

AI-03970 PDSA vs TAOU Framework

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in AI Agent development, there is a concept of Thought-Action-Observe-Update, when I read about it, it seems like an adoption of the PDSA cycle (Plan-Do-Study-Act), tell more.

Explain, list the pillars, list 22 examples

What it means? Deep dive and provide the psychological pillars.

Describe how a person typically thinks, behaves, and makes decisions.

Provide 22 concrete examples demonstrating these traits in real-life situations.

Then create a 22-point guidelines from the discussion.

Use numerical bullet list when appropriate.

The **Thought-Action-Observe-Update** loop (often formalized in AI design as the **ReAct** or Reason-Act framework) is indeed a direct technological mirror of the **PDSA (Plan-Do-Study-Act)** cycle. It is also deeply connected to the **OODA (Observe-Orient-Decide-Act)** loop used in military strategy and aviation.

At its core, this loop represents how intelligent entities—whether a software agent or a human being—navigate uncertainty, learn from feedback, and correct their course in real time.

1. What It Means: The Psychological Pillars

When an AI agent cycles through Thought, Action, Observation, and Updating, it is executing an automated version of human metacognition (thinking about thinking). Humans do not operate on static scripts; we are dynamic, goal-driven error-correction engines.

Psychologically, this cognitive cycle is built on four core pillars:

1. **Metacognition and Working Memory (Thought / Plan):** This involves the brain's executive function (primarily the prefrontal cortex). Before acting, an individual simulates outcomes, recalls relevant knowledge from long-term memory, holds constraints in working memory, and formulates a hypothesis: *"If I do X, then Y should happen."*
2. **Agency and Volition (Action / Do):** The transition from internal deliberation to external execution. This requires intentionality. The agent interacts with the environment, shifting from abstract potential to concrete impact.
3. **Perception and Feedback Processing (Observe / Study):** Humans do not just see; they observe against expectations. Using sensory inputs and cognitive filters, we measure the gap between our *predicted* outcome and the *actual* result. This is heavily tied to the brain's dopamine reward system, which fires when a result deviates from expectations (prediction error).
4. **Cognitive Flexibility and Neuroplasticity (Update / Act):** The capacity to abandon a failed mental model and assimilate new data. Instead of repeating an ineffective behavior, the individual updates their internal state, beliefs, or rules of engagement before starting the next loop.

2. How a Person Thinks, Behaves, and Makes Decisions

Human decision-making is characterized by a constant tension between speed and accuracy. According to dual-process theory, we use two cognitive systems:

- **System 1 (Intuitive/Fast):** Runs on heuristics (mental shortcuts), past patterns, and minimal cognitive load. It skips deep "Thought" and goes straight from an environmental trigger to an automated "Action."
- **System 2 (Deliberative/Slow):** Engaging System 2 triggers the full Thought-Action-Observe-Update cycle. We use it when the stakes are high, the environment changes, or System 1 encounters an error.

When making decisions, humans are naturally **Bayesian updaters**. We start with a prior belief (Thought), test it against reality (Action), look at the feedback (Observe), and adjust the probability of our belief being correct (Update).

However, unlike machines, human execution of this loop is often compromised by

cognitive biases—like confirmation bias (only observing what fits the thought) or sunk cost fallacy (refusing to update despite negative observations).

3. 22 Concrete Examples of the Loop in Real Life

Here is how this exact loop manifests across diverse, real-world human scenarios:

1. **Adjusting Coffee Extraction:** A barista tastes an espresso and finds it sour (**Observe**). They reason it under-extracted (**Thought**), grind the beans finer for the next shot (**Action**), and taste it again to check the balance (**Update/Observe**).
2. **Navigating a Bike on Gravel:** A cyclist feels the rear tire fish-tailing on loose stone (**Observe**). They realize their weight is too far forward (**Thought**), shift their hips back over the saddle (**Action**), and feel the traction stabilize (**Update/Observe**).
3. **Server Administration Troubleshooting:** A sysadmin deploys a Docker container, but the webpage returns a 502 Bad Gateway (**Observe**). They suspect a port mismatch in the reverse proxy configuration (**Thought**), update the Nginx config file (**Action**), and refresh the browser to verify traffic flows (**Update/Observe**).
4. **Medical Diagnosis:** A physician notes a patient's persistent cough isn't responding to amoxicillin (**Observe**). They deduce the pathogen might be atypical or viral (**Thought**), switch the prescription to azithromycin (**Action**), and monitor the patient's clear lungs a week later (**Update/Observe**).
5. **Aviation Emergency Management:** A pilot notices an unexpected drop in oil pressure (**Observe**). They run through emergency checklists to isolate the engine (**Thought**), reduce throttle on the affected engine (**Action**), and watch the pressure gauges stabilize while adjusting their flight path (**Update/Observe**).
6. **Carpentry and Woodworking:** A woodworker glues up a tabletop and notices a tiny gap along the center seam (**Observe**). They realize the bar clamps are applying uneven pressure (**Thought**), add an extra clamp to the underside to balance the torque (**Action**), and verify the seam is perfectly flush (**Update/Observe**).

