The Myth of the Well-Rounded Engineer: Why Unrealistic Professional Ideals Distort Identity, Learning, and Early-Career Development

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Abstract

Engineering graduates are routinely told they must become "well-rounded engineers": technically excellent yet commercially aware, innovative yet compliant, collaborative yet independent, resilient yet self-managing. While intended as positive guidance, these ideal forms an impossible professional template that no newcomer can realistically inhabit. This paper argues that the myth of the well-rounded engineer creates structural conditions that undermine learning, distort identity formation, and intensify early-career stress. Drawing on Ideal Worker Theory, professional identity formation, epistemic cultures, emotional labour, and workplace learning, the paper shows how unrealistic professional ideals shape how graduates interpret feedback, evaluate their competence, and navigate ambiguity in practice. The analysis illustrates how these ideals are reproduced across education and industry, and how they contribute to burnout, self-doubt, and withdrawal from the profession. The paper concludes by proposing a shift towards plural, situated, and developmentally realistic models of engineering identity that recognise diverse strengths, legitimate developmental trajectories, and the value of specialised expertise. Such a reframing would support healthier transitions into engineering work and more sustainable professional pathways.

Keywords: Engineering education; Professional identity; Early-career engineers; Workplace learning; Engineering workforce development; Emotional labour

1. Introduction

Engineering graduates are routinely told that success depends on becoming "well-rounded": technically strong yet commercially fluent, innovative yet compliant, collaborative yet independent, resilient yet transparent. On paper, these ideal promises versatility. In practice, it constructs an impossible professional identity that no early-career engineer—or senior engineer, for that matter—could realistically embody. The tension between these contradictory expectations forms one of the most overlooked structural pressures in engineering education and workforce development.

Across national education systems, the message is surprisingly consistent. Whether students are trained in tightly structured curricula or more inquiry-driven models, they encounter the same broad competence ideal: an engineer should be competent across domains, immediately productive, and adaptable to any role. Industry reinforces this message through recruitment narratives that emphasise agility, commercial fluency, leadership potential, and seamless professionalism. Yet many employers simultaneously expect deep technical specialisation from day one. The result is a mixed signal, be everything, and be excellent at all of it, immediately. Unsurprisingly, graduates interpret the inevitable gaps in their capability as personal shortcomings rather than a structural mismatch between expectation and developmental reality.

Structured graduate programs offer temporary scaffolding through rotational exposure, but they serve only a minority of graduates. Most engineers enter operational teams directly but face the same breadth-heavy expectations without the same developmental support.

The profession's reliance on the well-rounded ideal also obscures how engineering knowledge is produced, valued, and distributed. The ideal privileges breadth over depth, consistency over uncertainty, and performance over learning—reinforcing an identity script that rewards those who appear endlessly competent and penalises those who ask questions, struggle, or specialise. For newcomers, this creates a pressure to perform certainty long before they have built the tacit knowledge, contextual judgement, and situated understanding that real engineering work demands.

This paper argues that the myth of the well-rounded engineer is not simply aspirational rhetoric. It is a structural ideal that shapes identity formation, learning trajectories, and help-seeking behaviour in ways that undermine early-career development. Drawing on Ideal Worker Theory, professional identity formation, epistemic cultures, emotional labour, and workplace learning, the paper develops a conceptual critique of this ideal and its consequences. It demonstrates how unrealistic professional norms distort how graduates evaluate their competence, interpret feedback, and manage the emotional labour of early responsibility.

By analysing the myth's origins, contradictions, and impacts, this paper reframes graduate "unpreparedness" not as an individual deficit but as a systemic problem created by incompatible expectations across education and industry. It proposes a more realistic model of engineering identity—one that values specialisation, recognises developmental progression, and supports healthy participation in complex socio-technical environments. Such a shift is essential if engineering education is to align with the realities of contemporary practice and if early-career engineers are to thrive rather than endure their first years in the profession.

1.1 Article type and approach

This paper offers a conceptual analysis grounded in established sociological and educational theory. Rather than presenting new empirical data, it synthesises Ideal Worker Theory, professional identity formation, epistemic cultures, emotional labour, and workplace learning to examine how the well-rounded engineer ideal operates as a structural norm shaping early-career experience. The contribution lies in articulating this ideal as a unifying mechanism that links identity tension, distorted learning expectations, and premature performance demands.

