830
			5. Redline/draft the documents described in "Additional Information"	Perform			Change Design		Manually Assign		831
			Redline PFD	Perform			Change Design		Manually Assign		834
			Redline Piping and Instrumentation Diagrams	Perform			Change Design		Manually Assign		814
			Conduct HAZOP analysis	Perform			Impact Analysis		OWNER		816
			Approve	Sign-off			Approvals		MOC Approver(s)		833
			Notification: An MOC has been approved in your area, and implementation is about to begin	Notify			Approvals		Asset Team		821
			Implement the change in the facility. Sign-off when done.	Sign-off First			Implementation		OWNER		822
			Redline Operating Procedure	Perform			Implementation		Manually Assign		817
			Redline training manual	Perform			Implementation		Manually Assign		819
			Conduct PSSR	Perform			PSSR		Manually Assign		823
			Create follow-up action items	Perform			PSSR		Manually Assign		824
			Approve to start-up	Sign-off			PSSR		Operations Manager		825
			Capture the actual startup date. Use the tool provided	Perform Last			PSSR		OWNER		826
			Update P&ID	Perform			Close-out		Manually Assign		815
			Update Operating Procedure	Perform			Close-out		Manually Assign		818
			Update training manual	Perform			Close-out		Manually Assign		820
			Close-out the MOC	Perform Last			Close-out		INITIATOR		813

# Interpreting AI-PSM Posts

---

# LinkedIn Group: AI-PSM

The screenshot displays the LinkedIn interface for the 'AI-PSM' group. At the top, the navigation bar includes the LinkedIn logo, a search bar, and icons for Home, My Network, Jobs, Messaging, and Notifications. The group's header features a blue banner with a globe and the text 'AI-PSM', along with icons for information, sharing, notifications, and a menu. Below the header, the group is identified as a 'Public group'. The left sidebar shows the group's profile picture (Eva Edwards), a 'Recent' section with the 'AI-PSM' group, and links to 'Groups', 'Events', and 'Followed Hashtags'. The main content area shows two posts. The first post by Sean Dee, a Chemical Engineering and Process Safety Consultant, discusses a legal case involving ChatGPT. The second post by Jerson W., an Environment Health Safety Lead, includes a link to a LinkedIn post and a question about trust in AI. Below the posts is a large image of two humanoid robots with the text 'AI FOR GOOD SUMMIT AIMS TO REDUCE CONCERNS OVER AI'.

in Search for posts in this group Home My Network Jobs Messaging Notifications

Eva Edwards  
Joined group: Jun 2023

Recent

- AI-PSM

Groups

- AI-PSM

See all

Events

Followed Hashtags

Discover more

AI-PSM  
Public group

Sean Dee • 3rd+  
Chemical Engineering and Process Safety Consultant  
1mo •

+ Follow ...

Thought this was interesting - an attorney using ChatGPT to do 'legal research' didn't realize some of the referenced case law he was given was fabricated.

In Landmark Case Involving Attorneys Who Submitted Fake Court Decisions Generated by ChatGPT, Federal Judge Sanctions the Attorneys and Dismisses...  
condonlaw.com • 5 min read

In the first decision of its kind, a New York federal judge has sanctioned two lawyers and their ...

3

Jerson W. • 3rd+  
Environment Health Safety Lead - Building a sustainable fu...  
1mo •


+ Follow ...


<https://lnkd.in/eSegsbYb>



What do you think? The main issue -is do we trust it. My thoughts were around - do we even trust other humans?

AI FOR GOOD SUMMIT  
AIMS TO REDUCE CONCERNS OVER AI


# PSM Use Cases of Generative AI

 Research summary

 Fake citations


 General PSM questions ©  
 “Bingo”

 Procedure editing

 Procedure development (suggested text)

**We are not amused!**



 Procedure development (complete text)



TOOLS



ASSISTANTS






PEERS




MANAGERS

# PSM Use Cases of Non-Generative AI Models

-  Mathematical problem solving
-  Mathematical problem solving

 Toxic release analysis

 Incident prediction



TOOLS



ASSISTANTS



PEERS



MANAGERS

# Mathematical Problem Solving

arXiv:2301.13867v2 [cs.LG] 20 Jul 2023

## Mathematical Capabilities of ChatGPT

Simon Frieder<sup>\*,1,5</sup>, Luca Pinchetti<sup>1</sup>, Alexis Chevalier<sup>3</sup>, Ryan-Rhys Griffiths<sup>4</sup>, Tommaso Salvatori<sup>2,7</sup>, Thomas Lukasiewicz<sup>2,1</sup>, Philipp Christian Petersen<sup>5,6</sup>, and Julius Berner<sup>5</sup>

