

# **From AI Sparks to Actionable Signals: Elevating Biometrics with AI Agents & Agentic Workflows – Agentic AI**

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# Disclaimer

The views and opinions presented here represent those of the speaker and should not be considered to represent any companies or organizations.

# Agenda

- **AI Sparks : ChatGPT Moment**
- **Biometrics workflow before ChatGPT**
- **Biometrics workflow after ChatGPT**
- **Biometrics workflow with Agentic AI**
- **Introduction of AI Agent & Agentic workflow & Agentic AI**
- **Agentic AI integration in Biometrics ( System, Process, People )**
- **Elevating with Agentic AI**
- **Discussion**



# Do you NOT use “ChatGPT” for your work?



# How ChatGPT changed our work?

- Programming & Code Support
  - Code development
  - Code Debugging
  - Learning new languages (e.g., SAS, R and Python )
  - Vibe-Coding
- Document & Specification development / interpretation
- Collaboration & Communication : Email, Report writing, Analysis, Research
- Co-workers / Intern



# Biometrics Programming workflow before ChatGPT



# ChatGPT impact on programming

- Code Development
- Code Debugging
- Lowering the boundary of languages ( e.g., SAS, R and Python ) – vibe coding

# Codes Development – R

Prompt 1:

Write a **R script** that groups data by “TRTA” and “AVISIT” columns in "advs.xpt"

and calculates the mean of “AVAL” column for each group at PARAMCD =‘WEIGHT’

Prompt 2:

Write a **R script** that groups data by actual treatment and actual visit in "advs.xpt"

and calculates the mean for each group at weight.

Use ADaM CDISC variable.

Output :

```
library(haven) # For reading XPT files
library(dplyr) # For data manipulation
```

```
# Read the ADaM dataset
advs <- read_xpt("advs.xpt")
```

```
# Process the data
```

```
result <- advs %>%
```

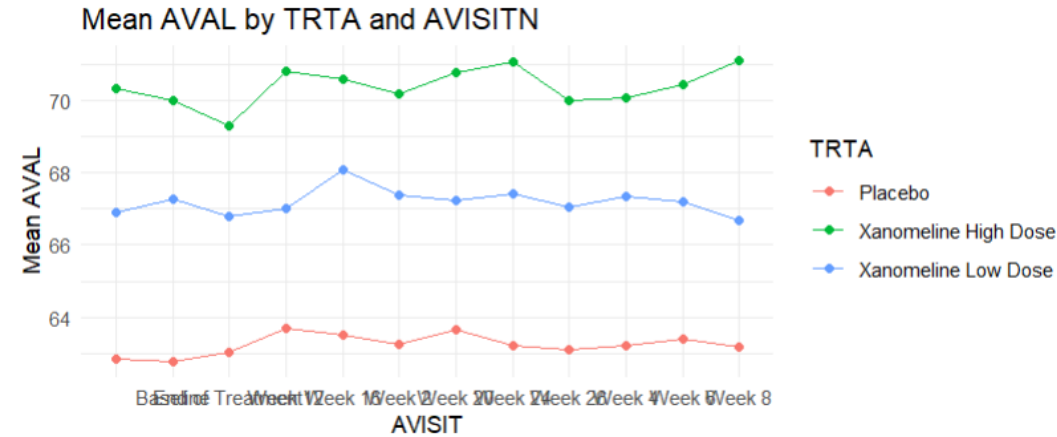
```
  filter(PARAMCD == "WEIGHT") %>% # Filter for PARAMCD = 'WEIGHT'
```

```
  group_by(TRTA, AVISIT) %>%      # Group by TRTA and AVISIT
```

```
  summarise(mean_AVAL = mean(AVAL, na.rm = TRUE)) %>% # Calculate mean of AVAL
  ungroup()
```

```
# Print the result
```

```
print(result)
```



# Codes Development – SAS

Prompt :

Write a **SAS script** that groups data by “TRTA” and “AVISIT” columns in "adv.s.xpt"

and calculates the mean of “AVAL” column for each group at PARAMCD =‘WEIGHT’

Output :

```
libname mydata xport 'path_to_adv.s.xpt'; /* Replace with the actual path to adv.s.xpt */
```

```
data weight_data;  
  set mydata.adv.s;  
  if PARAMCD = 'WEIGHT'; /* Filter data for PARAMCD = 'WEIGHT' */  
run;
```

```
proc sql;  
  create table weight_means as  
  select TRTA, AVISIT,  
         mean(AVAL) as mean_weight  
  from weight_data  
  group by TRTA, AVISIT;  
quit;
```

```
proc print data=weight_means;  
run;
```

# Codes Development – Python

Prompt :

Write a **Python script** that groups data by “TRTA” and “AVISIT” columns in “adv.s.xpt”

and calculates the mean of “AVAL” column for each group at PARAMCD = ‘WEIGHT’

Output :

```
import pandas as pd
import xport

# Load the .xpt file using xport
with open('adv.s.xpt', 'rb') as f:
    data = xport.load(f)

# Convert the xport data to a pandas DataFrame
df = pd.DataFrame(data['ADVS'])

# Filter the data for PARAMCD = 'WEIGHT'
df_weight = df[df['PARAMCD'] == 'WEIGHT']

# Group by TRTA and AVISIT, then calculate the mean of AVAL
grouped_data = df_weight.groupby(['TRTA', 'AVISIT'])['AVAL'].mean().reset_index()

# Output the grouped data
print(grouped_data)
```

# ChatGPT: Codes Debugging – Python

Prompt :

Debug below <python codes> using <error message>.

```
<python codes>:  
import pandas as pd  
import xport
```

```
# Load the .xpt file using xport  
with open('adv.s.xpt', 'rb') as f:  
    data = xport.load(f)
```

```
# Convert the xport data to a pandas DataFrame  
df = pd.DataFrame(data['ADVS'])  
# Filter the data for PARAMCD = 'WEIGHT'  
df_weight = df[df['PARAMCD'] == 'WEIGHT']
```

```
# Group by TRTA and AVISIT, then calculate the  
mean of AVAL
```

```
grouped_data = df_weight.groupby(['TRTA',  
'AVISIT'])['AVAL'].mean().reset_index()
```

```
# Output the grouped data  
print(grouped_data)  
</python codes>
```

```
<error message>  
TypeError: Could not convert ['aval'] to numeric  
</error message>
```

Output:

```
# Convert AVAL to numeric  
df_weight['AVAL'] = pd.to_numeric(df_weight['AVAL'],  
errors='coerce')
```

# Biometrics Programming workflow after/ using ChatGPT



Question :

- Can we automate this workflow further?

