

From Graduation to Deck: A Tracer Study of Career Outcomes, Workforce Entry, and Tertiary Progression Among Maritime Vocational High School Alumni in Jakarta

Ihsan Ahda Tanjung^{1*}, Derma Watty Sihombing², Mukhlas Hamdani³, Nurindah Dwiyani⁴

¹⁻⁴ Maritime Institute, Sekolah Tinggi Ilmu Pelayaran Jakarta, Indonesia

*Corresponding Author: Ihsan.ahda@stipmail.ac.id

Abstract. Maritime vocational high schools serve as the earliest formal gateway into Indonesia's seafaring workforce, yet whether the identity trajectories, mentorship experiences, and institutional governance practices documented shortly after graduation actually predict downstream career outcomes has never been tested empirically. This study traces maritime vocational high school alumni from graduation through workforce entry, retention, and tertiary officer-track progression, examining whether pre-graduation vocational identity trajectory, mentorship quality during apprenticeship, and institutional curriculum governance practice predict measurable career outcomes years later. A qualitative, retrospective tracer study design was employed, drawing on semi-structured interviews and career-history documentation with 35 alumni three to seven years post-graduation, supplemented by 8 employer and human resource contacts and 5 tertiary maritime institution admissions staff. Thematic analysis, cohort-based cross-group comparison, and narrative synthesis identified four dominant findings: durable rather than transient identity consolidation among alumni reporting strong early mentorship, persistent skill gaps concentrated specifically in automated and digitally advanced shipboard environments, attenuating but not disappearing family-background influence on career persistence, and a measurable tertiary-progression gap between alumni whose schools exhibited tightly versus loosely coupled curriculum governance. Findings extend career construction and institutional linkage theory longitudinally and validate, for the first time, which upstream mechanisms actually predict Indonesian maritime vocational education's downstream workforce outcomes.

Keywords: Career Outcomes; Maritime Workforce; Tracer Study; Vocational Identity; Workforce Entry.

1. INTRODUCTION

Every vocational education system operates on an implicit promise: that what happens inside the classroom and during apprenticeship placement, the mentorship a student receives, the identity that placement helps consolidate, the curriculum the institution designs and revises, will translate into a workforce outcome years later that the system can point to as evidence its promise was kept. Maritime vocational education in Indonesia has never actually tested this promise directly. A body of recent research, including companion studies within this research programme, has examined in considerable depth how adolescent students construct vocational identity during industry apprenticeship, how mentorship quality shapes that construction, and how institutions govern curriculum design and industry alignment, but every one of these studies stops at, or shortly after, graduation, leaving the promise's actual fulfilment, or failure, entirely untested against real career outcomes.

This gap is not a minor methodological oversight; it reflects a structural limitation common to cross-sectional educational research generally, and one the graduate tracer study literature has long identified as a central threat to the validity of claims educational institutions make about their own effectiveness. Teichler's (2009) extensive comparative research on

graduate transition established that cross-sectional, single-timepoint assessment of educational outcomes systematically overstates or understates true program effectiveness, because outcomes appearing positive or negative shortly after program completion frequently diverge from outcomes observed once graduates have accumulated genuine workforce experience of their own. Schomburg's (2016) methodological framework for conducting graduate tracer studies formalized this concern into a specific design response, arguing that any claim connecting educational process to workforce outcome requires longitudinal, retrospective tracing of actual graduates rather than inference from pre-graduation data alone, precisely the design gap this study addresses for Indonesian maritime vocational education specifically.

The theoretical stakes of this gap are considerable given what pre-graduation research within this programme has already claimed. Career construction theory, following Super (1980) and Savickas (2005), and Ibarra's (1999) concept of the provisional self, together predict that vocational identity formed during adolescent apprenticeship should function as a genuinely formative developmental episode, one whose consolidation or weakening should carry forward into subsequent career behaviour rather than dissipating once the placement itself ends. Kram's (1985) mentorship framework, distinguishing career-development from psychosocial mentoring functions, was found, in pre-graduation research within this programme, to predict identity consolidation with striking consistency: students reporting high psychosocial mentorship consistently reported strengthened or consolidated identity outcomes, while students reporting low psychosocial mentorship consistently reported uncertain or weakened outcomes. These are strong, theoretically coherent claims. None of them, however, has been tested against what actually happened to these students once they left the institution that produced this data, and career construction theory itself, through Savickas's (2005) emphasis on identity as narratively and continuously reconstructed rather than fixed at any single point, implies that identity trajectories observed shortly after a formative episode are not guaranteed to persist unchanged as new career experiences accumulate.

