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The Six Gestalts: Reframing Hard and Soft Skills into Systemic Roles for Professional Growth

Las Seis Gestalts: reformulando las habilidades duras y blandas como roles sistémicos para el desarrollo profesional

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Abstract

Traditional models of hard and soft skills provide valuable foundations for professional development but often reinforce siloed views of competence. This paper proposes the Six Gestalts as a systemic framework that reframes skills into cognitive roles for fostering professional growth in engineers and knowledge workers. At the heart of this framework lies the Problem-Solver gestalt—a preventive and adaptive reasoning role that functions as the dorsal spine of professional maturity, enabling individuals to convert needs into solutions and contribute to the state of the art in their fields. Plugged into this backbone are five complementary gestalts—the Maverick, Specialist, Architect, Shark, and Connector—each blending hard and soft skills into roles that enable effective collaboration. These gestalts operate at multiple levels: as roles within research teams, as roles embedded in organizational processes, and as roles in cross-functional problem-solving groups. Grounded in decades of industrial mentoring and educational practice, the framework shifts the focus from individual skill silos to systemic role integration, helping professionals evolve from technical contributors or department heads into process owners and adaptive team members. By orienting professional development around role-based problem-solving, the Six Gestalts provide a conceptual compass for preparing individuals and organizations to thrive in complex, evolving work systems.

Keywords: Education, hard and soft skills, holistic learning, critical thinking, problem-solving.

Resumen

Este artículo propone las Seis Gestalts como marco sistémico que reformula las habilidades duras y blandas en roles cognitivos para crecimiento profesional. En el núcleo está el Problem-Solver, razonamiento preventivo-adaptativo que actúa como columna dorsal y convierte necesidades en soluciones. Lo complementan Maverick, Specialist, Architect, Shark y Connector, que integran lo duro y lo blando para colaborar eficazmente. El marco opera a varios niveles (equipos, procesos y grupos interfuncionales) y, basado en décadas de mentoría y docencia, desplaza el foco de los silos de habilidades hacia la integración de roles, preparando a personas y organizaciones para sistemas complejos y cambiantes.

Palabras clave: Educación, habilidades duras y blandas, aprendizaje holístico, pensamiento crítico, resolución de problemas.

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1. Introduction

The accelerating complexity of modern engineering and knowledge-intensive work demands professionals who are not only technically proficient but also adaptable, interdisciplinary, and capable of navigating ambiguous and dynamic environments. Despite this reality, many educational systems and training programs continue to prioritize deep technical knowledge over readiness for real-world challenges, leaving graduates underprepared for the globalised complex systems they will face in practice (Ming et al., 2024).

Traditional STEM curricula often emphasize programming, theory, and discipline-specific expertise but fall short in fostering the holistic maturity required to design, implement, and sustain effective solutions in real organizational contexts (Paleyes et al., 2022), leaving students unable to address real-world challenges (Webster and Turner, 2024). This issue extends beyond education. Scientific research is often conducted from an in vitro perspective, applying various techniques in the same controlled and limited environments (Brodley et al., 2012), which restricts its applicability to real-world scenarios. This gap is further exacerbated in workplace learning scenarios, where firms struggle to develop and retain talent capable of bridging technical skills with problem-solving agility, collaborative intelligence, and results-oriented mindsets (Jonassen, 2014; Webster and Turner, 2024).

A common countermeasure to this gap has been the attempt to complement technical preparation with additional emphasis on so-called *soft skills*. The rationale is that combining domain-specific expertise with interpersonal and communication abilities should better equip professionals for real-world challenges. This perspective has gained significant traction across both education and labor economics. For instance, job market analyses show a rising demand for soft skills in tandem with technical qualifications (Lyu and Liu, 2021). Similarly, Heckman and Kautz (2012) present evidence that soft skills are critical predictors of labor market outcomes, while Schulz (2008) highlights their importance for education beyond academic knowledge.

While this hard–soft skill dichotomy has proven useful, it continues to frame competence in parallel silos rather than as an integrated system. The result is a layering of soft skills *on top of* technical expertise, rather than a reframing of how professionals act within organizational and research contexts.

Thus, while adding soft skills to hard skills undoubtedly enhances individual competences, it still fails to break professionals out of the silo syndrome. Our Six Gestalts framework draws inspiration from the *Pipes and Puddles* model (Gual et al., 2024), which originally addressed organizational maturity. Here, we adapt its insights to the individual level, conceptualizing professional maturity as a balance of *pipes*—the dynamic flows of competencies and mindset—and *puddles*—the reservoirs of knowledge and experience.

By framing maturity as a holistic integration of cognitive roles, the Six Gestalts framework offers a conceptual compass for redesigning STEM education and workplace learning environments, in line with studies that emphasize the need for structured frameworks to support trainers themselves (Ahuett-Garza et al., 2022). It moves beyond incremental curriculum tweaks to promote a deliberate shift in how educators, firms, and mentors nurture professionals capable of tackling the complex, interdisciplinary challenges of today and tomorrow.

The remainder of this paper is organized as follows. **Section 2** reviews current literature on STEM education and competency development, identifying gaps in both pedagogical approaches and maturity frameworks. **Section 3** presents the Six Gestalts framework in detail, describing the six dimensions in isolation and their interdependence. **Section 4** reframes hard and soft skills as Six Gestalts—shifting from duty-doing to preventive problem solving, specifying learning arenas and pedagogical pillars, and illustrating integration through two scenarios. **Section 5** concludes with operational implications and notes limitations alongside directions for empirical validation and future research.

2. Literature Review

Decades of industrial mentoring, supervision of student projects, and onboarding of junior professionals reveal consistent limitations in the traditional separation of technical and interpersonal competencies. By treating hard and soft skills as separate layers, educational and organizational programs often reinforce siloed categories of competence. As a result, professionals may acquire technical expertise and interpersonal abilities, yet still struggle to integrate them into systemic roles that navigate ambiguity, align stakeholders, and deliver results within complex organizations. Pantoja Yépez et al. (2024) highlight the increasing demand for frameworks that move beyond fragmented competencies toward global, integrative learning designs to navigate this complexity. This perspective motivates the exploration of approaches that emphasize holistic, process-centric, and context-aware professional training.

