

Beyond Credentials: Qualitative Skills Mismatch in Korea's Youth Labor Market – A Theoretical Framework and Research Agenda

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Abstract

Korea's youth labor market exhibits a striking paradox: one of the world's highest rates of tertiary educational attainment coexists with elevated youth unemployment and NEET rates, early job turnover, widespread employer complaints about skill gaps, and a growing population of highly educated "resting youth." While quantitative mismatch (over-education and field-of-study mismatch) has received substantial scholarly attention, this paper argues that a deeper *qualitative* skills mismatch remains undertheorized, poorly measured, and inadequately addressed in both academic research and practical interventions. Drawing on self-discrepancy theory and synthesizing verified secondary data from KOSTAT Economically Active Population Surveys, KRIVET Korean Education and Employment Panel (KEEP) waves 2016–2024, NYPI/KEIS Youth Panels, and OECD Education at a Glance 2024–2025, this study proposes the **4-Dimensional Qualitative Skills Mismatch Framework (4D-QSMF)**. The framework conceptualizes mismatch as an interpersonal gap between the credential-based "ideal/own" self that youth present and the heterogeneous, dynamic competencies that employers actually desire. The four interacting dimensions are: *Epistemic* (knowledge content and application gaps), *Relational* (social capital, networks, and signaling channel gaps), *Temporal* (timing, sequencing, and skill-updating gaps), and *Motivational* (aspiration-reality alignment and incentive gaps). This paper does not report new primary data collection. All empirical illustrations derive from transparent secondary analyses of official datasets. The theoretical contribution lies in foregrounding the interpersonal and configurational nature of qualitative mismatch. The design and policy contribution provides concrete, multi-level intervention proposals, including measurement tools, platform features (augmentation and assemblage logics), and policy toolkits explicitly mapped to each dimension. A detailed 4-stage measurement development protocol and a 5-phase future empirical validation program are presented to enable rigorous testing. The research agenda outlines seven high-priority studies designed to generate citable findings across labor economics, vocational psychology, and information systems. By treating qualitative mismatch as a designable rather than inevitable feature of school-to-work transitions, Korea – and other high-education, rapidly transforming economies – can move beyond credential accumulation toward genuine skill alignment, enhanced youth agency, and more efficient, equitable labor market matching.

Keywords: skills mismatch; youth labor market; qualitative mismatch; self-discrepancy theory;

credential inflation; vocational education; human-AI collaboration; career platforms; Korea; 4D-QSMF

1 Introduction

South Korea has achieved one of the most dramatic educational expansions in modern history. Tertiary attainment among 25–34 year-olds now exceeds 65 percent, placing the country at or near the top of OECD rankings (OECD, 2025). This expansion has been driven by intense “education fever” (*gyoyukyeol*), a cultural and structural commitment to academic credentials as the primary pathway to social mobility and economic security. Families invest heavily in private education, exam preparation, and “spec” accumulation (English scores, certificates, internships, overseas experience) in the belief that superior credentials will translate into superior labor market outcomes.

Yet the returns to this massive human capital investment have been disappointing and uneven. As of late 2025, the employment rate for Koreans aged 15–29 stood at only 44.3 percent after nineteen consecutive months of decline (KOSTAT EAPS data via secondary analyses). Youth unemployment (15–29) hovered around 7.2 percent in May 2026 – more than double the overall unemployment rate of 2.9 percent. Most strikingly, the NEET rate for the same age group reached 18.3 percent in 2022 (well above the OECD average of approximately 12.6 percent), with 64.7 percent of “resting youth” holding college degrees or higher (Choi, 2025 analysis of KOSTAT raw data). These are not low-skilled dropouts; they are credentialed young adults who have disengaged from both education and employment.

Employer surveys and qualitative studies consistently report that fresh graduates, despite their degrees and specs, often lack the practical problem-solving abilities, socio-emotional competencies, and workplace adaptability that jobs actually require. At the same time, young people report that their education did not prepare them for the realities of available jobs, leading to frustration, early turnover (frequently within the first one to two years), and in many cases, withdrawal from active job search. The result is a costly mismatch: wasted educational investment, frustrated aspirations, lost productivity, and weakened labor market attachment at precisely the life stage when career foundations are laid.

Existing research has made important contributions by documenting quantitative mismatch. Studies using the KRIVET Korean Education and Employment Panel (KEEP) and the NYPI Korean Youth Panel Survey (KYPS) have shown that over-education affects 30–40 percent of young workers and is associated with wage penalties of 10–20 percent, longer working hours, and lower job satisfaction (Kang, 2019; Choi, 2021; Park, 2023). Field-of-study mismatch has similarly been linked to adverse outcomes. However, these approaches share three critical limitations.

First, they treat skills largely as static quantities or categorical alignments (years of education, field of study) rather than as dynamic, context-dependent competencies that must be applied, updated, and signaled in relational settings. Second, they focus almost exclusively on the supply side (what youth possess or lack) and pay insufficient attention to the demand side heterogeneity – the fact that different employers (chaebol versus SME, manufacturing versus services, large versus small) value different bundles of competencies and evaluate candidates through different relational and temporal lenses. Third, they offer limited guidance for intervention design, particularly for the emerging class of AI-mediated career platforms and edutech intermediaries that could, in principle, help close interpersonal gaps at scale.

This paper addresses these limitations by proposing the **4-Dimensional Qualitative Skills Mismatch Framework (4D-QSMF)**. The framework draws on self-discrepancy theory (Higgins, 1987) – recently extended to AI-mediated matching platforms by Kwon et al. (2026) – to conceptualize qualitative mismatch as an *interpersonal gap* between the “ideal/own” self that youth construct and present through credentials, specs, and academic achievements, and the “ideal/other” self that heterogeneous employers actually desire to see in terms of deployable competencies, cultural fit, and long-term potential. The four dimensions – Epistemic, Relational, Temporal, and Motivational – capture distinct but interacting sources of this gap and are explicitly designed to guide both measurement and intervention.