# AI Agent

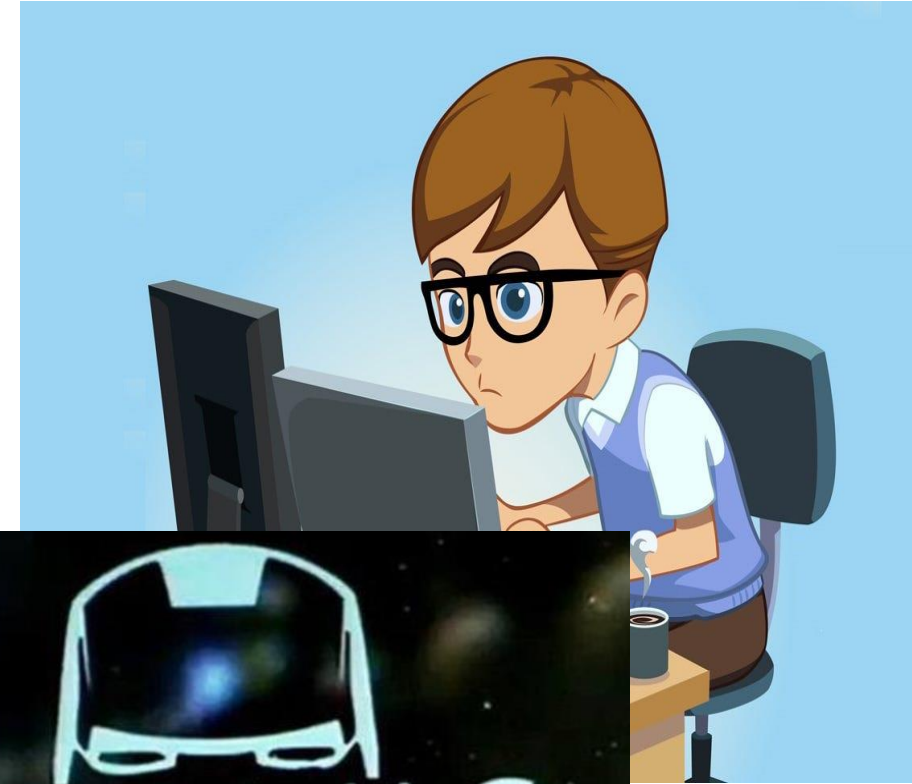
- System that can interact with its environment, collect data, and **autonomously** perform tasks and make decisions to achieve the goals.
- Main Components
  - LLM (e.g., ChatGPT5.2, Claude4.5 )
  - Prompts: ( e.g., instruction for AI Agent –  
**'You are stat programmer.  
Use the input and create SAS results.'**

**Follow below steps:**

- 1. Generate SAS codes based on input**
- 2. Execute generated SAS codes using SAS Studio.**
- 3. If there are error messages, debug SAS codes.**
- 4. Rerun SAS codes.**

**'Do Step 2 to 4 until there are no error message.'**

- Tools (e.g., SAS Studio, R Studio, Python )
- Memory : short-term /long-term memory/ RAG (e.g., previous SAS codes)