<sup>1</sup>Department of Computer Science, University of Oxford, Oxford, UK

<sup>2</sup>Institute of Logic and Computation, Vienna University of Technology, Vienna, Austria

<sup>3</sup>School of Mathematics, Institute for Advanced Study, Princeton, US

<sup>4</sup>Department of Physics, University of Cambridge, Cambridge, UK

<sup>5</sup>Faculty of Mathematics, University of Vienna, Vienna, Austria

<sup>6</sup>Research Network Data Science, University of Vienna, Vienna, Austria

<sup>7</sup>VERSES Research Lab, Los Angeles, CA 90016, USA

### Abstract

We investigate the mathematical capabilities of two iterations of ChatGPT (released 9-January-2023 and 30-January-2023) and of GPT-4 by testing them on publicly available datasets, as well as hand-crafted ones, using a novel methodology. In contrast to formal mathematics, where large databases of formal proofs are available (e.g., the Lean Mathematical Library), current datasets of



# Mathematical Problem Solving in ChatGPT

RH

What are the roots of " $x^3 - 6x^2 + 11x - 6 = 0$ "

What are the roots of:

$$X^3 - 6x^2 + 11x - 6 = 0 ?$$

$x = 1, x = 2$  and  $x = 3$

# Mathematical Problem Solving in ChatGPT

What are the roots of:

$$X^3 - 6x^2 + 11x - 6 = 0 ?$$

RH

What are the roots of " $x^3 - 6x^2 + 11x - 6 = 0$ "

Error!

$$x = 2, x = i\sqrt{3}, x = -i\sqrt{3}$$

# Mathematical Problem Solving in ChatGPT

RH

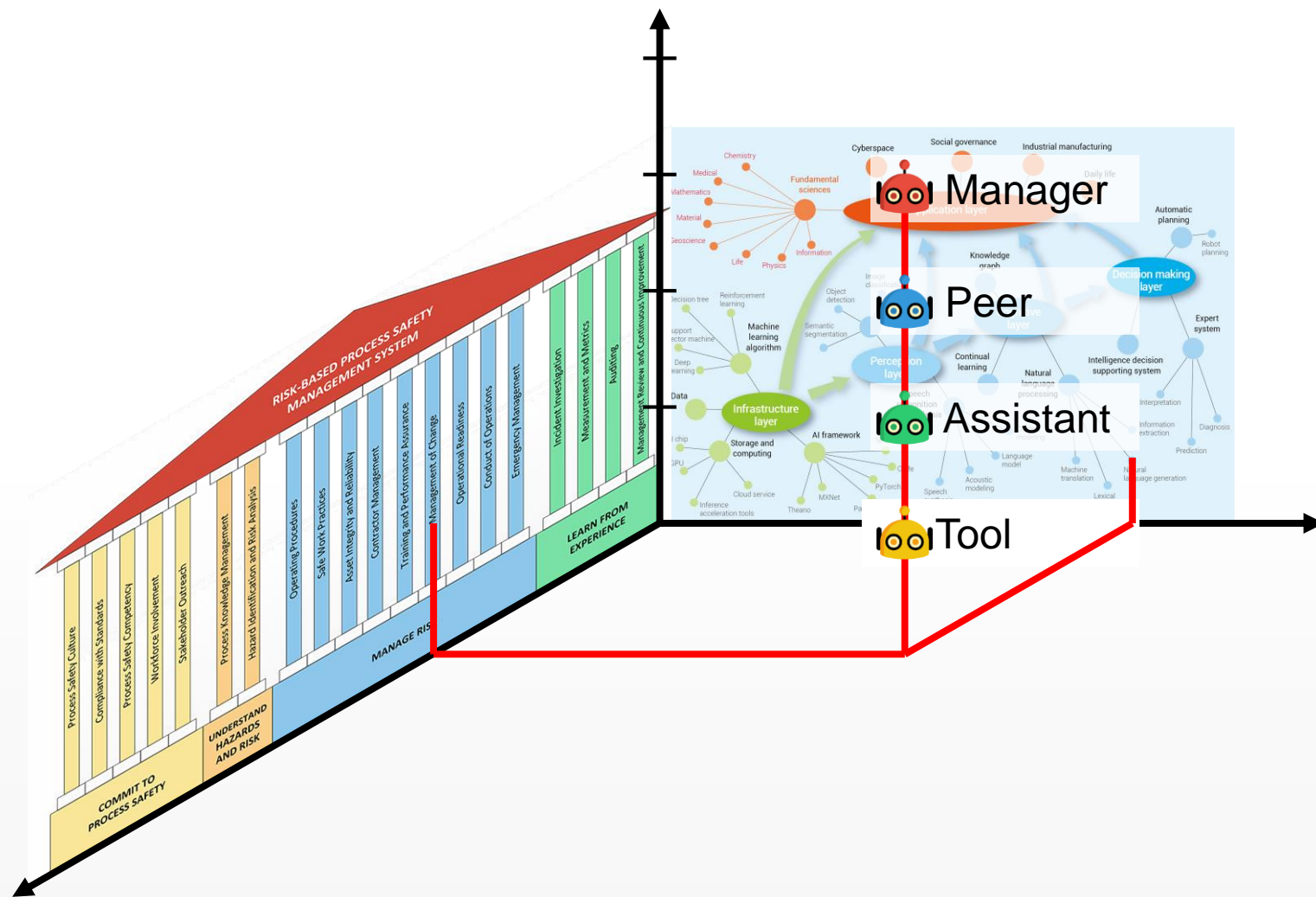
What wall thickness is needed for a pressure vessel made of steel with a yield strength 36,000psi where the pressure is 100psi and the diameter is 12in?