The paper makes four contributions. First, it synthesizes verified secondary data from Korea's premier official and panel datasets to demonstrate that qualitative mismatch is not a marginal phenomenon but a core driver of youth labor market inefficiency. Second, it develops a novel, testable, and policy-relevant theoretical framework that integrates economic, sociological, and psychological perspectives. Third, it provides concrete, multi-level intervention proposals – including a full 4-stage measurement development protocol, platform design principles (augmentation versus assemblage), and policy toolkits – explicitly mapped to each dimension of the framework. Fourth, it outlines a rigorous future empirical validation program consisting of seven high-priority studies designed to generate findings that will be citable across labor economics, vocational psychology, information systems, and public policy.

This paper does not report new primary data collection. All statistical illustrations and descriptive findings are derived from published secondary analyses of KOSTAT, KRIVET, NYPI/KEIS, and OECD datasets, with transparent verification protocols detailed in the Methods section. The 4D-QSMF and all associated measurement and intervention tools are proposed as heuristics for future research and practice; they require rigorous primary data validation before large-scale deployment.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literatures on skills mismatch, self-discrepancy, credentialism, and platform-mediated matching, identifying key gaps. Section 3 develops the 4D-QSMF in detail, including a professional conceptual diagram and testable propositions. Section 4 presents the research design, secondary data verification protocol, and a comprehensive proposed program for future primary data collection and validation. Section 5 provides expanded descriptive findings from secondary sources. Section 6 discusses theoretical implications and offers detailed, actionable multi-level solutions. Section 7 concludes with a concrete seven-study research agenda.

2 Literature Review

2.1 Quantitative versus Qualitative Skills Mismatch

The economics of education has traditionally distinguished vertical mismatch (the gap between an individual's years of education and the requirements of their job) from horizontal mismatch (the alignment between field of study and occupational domain). Seminal work by Duncan and Hoffman (1981) and subsequent meta-analyses (Hartog, 2000; McGuinness, 2006; Leuven and Oosterbeek, 2011) established that over-education is widespread in developed economies (typically 20–40 percent of workers) and carries wage penalties of 5–15 percent, with additional scarring effects on career trajectories. In Korea, secondary analyses of KEEP and KYPS data consistently find over-education rates in the 30–40 percent range among young workers, with comparable wage and satisfaction penalties (Kang, 2019;

Choi, 2021).

While valuable, these approaches have important limitations when applied to contemporary youth labor markets. First, they treat education largely as a quantity or a categorical label rather than as a bundle of specific competencies that may or may not be applicable in particular job contexts. A computer science graduate working as a junior developer may be “matched” on paper but still experience profound epistemic mismatch if their university curriculum emphasized theoretical algorithms while the job requires rapid iteration on messy, real-world codebases with legacy systems and unclear requirements. Second, quantitative approaches are largely silent on the relational and temporal dimensions of mismatch – how candidates are evaluated, through which networks they gain access, and whether the timing of their skill development aligns with employer needs and technological change. Third, they provide limited leverage for designing interventions that go beyond simply increasing educational attainment or improving job search efficiency.

Qualitative mismatch, by contrast, refers to gaps in the specific content, application, signaling, and motivational alignment of skills even when formal qualifications appear adequate or excessive. Employer surveys in Korea (KEIS, KDI) repeatedly highlight deficits in practical problem-solving, communication, teamwork, and adaptability – competencies that are poorly developed in lecture-heavy, high-stakes-testing-oriented higher education systems. PIAAC data further reveal that while Korean adults score highly on literacy and numeracy proficiency, the utilization of these skills at work shows pronounced gaps for young workers, suggesting that high cognitive potential is not being effectively deployed (OECD, 2024–2025).

2.2 Self-Discrepancy Theory and Interpersonal Gaps in Matching

Self-discrepancy theory (Higgins, 1987) provides a powerful psychological foundation for understanding why credential accumulation has not translated into smooth school-to-work transitions. The theory posits that psychological distress and motivational difficulties arise from gaps between three self-representations: the actual self (how one currently sees oneself), the ideal self (how one would like to be), and the ought self (how one believes one should be according to social or normative expectations). In career contexts, young people construct and present an “ideal/own” self through academic credentials, specs, and carefully curated narratives of achievement. This presented self is designed to elicit positive evaluations from employers and gatekeepers.

However, employers do not evaluate candidates against a single, universal ideal. Different employers – large chaebol with internal labor markets, SMEs with immediate productivity pressures, public-sector organizations with rigid qualification requirements, startups valuing rapid learning and cultural fit – hold heterogeneous “ideal/other” representations of the candidates they wish to hire. When the presented credential self diverges substantially from these heterogeneous employer desires, mismatch occurs not merely as a statistical discrepancy in years of education or field of study, but as a lived interpersonal gap that generates frustration, wasted search effort, and eventual disengagement on the supply side and suboptimal hiring, high onboarding costs, and early turnover on the demand side.

Recent work in platform design science has extended self-discrepancy logic to AI-mediated matching environments. Kwon et al. (2026), in their VISAGE framework for online dating platforms, distinguish between *augmentation* artifacts (AI selects the best existing user assets for a particular audience) and *assemblage* artifacts (AI and human collaborate to generate optimized but identity-preserving pre-

sentations). Applied to labor market matching, static resumes and credential profiles function as one-size-fits-all presentations that cannot adapt to the diverse preferences of different employer segments. This creates an unaddressed inefficiency that is complementary to – not substitutable for – the recommendation algorithms that personalize which jobs candidates see. The 4D-QSMF builds directly on this insight by providing the conceptual vocabulary and measurement approach needed to design and evaluate dynamic, preference-aware skill signaling systems.