2. Theoretical Frameworks

Understanding why the well-rounded engineer ideal persists—and why it places such pressure on early-career engineers—requires grounding the analysis in established bodies of theory. Five frameworks provide the conceptual scaffolding for this paper: Ideal Worker Theory, professional identity formation, epistemic cultures, emotional labour, and workplace learning. Together, they explain how unrealistic professional ideals become normalised, how individuals internalise them, and how they distort early participation in engineering work.

2.1 Ideal Worker Theory

Ideal Worker Theory [1,2] describes how professions construct an implicit template of the "perfect worker": endlessly capable, consistently available, and unburdened by developmental needs or contextual limitations. Although initially applied to organisational behaviour and gender studies, the framework aligns strikingly with engineering's cultural expectations. The profession privileges breadth, availability, resilience, and flawless competence—traits that map closely onto the myth of the well-rounded engineer.

Ideal worker norms create a paradox for newcomers: engineers are told they must be adaptable and multifaceted, yet any deviation from this ideal is interpreted as weakness or insufficient readiness. The framework helps explain why early-career engineers often conceal uncertainty or avoid help-seeking behaviours, which compromise both learning and safety. Ideal Worker Theory clarifies that the pressure does not originate within individuals; it is embedded in the profession's structural narratives. Recent extensions of the Ideal Worker Theory show how contemporary organisations intensify expectations of constant availability and boundaryless competence [3].

2.2 Professional Identity Formation

Professional identity formation theory [4,5] emphasises that identity is developed through participation, shared practices, and social recognition—not through abstract role descriptions. Engineers become engineers by engaging in meaningful work, negotiating expectations, and integrating colleagues' feedback. Engineering identity is also shaped by the cultural and social practices students encounter as they "become" engineers through participation in authentic problem-solving communities [6]. When the entry-level identity template is built around an impossible ideal, newcomers struggle to reconcile their real trajectories with what they believe "a proper engineer" should be [6,7]. These identity tensions reflect broader findings that engineering cultures reward particular performances of competence and belonging, shaping who is recognised as an engineer in the first place [8]

The well-rounded engineer ideal narrows the range of acceptable identities: those who specialise, take time to develop tacit judgement, or display uncertainty may feel misaligned with the profession's expectations. Professional identity theory explains why such misalignment becomes internalised as self-doubt rather than recognised as a normal developmental progression. It also reveals how the myth suppresses legitimate diversity in engineering identities, privileging certain dispositions while marginalising others. Engineering identity research consistently shows that belonging is shaped by cultural norms, recognition, and access to meaningful participation [9].

2.3 Epistemic Cultures and Knowledge Hierarchies

Epistemic culture theory (Knorr-Cetina, 1999examines how different fields construct, value, and legitimise knowledge. Engineering is often framed as a rational, technical discipline; however, the realities of engineering work rely heavily on contextual judgement, tacit reasoning, and negotiated meaning. Ethnographic studies of engineering practice show that knowledge is constructed through negotiation and situated interpretation rather than through universal, transferable procedures [10]. The myth of the well-rounded engineer emerges partly from an epistemic hierarchy that overvalues breadth and procedural fluency while undervaluing depth, specialisation, and situated expertise.

This epistemic hierarchy feeds the ideal: if "good engineers" should be competent in everything, then those who focus intensely—software, geotechnical, process dynamics—are subtly positioned as incomplete. Epistemic culture theory clarifies how the profession's internal knowledge norms sustain the breadth-heavy ideal, even when real engineering work depends on teams of specialists rather than universal generalists.

2.4 Emotional Labour

Emotional labour [11,12] refers to the effort required to regulate emotions to meet organisational expectations. Engineering culture rarely acknowledges emotional labour, yet early-career engineers perform significant affective work: displaying confidence despite uncertainty, managing the weight of responsibility, interpreting ambiguous feedback, and maintaining composure in high-pressure environments [13].

The well-rounded engineer ideal intensifies emotional labour by equating confidence with competence. These cultural expectations reflect long-standing patterns in engineering education, where confidence, rationality, and self-sufficiency are implicitly positioned as markers of the "ideal engineer" [14]. Graduate engineers quickly learn that revealing doubt may conflict with expectations of readiness and independence [15]. Emotional labour theory explains why many newcomers perform certainty, suppress vulnerability, and internalise stress—behaviours that reinforce the myth while compromising learning and wellbeing. More recent analyses highlight how emotional labour in professional roles contributes to cumulative strain and identity tension [16,17].