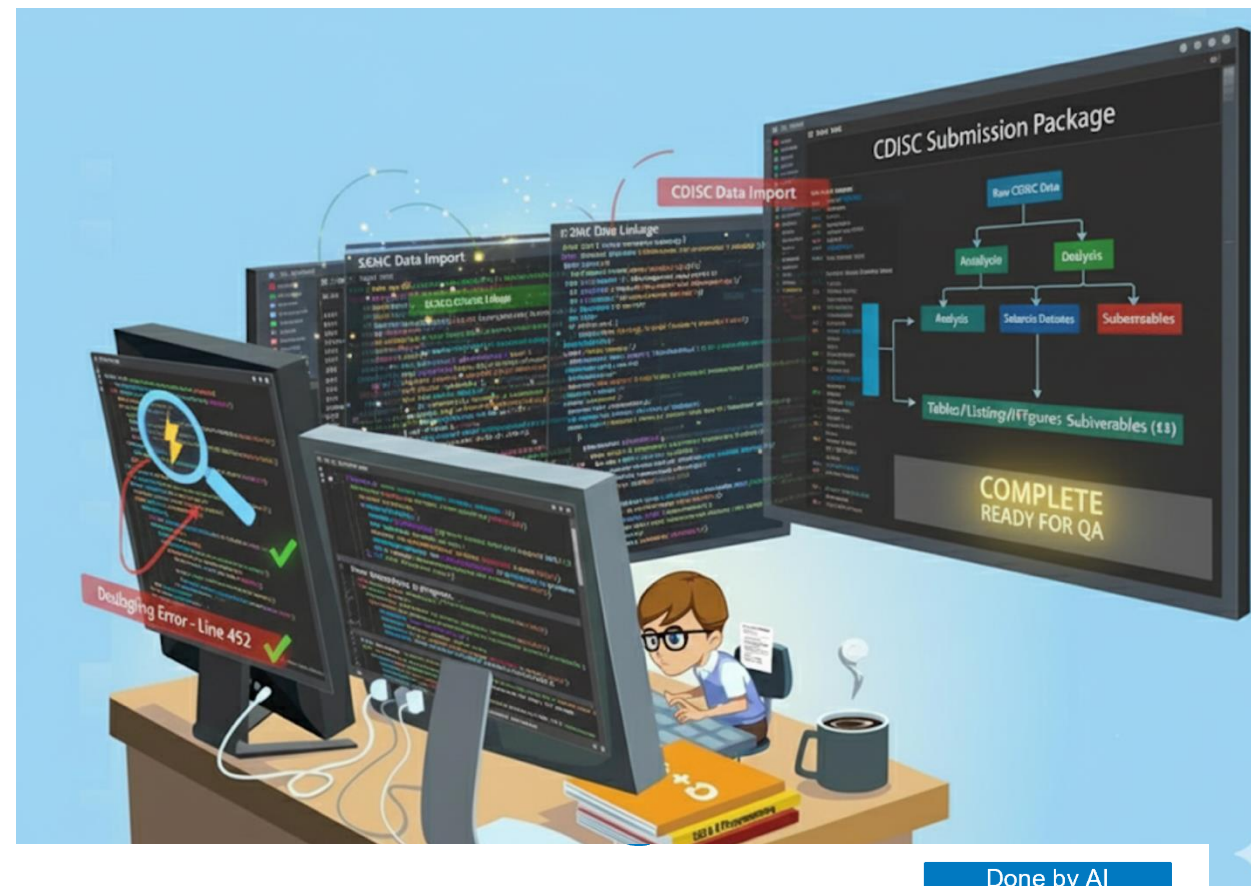


# AI Agentic workflow

**AI Agentic Workflow** is a workflow or process where an **AI agent** not only generates outputs (like code or text) but also **plans, executes, monitors, and adapts its actions** step by step to achieve a goal.

Ex. AI Agents will act like Junior Stat Programmer,

- Receive instruction
- Develop codes
- Execute codes
- Find the errors
- Debug codes
- Re-execute codes
- Do debugging and executing the codes until the codes are error-free or He or She can't resolve the errors.
- Then, deliver the final results.



Done by AI

Done by Human

Clinvia

Receive  
instruction

Develop  
code

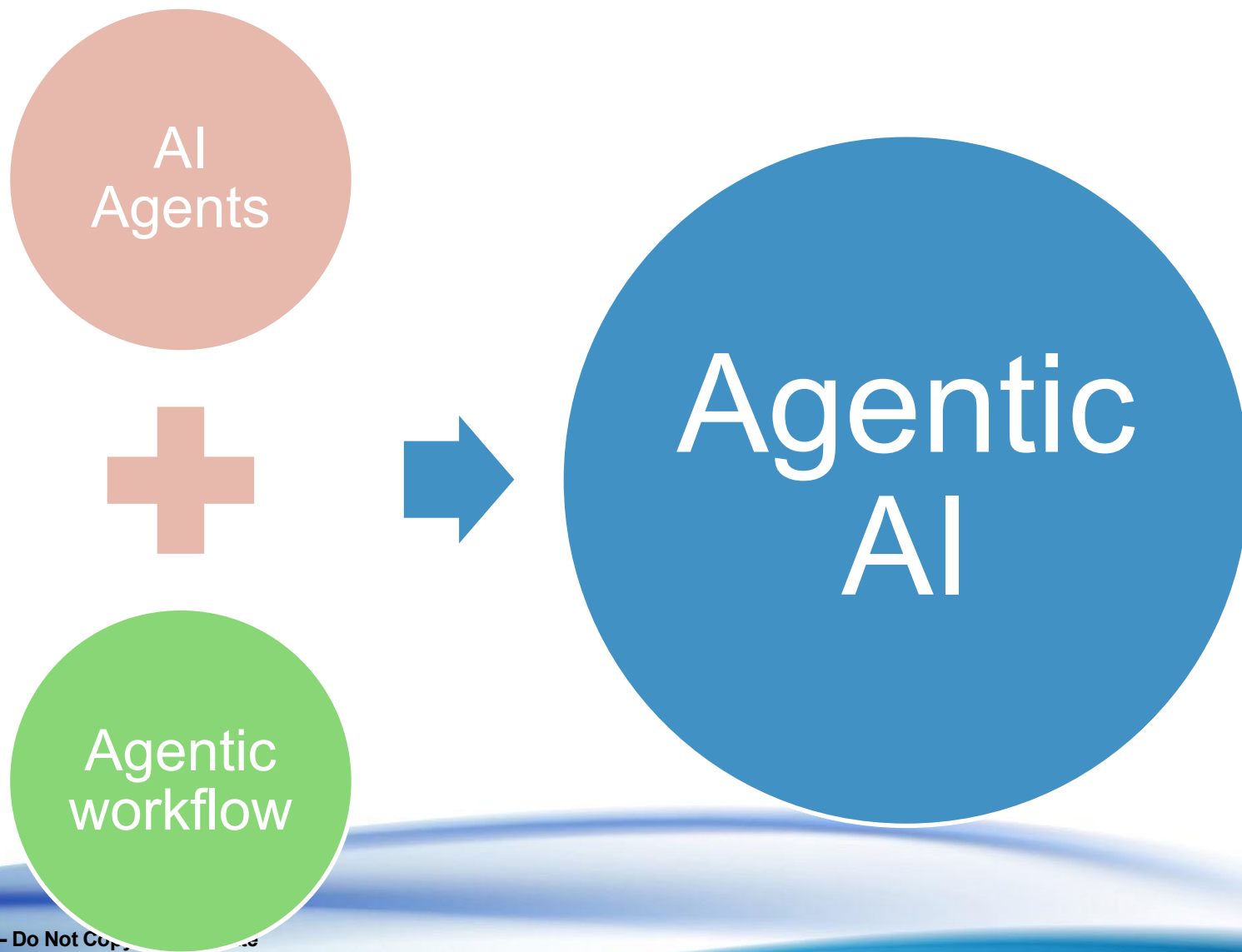
Execute  
code

Debug  
code

Create final  
output

# Agentic AI

**Agentic AI** refers to an **AI paradigm** in which **autonomous AI Agents** actively pursue goals and execute tasks through **Agentic workflows**.