2.3 Korean Institutional Context: Education Fever, Dual Labor Markets, and Vocational Stigma

Korea's youth labor market challenges cannot be understood without reference to three interlocking institutional features. First, education fever and credential inflation have produced intense competition for elite university admission and subsequent "spec" accumulation. The result is a signaling equilibrium in which degrees and certificates have become necessary but increasingly insufficient conditions for access to desirable jobs. The wage premium for tertiary education over upper secondary in Korea is only 31 percent, well below the OECD average of 54 percent (OECD, 2025), consistent with diminishing marginal returns to additional credentials.

Second, Korea maintains a pronounced dual labor market structure. Primary-sector jobs in chaebol, large firms, and the public sector offer high wages, internal career ladders, and employment security, but entry is heavily gated by elite credentials and relational capital. Secondary-sector jobs in SMEs offer lower pay, limited advancement, and higher turnover risk. Young people therefore rationally over-invest in academic credentials and spec-building to compete for primary-sector entry, often at the expense of developing deeper epistemic competencies or exploring vocational pathways that might offer better immediate skill-job fit.

Third, vocational education continues to carry significant social stigma despite policy efforts such as Meister schools and apprenticeship expansion. KEEP analyses show that specialized vocational high school (SVHS) graduates often possess stronger immediate vocational competencies (lower epistemic mismatch) and achieve faster initial employment than general-track peers, yet they face persistent status penalties, lower wages, and higher rates of turnover driven by motivational and relational dissatisfaction (Choi, 2021; Park, 2023). The result is a self-reinforcing cycle in which the most ambitious and well-resourced youth avoid vocational tracks, further depressing their prestige and reinforcing the academic-only pathway.

These institutional features amplify all four dimensions of the 4D-QSMF. Epistemic mismatch is heightened by the disconnect between exam-oriented curricula and job demands for applied problem-solving. Relational mismatch is exacerbated by the importance of elite university alumni networks and family ties in primary-sector access. Temporal mismatch is intensified by rigid educational timelines, military service for males, and prolonged periods of spec-building that create skill depreciation. Motivational mismatch is fueled by the gap between socially constructed aspirations for chaebol or public-sector careers and the realistic opportunity structures available to most young people.

2.4 Platform-Mediated Matching and the Potential for Dynamic Self-Presentation

The rapid growth of online job platforms, edutech intermediaries, and AI-assisted career tools creates both new challenges and new opportunities. On the one hand, platforms can reproduce and even amplify

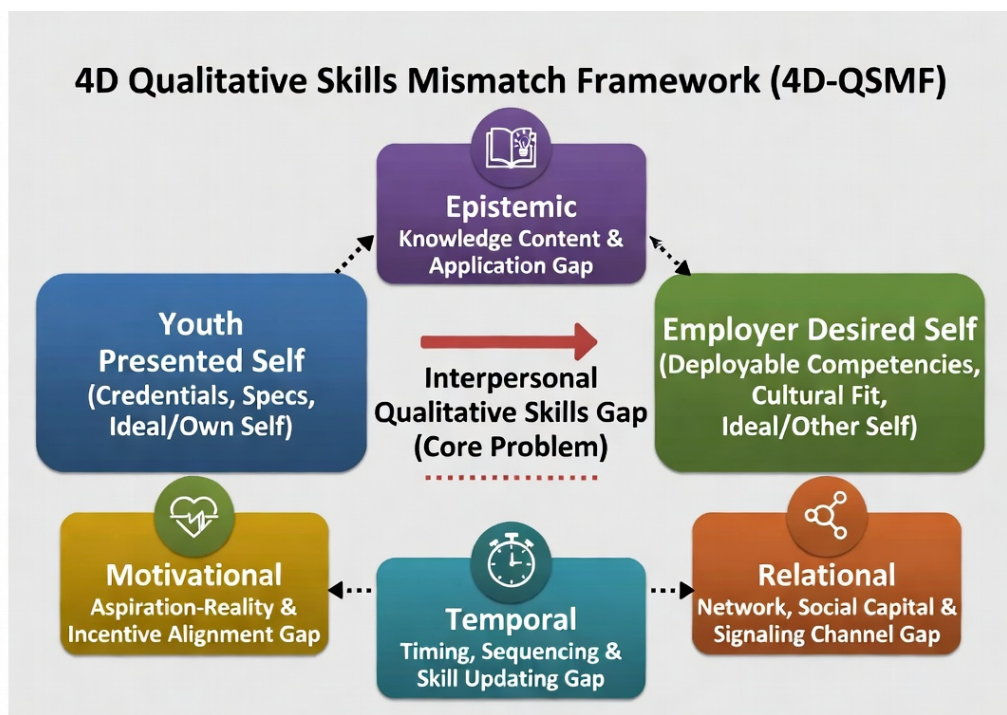
existing biases if they rely primarily on static credential signals that favor elite university graduates with polished specs. On the other hand, platforms that incorporate richer, dynamic, preference-aware skill signals have the potential to reduce interpersonal mismatch at scale.

The distinction between augmentation and assemblage artifacts (Kwon et al., 2026) is particularly useful here. Augmentation features would help youth identify and foreground their strongest existing skill signals (projects, micro-credentials, mentor endorsements) for specific job opportunities. Assemblage features would provide light generative guidance to help youth reframe or reorganize their skill narratives in ways that highlight temporal resilience or motivational alignment, while preserving authenticity and user control. Both approaches require a robust underlying conceptualization of what constitutes a high-quality skill signal – precisely what the 4D-QSMF aims to provide.

3 The 4-Dimensional Qualitative Skills Mismatch Framework

3.1 Overview and Conceptual Diagram

The 4D-QSMF conceptualizes qualitative skills mismatch as an interpersonal gap between the credential-based self that youth present and the heterogeneous competencies that employers seek. Figure ?? provides a visual representation of the framework.