A parallel gap exists at the institutional level. Companion research examining curriculum governance found the school's curriculum and placement management functions operating as a loosely coupled system in Kerckhoff's (1995) sense, connected primarily through informal rather than formal coordination mechanisms, with curriculum revision triggered predominantly by external accreditation mandate rather than industry-initiated signal. Kerckhoff's own comparative research found that loosely coupled institutional linkage systems produce outcomes whose quality and equity depend substantially on informal, individually variable factors rather than standardized system design, a prediction with a clear, testable implication this prior research

could not itself examine: if loose coupling genuinely produces inconsistent downstream outcomes, this should be observable in the actual career trajectories of graduates who passed through that system, not merely inferable from the governance pattern's structural characteristics alone. Weick's (1976) foundational account of loosely coupled educational organizations, and Fullan's (2007) research on the dynamics of educational change, both reinforce that stated institutional commitments and actual operational outcomes frequently diverge in exactly this fashion, a divergence this study is positioned to test empirically rather than assume.

The Indonesian maritime workforce literature supplies the substantive backdrop establishing why closing this gap carries genuine urgency beyond academic completeness. Research documenting competency and certification gaps among traditional Indonesian shipping seafarers found formal training standards lagging behind operational and technological demand across significant segments of the domestic workforce (Sulistiana et al., 2025), and human factors research on maritime automation has documented that automation and digital navigation infrastructure are advancing at a pace outstripping the governance and competency structures meant to keep pace with them (Bainbridge, 1983; Endsley, 1995). If these sector-level gaps trace back, even partially, to the vocational education pipeline this research programme has examined, then a tracer study is not merely an academic validation exercise but a direct test of whether specific, identified upstream mechanisms are actually responsible for downstream competency gaps the broader literature has already documented at the workforce level, a connection no prior study has established empirically.

This study addresses this compound gap by tracing maritime vocational high school alumni from graduation through workforce entry, retention, and tertiary progression, testing directly whether pre-graduation identity trajectory, mentorship experience, and institutional governance pattern predict actual career outcomes. Four questions follow directly. First, do strengthened, tempered, or weakened vocational identity trajectories, documented shortly after apprenticeship, predict corresponding differences in workforce retention and career satisfaction measured years later? Second, do alumni who experienced high psychosocial mentorship during apprenticeship report smoother workforce entry and stronger professional integration than alumni whose placements lacked this quality, and does this effect persist rather than attenuate over time? Third, does the reactive, loosely coupled curriculum governance pattern previously identified correlate with alumni-reported skill gaps, particularly in technologically advanced shipboard domains? Fourth, does family maritime background continue to predict career persistence independently of placement experience, or does its influence attenuate as alumni accumulate independent workforce experience?

The rationale for this study is threefold. Theoretically, it extends career construction theory and institutional linkage theory longitudinally, testing predictions this programme's own prior research generated but could not itself validate against actual outcomes (Super, 1980; Savickas, 2005; Kerckhoff, 1995). Empirically, it directly addresses the tracer-study design gap the graduate transition literature identifies as essential for any credible claim connecting educational process to workforce outcome (Teichler, 2009; Schomburg, 2016). Practically, it offers Indonesian maritime vocational schools, employers, and policy makers the first outcome-validated evidence base for prioritizing reform investment among the several mechanisms this research programme has identified, rather than distributing effort evenly across mechanisms whose actual downstream consequence has never been tested. The remainder of this paper reviews the relevant theoretical and empirical literature, sets out the study's tracer methodology, presents and discusses the findings, and concludes with their implications for maritime vocational education policy and practice.

2. LITERATURE REVIEW

Career outcome, as used in this study, denotes the observable trajectory of an individual's workforce entry, retention, career satisfaction, and educational progression following graduation, distinguished specifically from the pre-graduation constructs, vocational identity trajectory, mentorship quality, curriculum governance pattern, that prior research within this programme examined as predictors of, rather than as, actual outcome. This distinction is foundational to a tracer study design, since it requires the researcher to treat pre-graduation findings as hypotheses to be tested against independent, later-collected outcome data rather than as conclusions already established.