In terms of pedagogical methods, recent studies emphasize active, collaborative, and project-based learning approaches across STEM disciplines. Frameworks for designing project-based learning experiences support deeper integration of theory and practice, helping learners connect abstract knowledge with concrete problem-solving (Luburić et al., 2025). Pair programming has shown particular promise in early-stage programming education, fostering peer learning, reflection, and collaborative skill development (Zakaria et al., 2022). Team-based learning is also gaining traction in various educational programs, demonstrating improvements in engagement, accountability, and the development of meta-cognitive skills (Peng et al., 2025; Bikanga Ada and Foster, 2023). Recent literature also documents applications of flipped teaching aimed at enhancing students' learning experience (Cardós et al., 2024). Collectively, these methods move beyond rote learning toward cultivating adaptive, engaged learners, yet they often emphasize how knowledge is transmitted rather than what knowledge and cognitive capabilities are essential for real-world STEM practice.

On the competency side, foundational skills such as computational thinking, problem-solving, and logical reasoning have received growing attention (Qamar et al., 2019; Tan et al., 2024; Zhou et al., 2024). Studies in computational thinking emphasize abstraction, systemic reasoning, and the ability to model complex problems as critical dimensions for learner development (Arastoopour Irgens et al., 2020). Other frameworks integrate technical skills with agile practices and organizational values to support sustainable professional growth (Kropp and Meier, 2014). Despite these advances, many models remain fragmented, focusing on either discrete technical skills (To et al., 2025) or interpersonal competencies, without providing an integrated framework that addresses the multifaceted maturity required for STEM professionals operating in dynamic and interdisciplinary contexts (Pantoja Yépez et al., 2024). Recent efforts signal a shift toward integrative approaches: Ming et al. (2024) employ a Q-sort methodology to emphasize interdisciplinarity and challenge the "cave" of narrow specialization, while Özkan et al. (2024) advance systems thinking development through a data-driven framework. Ravi and Besharat (2025) partially bridge this gap by proposing evaluation mechanisms that intentionally look beyond technical mastery, using survey data and mind maps, yet they also highlight the benefits of situating such assessments within a structured, holistic framework.

Recent empirical evidence suggests that simply emphasizing "soft" skills may not reliably enhance organizational outcomes. Lyu and Liu (2021) analyze job postings and find that the increasing demand for soft skills in hiring does not necessarily contribute to firm performance and may even be detrimental. This observation highlights a key limitation of conventional competency frameworks that treat technical ("hard") and interpersonal ("soft") skills as separate, additive layers. In practice, isolated acquisition of soft skills without integration into systemic problem-solving and organizational context may fail to produce the intended performance improvements.

There remains a clear gap for conceptual frameworks that explicitly support the development of professional maturity encompassing technical expertise, systemic design thinking, adaptability, stakeholder alignment, and results orientation across both educational and workplace learning environments. The present work proposes the Six Gestalts framework to address this need, providing educators and organizations with a structured guide for cultivating the comprehensive competencies essential for success in contemporary STEM fields. By synthesizing pedagogical approaches, competency requirements, and systemic integration, this framework aims to move beyond fragmented learning designs toward holistic, real-world readiness.

3. Proposed Conceptual Framework

3.1. The Six Gestalts. Overall picture

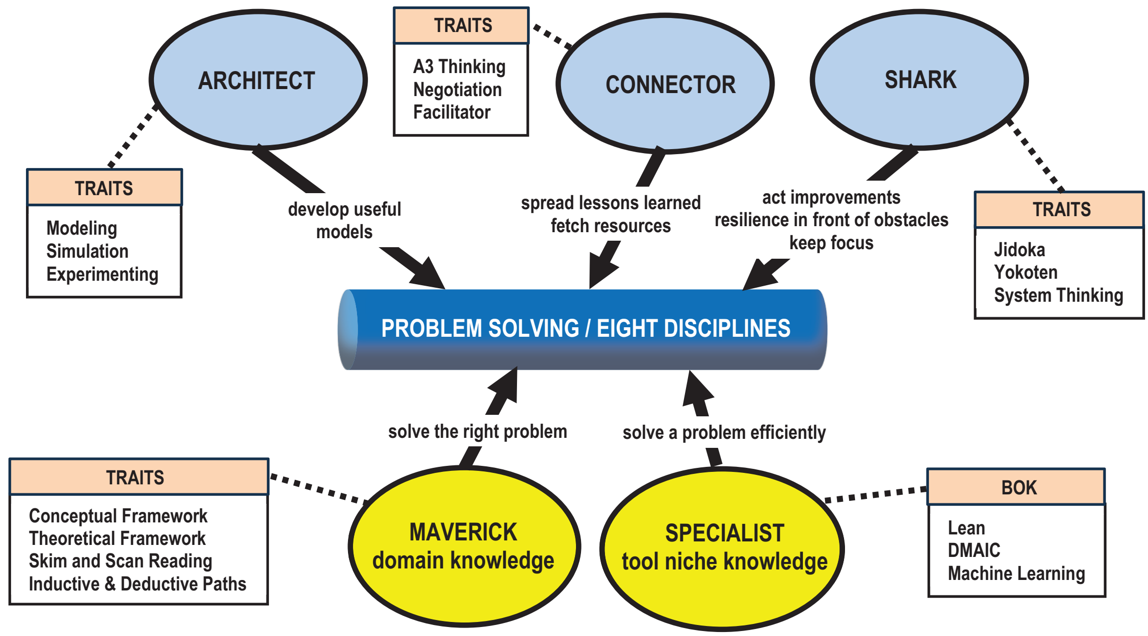
The Six Gestalts framework emerged from years of mentoring, observation, and iterative training, and offers a conceptual model for supporting the development of professional maturity among AI architects, engineers, and other knowledge workers operating in complex environments. The model is both normative and descriptive: it distils patterns observed in field practice while providing an actionable guide to structure learning environments and competency development pathways.

The framework comprises six interdependent roles—Specialist, Architect, Problem Solver, Connector, Shark, and Maverick—which together form a developmental compass for moving from fragmented skills to cohesive, outcome-driven practice (Figure 1). Two Gestalts, the Maverick and Specialist, are domain-specific: they focus on deep, domain-specific expertise and precise technical or contextual knowledge. The remaining four, Connector, Problem Solver, Architect, and Shark, are transversal: they adopt a holistic stance, integrating stakeholders, processes, and feedback loops across organizational and project boundaries. Crucially, the framework does not position holism against reductionism. Both logics are required and mutually reinforcing; professional maturity emerges from their deliberate coupling.