Research on emotional labour in professional roles shows that these regulatory demands can accumulate over time, contributing to strain and reduced well-being [18].

2.5 Workplace Learning and Developmental Trajectories

Workplace learning frameworks [19,20,21] emphasise that competence develops through gradual participation, feedback, and meaningful task engagement. Learning is situated, relational, and highly sensitive to workplace affordances. This sharply contrasts with the well-rounded engineer ideal, which assumes immediate capability across multiple domains.

Workplace learning theory exposes the developmental impossibility of the ideal: no novice can realistically acquire technical depth, contextual judgement, organisational awareness, and interpersonal fluency simultaneously. Workplace learning research also shows that expansive learning environments—those offering support, mentoring, and graduated responsibility—are essential for novice development [22].

Workplace learning research consistently shows that early-career development depends heavily on access to knowledgeable colleagues and opportunities for guided participation [23]. When workplaces expect early-career engineers to perform at this level from day one, misalignment occurs between real developmental needs and perceived competence requirements. This misalignment is a core mechanism that sustains the myth and intensifies early-career strain.

2.6 Integrating the Frameworks

Rather than operating as parallel explanations, these five frameworks describe different dimensions of the same structural phenomenon. Ideal Worker Theory explains how an impossible professional template is normalised. Professional identity formation theory shows how individuals internalise this template through participation and recognition. Epistemic culture theory clarifies why breadth and procedural fluency are privileged over depth and situated expertise. Emotional labour reveals the hidden cost of performing this ideal under conditions of uncertainty. Workplace learning theory explains why the ideal is developmentally unattainable in practice. Taken together, these lenses form an integrated analytical scaffold for examining how the well-rounded engineer ideal is produced, sustained, and experienced across education and industry.

3. The Well-Rounded Engineer Ideal: A Structural Impossibility

The notion of the “well-rounded engineer” is often framed as a pragmatic aspiration: an engineer should be technically strong, commercially aware, communicative, adaptable, and able to move fluidly across roles. Yet when examined through the combined lenses of identity theory, organisational expectations, and workplace learning, the ideal collapses under its own contradictions. It is not simply difficult to achieve; it is structurally impossible.

3.1 Contradictory Expectations: Breadth Without Trade-Offs

The well-rounded ideal assembles qualities that rarely coexist in real professional practice. Engineers are expected to be: innovative yet compliant; collaborative yet independently productive; deeply technical yet commercially fluent; risk-aware yet confident and decisive; thorough yet fast under pressure.

These are not complementary attributes; they are tension pairs that require situational judgement, not constant simultaneous performance. Real engineering decisions often involve prioritising one dimension over another. Ethnographic studies of engineering design show that engineers routinely navigate competing demands and negotiate trade-offs rather than embodying all ideal attributes simultaneously [10].

The ideal pretends these trade-offs do not exist. Graduate engineers quickly learn that meeting one expectation can violate another, leading to an ongoing sense of insufficiency that is interpreted as personal rather than structural.

3.2 The Performance Paradox: Readiness Without Development Time

While Section 3.1 outlines the contradictory nature of the well-rounded ideal, this section examines why these expectations are developmentally impossible for early-career engineers

The ideal also assumes instant readiness. New engineers are expected to: produce high-quality work with limited oversight; interpret ambiguous information; manage stakeholder interactions; contribute across disciplinary boundaries; display confidence while still learning basic workplace norms.

These expectations contradict everything we know about workplace learning. Tacit knowledge, professional vision, and contextual judgement develop only through extended participation and repeated exposure to real stakes. Research on early-career learning shows that novices require substantial time, scaffolding, and graduated responsibility before they can perform confidently and independently [24].

The ideal engineer, however, is imagined as already possessing these capacities, leaving no legitimate space for learning, error, or uncertainty. The disconnect between developmental reality and organisational fantasy amplifies early-career stress and shapes unhelpful self-evaluations.

3.3 The Generalist Ideal vs. the Reality of Specialised Engineering

Engineering work is increasingly specialised. Studies of engineering practice further demonstrate that expertise is distributed across networks of specialists who rely on shared artefacts, representations, and collaborative tools rather than individual generalists [25,26,27].