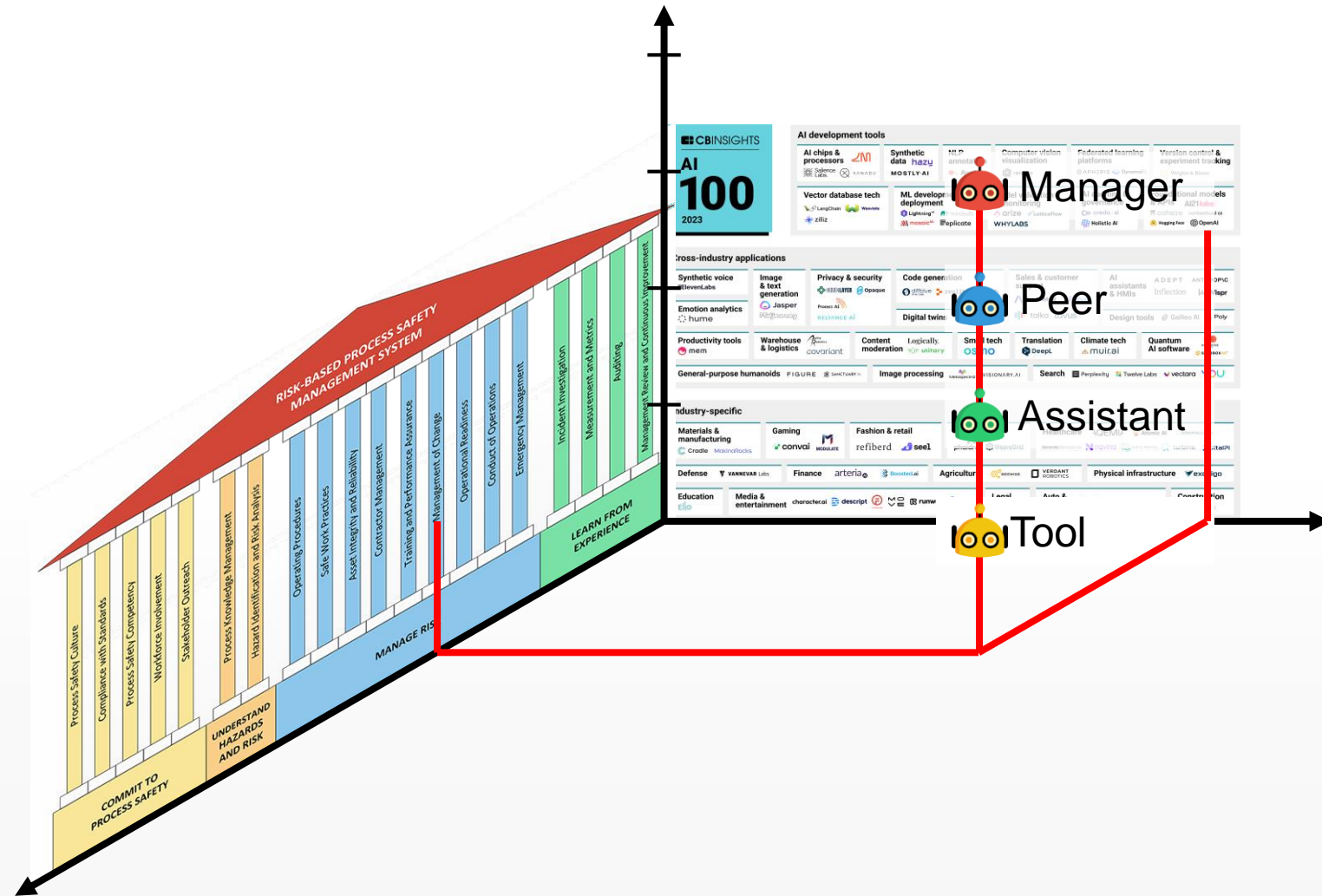
What wall thickness is needed for a pressure vessel made of steel with a yield strength of 36,000 psi where the pressure is 100psi and the diameter is 12in. ?