Prior studies support this integrative perspective. For example, Peng et al. (2025) show that teams composed of members with identical skills and personalities underperform compared to teams with complementary profiles. Our framework extends this principle from the team level to the individual level, arguing that professional maturity requires the integration of complementary dimensions within a single engineer.

These Gestalts are not checkboxes or personality types, but complementary modes of action. Professionals can—and must—move fluidly among them as the situation demands. Like the Pipes & Puddles framework (Gual et al., 2024), our model adopts a requirements engineering-based approach to transform needs into effective solutions. Originally devised for organizational maturity, the framework

Figure 1. Proposed conceptual framework.



was reframed here to capture individual professional growth as a balance between dynamic competency flows and accumulated expertise. Both frameworks aim to provide a clear, structured roadmap that guides stakeholders from problem identification to the design of efficient, adaptable solutions. In this context, the Six Gestalts serve as foundational pillars that identify and address the core competencies engineers must develop to move beyond improvisation and trial-and-error approaches. This framework enables tackling technical and contextual challenges with precision while aligning solutions closely with the unique demands of both the problem and its environment. Consequently, results progress from mere adequacy to sustained excellence.

In our adaptation of Pipes & Puddles framework (Figure 2):

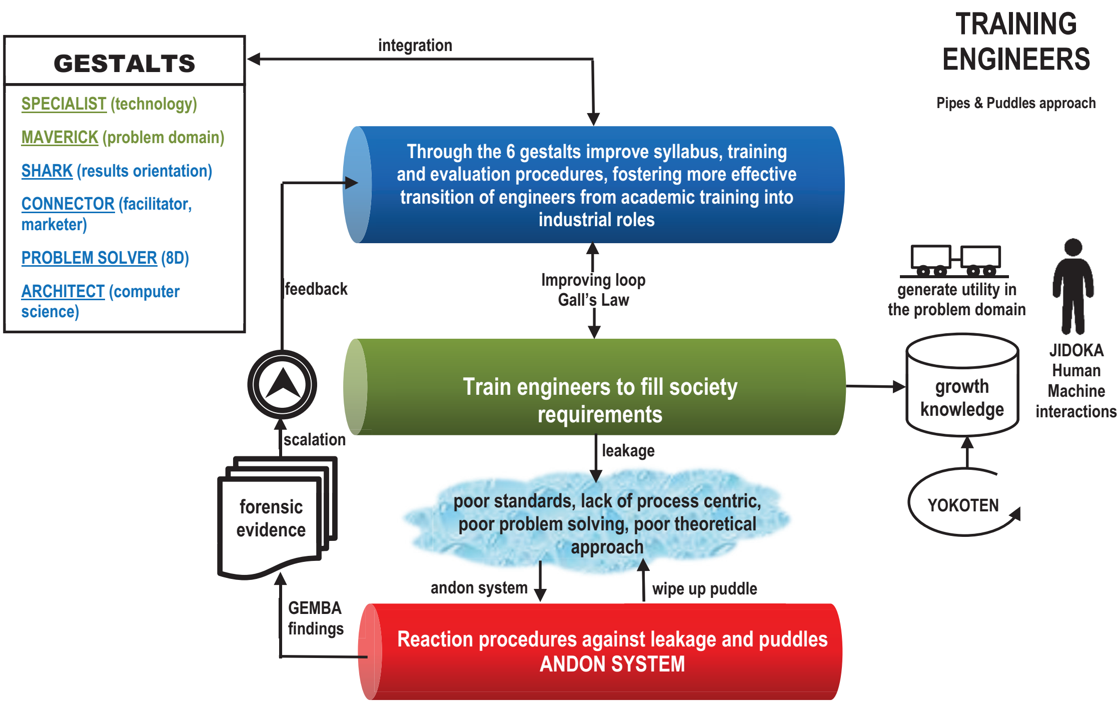
- The **Green Pipe** represents fundamental technical competencies—model formulation, algorithm design, and data practices—captured by the *Problem Solver, Specialist* and *Maverick* Gestalts.
- The **Red Pipe** encompasses advanced analytical skills—structured problem scoping, anomaly detection, assumption validation, risk management, and test design—embodied in the *Problem Solver* and *Connector* Gestalts.
- The **Blue Pipe** signifies holistic integration, where abstraction, system evolution, and adaptive design emerge through the *Problem Solver, Architect* and *Shark* Gestalts.

By linking these pipes, the framework transforms each previously identified gap into an opportunity for growth, ensuring a seamless progression from technical mastery to adaptable, outcome-driven engineering practice.

From the *Maverick* perspective, practitioners explore problems or opportunities deeply within their specific domains, investigating contextual dynamics to propose meaningful solutions. Meanwhile, the *Specialist* leverages precise technologies and methods to realize these insights. Although these roles focus on domain-specific and technical expertise, they gain full potency when reinforced by the framework's transversal. For instance, converting data into actionable knowledge relies on the *Architect* to structure insights for decision-making, while applying those insights to drive measurable improvements depends on the *Shark*'s process-centric orientation. The *Connector* then overcomes resource constraints and disseminates ideas across contexts, maximizing their impact. The Problem Solver Gestalt plays a foundational role: it transforms observations into tractable problems and coordinated interventions. As Jonassen (2014) already emphasized, structured problem solving is indispensable in engineering practice.

While conventional approaches often categorize problem-solving capabilities as either "hard" (technical) or "soft" (interpersonal), the Six Gestalts framework deliberately shifts the focus. Rather than asking whether problem-solving skills are hard or soft, we ask: *what combination of competences is required to maximize problem-solving effectiveness?*

Figure 2. Pipes & Puddles adapted to Six Gestalts.



This view also clarifies why isolated emphasis on hard or soft skills can be insufficient—or even misleading. Without a structured blend of competences surrounding problem solving, individuals may execute tasks diligently but fail to anticipate interactions, dependencies, or organizational consequences. The Six Gestalts therefore primes learners and teams to recognize which roles, knowledge domains, and cognitive capabilities are required at each stage—ensuring that problem solving is both rigorous and sustainable.

This framework offers a structured guide for engineers to develop high levels of professional maturity—moving beyond mechanical tool application toward cultivating a comprehensive vision of designing, building, and deploying robust systems. The following subsections detail each of the Six Gestalts, highlighting their distinctive characteristics, the specific gaps they address, and their interrelationships.