Complex projects rely on distributed expertise, not individuals who can perform every function. Empirical studies of engineering practice show that real engineering work is deeply specialised, relational, and context-dependent, contradicting the universalist assumptions embedded in the well-rounded ideal [26]

Yet the well-rounded ideal retains an older professional fantasy: the engineer as universal problem-solver. This vision persists in recruitment narratives, graduate handbooks, accreditation language, and even university marketing. This universalist image has been critiqued as a cultural construction that obscures the relational, negotiated, and situated nature of engineering work [25].

In practice, engineering organisations depend on specialists—controls engineers, geotechnical modellers, safety analysts, process engineers—whose expertise is deep rather

than broad. When early-career engineers perceive specialisation as a deviation from the ideal rather than a typical developmental trajectory, they experience avoidable identity friction. The myth suggests that "real engineers" should remain broadly capable indefinitely, even as industry structures reward depth and niche expertise.

3.4 Misaligned Messages Across Education and Industry

University curricula often reinforce breadth through employability language, generalist competencies, and assessments that favour versatility. These messages reflect long-standing cultural patterns in engineering education, where confidence, rationality, and self-sufficiency are implicitly positioned as markers of the "ideal engineer" [28,14]. These cultural norms are reinforced by what Cech describes as the "culture of disengagement," which privileges technical mastery while sidelining the social, contextual, and developmental dimensions of engineering practice [28]

Industry, meanwhile, articulates similar expectations in recruitment materials but rewards technical depth and project-specific knowledge once graduates enter the workforce. This confusing developmental signal: be broad to get hired; be deep to succeed; always be both. Graduate engineers are left to interpret this inconsistency without explicit guidance. Those who struggle to satisfy both sides of the message often conclude that the problem lies in their personal capabilities rather than systemic tensions.

3.5 Uneven Development Pathways and the Illusion of Roundedness

Structured graduate programs offer temporary scaffolding through rotational exposure, but they serve only a minority of graduates. Most engineers enter operational teams directly but face the same breadth-heavy expectations without the same developmental support.

Figure 1: The Impossible Juggling Act: Early-career engineers are expected to simultaneously embody technical excellence, leadership potential, adaptability, commercial awareness, and emotional resilience—expectations that cannot be satisfied concurrently

3.6 Why the Ideal Persists Despite Its Impossibility

Three mechanisms sustain the myth:

(a) Organisational convenience – A single, broadly capable engineer is easier to imagine, recruit, and deploy than a nuanced set of specialised roles. The ideal simplifies workforce planning—even if it does not reflect reality.

(b) Professional identity narratives – Engineering has a long tradition of celebrating versatility, self-reliance, and competence under pressure. The myth reinforces these cultural stories.

(c) Lack of visibility into engineering work – Students and educators often work with abstracted representations of engineering. The messy, contingent, highly interdependent reality of practice remains hidden, making such idealised identities seem plausible. Classic studies of technical work show that much of engineering practice is invisible to outsiders, contributing to persistent misconceptions about what engineers actually do[29].

3.7 The Consequence: An Impossible Template for Early-Career Engineers

When read together, these contradictions produce a structural impossibility: an engineer who is simultaneously a specialist and a generalist, an autonomous and collaborative, risk-averse and risk-confident, and polished and still learning. No developmental pathway, however well designed, can cultivate these attributes concurrently.

This impossible template becomes the standard against which graduates compare themselves. It shapes how they interpret workplace experiences, respond to feedback, and evaluate their emerging identities. Identity research shows that when professional expectations are unrealistic or contradictory, newcomers internalise these tensions as personal inadequacy rather than recognising them as structural[4].

The following sections examine how this structural ideal translates into concrete impacts on learning, emotional labour, and early-career wellbeing.

4. Impacts on Early-Career Engineers

The well-rounded engineer ideal is not merely an abstract expectation. It becomes a lived experience that shapes how early-career engineers interpret their competence, navigate uncertainty, and participate in workplace learning. This section outlines the primary mechanisms through which the ideal exerts pressure on newcomers.

Illustrative vignette
Consider a graduate engineer entering an operational team directly after university. Within weeks, they are expected to contribute technically, communicate confidently with senior

colleagues, manage competing tasks, and demonstrate initiative—while still learning unfamiliar systems, organisational norms, and tacit practices. When they hesitate or ask questions, feedback suggests they should be "more independent." When they act independently, feedback cautions against "taking risks." Interpreting these mixed signals through the lens of the well-rounded engineer ideal, the graduate concludes that their difficulty reflects personal inadequacy rather than a normal developmental process. The result is masked uncertainty, reduced help-seeking, and increased emotional strain—despite no explicit performance failure.