$t = 0.0167$  in.

# **What Can You Do Today?**

---





# A Cautious Approach: Develop a Roadmap

- Single product, maybe as a first step?
  - Additional roadmap concerns:
    - (Cyber) Security concerns
    - Intellectual property protection
    - Legal concerns
  - Cost:
    - Cost of AI product: \$
    - Cost of training for custom ML model: \$\$\$\$
-

# Wrap-Up

---



# Summary

- Introduction
  - Malone's "Four Roles of AI"
  - The 4 Roles Applied to MOC
  - Interpreting AI-PSM Posts
  - What Can You Do Today?
-

# Questions?

---

(or send them to: [rhoff@gatewaygroup.com](mailto:rhoff@gatewaygroup.com))

# The Rise of the Chatbots: Is there a place for AI in PHA Facilitation?

- Will Sharp – Process Safety Group Lead, Kent

# The Rise of the Chatbots

Is there a place for AI in PHA Facilitation?

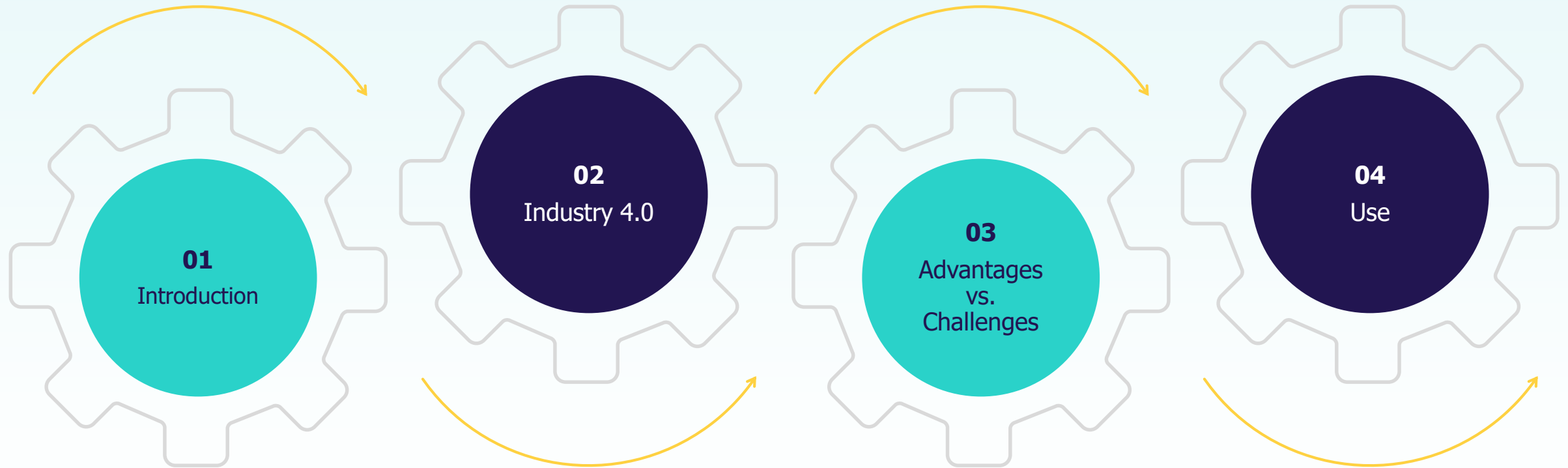
Will Sharpe

*and special thanks to Madeleine Sullivan*

## athazagoraphobia

(n.) the fear of forgetting, being forgotten or ignored, or being replaced.