3.2. Problem Solver (8D)

The ability to solve problems in a structured manner is crucial for any engineer (Jonassen, 2014). The *Problem Solver* dimension is based on the 8D methodology, allowing problems to be addressed from an analytical and methodical perspective. This dimension underpins mature engineering by fostering deep capabilities in abstraction and ambiguity management, enabling individuals to navigate complexity, identify root causes, and institutionalize learnings beyond surface-level fixes. Incorporating this dimension into engineering education would increase student motivation (Xiang et al., 2024) and enhance teaching quality (Chang, 2025).

This Gestalt is the most relevant of all the dimensions in the framework, as its competencies intersect deeply and extensively with all the others. For instance, tackling challenges in algorithm design links Problem Solver with the Specialist Gestalt, providing context and technical tools. Converting data into actionable knowledge requires the Architect's modular and scalable systems, rooted in systemic thinking. Meanwhile, the Shark ensures outcomes are measurable and impactful, the Maverick integrates domain-specific understanding, and the Connector mobilizes resources and stakeholder alignment. Together, these interdependencies make the Problem Solver Gestalt the transversal backbone of professional maturity.

This dimension cultivates practitioners capable of abstraction, ambiguity management, and systemic problem-solving—abilities essential for navigating complex, interdependent environments. A high level of maturity in this Gestalt requires more than the ability to diagnose problems: it also involves identifying opportunities for improvement in seemingly functional systems, forming effective teams, and sustaining constructive dialogue. Without these capabilities, problem solving collapses into surface-level pattern matching rather than the creation of robust mental models and sustainable solutions (Cai and Guo, 2019). True learning, in any discipline, comes not from memorization but from structuring ideas and building mental models. Yet, as authors have noted, the incorporation of these capabilities into education remains an unresolved challenge (Pantoja Yépez et al., 2024).

3.3. Maverick (Domain Body of Knowledge)

Whereas the Problem Solver Gestalt is transversal, the problem-solving dimension requires additional competences. We now focus on local Gestalts—roles whose implementation may vary depending on the type of problem. The first is the Maverick: the deep domain knower who grounds the work in a concrete understanding of the problem-world and its operations.

While any practitioner benefits from a foundational understanding of the problem's context, it is through the orchestration of the full Six Gestalts framework that this knowledge becomes actionable, guiding systemic problem-solving and coordinated decision-making. The Maverick dimension emphasizes the context-specific knowledge necessary to apply solutions effectively within a given domain. Unlike the cross-domain Problem Solver, which spans diverse contexts and development aspects, Maverick is anchored in a particular field. This expertise enables practitioners to identify relevant problems, discern opportunities for improvement, and develop a coherent rationale linking conceptual insight to practical implementation. The Maverick Gestalt closely synergizes with Problem Solver. While Maverick asks, *"What is happening?"* and *"What is wrong?"*, Problem Solver translates that insight into action, enabling systemic and sustainable solutions.

A mature Maverick not only masters general principles but also grasps domain-specific nuances. In production planning, for instance, this includes multi-layered production systems, job shop scheduling challenges, and Lean manufacturing principles. Depth of understanding ensures that solutions are both technically sound and aligned with real operational constraints. A frequent shortcoming in risk analysis illustrates the importance of this integration. Without genuine immersion in the processes generating the data, Mavericks cannot distinguish between nominal operations and firefighting modes, resulting in bloated risk registers, latent failure modes, and elevated Cost of Poor Quality. Effective risk-analysis training therefore requires moving beyond form filling toward simulations and exercises grounded in real process dynamics. As Figure 3 illustrates, meaningful contribution to a concrete problem demands first embedding enough of the domain's episteme across the relevant subdomains and only then exploiting it in problem solving. Without that embedding, contribution is brittle.

Historical examples reinforce this principle. At Toyota, the sensei tradition emphasizes cultivating employees who combine domain mastery with disciplined problem-solving capabilities. This enduring practice demonstrates that Maverick expertise, when paired with Problem Solver skills, produces meaningful organizational impact—a lesson applicable across modern STEM and engineering contexts.

While the Maverick Gestalt may appear primarily "hard" in its emphasis on domain expertise, it is fundamentally a latent, intrapersonal construct. It emerges not only from a practitioner's competences but also from the policies, culture, and environmental conditions management establishes to support problem-solving, knowledge sharing, and empowerment. Just as in structural equation modelling, where latent variables reflect the combined influence of observed indicators, the Maverick Gestalt captures how an individual integrates knowledge with organizational support. In this sense, the Maverick "melody" emerges within the practitioner—not as a merely isolated expert trait—shaped by the instruments (one's complementary capacities), the score (processes and methodologies), and the conductor (self-regulation) that provides space for initiative, reflection, and synthesis.

Finally, the Maverick Gestalt sets the stage for complementary local competences, such as the Specialist Gestalt, which focuses on deep technical or tool-specific expertise. While Mavericks provide the domain understanding that frames the problem, Specialist bring specialized knowledge and methods that allow the team to explore, experiment, and implement solutions effectively. Together, these local Gestalts, orchestrated through the full Six Gestalts framework, ensure that domain knowledge is transformed into actionable insight and robust systemic solutions.

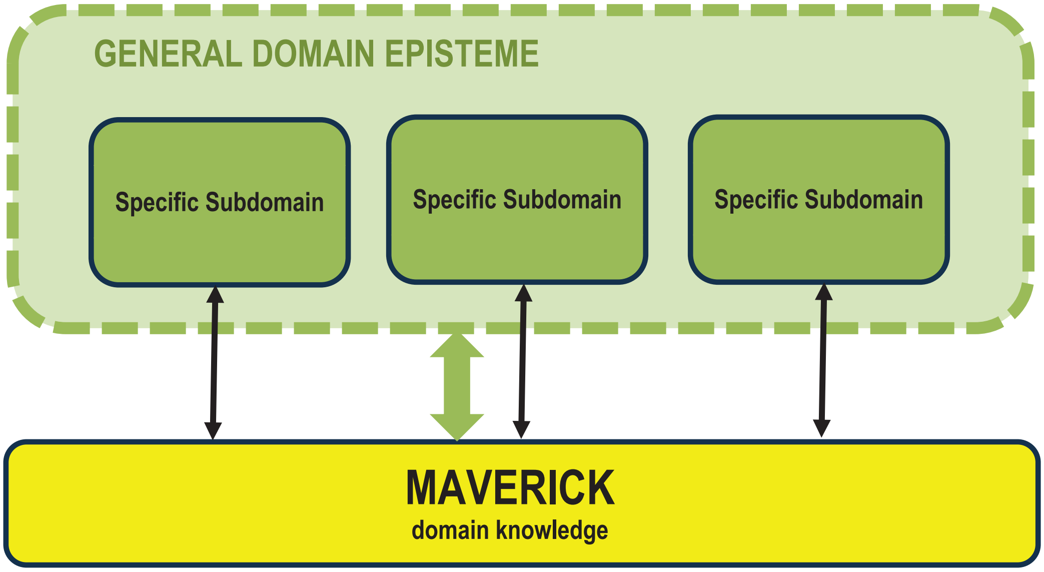
3.4. Specialist (Technical Expertise / Nerd)