4.1 Identity Conflict: The Gap Between Aspiration and Reality

Newcomers enter the workforce with a template of what a "proper engineer" should look like: capable across domains, confident under pressure, and able to make sound decisions with minimal guidance. Real engineering work, however, is fragmented, ambiguous, and full of competing priorities. When the idealised template collides with the realities of practice, newcomers experience identity conflict: "If I were really competent, I wouldn't need this much help."; "A well-rounded engineer wouldn't struggle with something this basic."; "If I can't do everything, maybe I'm not cut out for this" [30]

Because the benchmark is impossible, even normal learning experiences—asking questions, making mistakes, slowing down to understand—are misinterpreted as evidence of inadequacy. This distorts early identity formation and undermines confidence during the period when professional identity is most malleable. Identity research shows that when newcomers face mismatches between expected and actual work, they often experience identity discontinuity and question their professional legitimacy [31].

4.2 Masked Uncertainty and Reduced Help-Seeking

The ideal carries an implicit behavioural rule: competent engineers do not show uncertainty. Early-career engineers quickly internalise that revealing confusion may be read as unpreparedness or lack of potential. As a result, they respond by delaying questions, avoiding clarifications, attempting tasks beyond their capabilities, masking uncertainty in front of supervisors, and minimising errors rather than analysing them.

Reduced help-seeking is not a personality trait; it is a rational response to an environment that conflates development with deficiency. Yet the consequences are severe: poorer learning, weaker decision-making, and in safety-critical settings, increased operational risk. Research on psychological safety shows that when environments penalise uncertainty, individuals avoid asking questions or admitting gaps in knowledge, even when doing so undermines learning [32].

4.3 Emotional Labour and the Performance of Competence

While engineering culture rarely acknowledges emotional labour, newcomers expend significant effort regulating their emotions to appear calm, capable, and unfazed. The need to "perform competence" creates a hidden emotional workload that includes: suppressing anxiety when the stakes are high; managing disappointment after errors; maintaining composure under time pressure; projecting confidence in meetings; concealing overwhelm during peak workload periods.

This performance is intensified by the myth's contradictory expectations: show initiative without recklessness; be confident without arrogance; be independent without isolation. The emotional labour required to navigate these tensions contributes directly to burnout, even in roles that appear technically straightforward. These emotional demands align with broader research showing that surface acting and deep acting in professional roles can deplete cognitive resources and intensify burnout [33]. Emotional labour research further shows that sustained surface acting is associated with emotional exhaustion, reduced wellbeing, and diminished job satisfaction.

4.4 Overextension: Doing Too Much, Too Early

Believing they must embody breadth, many early-career engineers overextend themselves: volunteering for tasks outside their expertise; agreeing to deadlines they cannot realistically meet; attempting to "prove versatility" by taking on multiple roles; working beyond regular hours to compensate for learning time.

Overextension is often misread by organisations as enthusiasm or "high potential," reinforcing the behaviour. It erodes sustainable learning, narrows attention, and increases the likelihood of errors—the pressure to be immediately versatile leaves little cognitive capacity for absorbing tacit knowledge or building depth. Workplace learning research shows that when novices are overloaded with responsibilities beyond their developmental readiness, their capacity to engage in deep learning is significantly reduced [34]. Studies of newcomer socialisation show that inconsistent supervisory signals often lead individuals to internalise ambiguity as personal inadequacy rather than recognising it as a normal feature of organisational life [35].

4.5 Inconsistent Feedback and the Internalisation of Failure

Supervisors, often unintentionally, send mixed signals: "You need to be more independent."; "Ask more questions."; "Take initiative."; "Don't take risks" [35].

Because the ideal engineer is expected to satisfy all these expectations simultaneously, newcomers interpret such inconsistencies as personal failings rather than standard features of complex work environments. This contributes to: chronic self-evaluation; difficulty prioritising; reluctance to make decisions; overreliance on external validation.

Inconsistent feedback strengthens the perception that shortcomings are individual rather than structural [35].

4.6 Attrition and Avoidance of Specialist Pathways

For some, sustained identity conflict and emotional labour lead to withdrawal: avoiding high-stakes tasks, drifting into peripheral roles, reducing long-term ambition, and leaving engineering entirely.