# Biometrics Programming workflow using AI Agents



Question :

- What is the problem in this picture?

**ChatGPT or AI Agent is like a very smart, capable,  
recently graduated very smart intern/new hire.**



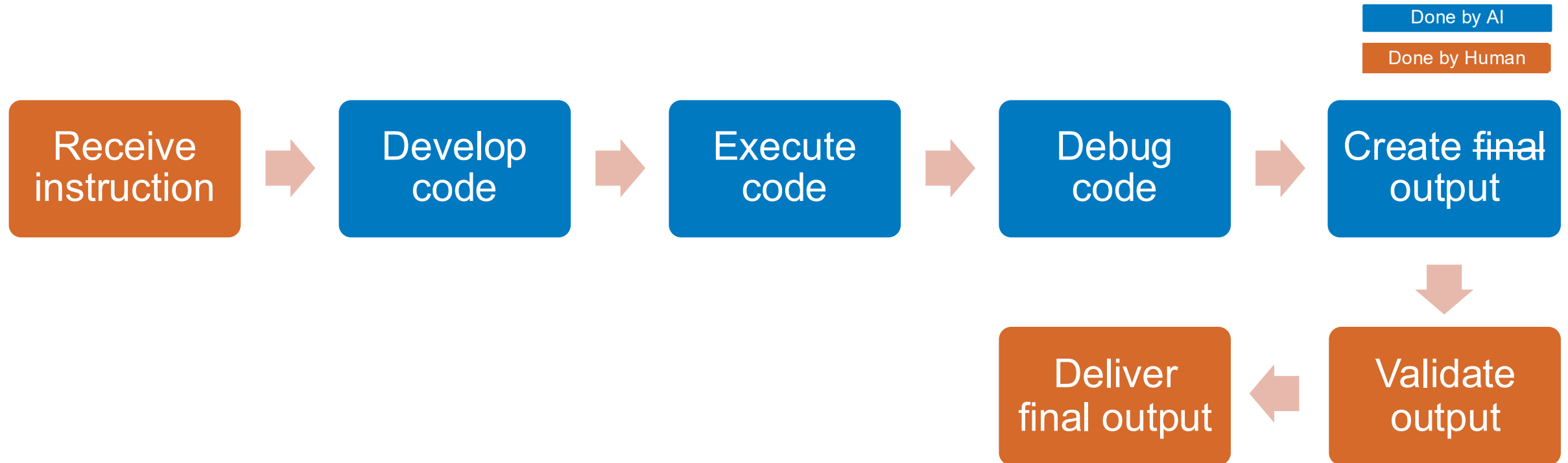
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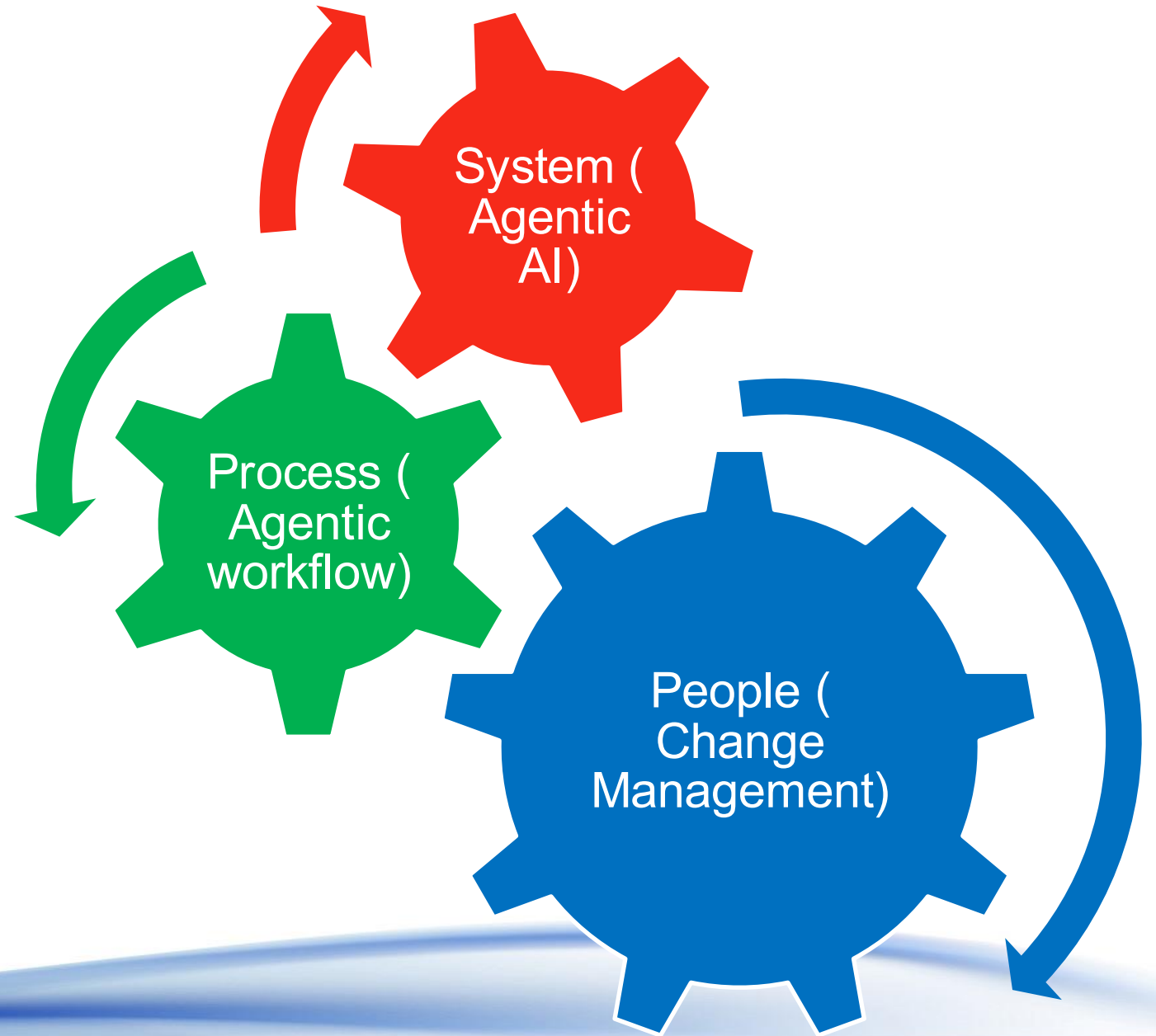
# What will we do with the results from an intern?