The second local Gestalt emphasizes the ability to apply specific toolkits and techniques. In conventional hard/soft frameworks, this would be primarily classified as "hard" skills. However, as with Maverick, the Specialist is best understood as a intrapersonal construct, whose effectiveness emerges from the interplay between individual roles, Problem Solver integration, and organizational context.

The Specialist Gestalt centres on deep, practical knowledge of core technical principles, methods, and tools relevant to a given domain—whether in engineering, computer science, or other STEM fields. Specialists master foundational theories, algorithms, and scientific laws that underpin the technologies they use. We emphasize developing a niche of tools—an integrated competence kit of analytical methods, guidelines, and exemplars—so practitioners can critically absorb and operationalize what the Specialist role exploit, in line with the competence-kit perspective (Raven et al., 2010).

While technical mastery is necessary, it alone is insufficient. To have real-world impact, Specialist expertise must be anchored to the Problem Solver dorsal spine, ensuring

Figure 3. The Maverick (bottom) operates within a general domain episteme (dashed boundary) and connects bidirectionally to several specific subdomains. The two-way links indicate the embed / exploit loop through which knowledge is internalized, applied, and refined.



that knowledge is applied to identify, frame, and address genuine problems rather than isolated technical exercises.

A mature Specialist moves beyond surface-level tool use or rote procedures, cultivating the ability to experiment, test, and validate solutions rigorously. In doctoral mentoring, even technically proficient candidates often produce one-off scripts rather than modular, maintainable systems. Solo experimentation without systemic frameworks exemplifies the siloed mindset that prevents technical knowledge from translating into robust, real-world solutions. Similarly, in product engineering, specialists frequently validate design changes using single samples or uncontrolled tests, ignoring process variability and measurement uncertainty. Such trial-and-error approaches underscore the critical need for statistical reasoning and structured experimentation to ensure solutions remain resilient under real-world conditions.

Prior research supports this perspective. Treating complex technical systems as inscrutable "black boxes" is a common novice pitfall (Patel et al., 2008), whereas deep technical knowledge enables professionals to understand when and how assumptions underlying models or tools may be violated, a capability considered critical for engineers (Chatley and Field, 2017). Other analyses, such as in AI applications, emphasize assessing the specific contexts where solutions add meaningful value, moving beyond generic implementations (Alter, 2022).

Like Maverick, Specialist expertise should be understood as a latent intrapersonal construct. Its real-world effectiveness is not solely determined by the individual's skill, but by the environment, processes, and organizational support that allow deep technical knowledge to be applied, shared, and integrated. Policies that encourage experimentation, visibility of work, and structured reflection transform Specialist know-how from isolated capability into integrated, system-wide capability.

In sum, the Specialist Gestalt provides the granular, reductionist foundation upon which adaptive, systemic, and outcome-driven engineering practice is built. Mastery here enables precision, innovation, and robustness—but only when embedded within a holistic, role-integrated framework orchestrated by the Six Gestalts artifact.

3.5. Shark (orientation to results)

The Shark Gestalt captures the problem-solving team's capacity to orient work toward demonstrable outcomes, ensuring that solutions deliver value within the specific context in which they operate. While often most visibly expressed through the actions of a team leader, Shark is more than a personal trait: it engrains result-orientation into the organizational tissue, shaping how individual practitioners and teams coordinate, make decisions, and sustain performance over time.

Shark activates at the close of any investigative or development cycle, when contributions must be assessed along two axes: (i) advancement of knowledge in the problem domain and (ii) practical applicability and impact. Students and professionals exhibiting strong Shark capabilities demonstrate resilience, tenacity, and calm under pressure. They help maintain team morale and commitment, especially during critical phases where ambiguity, setbacks, or failures threaten momentum.

However, Shark orientation is not universal. Students and junior engineers often complete artefacts—requirements forms, validation protocols, test reports, risk registers—merely as procedural checklists, without questioning whether these documents support coordination, decision-making, or value creation. When work progresses from isolated tasks to coordinated systems, many fail to perceive actors, signals, triggers, and feedback loops as elements of a unified cybernetic whole. This fragmentation—treating information systems and operations as separate silos—undermines effective intervention design and dilutes ownership of results.

A genuine Shark orientation requires more than individual resolve. Deficits often appear as confusion between instruments and outcomes, or short-termism that neglects ethical, organizational, or environmental side effects. Tools such as audits, dashboards, or KPIs are useful only when they inform action and learning; otherwise, they risk simulating control rather than improving performance. A true results orientation continuously asks: *"Is this system fit for purpose?"*—evaluating how well it fulfils intended functions given design assumptions, operating conditions, and stakeholder objectives (Alter, 2022).

Shark spans both "hard" (tangible, measurable) and "soft" (intangible, qualitative) benefits, including:

- Customer focus: improved user experience and well-being, as solutions meaningfully address needs.
- Efficiency: reduction of waste and friction, enabling more agile processes and greater stakeholder confidence.
- Interchangeability: modular architectures that accommodate extensions and maintenance while safely compartmentalizing risks to prevent cascading failures.

Advanced Shark practice requires epistemic discipline: outcomes must be effective, rigorously validated, and grounded in transparent reasoning, enabling knowledge to transfer across contexts. Shark ensures that solutions are not only built, tested, and deployed correctly, but also institutionalized so that results orientation becomes part of the organizational fabric, shaping work habits, decision-making norms, and systemic accountability. In this sense, Shark integrates hard dimensions—measurement, experimentation, and deployment rigor—with soft dimensions—alignment, influence, and stewardship—thereby completing the Six Gestalts by embedding impact as a structural, enduring feature of professional maturity.