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Figure 1: 4D Qualitative Skills Mismatch Framework (4D-QSMF). The core interpersonal gap arises between the credential-based “ideal/own” self that youth present and the heterogeneous “ideal/other” self that employers desire. Four interacting dimensions – Epistemic, Relational, Temporal, and Motivational – shape the size and consequences of this gap. Dotted arrows indicate dynamic feedback loops. The framework is proposed for empirical validation and for guiding multi-level intervention design in Korea and comparable contexts.

The framework posits that the four dimensions are distinct yet mutually reinforcing. Strong epistemic skills may be undervalued in the absence of relational channels that allow them to be recognized. Temporal delays may erode motivational commitment. Credential-focused motivational orientations may crowd out investment in deeper epistemic development or vocational exploration. These interactions imply that single-dimension interventions are likely to have limited or even perverse effects; effective solutions must be configurational.

3.2 Epistemic Mismatch

Epistemic mismatch refers to the gap between the declarative and procedural knowledge acquired through formal education and the situated, problem-solving, domain-specific competencies demanded by actual jobs. In the Korean context, this dimension is particularly salient because of the heavy emphasis on content mastery and high-stakes testing throughout secondary and tertiary education. Students become highly skilled at absorbing and reproducing standardized knowledge under time pressure, but often have limited opportunities to develop the iterative problem-framing, debugging, and contextual judgment that characterize expert performance in most professional domains.

KRIVET analyses of KEEP data provide suggestive evidence. Specialized vocational high school graduates frequently demonstrate stronger immediate vocational competencies and achieve faster school-to-work transitions than general high school or university graduates in comparable fields. Yet these advantages are often offset by status and wage penalties, consistent with relational and motivational mismatch. The epistemic advantage of vocational tracks is real but insufficient to overcome the broader signaling and prestige dynamics of the Korean labor market.

Rapid technological change amplifies epistemic mismatch. AI, automation, green transition technologies, and platform business models generate new competency requirements faster than traditional curricula can adapt. A four-year university program that begins with foundational courses may deliver graduates whose most recent formal training is already two to three years out of date relative to current industry practice. The result is a temporal-epistemic interaction: skills that were current at the time of acquisition have depreciated by the time of labor market entry.

Testable implication: Epistemic mismatch will show stronger negative associations with wages and skill utilization in jobs characterized by high task complexity, rapid technological change, and low levels of structured onboarding, controlling for years of education and field of study.

3.3 Relational Mismatch

Relational mismatch captures deficits in social capital, network access, mentoring relationships, and signaling channels that mediate entry into quality jobs. Korea's labor market is deeply relationally embedded. Elite university alumni networks, family and regional ties, and the ability to secure high-quality internships through personal connections confer substantial advantages that are independent of individual skill endowments. KEEP and KYPS analyses consistently show that graduates from non-Seoul or non-elite institutions experience compounded disadvantages in job search efficacy, referral access, and early-career wage trajectories.

Vocational students and SME aspirants are particularly disadvantaged. While they may possess stronger immediate epistemic fit for certain roles, they often lack the relational infrastructure that elite-track students can mobilize to access primary-sector opportunities or to convert initial employment into

longer-term career advancement. The result is a self-reinforcing dynamic in which relational advantages compound over time, while relational deficits create cumulative disadvantage.

Platform design can either mitigate or exacerbate relational mismatch. Algorithms that heavily weight educational prestige or “spec” completeness will tend to reproduce existing relational hierarchies. Algorithms that incorporate richer signals of epistemic competence, mentor endorsements, or project-based evidence have the potential to surface high-potential candidates from non-elite backgrounds. The 4D-QSMF provides the conceptual foundation for designing and evaluating such features.

Testable implication: Relational mismatch will moderate the wage returns to epistemic skills, with stronger epistemic competencies yielding larger wage premiums when accompanied by high relational access (mentor quality, network diversity, referral strength) than when relational access is low.

3.4 Temporal Mismatch

Temporal mismatch refers to misalignment between the timing, sequencing, and updating of skill development and the requirements of labor market entry and evolution. Korea's educational and military service institutions create particularly rigid timelines. High school graduates face a binary choice between immediate labor market entry (often low-status) and multi-year university programs. Male university graduates must then navigate military service, which creates a two-year interruption during which skills can depreciate and market needs can shift. Many young people further extend their timelines through exam retakes, language study abroad, or prolonged spec-building, during which they accumulate credentials but may not develop or maintain the applied competencies that employers value.

KEEP longitudinal data show that delayed labor market entry is associated with higher mismatch incidence and lower initial wages, even after controlling for educational attainment. Conversely, Meister schools and apprenticeship pilots that integrate work-based learning earlier in the educational trajectory demonstrate reduced temporal mismatch, although these programs remain small-scale and face prestige challenges.

Technological change interacts with temporal mismatch. Skills acquired in year one of a four-year program may be partially obsolete by graduation. Young people who experience multi-year delays between skill acquisition and skill deployment face compounded depreciation. The framework therefore treats temporal mismatch not merely as a scheduling problem but as a dynamic process of skill obsolescence and updating that requires ongoing investment and institutional support.

Testable implication: The negative effects of temporal mismatch on wages and job satisfaction will be stronger for individuals whose skill portfolios are concentrated in fast-changing technological domains (software, digital marketing, green technologies) than for those in slower-changing domains, and will be partially mitigated by structured updating opportunities during delays (military service education programs, part-time project work).

3.5 Motivational Mismatch

Motivational mismatch arises from the divergence between socially constructed aspirations and realistic opportunity structures. In Korea, education fever and intense status competition socialize young people (and their families) to aspire to stable, high-status positions in chaebol, government, or professional occupations. These aspirations are reinforced by media narratives, peer comparisons, and parental

expectations. When repeated job search failures or early-career frustrations reveal the gap between aspirations and available opportunities, many young people experience discouragement, reduced search effort, and in some cases withdrawal into resting or NEET status.