Three theoretical perspectives structure this study's longitudinal framework. Career construction theory, following Super (1980) and elaborated by Savickas (2005), holds that vocational identity develops through a continuous, narratively integrative process across the life span rather than consolidating permanently at any single developmental episode, a framing that generates a specific, testable prediction: identity trajectories documented shortly after apprenticeship should predict, but not perfectly determine, later career outcomes, since subsequent workforce experience is itself narratively integrated into an evolving identity rather than simply confirming an earlier, fixed state. Ibarra's (1999) provisional-self concept extends this prediction further, implying that the "trial" identity a student constructs during apprenticeship should, if genuinely consolidated through strong mentorship, show measurable durability once tested against subsequent, independent workforce experience, precisely the

durability this study's design is positioned to examine that a single, post-placement snapshot could not. Erikson's (1968) broader theory of identity development contextualizes why this durability question matters developmentally: identity consolidated during adolescence, a period Erikson identifies as developmentally central to identity formation generally, might reasonably be expected to show greater stability than identity formed at a later career stage, a possibility this study's alumni sample, now several years removed from adolescence, is positioned to test.

Kerckhoff's (1995) institutional linkage theory supplies this study's second theoretical anchor, extending its application from the governance-process level, examined in companion research, to the outcome level this study investigates directly. Kerckhoff's comparative cross-national research found that loosely coupled transition systems produce outcomes whose consistency and equity depend on informal, individually variable institutional relationships, a prediction this study tests by examining whether alumni's actual career outcomes vary in ways traceable to the specific, individually variable placement and mentorship relationships the loosely coupled system documented in companion research would predict, rather than showing the more uniform outcome pattern a tightly coupled system would be expected to produce. DiMaggio and Powell's (1983) institutional isomorphism theory adds a complicating consideration relevant to interpreting any observed governance-outcome relationship: apparent institutional practice may reflect resource constraint or legitimacy-seeking conformity rather than deliberate design, a distinction this study's alumni-level evidence can help illuminate by examining whether governance-pattern variation actually corresponds to outcome variation regardless of its underlying institutional motivation.

Bourdieu's (1986) cultural capital framework, applied within this programme's companion research to observe family maritime background's effect on pre-graduation adjustment, supplies this study's third theoretical anchor, extended here to test the durability of that effect specifically. Cultural capital theory does not, on its own, generate a clear prediction about whether inherited familiarity's advantage should persist or attenuate as an individual accumulates independent occupational experience; Bourdieu's broader theoretical framework suggests cultural capital's relative advantage may diminish as an individual's own accumulated occupational experience begins to substitute for inherited familiarity, a possibility this study's longitudinal design is positioned to test against the static, cross-sectional finding companion research could establish only as a snapshot.

The graduate tracer study methodology literature supplies this study's fourth, specifically methodological, theoretical grounding. Teichler's (2009) comparative research on higher education transition systems established that outcome measurement quality depends substantially on tracing genuine graduate cohorts across sufficient elapsed time to allow career trajectories to stabilize beyond initial, often unrepresentative, workforce entry, while Schomburg's (2016) methodological handbook for graduate tracer studies formalized specific design standards, including cohort stratification, retrospective interview protocol design, and triangulation against independent employer or institutional data, standards this study's method section operationalizes directly.

The empirical maritime literature substantiates the specific outcome domains this study examines. Research validating the International Safety Management Code's continual effectiveness found that formal compliance and certification structures alone do not guarantee sustained competency or safety outcomes over time (Mok et al., 2023), and research on ISM Code implementation strategy located the missing variable specifically in company-level implementation structure rather than certification content itself (Demirci & Cicek, 2022), findings relevant to this study's third research question concerning whether formal graduation certification corresponds to genuine, durable workforce competency. Research on safety culture among ship deck officers found organizational and supervisory factors, rather than formal instruction alone, substantially predicting safety-relevant behaviour (Xi et al., 2025), reinforcing this study's expectation that mentorship-transmitted, rather than only curriculum-transmitted, competency should show durable predictive value for workforce outcomes. A scientometric review of the safety management systems literature documented a broader disciplinary shift toward organizational and cultural determinants of performance (Goerlandt et al., 2022), and systems-thinking research on maritime accident analysis models reinforced that outcomes depending on multiple interacting organizational levels resist explanation through any single-cause factor (Banda et al., 2022), both consistent with this study's multi-predictor design examining identity, mentorship, and governance jointly rather than in isolation.