# Overview





01

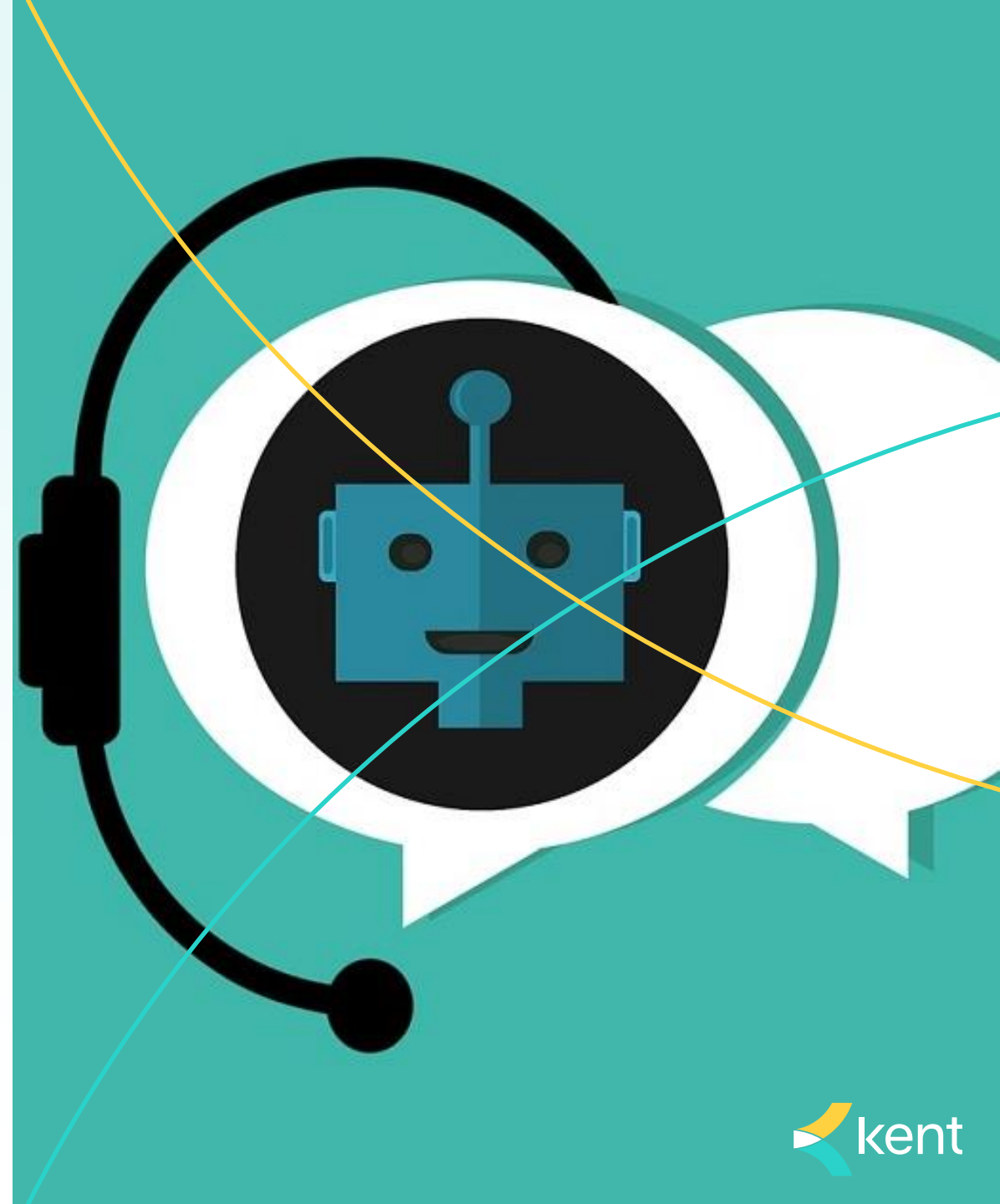
# Introduction

# Chatbots

A chatbot is a computer program that uses Artificial Intelligence (AI) and Natural Language Processing (NLP) to understand customer questions and automate responses to them, simulating human conversation.