# Biometrics Programming workflow using AI Agents with human involvement – **Agentic AI workflow**

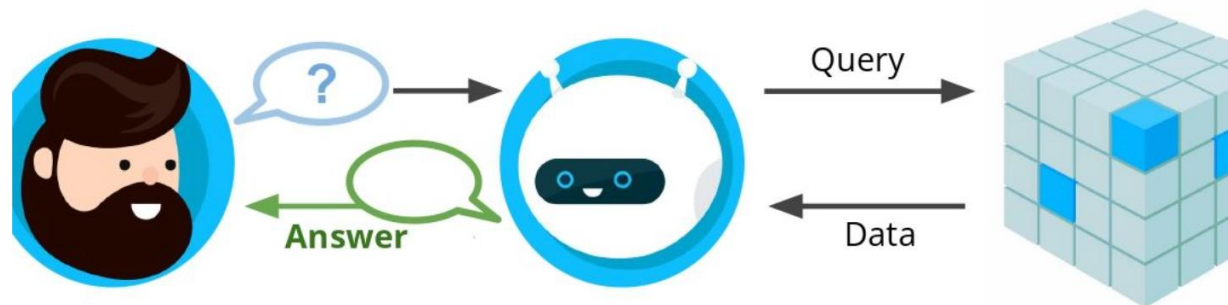
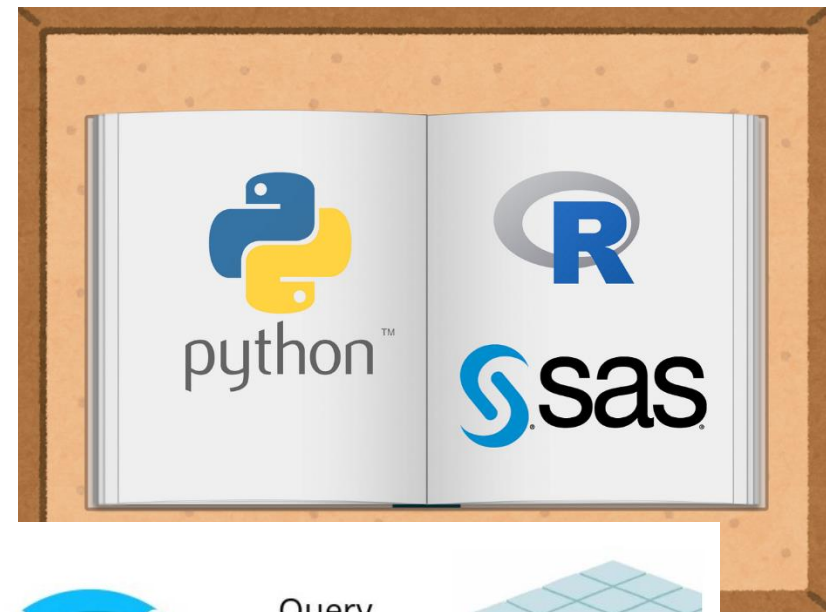