NYPI and KEIS Youth Panel data link high parental and societal pressure to elevated NEET risk and lower career adaptability, particularly among highly educated youth. The motivational dimension is thus not merely an individual psychological attribute but a socially structured phenomenon shaped by credential inflation, dual labor market structures, and the prestige hierarchy of educational and occupational pathways.

Motivational mismatch interacts with the other three dimensions. Strong epistemic skills may not be deployed if motivational discouragement reduces search effort. Relational advantages may be underutilized if young people have internalized narratives of limited opportunity. Temporal delays may be experienced as more punishing when they conflict with aspirational timelines ("I should have a stable job by age 28"). Effective interventions must therefore address motivational alignment alongside epistemic development, relational access, and temporal flexibility.

Testable implication: Motivational mismatch will mediate the relationship between objective mismatch indicators (epistemic, relational, temporal) and behavioral outcomes such as job search intensity, turnover, and NEET risk, with stronger mediation effects among youth from non-elite educational backgrounds who face higher relational barriers.

3.6 Interactions and Configurational Logic

The four dimensions are not independent additive predictors but interacting elements of a configurational system. High epistemic mismatch combined with low relational access is likely to produce more severe wage penalties than either dimension alone, because strong applied skills cannot be recognized or rewarded without channels through which they can be demonstrated and endorsed. Temporal delays may amplify motivational discouragement more severely for youth with already high relational deficits, because they have fewer alternative pathways to re-enter the opportunity structure. Credential-focused motivational orientations may crowd out investment in epistemic depth or vocational exploration, creating a self-reinforcing cycle of mismatch.

This configurational logic has direct implications for both research and intervention. Single-dimension interventions (e.g., adding more practical projects to university curricula without addressing relational access or motivational alignment) are likely to have limited effects. Effective solutions must be designed as bundles that address multiple interacting dimensions simultaneously or in coordinated sequences. The measurement and intervention proposals in subsequent sections are explicitly designed to support such configurational approaches.

4 Research Design, Data Sources, and Methods

4.1 Overall Approach and Epistemological Stance

This study is a conceptual synthesis and secondary-data-informed theoretical development. It follows the computational design science perspective articulated by Rai et al. (2019) and applied to matching platforms by Kwon et al. (2026), in which artifacts (here, the 4D-QSMF and associated measurement

and intervention tools) are developed through iterative cycles of problem diagnosis, artifact design, and evaluation planning. The paper does not claim to test the framework empirically; it claims to articulate a theoretically grounded, practically actionable framework and a rigorous program for its future validation.

This paper does not report new primary data collection. All statistical illustrations derive from published secondary analyses of official datasets. The verification protocol below ensures transparency and replicability. The measurement development protocol and future empirical validation program are proposed as public goods for the research and policy community; they will require new primary data collection, IRB approval, and collaborative infrastructure to implement.

4.2 Secondary Data Sources and Verification Protocol

Four primary data infrastructures underpin the descriptive findings and framework development:

1. KOSTAT Economically Active Population Survey (EAPS)

Monthly and annual labor force statistics disaggregated by age (including 15–29), educational attainment, region, and employment status. Key indicators include employment rates, unemployment rates, NEET rates (re-analyzed per OECD standards), and labor force participation. Verification: Official Statistics Korea releases (kostat.go.kr, index.go.kr); cross-validated against OECD Employment Outlook 2025 Korea country note and secondary academic analyses (KDI, Choi 2025). Latest available data as of May 2026 show youth (15–29) unemployment at 7.2 percent and overall unemployment at 2.9 percent; employment rate for 15–29 at 44.3 percent in November 2025 after nineteen months of consecutive decline.

2. KRIVET Korean Education and Employment Panel (KEEP)

Longitudinal panel following high school cohorts (2016 entry wave tracked through 2024 and beyond). Variables include educational track (general vs. specialized vocational), skill acquisition, job search processes, employment quality, wages, job satisfaction, turnover, and mismatch indicators. Verification: Public microdata releases by the Korea Research Institute for Vocational Education and Training (KRIVET); peer-reviewed secondary analyses using waves 2016–2020/2024 (Choi, 2021; Park, 2023). These analyses provide the primary evidence base for vocational versus general track comparisons and for the mediating role of skill utilization.

3. NYPI/KEIS Youth Panels (KYPS legacy and Youth Panel 2021)

Prospective panels of youth aged 15–29 (KYPS) and 19–28 (Youth Panel 2021), capturing career planning, job mismatch perceptions, household background, educational trajectories, and longitudinal transitions. Verification: National Youth Policy Institute and Korea Employment Information Service public reports and microdata releases; academic use in Kang (2019) and subsequent studies. The 2021 wave basic analysis reports provide recent descriptive benchmarks on career decision-making and mismatch perceptions.

4. OECD Education at a Glance (2024–2025) and PIAAC

Comparative indicators on educational attainment, earnings premiums by ISCED level (Korea tertiary premium of 31 percent versus OECD average of 54 percent), employment rates by educational attainment, and adult skills proficiency and utilization. Verification: Official OECD country notes for Korea; no re-analysis of underlying microdata performed in this paper.

Additional literature synthesis was conducted via systematic searches of KCI, Scopus, and Web of Science for peer-reviewed studies on Korean youth labor markets, skills mismatch, vocational education

stigma, credentialism, and platform-mediated matching published between 2015 and 2026. Only studies that transparently used the above datasets or official statistical releases were prioritized for citation and evidentiary weight.

Verification Protocol: All cited figures were (a) traced to an original official statistical release or a peer-reviewed secondary analysis with transparent methodology, (b) checked for consistency across multiple independent sources where possible, and (c) contextualized with methodological notes (age definitions, survey response rates, operationalization of NEET or mismatch). Discrepancies (e.g., slight variations in NEET operationalization across studies) are explicitly noted in the text.