3.6. Architect (systemic design)

Once a problem-solving team has addressed the local needs of Maverick and Specialist, other transversal needs naturally emerge—those concerned with creating a robust, coherent artifact that can withstand a variety of failure modes. Even when armed with deep domain knowledge (Maverick) and technical expertise (Specialist), the team may still struggle to map reality into structured models, representations, or ontologies that preserve essential system characteristics. Such models are not an end in themselves—they are essential for developing tractable solutions, enabling the team to reason about complex interactions, explore alternative designs, and implement interventions that are both feasible and effective.

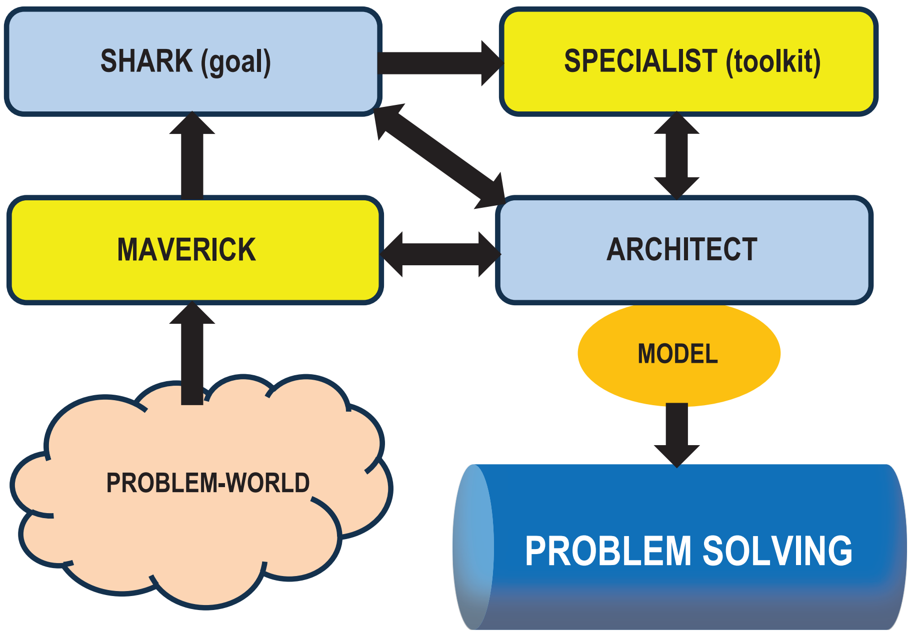
The Architect dimension concerns the capacity to conceive, structure, and evolve engineered systems—physical, digital, and socio-technical—in ways that preserve coherence under change. Its focus is systemic design: building architectures that are modular, composable, and capable of absorbing environmental variety while remaining legible to those who operate and maintain them. In this sense, the Architect translates Specialist technical depth, Maverick domain understanding and Shark orientation to results into scalable, interoperable, and enduring forms, as illustrated in Figure 4.

These skills channel disciplinary knowledge into adaptable solutions by emphasizing reuse of components, clear interface contracts, and layered abstractions. Adaptation—the continual replacement of outdated elements with updated realities—must be coupled with modularity. Without it, systems harden into monoliths rather than evolving as networks of interacting subsystems. Composability, central in category-theoretic thinking, enables designers to reason about wholes through their parts. Gall's Law (Gall, 1977) and Ashby's Law of Requisite Variety (Ashby, 1956) provide the theoretical backbone: robustness emerges incrementally, through architectures capable of matching the variability of their environments.

Maturity in this Gestalt also entails integrating agile management practices, disciplined technical documentation, and systematic attention to quality attributes such as functionality, testability, usability, reliability, and interoperability. The Architect does not merely "fix bugs"; they anticipate failure modes and embed detection, containment, and recovery mechanisms. Practices drawn from Lean—5S for organization, cross-checks and audits, traceability for early anomaly detection, and andon-like escalation paths—can serve as architectural safeguards rather than administrative chores. These practices intersect directly with the Problem Solver's analytical rigor, the Shark's results orientation, and the Maverick's domain insights, ensuring that knowledge and action are embedded within resilient structures.

Field mentoring reinforces the importance of this dimension. Even highly capable doctoral candidates often lacked familiarity with Gall's and Ashby's principles and had no clear understanding of layering, modularity, or interaction loops as mechanisms to absorb variety. Prototypes—lines of code, spreadsheets, or lab rigs—were often treated as ends in themselves rather than evolving components within a broader system. Targeted training in process modelling and

Figure 4. The Maverick dimension reads the problem-world. To be effective, it anchors goals via the Shark dimension and feasible means via Specialist dimension. The Architect fuses these into a shared Model—yielding an effective problem-solving model.



test-oriented development revealed that technical tools alone cannot compensate for poor system modelling; artifacts must serve the logic of the process, not the other way around.

Ultimately, the Architect Gestalt provides the structural scaffold on which the other dimensions operate. It ensures that solutions imagined by the Maverick, implemented by the Specialist, refined by the Problem Solver, and driven to impact by the Shark can cohere into systems capable of evolving gracefully in complex environments. In this way, the Architect transforms individual and local competences into an integrated hard–soft capability across the six interdependent dimensions, enabling knowledge, action, and value creation to propagate harmoniously across the artifact.

3.7. Connector (intelligence)

Following the Architect's structural scaffold, a further capability is required: one that sets the system in motion. The Connector Gestalt mobilizes people, information, and resources across organizational and temporal boundaries so that engineered solutions can be conceived, delivered, and sustained. It couples technical interfaces with human coordination, securing coherent requirements, clear ownership of upstream and downstream interfaces, and unblocked knowledge flows. By overcoming resource constraints and repackaging knowledge for situational value, the Connector translates integrated hard–soft design into effective practice—providing the tempo, continuity, and adaptability that problem-solving systems need to operate in the real world.