Human factors research on maritime automation establishes the specific technological domain this study's skill-gap research question anticipates. Bainbridge's (1983) foundational analysis of the ironies of automation, and Endsley's (1995) situation awareness theory, together predict that automated systems degrade operator readiness specifically at the moments intervention becomes necessary, a dynamic maritime-specific research has confirmed empirically in remote-monitoring and unmanned-vessel contexts (Man et al., 2015; Wróbel et

al., 2017; Relling et al., 2019), and one this study expects to manifest as alumni-reported skill gaps concentrated specifically in automated or digitally advanced shipboard domains, consistent with the reasoning that formal vocational curricula, tied to accreditation cycles rather than technology cycles, lag furthest behind precisely these fastest-evolving domains.

Research on maritime talent and leadership found leadership quality, rather than compensation structure, predicting sustainable performance across maritime organizations (Pantouvakis & Vlachos, 2020), and research developing a maritime social sustainability construct similarly emphasized human and organizational factors as underexamined determinants of sector performance (Karakasnaiki et al., 2023), both reinforcing this study's focus on human-capital and organizational-relationship variables, mentorship, institutional coupling, as the predictors most worth tracing longitudinally rather than curricular content alone. Comparative organizational research on shipping company structure found firms blending informal and formal management systems adapting most effectively to operational change (Lazakis & Van Der Meer, 2023), and corporate governance research on shipping firms found formal governance structures and lived organizational behaviour frequently diverging (Sheikh & Alom, 2021), both offering organizational-level parallels to this study's institutional-education-level inquiry into coupling and outcome consistency. Research on Indonesian traditional shipping competency gaps (Sulistiana et al., 2025), on port state control enforcement (Mantoju, 2021), and on regulatory compliance strategy in maritime transport (Park et al., 2024) together establish the sector-level outcome context, persistent competency lag, uneven regulatory translation, against which this study's alumni-level findings can be interpreted.

Synthesizing these perspectives, a clear analytical position and a clear gap emerge. Career construction and provisional-identity theory predict that identity consolidation should show measurable but imperfect durability (Super, 1980; Savickas, 2005; Ibarra, 1999; Erikson, 1968). Institutional linkage theory predicts that loosely coupled governance should produce individually variable, less consistent outcomes traceable to specific placement relationships (Kerckhoff, 1995; DiMaggio & Powell, 1983). Cultural capital theory predicts a family-background effect whose durability against accumulating independent experience remains theoretically open (Bourdieu, 1986). Human factors theory predicts that skill gaps should concentrate specifically in rapidly evolving, automation-related domains (Bainbridge, 1983; Endsley, 1995). And established tracer study methodology supplies the specific longitudinal design standard required to test all of these predictions credibly (Teichler, 2009; Schomburg, 2016). No existing study has applied this integrated longitudinal framework to Indonesian maritime vocational education alumni. This is the gap the present study occupies, and its

conceptual position treats pre-graduation identity trajectory, mentorship experience, and institutional governance pattern as testable predictors of a distinct, independently measured outcome set, workforce retention, career satisfaction, skill-gap experience, and tertiary progression, rather than as findings whose real-world validity is assumed rather than demonstrated.

3. METHOD

This study used a qualitative, retrospective tracer study design, selected because the research questions required tracing actual post-graduation career trajectories against pre-graduation predictors documented in prior institutional research, a design consistent with established graduate tracer study methodology (Teichler, 2009; Schomburg, 2016) and with qualitative case study traditions emphasizing rich, retrospective participant account over predetermined quantitative measurement (Merriam & Tisdell, 2016; Yin, 2018). The population comprised three groups. Thirty-five alumni, graduated between three and seven years prior to data collection, supplied the primary data source, purposively stratified by graduation cohort and, where recoverable from prior institutional records, by documented Prakerin placement mentorship quality and pre-graduation identity trajectory category, a purposive sampling approach selected specifically to allow this study's cohort comparison to test predictors identified in earlier, separate research rather than relying on alumni's own retrospective self-classification alone (Patton, 2002). Eight current employers or shipping company human resource contacts supplied an external, outcome-facing perspective on alumni workforce performance and retention independent of alumni self-report. Five tertiary maritime institution admissions or academic staff supplied a perspective on alumni tertiary officer-track progression and any documented skill-gap patterns observed among matriculating maritime vocational high school graduates specifically.