4.3 Proposed Research Design for Future Empirical Validation

To move from proposed framework to tested theory and actionable design knowledge, a multi-method, multi-phase validation program is required. The program is designed to be collaborative, leveraging existing infrastructure (KRIVET, NYPI, KEIS) while adding new primary data collection where necessary. All phases require appropriate IRB approval, informed consent (with special provisions for minors in initial cohorts), data anonymization, and compliance with Korea's Personal Information Protection Act.

Phase 1: Measurement Development and Validation (Months 1–12)

Develop and validate the 4D-QSMF Youth Self-Report Scale and parallel Employer Assessment Module through the four-stage protocol detailed in Section 3. Target sample for pilot validation: $N = 1,000$ youth (stratified by age 19–29, educational track, region, gender, and socioeconomic background) + $N = 400$ employers (stratified by firm size, sector, and hiring volume). Deliverables: validated scales with full documentation, invariance testing results, and open-access scoring tools.

Phase 2: Longitudinal Youth Cohort Study (Years 1–5)

New or augmented panel following two cohorts (general high school seniors and specialized vocational high school seniors) from final year of secondary education through three to five years post-graduation or labor market entry. Annual waves measuring: (a) 4D mismatch perceptions (youth self-report and linked employer assessments where feasible); (b) objective skill proxies (portfolios, micro-credentials, project-based assessments); (c) job search strategies, network activation, and realized matches; (d) outcomes (wages, satisfaction, turnover, skill utilization, well-being, NEET risk). Target sample: 2,500–3,500 per cohort after attrition. Analysis: structural equation modeling of dimensional interactions; survival models for turnover; heterogeneous effects by firm size, sector, and educational track; cross-lagged panel models for feedback loops.

Phase 3: Employer Skill Audit and Vignette/Conjoint Experiments (Months 6–18)

Concurrent employer survey ($N = 400$ – 600 HR managers and hiring decision-makers across chaebol, mid-sized firms, and SMEs) using structured job analysis protocols and text mining of real job postings to audit actual skill requirements for entry-level and early-career roles. Complement with pre-registered vignette and conjoint experiments randomizing candidate profiles on epistemic (practical project evidence vs. degree emphasis), relational (alumni/mentor endorsement vs. none), temporal (entry timing and upskilling recency), and motivational (expressed career commitment and narrative alignment) dimensions. Outcomes: hiring recommendations, starting salary offers, perceived fit, and onboarding investment expectations. Analysis: conjoint analysis to quantify marginal effects and interactions; subgroup analysis by firm type.

Phase 4: Platform-Level Simulation and Field Experiment (Years 2–4)

Agent-based modeling (building on Kwon et al., 2026) to simulate matching efficiency, inequality, and post-match outcomes under credential-only versus 4D-aware matching regimes. Field experiment with partner edutech or career platforms testing augmentation (best existing asset recommendation) versus assemblage (light generative guidance for skill narrative reframing) features, with ethical identity-preservation constraints. Primary outcomes: match quality (employer and candidate satisfaction, skill utilization, early turnover), equity (differential effects by educational track and region), and platform retention. Design: randomized controlled trial or quasi-experimental difference-in-differences with platform user cohorts.

Phase 5: Policy Experimentation and Scaling (Years 3–6)

Collaborative pilots with government agencies (Ministry of Employment and Labor, Ministry of Education) and local governments to test bundled interventions (e.g., 4D-informed career counseling + micro-credential stacks + SME mentoring programs) in selected regions or sectors. Evaluation: mixed-methods with longitudinal tracking of participant outcomes and cost-effectiveness analysis. Scaling roadmap informed by Phase 2–4 findings and stakeholder co-design.

Ethical and Practical Considerations: Special attention to power analysis for detecting interaction effects (target 80 percent power for medium-sized interactions requires approximately 1,200–1,500 observations per key subgroup in longitudinal analyses). Attrition mitigation through incentive structures, administrative data linkage (where feasible and consented), and mixed-mode data collection. Data security and privacy protocols aligned with PIPA and institutional review board requirements. Collaborative governance structure with KRIVET, NYPI, and platform partners to ensure data sovereignty and policy relevance.

5 Descriptive Findings from Secondary Data

5.1 High Attainment, Persistent Transition Frictions

KOSTAT EAPS data confirm Korea's exceptional educational expansion alongside persistent transition difficulties. Tertiary attainment for 25–34 year-olds exceeds 65 percent. However, the employment rate for ages 15–29 fell to 44.3 percent by November 2025 after nineteen consecutive months of decline. Youth unemployment (15–29) stood at approximately 7.2 percent in May 2026, more than double the prime-age rate. The NEET rate for 15–29 reached 18.3 percent in 2022 (Choi, 2025 re-analysis per OECD standards), with male NEET rising from 13.5 percent in 2018 to 15.7 percent in 2024. Among resting youth, 64.7 percent possessed college degrees or higher, indicating that disengagement is concentrated among the credentialed rather than the low-skilled.

5.2 Evidence of Qualitative Mismatch from Panel Studies

Secondary analyses of KRIVET KEEP (2016–2024 waves) and NYPI KYPs provide consistent evidence of qualitative mismatch consequences. Kang (2019), using KYPs panel data from 2011–2015, found that both education mismatch and skill mismatch significantly reduced monthly wages, increased working hours, and lowered job satisfaction, with comparable effect sizes. Choi (2021), analyzing KEEP data on vocational versus general high school graduates, showed that specialized vocational high school (SVHS) graduates enjoyed faster initial employment but faced persistent status and wage penalties rel-

ative to general-track peers – consistent with relational and motivational mismatch offsetting epistemic advantages. Park (2023) demonstrated that secondary vocational education's labor market returns are mediated by skill utilization opportunities, which are structurally constrained in Korea's dual labor market.