Definition: <https://www.ibm.com/topics/>

Image: <https://marketbusinessnews.com/financial-glossary/>



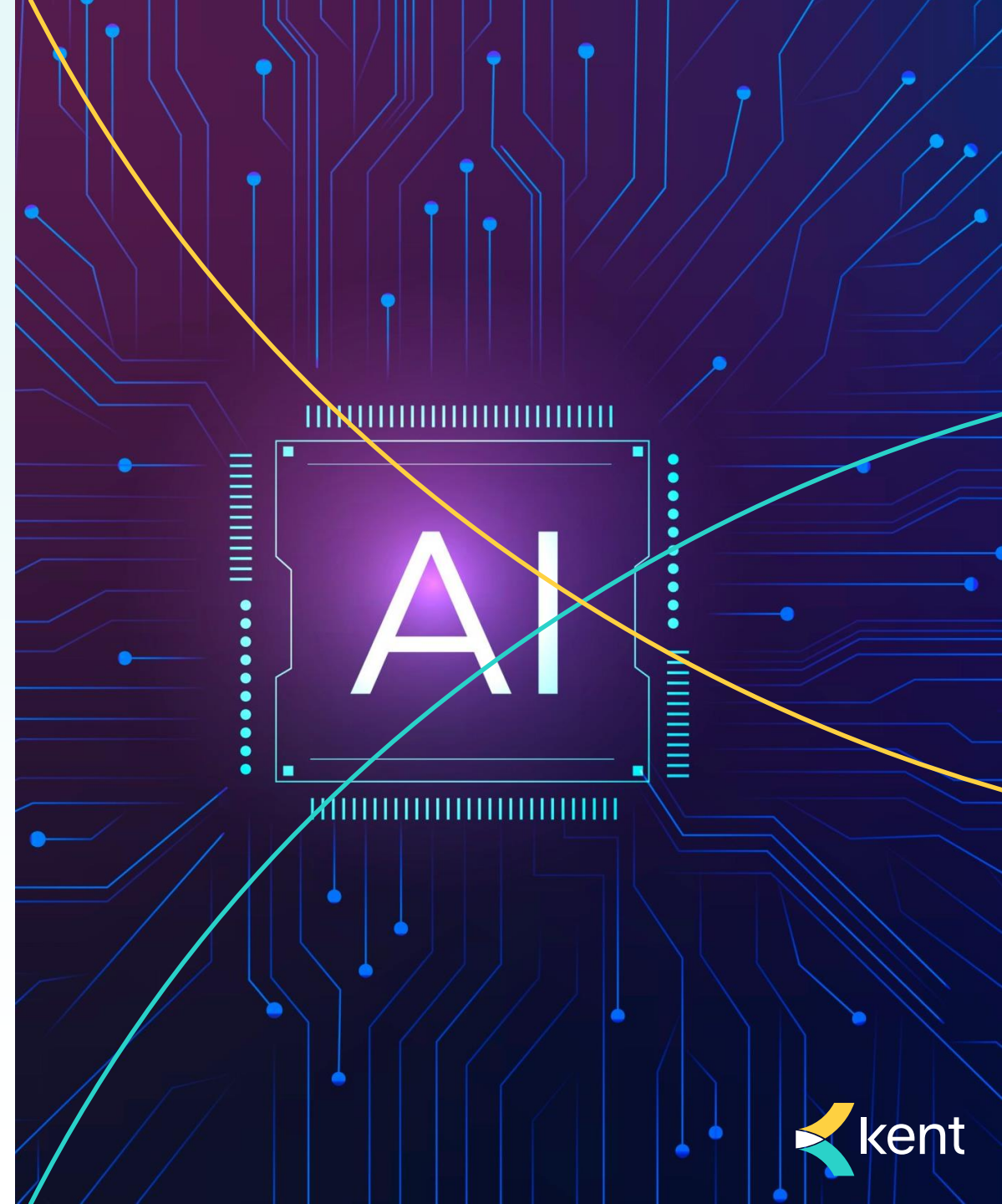


# AI

The science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.

Definition: <https://www.ibm.com/topics/>

Image: <https://www.engineersgarage.com/>



# Natural Language Processing (NLP)

Natural Language Processing (NLP) refers to the branch of computer science, concerned with giving computers the ability to understand text and spoken words in much the same way human beings can.

NLP combines computational linguistics—rule-based modeling of human language - with statistical, machine learning, and deep learning models.

Definition: <https://www.ibm.com/topics/>

Image: <https://online.york.ac.uk/>



# PHA Facilitation

Process Hazard Analysis (PHA) is an organized effort to identify and evaluate hazards associated with processes and operations to enable their control. This review normally involves the use of qualitative techniques to identify and assess the significance of hazards, where conclusions and appropriate recommendations are developed. PHA is facilitated in a workshop setting.

Definition:

<https://www.aiche.org/ccps/resources/glossary/>

Image: <https://www.exida.com/>

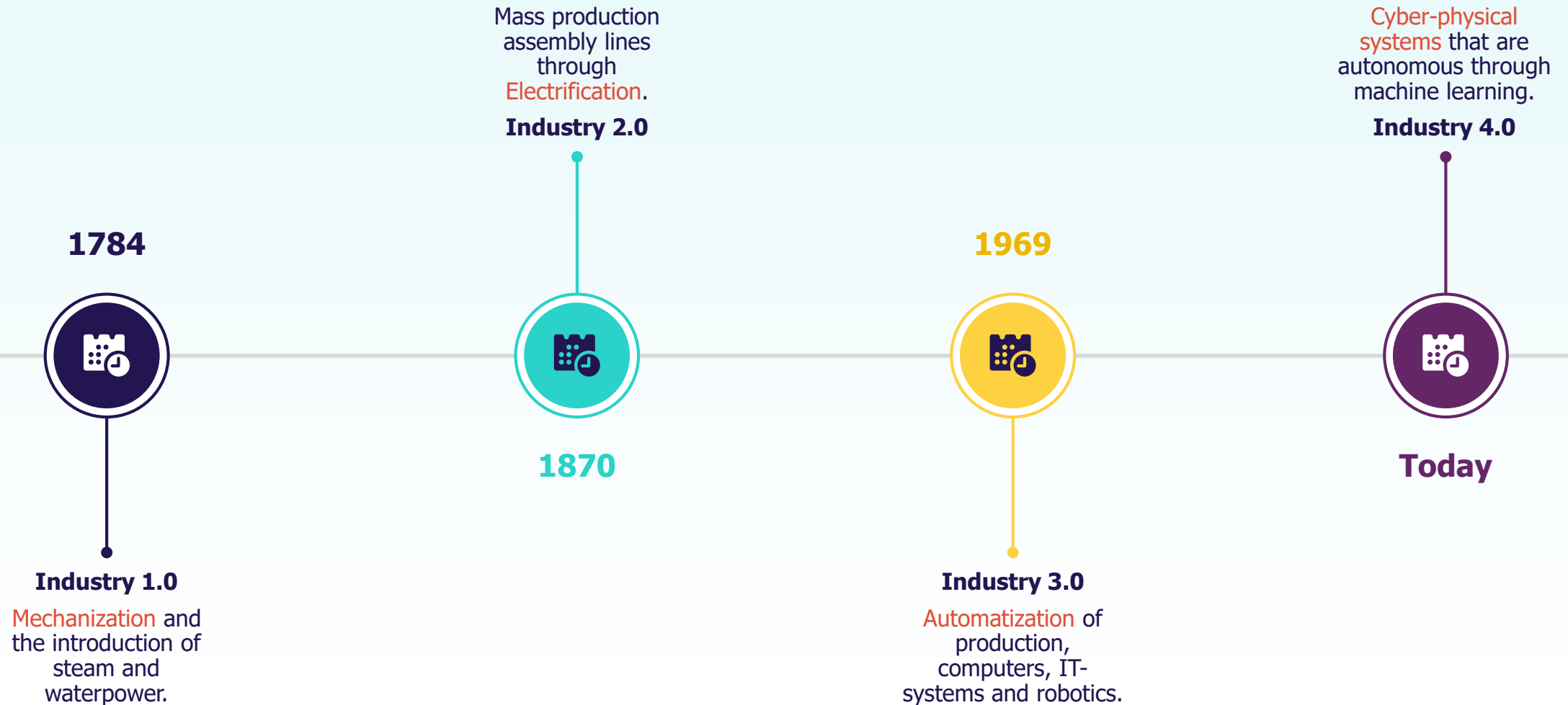




02

**Industry 4.0**

# The Four Industrial Revolutions














03

## **Advantages vs. Challenges**

# Challenges (X) and Advantages (O)



Click on the left side of the square

 <p>Data Processing &amp; Analysis</p>	 <p>Enhanced Efficiency</p>	 <p>Time &amp; Effort Savings</p>
 <p>Real-time Insights</p>	 <p>Consistency</p>	 <p>Knowledge Sharing</p>
 <p>Risk Prediction &amp; Assessment</p>	 <p>Continuous Learning</p>	 <p>Visual Data Analysis</p>



Click on the right side of the square



Advantages		Challenges	
<b>Data Processing and Analysis</b>	Trendspotting in large databases.	<b>Data Quality and Availability</b>  <b>Accuracy</b>  <b>Overcoming Bias</b>  <b>Complexity</b>  <b>Understanding Decision-Making Logic</b>  <b>Expertise Integration</b>  <b>Cost and Resource Constraints</b>  <b>Validation</b>  <b>Acceptance</b>	Junk in, junk out. Formatting required.
<b>Enhanced Efficiency</b>	Automation of data collection.		Propensity for hallucinations.
<b>Time and Effort Savings</b>	Increased efficiency and decision making.		Incorrect biases may form, illogical connections.
<b>Real-time Insights</b>	Linked to operations dashboard.		Process models may be too complex for AI.
<b>Consistency and Standardization</b>	Adherence to company standards.		“Black Boxes” that are difficult to understand.
<b>Knowledge Sharing and Retention</b>	Storing expertise of PHA facilitators.		Facilitation skills and AI user.
<b>Risk Prediction and Assessment</b>	Based on historical data and past incidents.		Upfront investments in software and training.
<b>Continuous Learning and Improvement</b>	Real-world feedback and subsequent updates.		Rigorous testing and validation required.
<b>Visual Data Analysis</b>	Inputs: P&ID / PFD Outputs: Graphics		Issues surrounding ethics, security and public trust.