Attrition is not caused by lack of talent. It is often a rational response to an environment that demands breadth without offering time or support to develop it. The well-rounded ideal can also discourage specialisation by signalling that depth is narrow, risky, or insufficiently valued—despite the profession's dependence on specialised knowledge.

5. How Education Reproduces the Ideal

Although the well-rounded engineer ideal is most visible in industry recruitment and workplace expectations, its foundations are laid much earlier. Higher education systems—intentionally or not—reinforce the idea that engineers should develop broad, stable, and immediately transferable competence across multiple domains. This occurs not through a single policy or curriculum decision, but through a series of subtle, coherent messages that collectively shape how students imagine engineering identity [15].

5.1 Employability Narratives and the Promise of Versatility

Across countries and disciplines, engineering programmes frame graduates as adaptable problem-solvers capable of thriving in any context. University marketing, accreditation language, and employability frameworks routinely highlight teamwork, leadership, communication, innovation, ethical judgment, project management, technical proficiency, and global and intercultural understanding [28,14,36,6].

Individually, these attributes are reasonable. Together, they form an expectation of unbounded capability. Competency studies show that engineering programmes often emphasise broad, generic capabilities that few graduates can realistically demonstrate simultaneously, reinforcing the breadth-heavy ideal [36].

Students absorb the message that versatility is both achievable and required, long before they encounter the complexity and specialisation of real engineering work. This framing positions breadth as the default measure of readiness and success.

5.2 The Hidden Curriculum: Subtle Lessons About the "Good Engineer"

Much of the ideal is transmitted through the hidden curriculum: the implicit norms, values, and expectations that shape students' professional identities. These include: instructors presenting the "ideal engineer" as confident, rational, and self-sufficient; project-based learning that rewards students who assume generalist or leadership roles; cultural messaging that engineers should be able to "turn their hand to anything"; and assumptions that students will naturally transition from structured coursework to ambiguous real-world tasks.

These signals may be unintentional, but they reinforce the sense that competent engineers should have broad capabilities and minimal developmental needs. Hidden curriculum research shows that unspoken norms and expectations strongly shape how students interpret professional identity and competence [37].

5.3 Curriculum Design: Breadth as a Substitute for Clarity

Engineering degrees often prioritise broad exposure to multiple domains—mechanical design, circuits, materials, programming, management—under the rationale of producing versatile graduates. While this broad foundation has value, it also reinforces the myth by implying that mastery across diverse subjects is both possible and expected.

The structure of engineering degrees in different national contexts varies widely. Some systems emphasise depth early; others delay specialisation until postgraduate study. Yet, regardless of these differences, the same message tends to emerge: roundedness is the standard; specialisation is an optional deviation. Students internalise this message long before they develop a realistic sense of the profession's knowledge structures.

5.4 Assessment Practices That Reward Performance Over Development

Assessments frequently reward students who: take charge of group projects; manage broad sets of tasks competently; demonstrate surface-level versatility across domains; produce polished results under time pressure.

These assessment designs unintentionally valorise traits associated with the well-rounded ideal. They rarely acknowledge the slower, iterative processes that underpin genuine competence—deep learning, uncertainty management, reflection, and focused experimentation. Students learn to perform breadth rather than develop depth or recognise their own developmental limits.

5.5 Industry Engagement That Reinforces the Ideal

Work-integrated learning, capstone projects, and employer presentations often emphasise: agility; commercial awareness; rapid learning; multidisciplinary communication; "Hitting the ground running".

At the same time, industry representatives commonly express frustration that graduates "lack depth" or "need more practical experience." Because these contradictory messages are rarely reconciled, students form identity expectations based on the broad, polished narratives rather than the lived realities of engineering roles.

5.6 Uneven Preparation Across Global Education Systems

International graduates often encounter an additional layer of complexity. Education systems differ in: pedagogical styles (theoretical vs applied); collaborative norms; expectations of independence; assessment formats; communication conventions.

Yet employers often assume a universal standard of readiness aligned with the well-rounded ideal. Graduates trained in systems that emphasise theory or structured guidance may feel misaligned with workplaces that value autonomy and breadth, even when technically well-prepared. Again, the individual—not the ideal—is perceived as the misfit.