This dimension closely aligns with the homonymous role commonly found in the business world (Redman and Davenport, 2023). The Connector Gestalt captures the capability to mobilize people, information, and resources across organizational, disciplinary, and temporal boundaries, ensuring that engineered solutions can be conceived, delivered, and sustained. This role reframes teams not as mere task-dividing devices but as living systems of complementary roles, communication dynamics, and shared purpose. The Connector secures coherent requirements, assigns clear ownership to upstream and downstream interfaces, and maintains knowledge flows without blockage throughout the project lifecycle.

When obstacles arise—scarce data, limited budgets, fragmented expertise—this Gestalt sets things in motion. Two complementary functions are particularly salient. First, the resource gatherer focuses on overcoming structural and hierarchical barriers to obtain what the project needs: access, tooling, funding, expert time. This requires empathy, negotiation, and practical skill in unblocking critical flows. Procedures derived from procurement or stage-gate reviews can be repurposed to keep resource pipelines transparent and responsive rather than bureaucratic. Second, the merchant role integrates and repackages knowledge so that it acquires situational value. Benchmarking, context scanning, and comparative techniques help avoid reinventing existing solutions while supporting adaptation to local constraints. Digital knowledge management tools serve as enablers, facilitating collective sense-making and timely decision-making. Effectiveness in both roles hinges on understanding what resources are available, who the audience is (stakeholders, users, regulators), and how to align efforts with real needs.

A mature engineer in this dimension continually inspects the strengths and limitations of existing arrangements, identifies opportunities for improvement, and guides the design of more efficient and sustainable collaborations. The Connector intersects tightly with Problem Solver (structuring cross-functional investigations and disseminating learning), Shark (maintaining focus on outcomes and benefits), and Maverick (adapting to domain-specific contexts where resources are sourced and applied). It also supports the Architect by ensuring that informational and organizational interfaces required by systemic design are present, maintained, and resilient.

Viewed through an integrated hard–soft lens, the Connector is the practitioner's capacity to couple technical interfaces with human coordination. Its effectiveness arises from the within-individual orchestration of the six interdependent dimensions together with processes and enabling organizational policies, so the problem-solving system operates cohesively and adapts dynamically to challenges.

4. From Hard and Soft Skills to Six Gestalts

This section reframes the hard–soft skills paradigm through the Six Gestalts framework: rather than discrete assets, skills are treated as observables of latent systemic roles that, in interaction with context, integrate into a single hard–soft repertoire oriented to preventive problem solving. Section 4.1 develops the conceptual shift from duty-doing to problem-solving, centring the Problem-Solver as an endogenous backbone enriched by Maverick, Specialist, Architect, Shark, and Connector; Section 4.2 translates this shift into practice by specifying learning arenas where teams enact these roles collectively; Section 4.3 distils the pedagogical pillars that align with the gestalts; and Section 4.4 illustrates the integration through two compact scenarios (an evolving chess master and a high-reliability surgical team), showing how performance improves when gestalts co-activate and are orchestrated as a system.

4.1. From duty-doing to problem-solving

Conventional approaches to professional development often emphasize the accumulation of hard and soft skills as discrete assets. While valuable at the individual level, this dichotomy tends to reproduce organizational silos when imported directly into the workplace. Engineers are trained as repositories of technical expertise, managers as guardians of interpersonal skills, and educators as transmitters of codified knowledge. In such a framework, performance is often reduced to duty fulfilment: executing tasks, following instructions, and reacting to problems once they arise.

The Six Gestalts framework offers a reframing of this condition. Rather than treating skills as endpoints, it interprets them as observables that—together with environmental conditions such as leadership styles, workspace atmosphere, and organizational culture—manifest deeper systemic roles. These roles, the gestalts, act as *latent constructs* that integrate fragmented competences into functional wholes. At the core lies the Problem-Solver, an endogenous construct that represents the preventive and adaptive backbone of professional maturity. By contrast, the other five gestalts—Maverick, Specialist, Architect, Shark, and Connector—function as exogenous constructs, feeding into and enriching this backbone.

From an educational perspective, the challenge is therefore not simply to equip individuals with skills, but to cultivate groups that behave as problem solvers rather than duty doers. This requires both pedagogical strategies and conceptual tools that make preventive, systemic reasoning a shared ethos.

4.2. Learning arenas for teams

To instil this orientation, students and professionals must be immersed in environments where collaboration is not limited to dividing tasks but becomes an exercise in collective problem-solving. Workshops, obeya spaces, and game-based learning simulations provide precisely such arenas.

- **Workshops** allow participants to experience the dynamics of reframing outputs as problems to be solved rather than duties to be executed.
- **Obeya spaces**, inspired by Lean practice, foster transparency and shared ownership, aligning teams around visible problem backlogs.
- **Game-based learning** introduces structured play where groups confront uncertainties, experiment with strategies, and internalize preventive thinking. This methodology has already been examined in recent literature (Lorente and Pereda, 2024).

These environments help groups enact the Problem-Solver gestalt collectively, plugging in the other gestalts as complementary roles. They shift the locus of learning from individual mastery to systemic enactment.

4.3. Pedagogical pillars aligned with the gestalts

The transition from duty-doing to integrated problem-solving practice can be reinforced through four complementary educational pillars:

1. **Socratic teaching** stimulates critical inquiry, activating the Problem-Solver and Maverick gestalts by challenging assumptions and contextualizing abstract reasoning

(Elder & Paul, 1998; Bjelica et al., 2025). From a Gestalt perspective, Socratic teaching complements typically "hard" skills by fostering critical reflection on the core technical tools that have been acquired.
2. **Gall's Law** emphasizes building complex systems from simple, functioning components, aligning with the Specialist and Architect gestalts by grounding systemic thinking in mastery of fundamentals.
3. **Ashby's Law** indicates that system complexity is not gratuitous but subordinate to the Law of Requisite Variety—only variety can absorb variety. Consequently, the repertoire of responses and roles available to an engineer (or practitioner more generally) should exhibit at least as much variety as the diversity of problems to be addressed, without treating "hard" and "soft" skills as segregated domains.
4. **Teamwork**, carefully facilitated, enacts the Connector and Shark gestalts by clarifying roles, negotiating resources, and sustaining purposeful alignment (Tuckman, 1965; Cresswell-Yeager, 2021), thereby moving teamwork beyond its customary confinement to a "soft skills" context and positioning it as a structured, performance-critical practice.

Together, these pedagogical strategies do not merely produce skilled individuals. They enable practitioners to integrate the Six Gestalts within a single hard–soft repertoire, making problem-solving their central orientation.