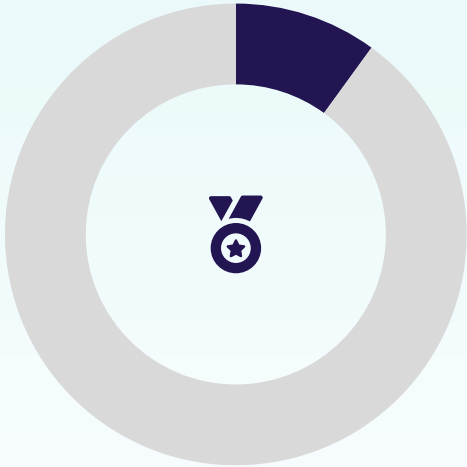


04

**Use**

# Applicability to Facilitation

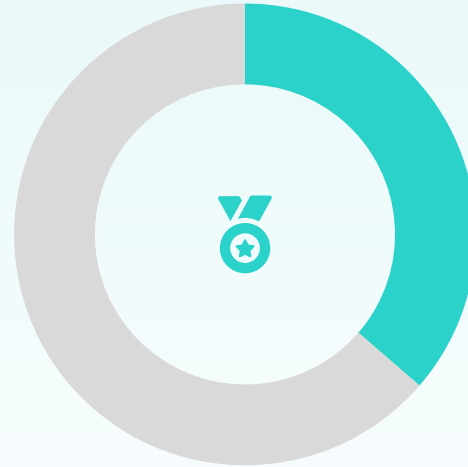
01



## Preparation

- Generating agendas, email drafts, and meeting outlines.
- Brainstorm ideas and generate discussion questions to drive the session.
- Create supporting visuals to enhance participant experience and understanding.
- Summarize preparatory research and refine language to improve clarity and engagement.

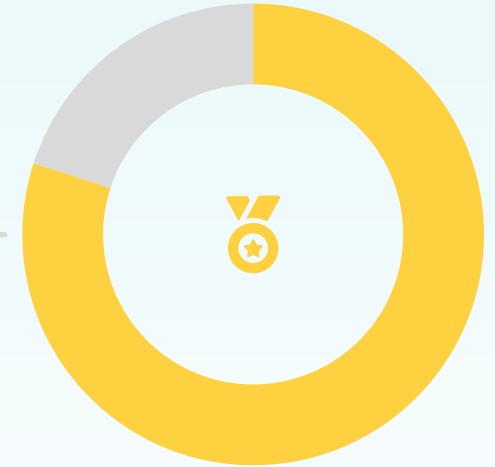
02



## Workshop

- Provide real-time translation and language support, facilitating communication among diverse attendees.
- Record and transcribe meetings in real-time and highlight key points.
- Monitor participant engagement and suggesting breaks as needed.

03



## Reporting

- Summarize meeting content, allowing participants to search for key words or themes during the meeting.
- Evaluate meeting effectiveness, identifying areas for improvement.
- Recommend next steps or action items in alignment with meeting objectives and results.
- Automatically schedule follow-up meetings, considering participant availability.



During the risk assessment, HAZOP.ai can guide attendees, informing them of related safety incidents, good practices, highlighting potential hazards missed and comparing findings to other reports.



Fireflies.ai can help your team transcribe, summarize, search, and analyze voice conversations.



Chartify.ai assists in generating interactive charts and graphs from CSVs and database tables. Users can upload their data, and the AI will recommend a variety of visualizations, including pie charts, bar charts, and line graphs.

## Applicable AI Systems

How could these tools improve your workshops?

# **Is there a place for AI in PHA Facilitation?**

# THANK YOU

**Will Sharpe**

Process Safety Group Lead  
@: [will.sharpe@kentplc.com](mailto:will.sharpe@kentplc.com)  
M: +1 (403) 827-0629

**Madeleine Sullivan**

Junior Specialist, Safety  
@: [madeleine.Sullivan@kentplc.com](mailto:madeleine.Sullivan@kentplc.com)

# Application of Machine Learning for Root Cause Analysis and Fuzzy Logic in Barrier Assessment

- Mohammadreza Dehkordi – University of Alberta
- (Slides not shared)

# Break

- Starting again at 2:45
- Thanks