7. **Public Speaking Adaptations:** A presenter notices the audience looking at their phones during a dense slide (**Observe**). They realize they are losing engagement (**Thought**), skip the next three bullet points to tell a brief, high-energy story instead (**Action**), and watch the audience look back up (**Update/Observe**).
8. **Automotive Repair:** A mechanic hears a localized clunking noise over bumps after installing new struts (**Observe**). They suspect the sway bar end link wasn't fully torqued (**Thought**), put the truck back on the lift to tighten the nut (**Action**), and take it for a test drive to confirm quiet operation (**Update/Observe**).
9. **Parenting Coordination:** A parent sees their child growing frustrated and throwing toys while trying to build a block tower (**Observe**). They realize the structural base is too narrow for the height (**Thought**), sit down to show them how to widen the foundation (**Action**), and watch the child successfully build higher without tears (**Update/Observe**).
10. **Financial Portfolio Rebalancing:** An investor looks at their quarterly statements and notes that technology ETFs have surged, leaving them over-allocated to one sector (**Observe**). They realize their risk profile is now dangerously unbalanced (**Thought**), sell off a portion of the tech funds to purchase broader index funds (**Action**), and log the new asset allocation baseline (**Update/Observe**).
11. **Home Renovation (Painting):** A DIYer steps back and sees the first coat of paint looks streaky and thin (**Observe**). They realize they rolled it out too dry without loading enough paint on the nap (**Thought**), change their technique to load more paint and use overlapping 'W' strokes (**Action**), and check the second coat for a seamless finish (**Update/Observe**).
12. **Military Tactical Planning:** A squad leader takes unexpected small arms fire from a ridgeline (**Observe**). They determine their current position offers poor cover (**Thought**), order the squad to deploy smoke and move 20 meters left behind a boulder (**Action**), and reassess the battlefield from a secure firing position (**Update/Observe**).
13. **Plumbing Fixes:** A homeowner clears a sink drain but notices water still pools slowly at the bottom (**Observe**). They realize the blockage is further down the

P-trap line than expected (**Thought**), feed a plumbing snake deeper into the pipe to clear the secondary clog (**Action**), and run the tap on full blast to watch it drain perfectly (**Update/Observe**).

14. **Amateur Radio Communication:** A ham radio operator tries to check into a net using FT8 digital mode but receives no signal reports (**Observe**). They realize the atmospheric conditions on the 20-meter band have degraded (**Thought**), shift down to the 40-meter band and adjust their power output (**Action**), and successfully log a contact (**Update/Observe**).
15. **Audio Engineering and Equalization:** A sound technician hears a muddy, boomy resonance in the acoustic guitar track (**Observe**). They identify a buildup around 250 Hz (**Thought**), apply a narrow parametric EQ cut at that specific frequency (**Action**), and listen to ensure the guitar sits cleanly in the mix (**Update/Observe**).
16. **Long-Distance Swimming:** A swimmer notices their shoulders feel prematurely exhausted at the 1-mile mark of a long swim (**Observe**). They deduce they are dropping their elbows during the catch phase, causing drag (**Thought**), consciously focus on a high-elbow catch to engage the lats (**Action**), and feel their stroke glide more smoothly with less joint strain (**Update/Observe**).
17. **Strategic Negotiation:** A corporate buyer sees the vendor turn defensive when a lower price point is proposed (**Observe**). They realize pushing further on price will stall the deal entirely (**Thought**), pivot the conversation toward adjusting payment terms and warranty lengths instead (**Action**), and watch the vendor relax and resume negotiating (**Update/Observe**).
18. **Personal Packing (Essentialism):** A traveler packs a carry-on bag but finds it won't zip shut without forcing it (**Observe**). They recognize they are carrying redundant items that violate their high-mobility framework (**Thought**), remove two pairs of shoes and an extra jacket (**Action**), and verify the zipper slides effortlessly (**Update/Observe**).
19. **Software Development/Coding:** A developer runs an algorithm and notices the execution time spikes exponentially with larger datasets (**Observe**). They realize they accidentally nested two loops, creating an $O(n^2)$ time complexity (**Thought**), rewrite the logic to use a hash map for $O(n)$ lookups

(**Action**), and rerun the benchmark script to confirm it executes in milliseconds (**Update/Observe**).