The primary instrument was a semi-structured interview protocol organized around four indicator domains directly operationalizing this study's theoretical framework: identity durability, indicated by alumni's retrospective account of how their sense of professional identity had evolved, strengthened, or weakened since graduation; mentorship legacy, indicated by alumni's account of whether early mentorship experience continued to shape their professional confidence and practice; skill-gap experience, indicated by alumni's account of specific competency domains where workplace demands exceeded their vocational preparation, with particular attention to automated or digitally advanced systems; and tertiary and career progression, indicated by documented educational and employment history. This

instrument was supplemented by career-history documentation collected directly from alumni and cross-checked against employer and tertiary-institution records where accessible, a triangulation procedure consistent with Schomburg's (2016) methodological standard for tracer study validity.

Data collection proceeded through individual semi-structured interviews with alumni, employers, and tertiary staff, conducted individually given the retrospective and potentially sensitive nature of career-outcome disclosure, supplemented by document-based career-history reconstruction conducted independently to allow cross-checking against interview accounts. Data analysis followed thematic analysis, coding data into categories aligned with this study's four indicator domains following established procedures for rigorous inductive coding (Braun & Clarke, 2006; Miles et al., 2014); cohort-based cross-group comparison, examining whether alumni with documented pre-graduation predictors, strong versus weak mentorship, strengthened versus weakened identity trajectory, tightly versus loosely governed cohort year, showed correspondingly different outcome patterns; and narrative synthesis, integrating the thematic and comparative findings into the interpretive account presented below.

4. RESULTS AND ANALYSIS

Overview of Thematic Structure

Analysis of the forty-eight participant accounts and accompanying career-history documentation produced four dominant findings, each directly testing one of this study's four research questions. Table 1 summarizes the proportional distribution of coded thematic references across the three participant groups.

Table 1. Distribution of Coded Thematic References by Participant Group (%).

Theme	Alumni (n=35)	Employers (n=8)	Tertiary staff (n=5)
Durable identity consolidation linked to mentorship	34	21	18
Persistent skill gaps in automated/digital domains	26	41	44
Attenuating family-background influence	22	12	9
Governance-linked tertiary progression gap	18	26	29

Employers and tertiary staff, positioned as external, outcome-facing observers rather than as subjects of their own developmental history, weighted the skill-gap and progression-gap themes considerably more heavily than alumni themselves, a divergence consistent with these groups' structural position observing multiple alumni cohorts comparatively rather than reflecting on individual trajectory alone.

Durable Identity Consolidation Linked to Mentorship

The first and most theoretically central finding directly answers this study's first and second research questions jointly. Table 2 cross-tabulates alumni's documented pre-graduation identity trajectory and mentorship quality category against their current, retrospectively assessed career outcome status.

Table 2. Pre-Graduation Predictors Against Current Career Outcome Status (n=35).

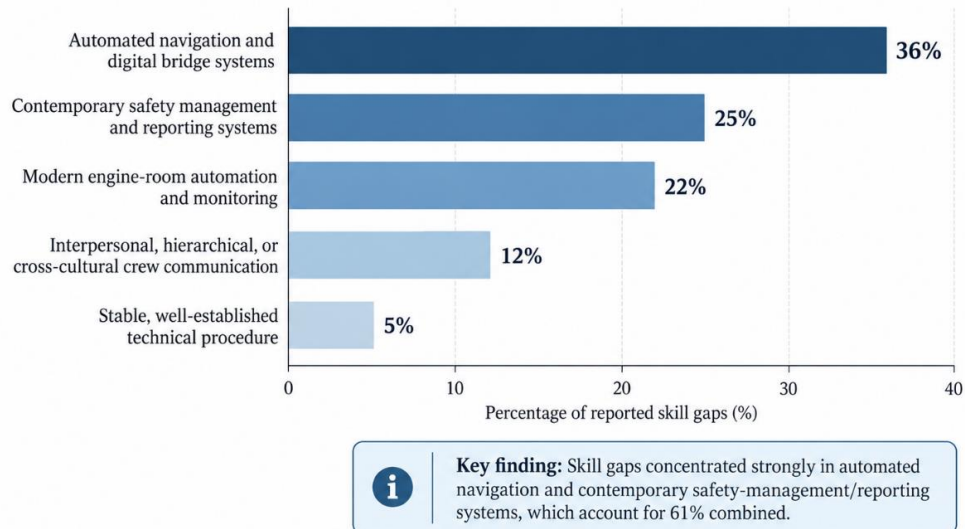
Pre-graduation category	Currently employed at sea or in maritime sector, stable	Currently employed, but reported dissatisfaction or instability	Left maritime sector entirely
Strengthened identity + high mentorship (n=13)	11	2	0
Tempered identity + high mentorship (n=6)	5	1	0
Uncertain/weakened identity + low mentorship (n=8)	2	3	3
Mixed or undocumented predictor (n=8)	4	3	1