4.4. Illustrative scenarios of gestalt integration

We next illustrate, using two examples, how problem solving becomes substantially more effective when framed within the Six Gestalts framework.

4.4.1. The growing chess master vs. the stagnant club player

Consider the difference between a chess master who continues to evolve and a club player whose performance plateaus. In terms of Maverick (domain immersion) and Specialist (technical proficiency), the gap may not be dramatic: both possess deep knowledge of openings, tactical motifs, and positional play.
The distinction emerges in the other gestalts:

- As an Architect, the master develops mental models of future evolutions, deliberately training for specific archetypes.
- As a Problem-Solver, he seeks complexity outside formal matches, confronting novel configurations to expand adaptive fluency.
- As a Shark, he cultivates situational vigilance and emotional control, even when winning.
- As a Connector, he builds learning loops through communities—online platforms, clubs, or coaching networks—accelerating feedback and exposure.

The club player, by contrast, remains trapped in the hard/soft skill dichotomy: technically competent, socially engaged, but without the gestalt integration that sustains long-term growth. The master advances not by accumulating more moves, but by activating the latent systemic roles that turn skills into evolving maturity.

4.4.2. The high-reliability surgical team

In healthcare, we will perceive the six gestalts in a magnified way. Let us pick the surgery from a historical perspective to illustrate the evolution of gestalt integration. In early centuries, surgical practice was often fragmented: barbers or general practitioners operated with limited tools, sparse anatomical knowledge, and almost no systemic safeguards. The six gestalts existed only in embryonic form – Specialists were shallow, Mavericks operated in isolation, and Architects absence could be seen from the planning side of interventions. Outcomes were shaped as much by chance as by skill.

Modern high-reliability surgical teams embody a different reality. Each member contributes the Specialist gestalt in a distinct domain – vascular surgery, anaesthesiology, robotics – anchored in deep disciplinary expertise. Their shared Maverick orientation arises from immersion in clinical realities and patient variability. Crucially, the Architectural gestalt structures the whole: roles, tools, timings, and contingencies are co-designed through rehearsal, simulation, and briefing.

The Problem-Solver gestalt manifests in the ability to absorb surprises – sudden haemorrhage, equipment failure – without collapsing flow. The Shark ensures sustained focus and pressure resilience during long or complex procedures. Complementarity is the key: a surgeon may drive architectural structure, a senior nurse may embody Shark and Connector as emotional anchor and resource negotiator, while a resident contributes fresh problem-solving energy.

Beyond the operating room, the Connector operates at multiple levels. Vertically and laterally, they link team routines with institutional protocols, evolving medical standards, and patient needs. Outwardly, they extend to communication with patients' families and, at times, the broader public—translating technical complexity into reassurance, clarity, and accountability. In this way, the surgical team's reliability is sustained not only in technical execution but also in maintaining trust and coherence within its wider human environment.

4.4.3. Summary of scenarios

The chess master illustrates how individuals grow when gestalts activate beyond isolated skills. The surgical team illustrates how high performance emerges when gestalts are distributed across roles and coordinated systemically. Together, these scenarios exemplify the shift from duty execution to preventive, adaptive problem-solving that lies at the heart of talented organizations.

5. Conclusions and Limitations

This paper has introduced the Six Gestalts framework—Maverick, Specialist, Architect, Shark, Connector, and Problem-Solver—as an integrated lens for understanding and developing professional maturity. While the model originates in decades of mentoring and education practice, its implications extend directly to operations and organizational performance.

Traditional approaches to competence development tend to emphasize either technical mastery (hard skills) or interpersonal capacity (soft skills). Left unintegrated, these trajectories reinforce siloed expertise and fragmented organizational behavior. The Six Gestalts framework addresses this limitation by reframing skills as **cognitive roles**, where both individual capabilities and contextual enablers converge into systemic performance. At the backbone of this integration lies the Problem-Solver gestalt—the endogenous driver of organizational adaptability.

From an operational perspective, the framework offers three major implications:

1. **From skill silos to integrated practice**: in operations, excellence cannot be reduced to having highly trained individuals. True resilience arises when complementary gestalts interlock: Specialists provide depth, Architects model system interdependencies, Sharks sustain focus and discipline, Connectors ensure alignment with stakeholders, and Mavericks challenge assumptions with domain-grounded insight. This gestalt complementarity transforms practice from duty execution into preventive problem-solving—anticipating breakdowns, embedding flexibility, and sustaining flow.
2. **Embedding preventive problem-solving into processes**: building on the Pipes and Puddles framework, processes are reframed as dynamic entities with three states: green pipes (intended function), red pipes (andon conditions requiring immediate countermeasures), and blue pipes (preventive problem-solving). By situating the Problem-Solver gestalt at the core of the blue pipe, organizations cultivate a culture where exceptions are not “undesired outputs” but signals for structured intervention. This systemic perspective prevents recurrence, enhances robustness, and aligns operational maturity with continuous improvement.
3. **Guiding organizational development and learning**: the Six Gestalts provide a diagnostic compass for leaders. Rather than generic training, managers can identify gestalt imbalances in practitioner repertoires—for example, strong technical Specialists but underdeveloped Connector capacities—and design interventions that rebalance integrated maturity. At the same time, educational and professional development programs can leverage Socratic teaching, Gall’s Law, coordination design, and game-based learning to accelerate gestalt growth at scale, beyond isolated individuals.

For operations leaders, the framework therefore represents both a map and a lever: a map to understand how professional maturity unfolds across interdependent roles, and a lever to redesign organizational processes, talent systems, and improvement programs toward systemic problem-solving capacity.

While grounded in extensive industrial mentoring and prior research, this framework remains at an early stage of formal validation. Its current articulation is primarily conceptual, supported by illustrative cases. Further research should:

- Test the Six Gestalts empirically across diverse operational settings (e.g., manufacturing, healthcare, services).
- Explore its alignment with existing maturity models (e.g., Lean, Six Sigma, Industry 4.0 capability frameworks).
- Investigate additional gestalts that may capture emerging needs, such as ethical reasoning or sustainability-oriented roles.

By advancing both conceptual synthesis and practical implications, the Six Gestalts framework invites organizations to move beyond training competent individuals toward cultivating adaptive, problem-solving teams—an essential capability in the complex, evolving systems that define modern operations.

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The authors have no competing interests to declare that are relevant to the content of this article.

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