5.7 How Education and Industry Together Reproduce the Ideal

The alignment between university messaging and industry expectations creates a reinforcing cycle: Education signals that a "good engineer" is broadly capable; Industry recruitment echoes these attributes; Early-career engineers believe they must perform breadth before building depth; Organisations interpret breadth performance as potential, reinforcing the ideal.

This cycle persists despite clear evidence that engineering competence is highly situational, deeply specialised, and developmentally staged. The well-rounded engineer ideal, therefore,

does not emerge spontaneously in the workplace. It is cultivated gradually across a learner's entire trajectory, creating expectations that are inconsistent with real engineering practice. The next section proposes an alternative identity model that better aligns with how engineers actually develop competence.

6. A More Realistic Model of Engineering Identity

If the well-rounded engineer ideal is structurally unattainable, what should replace it? This section proposes a developmental, plural, and situated model of engineering identity that aligns with how competence actually forms in practice. Rather than expecting early-career engineers to embody breadth, confidence, and immediate readiness, this model recognises that engineering capability emerges through participation, specialisation, and relational support.

6.1 Identity as Developmental, Not Fixed

Engineering identity should be understood as a trajectory, not a template. Newcomers begin with limited contextual knowledge, partial technical fluency, and emerging professional judgement. Over time, through exposure to real tasks, feedback loops, and increasing responsibility, they develop: tacit understanding; contextual awareness; professional vision; domain-specific expertise; confidence grounded in experience.

A realistic identity model acknowledges that early-career engineers are not miniature versions of senior engineers. They are novices whose primary task is to learn, not to perform breadth.

6.2 Identity as Situated and Context-Dependent

Engineering competence is deeply contextual. A graduate who appears confident in one environment may struggle in another. A realistic model recognises that identity is shaped by: team norms; supervisory styles; organisational affordances; access to meaningful tasks; psychological safety; local epistemic cultures.

This situatedness means there is no universal "engineer identity." Instead, there are multiple legitimate identities shaped by context.

6.3 Identity as Plural Rather Than Singular

The well-rounded ideal assumes a single, universal identity. In reality, engineering work is performed by: deep specialists; integrators; analysts; designers; maintainers; communicators; safety engineers; systems thinkers.

A plural identity model recognises that engineering is a constellation of roles rather than a monolith. Specialisation is not a deviation from the ideal—it is the foundation of real engineering practice.

6.4 Identity as Relational and Supported

Competence develops through relationships: mentoring, supervision, peer learning, feedback, and shared problem-solving.

A realistic model foregrounds the relational nature of engineering work. Early-career engineers thrive when they have access to supportive colleagues, not when they are expected to perform independently prematurely.

6.5 Identity as Negotiated, Not Performed

Rather than performing certainty, newcomers should be encouraged to negotiate expectations, ask questions, and articulate uncertainty. This requires organisational cultures that: normalise learning; value transparency; reward help-seeking; recognise developmental needs.

A realistic identity model reframes uncertainty as a regular part of professional growth, not a threat to credibility.

6.6 The Developmentally Realistic Identity Model

Bringing these elements together, a realistic model of engineering identity is: developmental (built over time); situated (shaped by context); plural (multiple legitimate identities); relational (supported by others); negotiated (not performed).

This model aligns with how engineers actually develop competence and provides a healthier, more sustainable foundation for early-career participation.

7. Implications

A shift away from the well-rounded ideal has significant implications across the engineering ecosystem.

7.1 Implications for Engineering Education

Educators should: explicitly teach that engineering competence develops over time; normalise specialisation as a legitimate pathway; design assessments that reward depth, reflection, and uncertainty management; reduce reliance on generalist employability narratives; expose students to the realities of specialised engineering work [38].

Education should prepare students for developmental trajectories, not for impossible ideals.

7.2 Implications for Industry and Employers

Organisations should: articulate realistic expectations for early-career engineers; provide structured developmental pathways; train supervisors in developmental feedback; reduce the pressure to perform breadth prematurely; recognise emotional labour as part of early-career work.

Workplaces that support learning—not performance of readiness—retain more engineers and reduce burnout.

7.3 Implications for Accreditation and Professional Bodies

Accreditation frameworks often reinforce the well-rounded ideal through broad competency lists. Professional bodies should: differentiate between entry-level and advanced competencies; recognise specialisation as a legitimate form of readiness; revise competency frameworks to reflect developmental progression; support diverse engineering identities.