# How can we integrate Agentic AI into Biometrics?

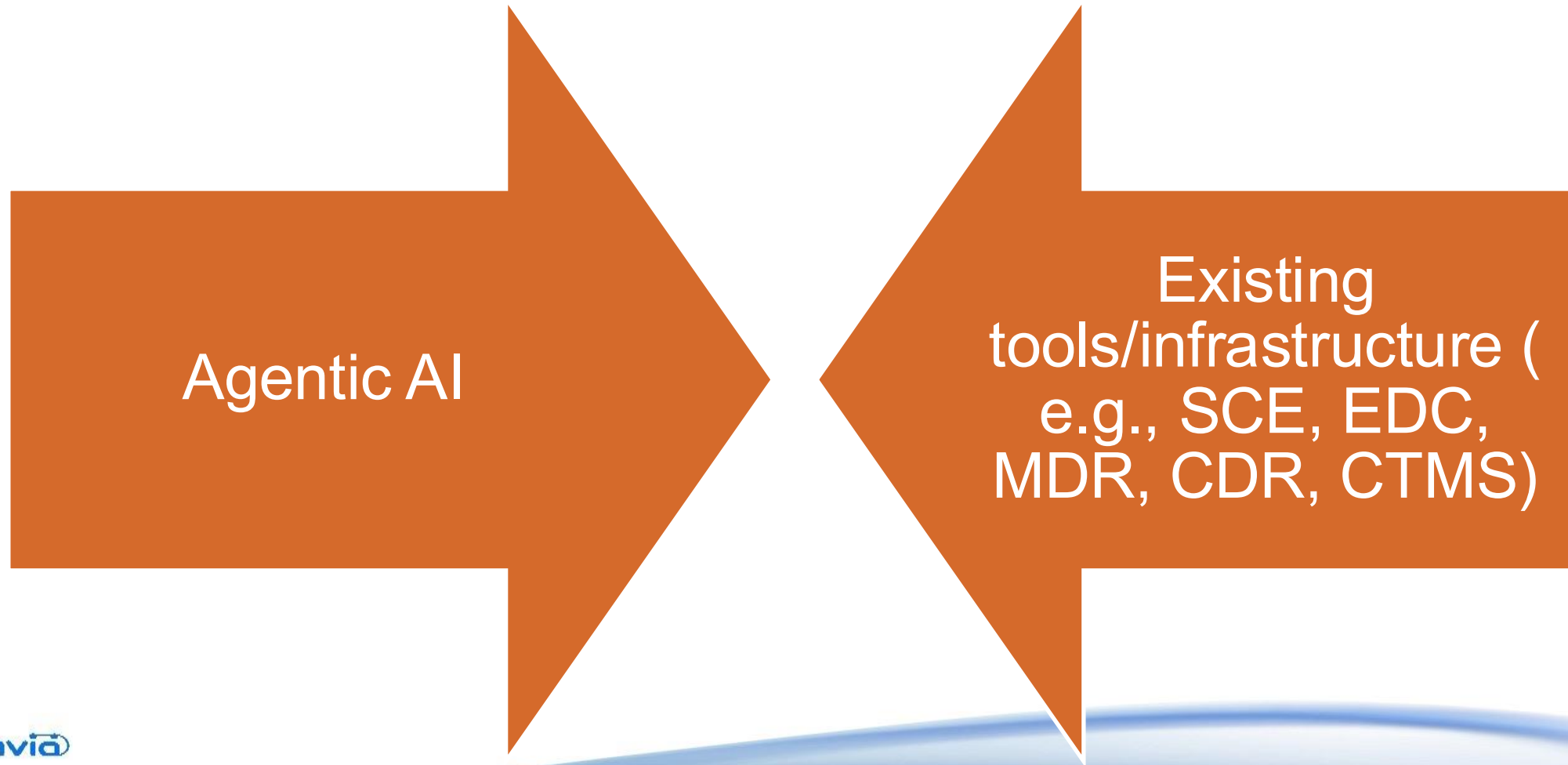


# Where could we use Agentic AI?

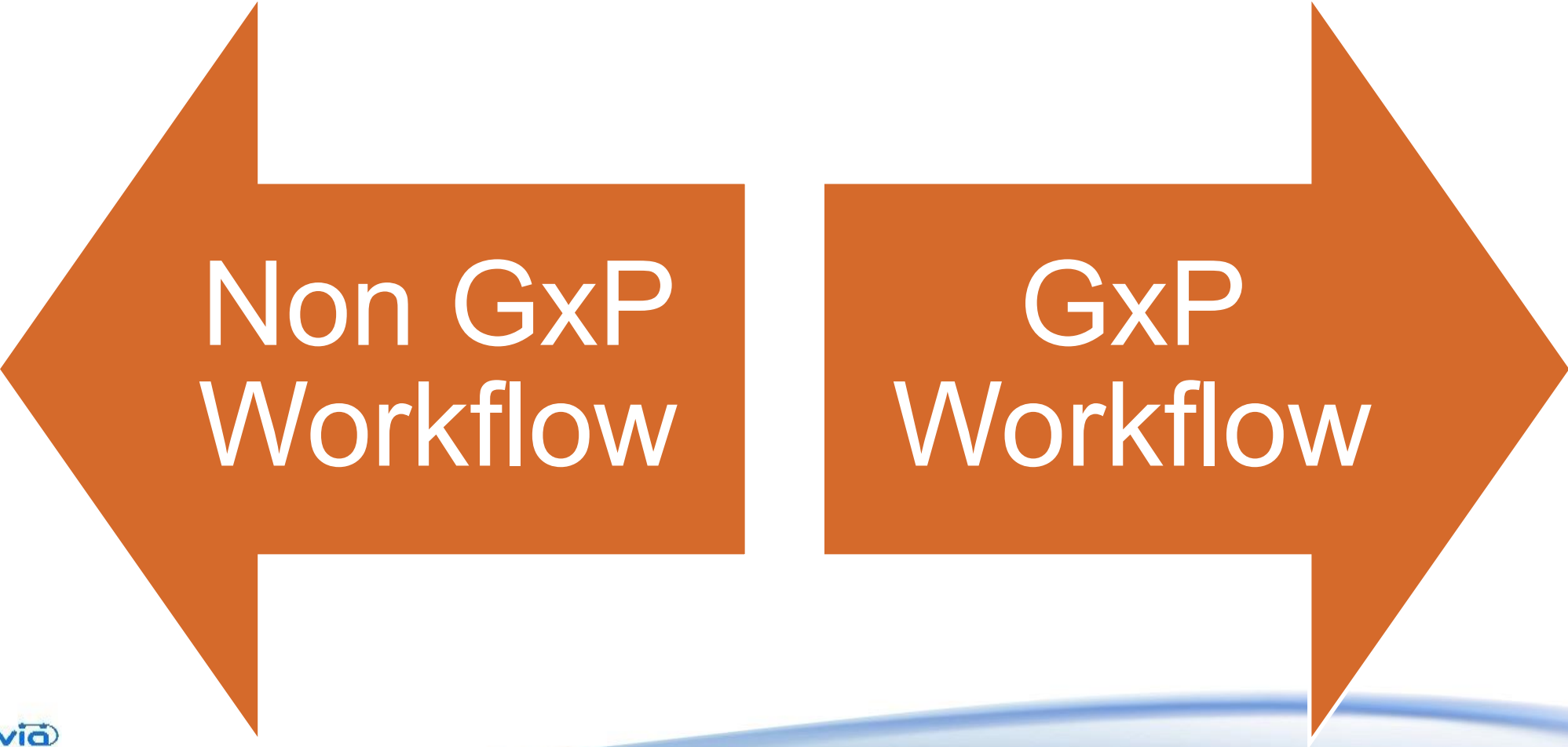
- Code Development ( SAS, R, Python ) for SDTM, ADaM, TFL
- Validation of the deliverables – SDTM, ADaM, TFL
- Generation of clinical trial artifacts – Protocol, SAP, Mock up Shell, Data Specification,,,
- Chatbot
  - Clinical trial study
  - Internal documents
- Project management
- Data Reconciliation
- Synthetic Data Generation
- And more