20. **Dietary Adjustments:** An individual tracks their energy levels and notes a severe afternoon crash every day at 3:00 PM (**Observe**). They realize their high-carbohydrate lunches are causing a rapid blood sugar spike and subsequent drop (**Thought**), swap their lunch pasta for a high-protein salad with avocado (**Action**), and notice sustained mental clarity throughout the afternoon (**Update/Observe**).
21. **Teaching and Pedagogy:** An instructor notices blank stares from students during a derivation of an electrical circuit formula (**Observe**). They realize the abstract math lacks a practical anchor (**Thought**), stop writing on the board and pull out a physical breadboard and resistor to show a real-world example (**Action**), and watch the students nod in understanding (**Update/Observe**).
22. **Sudoku Puzzle Strategy:** A puzzle solver gets stuck on a hard grid, noticing they cannot find a placement using simple elimination (**Observe**). They realize they need a more advanced framework like an "X-Wing" pattern (**Thought**), scan the rows and columns specifically for matching pencil-mark pairs (**Action**), eliminate candidates in intersecting boxes, and unlock the next sequence of moves (**Update/Observe**).

4. 22-Point Guidelines for Implementing the Loop

To apply this execution framework systemically to your life, workflows, or technical architectures, follow these 22 core principles:

1. **Avoid Zero-Thought Actions:** Never act purely out of habit or impulse when navigating complex situations; always establish a clear mental hypothesis first.
2. **Commit Wholeheartedly to the Action:** Once a path is chosen based on your thought process, execute it cleanly so your feedback loop isn't muddled by half-hearted attempts.
3. **Protect Your Observation Windows:** Allocate quiet, uninterrupted cognitive space to strictly look at the results of your actions without premature rationalization.

4. **Be a Strict Bayesian Updater:** Treat new data as a neutral metric. If reality contradicts your prior belief, drop the old belief immediately.
5. **Decouple Identity from Mental Models:** Do not look at a failed action as personal failure; view it simply as an incorrect code branch that needs an update.
6. **Beware of Confirmation Bias:** Actively search for observations that *disprove* your initial thought rather than only looking for clues that support it.
7. **Keep Your Working Memory Minimal:** Break large, overwhelming problems down into single Thought-Action-Observe loops to prevent cognitive overload.
8. **Document Your Baseline Prior to Action:** Write down or clearly articulate what you expect to happen before you execute, preventing hindsight bias later.
9. **Isolate Your Variables:** When taking an action to fix a problem, change only one parameter at a time. If you alter three things at once, you will never know which one worked.
10. **Shorten the Feedback Loop Length:** Design your environment so that the time between taking an action and observing the result is as short as possible.
11. **Engage System 2 Deliberately:** When the environment becomes chaotic, high-stakes, or unfamiliar, consciously slow down your breathing to shift from System 1 reaction to System 2 reflection.
12. **Audit Your Prediction Errors:** Pay closest attention when your observation is drastically different from your thought. That delta is where genuine learning happens.
13. **Don't Over-Correct on Noise:** Distinguish between a fundamental flaw in your mental model and baseline environmental noise. Do not change your strategy based on a single anomaly.
14. **Combat the Sunk Cost Fallacy:** If ongoing observations reveal that an action path is consistently failing, cut your losses and update your direction instantly.
15. **Establish Clean Feedback Loops in Tools:** When building servers, coding, or managing systems, ensure logs and monitoring tools are clear and accessible

so observations are immediate.

16. **Build an Essentialist Information Filter:** Filter out low-signal, high-noise data. Too much information paralyzes the Thought phase and clouds the Observation phase.
17. **Adopt a 'Live and Leave No Trace' Approach to Iteration:** Clean up temporary fixes, loose scripts, and messy intermediate steps once a loop is complete so the next loop starts clean.
18. **Scaffold Your Thinking with Frameworks:** Use proven mental models to structure the Thought phase so you do not waste energy reinventing cognitive wheels.
19. **Run Routine Calibration Checks:** Periodically check your physical tools, code repositories, or personal health metrics to ensure your observation mechanisms remain accurate.
20. **Welcome Divergent Observations:** Surround yourself with distinct perspectives or rigorous testing tools that actively challenge your operating assumptions.
21. **Automate the Monotonous Loops:** For low-leverage, predictable tasks, build automated systems (or script-driven agent workflows) so your human executive function is reserved for novel problems.
22. **Rest to Recharge the Meta-Engine:** Cognitive flexibility requires a fresh prefrontal cortex. Never attempt high-stakes loops when deeply fatigued; sleep resets your capacity to think, observe, and adapt.