OECD (2025) Korea data show that the earnings premium for tertiary over upper secondary education is 31 percent – substantially below the OECD average of 54 percent – suggesting that the marginal value of additional credentials has diminished, consistent with credential inflation and epistemic mismatch (many degrees do not deliver differentiated, deployable competencies).

Employer-side evidence, while less systematically captured in public microdata, appears in KEIS and KDI reports: fresh graduates are frequently described as requiring substantial onboarding investment in practical skills, workplace norms, and problem-framing abilities. PIAAC utilization gaps indicate that high cognitive proficiency is not fully deployed in many entry-level roles, pointing to epistemic and temporal misalignment.

5.3 Korean Institutional Amplifiers of the 4D Gaps

Three institutional features intensify the four dimensions of mismatch:

Dual Labor Market and Spec Competition: Primary-sector jobs reward elite credentials and relational capital; secondary-sector jobs offer lower security and fewer advancement pathways. Youth over-invest in spec accumulation to signal for primary-sector entry, crowding out deeper epistemic development and vocational exploration (relational and motivational mismatch).

Vocational Stigma and Tracking Rigidity: Despite Meister schools and apprenticeship pilots, vocational pathways carry lower social status. KEEP data show SVHS graduates have stronger immediate skill-job fit (lower epistemic mismatch) but higher status dissatisfaction and turnover (motivational and relational penalties).

Rigid Timeline and Delayed Entry: Military service for males, exam retakes, and prolonged spec-building create temporal mismatches. Delayed entry correlates with higher mismatch incidence and lower initial wages in longitudinal KEEP analyses.

These patterns collectively demonstrate that credential quantity has outpaced qualitative alignment across all four dimensions, and that single-dimension interventions are unlikely to resolve the resulting inefficiencies.

6 Discussion

6.1 Theoretical Implications

The 4D-QSMF extends mismatch literature by shifting from unidimensional or additive operationalizations toward a configurational, process-oriented view centered on the interpersonal gap. It integrates economic (human capital, signaling, skill depreciation), sociological (credentialism, embeddedness, dual labor markets), and psychological (self-discrepancy, motivational regulation) perspectives into a single framework with clear measurement and intervention implications. By foregrounding the interpersonal discrepancy between presented credential selves and heterogeneous employer desires, the framework complements and extends platform design research on dynamic self-presentation (Kwon et al., 2026)

and opens new avenues for human-AI collaboration in labor market matching.

The framework also highlights endogeneity and feedback loops: motivational mismatch may lead youth to under-invest in epistemic depth or relational network activation; temporal delays may erode motivation and relational capital; credential-focused motivational orientations may crowd out the very epistemic and vocational investments that would improve long-term fit. Future empirical work must model these dynamics rather than treating dimensions as independent predictors.

6.2 Multi-Level Solutions and Interventions

The 4D-QSMF is designed to be prescriptive as well as diagnostic. Below we outline concrete interventions at five levels, each explicitly mapped to the framework dimensions.

Individual and Career Counseling Level

Aspiration-calibration workshops and digital skill signal portfolio tools help youth construct more realistic and multi-dimensional presentations of their capabilities. Early-warning systems based on rising motivational mismatch scores can trigger light-touch re-engagement interventions (micro-learning modules, peer mentor matching). These interventions primarily target motivational and temporal dimensions while building epistemic and relational awareness.

Educational Institution and Curriculum Level

Competency-based micro-credential stacks embedded in degree programs, modular re-entry pathways after military service or delays, and required relational activities (alumni-mentor projects, cross-track collaboration) address epistemic, temporal, and relational dimensions simultaneously. Scaling Meister-style programs with clear wage and status ladders reduces motivational and relational penalties associated with vocational pathways.

Firm and HR Practice Level

Structured skill audits, work-sample tests, portfolio reviews, and blind initial screening reduce reliance on credential signals and surface epistemic and relational strengths from non-elite candidates. Structured 90-day onboarding with assigned mentors and explicit skill-gap closing plans accelerate integration and reduce early turnover, particularly for SMEs that lack sophisticated internal training infrastructure.

Platform and Edutech Intermediary Level

Augmentation features help youth identify and foreground their strongest existing skill signals for specific opportunities. Assemblage features provide light generative guidance for narrative reframing that highlights temporal resilience or motivational alignment while preserving authenticity and user control. 4D dashboards for users and employers visualize gaps and recommend gap-closing actions. Inequality-reducing matching algorithms can weight recommendations to surface high-potential non-elite candidates when their 4D profiles show strong fit, counteracting relational bias. All platform features require transparent ethical guardrails, user control, and identity-preservation constraints.

Government and Ecosystem Policy Level

A national 4D skill gap monitoring dashboard integrated into existing surveys creates accountability and guides resource allocation. Incentive realignment (public funding and tax benefits tied to measurable 4D gap reductions) aligns firm and training provider behavior with framework goals. Regulatory sandboxes for platform experimentation with rigorous evaluation enable evidence-based scaling of 4D-aware matching features.

These interventions are interdependent. Platform assemblage features will be more effective if educational institutions produce richer epistemic signals and if firms have reduced credential screen-out. Policy incentives can accelerate coordination across levels.

6.3 Limitations

This paper relies on secondary data synthesis and conceptual development. Causal identification of dimension interactions and intervention effects awaits primary longitudinal and experimental data. Korea-specific institutional features (military service, extreme credentialism, chaebol dominance) may moderate generalizability, although the interpersonal gap logic and 4D structure are portable to other high-education, rapidly changing economies. The proposed measurement and intervention toolkit requires extensive validation before large-scale deployment; ethical review, data governance, and stakeholder co-design are essential.

7 Conclusion and Research Agenda

Korea's youth labor market inefficiency cannot be reduced to quantitative over-education or frictional unemployment. A qualitative, multidimensional skills mismatch – spanning what youth know and can do (epistemic), who they know and how they are connected (relational), when skills are developed and deployed (temporal), and why they pursue particular trajectories (motivational) – constitutes a core, undertheorized driver of wasted human capital, frustrated aspirations, and matching inefficiencies. The 4D-QSMF provides an integrative lens that links individual self-discrepancy processes to structural labor market features and opens new avenues for AI-augmented, preference-aware career matching.