# Integration with existing infrastructure



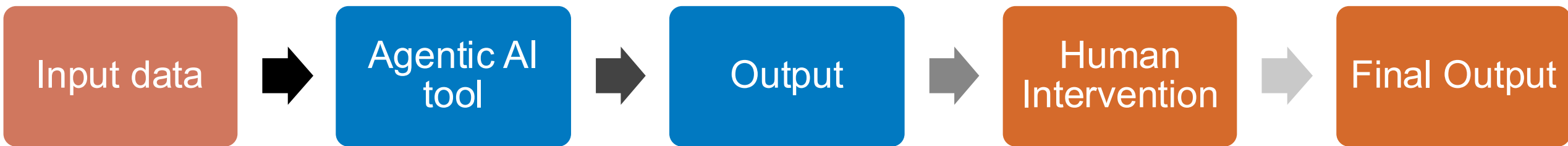
# Where Agentic AI could be used???



Non GxP  
Workflow

GxP  
Workflow

# Agentic AI outputs – mitigation / validation process



The output of Agentic AI is  
not the final result,  
but the beginning of new process.

# Validation framework

- **Regulatory Importance:** Agentic AI outputs must meet the **same quality standards** as traditionally produced results – traceability, reproducibility, accuracy, compliance.
- **Biometrics Leadership Role:** Must establish rigorous, **risk-based validation process/systems** tailored for Agentic implementation.
- **Framework Components:**
  - Risk-based validation planning
  - Verification of Agentic AI workflow output accuracy
  - Application of GxP / GAMP 5 principles
  - Comprehensive documentation (plans, protocols, test scripts, reports)
  - Data Security
  - Version control and audit trails
  - Package validation

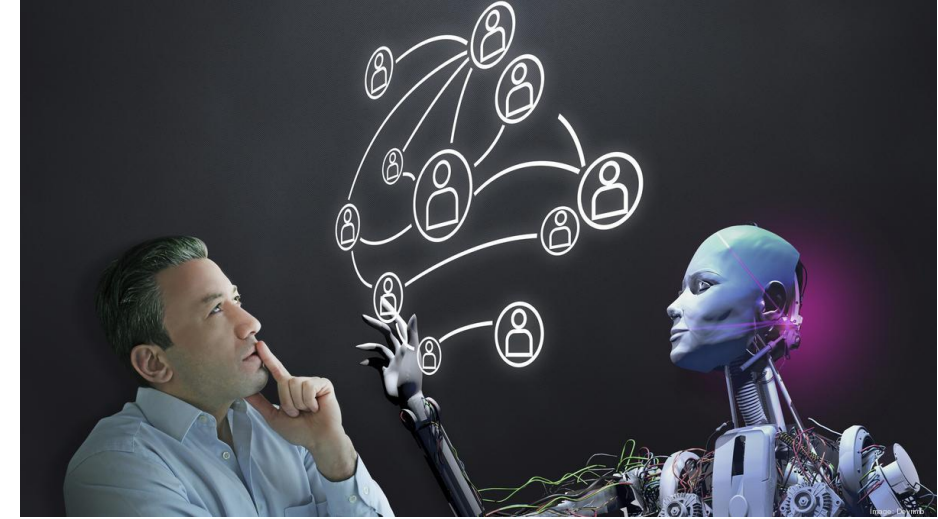


# Change Management – How we could lead this Agentic AI era

- Define Human vs AI Agents Collaboration Policy
- Capability Building
- Culture Transformation

# Human vs AI Agents Collaboration Policy

- Clear delineation
  - AI-driven activities
  - Human-driven activities
- AI roles
  - **Assistant**: e.g., generating initial code or report templates
  - **Autonomous Operator**: e.g., handling routine quality checks or standardized visualizations
- Human roles - **oversight** and **accountability**.



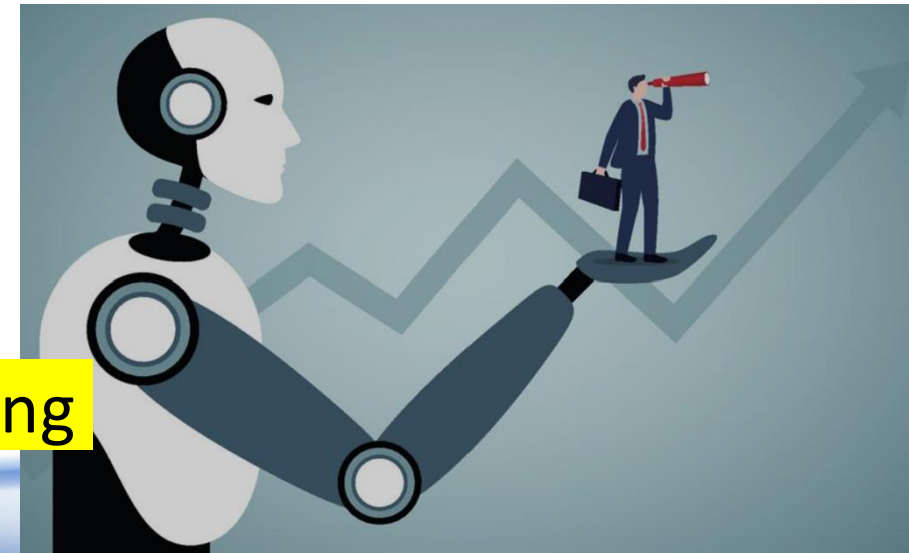
# Comprehensive Capability Building

- Assessment
  - Existing skill gaps
  - Targeted trainings
- Focus areas for capability building include:
  - Technical proficiency with Agentic AI tools
  - Prompt engineering skills
  - Validation skills for Agentic AI workflow outputs
- A systematic approach ensures department-wide readiness for Agentic AI workflow integration.