A shift in accreditation language would cascade through education and industry [7].

7.4 Implications for Diversity, Equity, and Inclusion

The well-rounded ideal disproportionately affects: women; international graduates; first-generation professionals; neurodivergent engineers; and engineers from underrepresented cultural groups.

A realistic identity model reduces the interpretive burden on these groups and supports more equitable participation.

8. Discussion: Reframing Engineering Identity and Rethinking Professional Development

The analysis across this paper reveals that the well-rounded engineer ideal is not simply a misguided aspiration, but a structural artefact produced through the interaction of educational narratives, organisational expectations, and professional epistemologies. Its persistence reflects deeper cultural commitments within engineering: a preference for certainty, a valorisation of versatility, and a reluctance to acknowledge the developmental realities of complex work. This section synthesises the implications of the preceding analysis and outlines how a more realistic identity model can reshape engineering education, early-career development, and organisational practice.

At its core, the well-rounded ideal functions as a boundary object—a shared but ambiguous construct that different stakeholders interpret in ways that serve their own needs. Educators use it to justify broad curricula; employers use it to signal desirable traits; accreditation bodies use it to articulate universal competencies. Yet this shared language masks profound inconsistencies. What appears as a coherent ideal is, in practice, a collection of contradictory expectations that no individual can satisfy simultaneously. The ideal persists not because it reflects the realities of engineering work, but because it simplifies complex developmental processes into a single, digestible narrative.

The developmental model proposed in Section 6 challenges this narrative by foregrounding the situated, relational, and plural nature of engineering identity. Rather than treating competence as a fixed attribute, it positions identity as something that emerges through participation, feedback, and exposure to meaningful tasks. This reframing has several implications.

First, it shifts the focus from individual deficits to structural misalignments. When graduates struggle, the issue is not a lack of roundedness but a mismatch between unrealistic expectations and the developmental time required to build expertise. Recognising this misalignment reframes early-career difficulties as a normal part of professional growth rather than as evidence of inadequacy.

Second, it highlights the importance of specialisation as a legitimate and necessary form of engineering identity. Modern engineering work is distributed across teams of specialists whose expertise is deep rather than broad. The well-rounded ideal obscures this reality, creating unnecessary identity conflict for those whose strengths lie in depth. A plural identity model legitimises diverse pathways and reduces the pressure to perform breadth prematurely.

Third, it underscores the centrality of relational support. Competence develops through mentoring, supervision, and shared problem-solving—not through individual performance of readiness. Organisations that recognise this relational dimension are better positioned to support early-career engineers and reduce attrition.

Finally, this reframing opens new avenues for research and practice. Future studies could examine how identity trajectories differ across engineering subfields, how organisational cultures shape help-seeking behaviour, or how emotional labour manifests in safety-critical environments. Practitioners could explore redesigning supervisory practices, onboarding structures, and feedback systems to align with developmental realities.

By synthesising these insights, Section 8 positions the paper's argument within broader debates about professional identity, workforce development, and the future of engineering education. It emphasises that abandoning the well-rounded ideal is not a rejection of excellence but a commitment to more realistic, humane, and sustainable models of professional growth.

9. Conclusion

The myth of the well-rounded engineer is more than an aspirational narrative; it is a structural ideal that shapes identity formation, learning trajectories, emotional labour, and early-career wellbeing. By expecting newcomers to embody contradictory traits—breadth without trade-offs, readiness without development time, confidence without experience—the profession creates conditions that undermine learning and distort self-evaluation.

This paper has shown that the ideal is sustained through education, recruitment, organisational culture, and epistemic norms. It has been argued that the ideal is not merely unrealistic but structurally impossible. In its place, the paper proposes a developmental, situated, plural, relational, and negotiated model of engineering identity—one that aligns with how competence forms in practice.

Reframing engineering identity in this way is not simply a conceptual exercise. It is a necessary step toward healthier transitions into engineering work, more sustainable professional pathways, and a profession that values the full diversity of its practitioners. If engineering is to meet the demands of contemporary socio-technical challenges, it must abandon the myth of the well-rounded engineer and embrace identities that reflect the realities of practice.

Notes

The author used AI to support proofreading and minor
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NOTE: Entry [26] contains TWO Trevelyan papers (2014 and 2010)

Similarly, entry [24] refers to Eraut 2004 cited in a multi-year format "(Eraut, 2004, 2000)"