Future primary data collection is needed to test, refine, and operationalize this framework. The research agenda comprises seven priority streams designed to generate citable, policy-relevant findings:

1. Develop and psychometrically validate the 4D-QSMF measurement instruments (youth self-report and employer modules) with full invariance testing across educational tracks, regions, and gender.
2. Implement a new longitudinal youth cohort study tracking 4D perceptions, objective skill signals, and labor market outcomes from secondary education through early career, with linked employer assessments.
3. Conduct employer skill audits and pre-registered vignette/conjoint experiments to quantify the causal impact of each dimension and their interactions on hiring, compensation, and perceived fit.
4. Design and field-test platform features (augmentation versus assemblage) that dynamically align youth skill presentation with heterogeneous employer preferences, with rigorous evaluation of match quality, equity, and post-match outcomes.
5. Test bundled multi-level interventions (4D-informed counseling + micro-credential stacks + SME mentoring) through collaborative policy pilots with rigorous mixed-methods evaluation.
6. Pursue comparative research (Korea–Germany–Japan–Singapore–selected ASEAN contexts) to identify transferable design principles for vocational prestige, work-integrated learning, and platform-mediated matching under different institutional regimes.
7. Develop and validate agent-based and structural models that simulate the dynamic interactions among the four dimensions and the aggregate matching efficiency and inequality consequences of alternative intervention bundles.

By treating qualitative mismatch as a designable feature of school-to-work transitions rather than an inevitable byproduct of educational expansion and technological change, Korea can move beyond credential accumulation toward genuine skill alignment, enhanced youth agency, and more efficient, equitable labor market matching. The theoretical, empirical, and design contributions outlined in this paper aim to catalyze that shift and to provide a foundation for cumulative, citable research across disciplines and national contexts.

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Appendices

Appendix A: Expanded 4D-QSMF Measurement Item Examples (Proposed for Validation)

Epistemic Dimension (Sample Items – 7-point Likert)

1. Even though I hold the required degree or certificate, I often struggle to apply my formal knowledge to the specific, messy problems that arise in my current or target job without substantial additional guidance.
2. My education emphasized absorbing and reproducing standardized content more than framing ill-structured problems and iterating toward workable solutions.
3. I feel confident that I can quickly learn and apply new tools or methods that were not part of my formal training when a job requires it.
4. (Reverse) Most of what I learned in school or university feels directly useful and up-to-date in the roles I am considering or currently performing.

Relational Dimension (Sample Items)

1. I have at least two professionals (outside immediate family and current university faculty) who have actively helped me understand what specific skills, experiences, or signals a target employer in my field values.
2. My university, high school, or alumni network has provided me with useful introductions or referrals to hiring managers or decision-makers in the past 12 months.
3. I feel confident reaching out to professionals I do not know well to ask for informational interviews or advice about career pathways.
4. (Reverse) I often feel that people from more privileged educational or family backgrounds have access to opportunities and information that are simply not available to me through my current networks.

Temporal Dimension (Sample Items)

1. The time I spent on exam retakes, military service, language study abroad, or prolonged spec-building created periods during which my skills became less relevant to current employer requirements.
2. I have been able to maintain or update my practical skills continuously (through projects, short courses, part-time work, or self-directed learning) even during periods of formal educational or military interruption.
3. I feel that the overall timeline of my education and skill development has been reasonably well aligned with the windows of opportunity in my target labor market segments.
4. (Reverse) I worry that the gap between when I acquired certain skills and when I will be able to deploy them in a stable role is so large that those skills will have depreciated significantly.

Motivational Dimension (Sample Items)

1. The career paths I most want feel realistically attainable given my current skills, networks, educational background, and the opportunity structures I observe around me.
2. I feel intrinsically motivated to invest time and effort in developing skills that are valuable in the labor market, beyond simply accumulating credentials or specs.
3. (Reverse) I have sometimes felt that investing more effort in skill development or job search is pointless because suitable, high-quality opportunities seem too limited or too heavily gated by factors outside my control.
4. (Reverse) I have considered or actually taken extended breaks from active education or job search because the gap between my aspirations and available options felt too large to bridge.

Full item banks (40–60 items), parallel employer versions, and validation protocols will be developed and published as open-access deliverables in Phase 1 of the proposed research program.

Appendix B: Proposed Platform Feature Specifications (Augmentation and Assemblage)

Augmentation Module (Selection from Existing Assets)

- Input: User's existing skill artifacts (projects, micro-credentials, endorsements, narrative elements) + target job posting or employer preference profile. - Processing: Multi-dimensional matching on epistemic requirements, relational signals (shared networks, mentor overlap), temporal relevance (recency, updating evidence), and motivational alignment (narrative fit). - Output: Ranked recommendations of which existing artifacts to foreground or combine for a specific opportunity, with explanations and user editing rights. - Ethical constraint: No generation of new content; only selection and ranking of user-owned assets.

Assemblage Module (Light Generative Guidance)

- Input: User's draft profile or narrative + target opportunity characteristics + 4D gap analysis. - Processing: Suggestion of alternative framings, portfolio reorganizations, or narrative emphases that highlight temporal resilience, epistemic application examples, or motivational alignment, while preserving factual accuracy and user authorship. - Output: 2–3 alternative versions with change highlights and rationale; user must actively accept, edit, or reject each suggestion. - Ethical constraint: Identity-preservation metrics (analogous to perceptual similarity constraints in image generation); full audit trail of suggestions; prohibition on fabricating achievements or endorsements.

Both modules are proposed for controlled field experimentation in Phase 4, with rigorous evaluation of match quality, equity, user trust, and post-match outcomes.