# Culture Transformation

- Foster psychological safety to encourage building AI agents and experimentation with Agentic AI.
- Promote a mindset of **responsible innovation**—where creativity thrives without compromising compliance.
- Expand **beyond submission** works.
- Goals : **To ensure continued commitment to regulatory compliance while embracing and leading Agentic AI integration.**



# ChatGPT Users vs Non-Users Comparison in Boston Consulting

- Results of ChatGPT Users
  - finished **12.2%** more tasks on average
  - completed tasks **25.1%** more quickly
  - produced **40%** higher quality results

**Reimagine with Agentic AI?????**

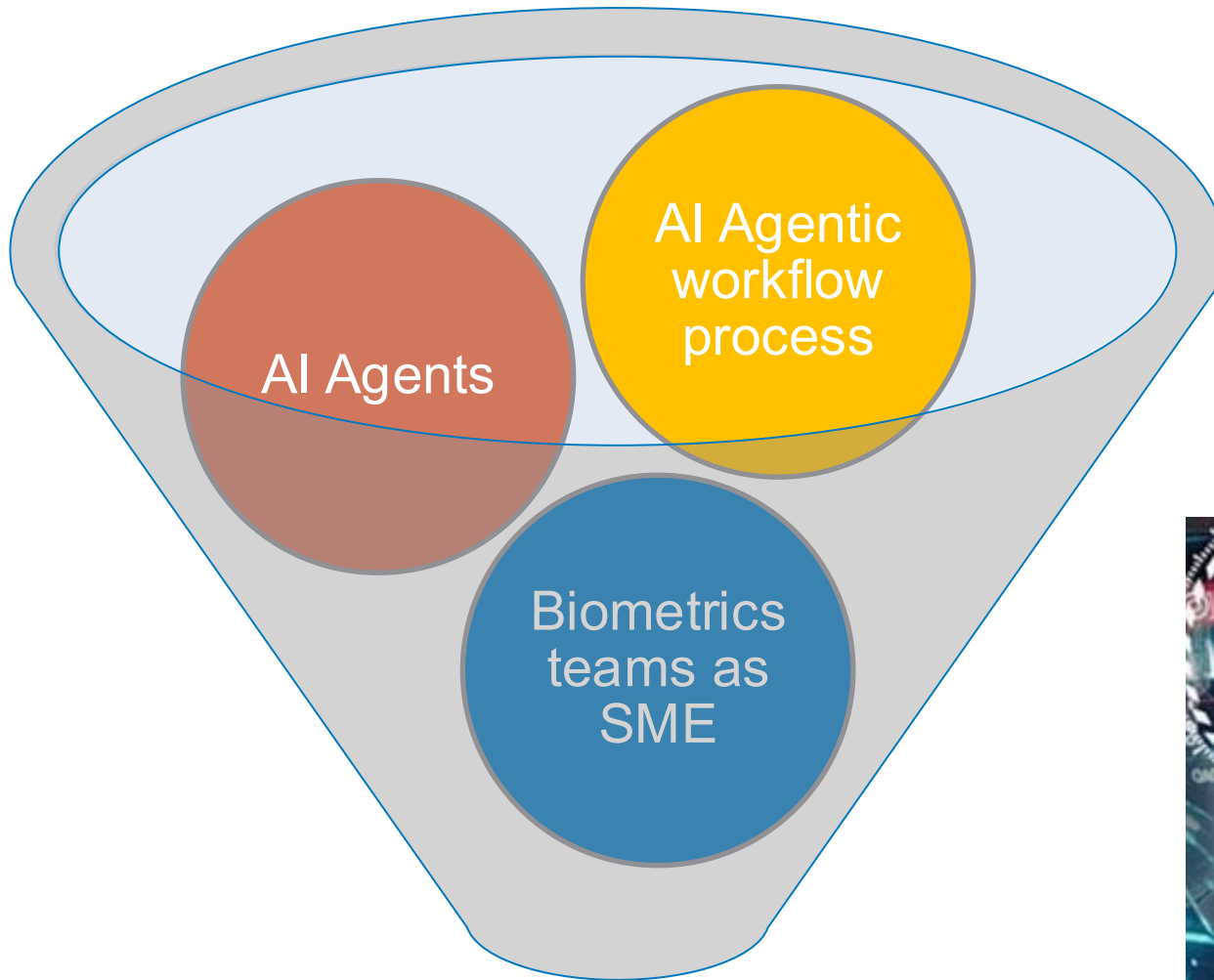


# Agentic AI integration – Vibe Coding impact

- Bain & Company : Average developer time savings: **10–15%** across all engineering tasks.
- Github & Stack Overflow : Efficiency boosts for targeted tasks (boilerplate, documentation, testing), **30–60% time savings**.
- Atlassian found that **99%** of developers reported time savings using AI tools, with **68%** estimating more than 10 hours saved per week.
- JPMorgan Chase measured up to **20% overall software engineering** efficiency gain with AI.
- Federal Reserve Bank of St. Louis : Higher reported savings for daily AI users, who save up to **33% more time per coding hour** by automating repetitive work.



# Elevating into “Super Biometric Team”



Agentic AI “Super Biometrics  
Team”



# ANY QUESTIONS



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