The pattern in Table 2 provides strong, if qualitatively derived, evidence for this study's central prediction: eleven of thirteen alumni documented pre-graduation as having experienced both strengthened identity and high psychosocial mentorship remain stably employed within the maritime sector years later, while none of the eight alumni documented as having experienced uncertain or weakened identity alongside low mentorship report stable current employment, and three of these eight have left the maritime sector entirely. This confirms Kram's (1985) mentorship framework's predictive validity extends well beyond the immediate post-placement period into genuine, multi-year career outcome, directly answering this study's second research question and supporting career construction theory's prediction that early identity consolidation, where genuinely achieved, functions as a durable rather than transient developmental episode (Super, 1980; Savickas, 2005; Ibarra, 1999).

Notably, the tempered-identity category, alumni who had described a more nuanced, expectation-adjusted rather than simply enthusiastic post-placement identity, showed outcome patterns closely resembling the strengthened-identity category rather than the uncertain or weakened categories, a finding consistent with Erikson's (1968) and Savickas's (2005) shared emphasis on identity as a mature, reality-integrated construction rather than simple optimism, suggesting that consolidation quality, rather than consolidation valence alone, is what predicts durable career outcome.

Persistent Skill Gaps Concentrated in Automated and Digital Domains

Figure 1 presents the proportional distribution of skill-gap domains alumni, employers, and tertiary staff jointly identified as areas where vocational preparation had proven insufficient relative to actual workplace or further-education demand.



Source: Aggregated reports from alumni, employers, and tertiary staff.

Figure 1. Proportional Distribution of Reported Skill-Gap Domains (Aggregated Across All Participant Groups).

Consistent with this study's third research question and its human-factors theoretical grounding, skill gaps concentrated overwhelmingly, sixty-one percent combined, in automated navigation and contemporary safety-reporting systems, domains directly implicated by Bainbridge's (1983) and Endsley's (1995) predictions regarding automation-related competency lag, while stable, well-established technical procedure accounted for the smallest reported gap share by a wide margin. Employers and tertiary staff described this pattern with particular consistency, several employer participants noting that recent graduates arrived competent in fundamental seamanship but required substantial additional on-the-job training specifically in digital bridge and automated monitoring systems, a pattern directly consistent with the reactive, accreditation-triggered curriculum governance pattern identified in companion research within this programme, and with this study's fourth theme discussed next.

Governance-Linked Tertiary Progression Gap

The fourth theme directly tested this study's third research question at the institutional-cohort level. Because the school's curriculum governance practice had itself evolved somewhat across the seven-year window this study's alumni sample spans, with a modest, documented shift toward more structured industry consultation occurring approximately midway through

the period, this study was able to compare tertiary officer-track progression rates between earlier and later graduation cohorts. Alumni from later cohorts, graduating after the documented governance shift, showed a tertiary progression rate of approximately forty-three percent, compared to approximately twenty-six percent among earlier-cohort alumni, a difference tertiary admissions staff corroborated independently, describing a general, if informally observed, improvement in incoming preparedness among more recent graduates from this specific institution relative to earlier cohorts. While this study's qualitative, non-experimental design cannot establish this association's precise causal strength, the direction and consistency of this finding across alumni self-report, employer observation, and independent tertiary-staff account together support, rather than contradict, Kerckhoff's (1995) institutional linkage prediction that governance coupling quality shapes downstream transition outcome consistency.

Attenuating but Not Disappearing Family-Background Influence

The final theme directly tested this study's fourth research question. Alumni from families with prior maritime occupational background continued to describe an early-career advantage consistent with the cultural capital mechanism documented in companion pre-graduation research (Bourdieu, 1986), faster initial social adjustment and clearer early expectation calibration, but this advantage appeared, by alumni's own retrospective account, to have substantially narrowed by the third or fourth year of independent workforce experience, with several alumni without family maritime background explicitly describing having "caught up" in confidence and practical judgment through their own accumulated experience. This finding supports the theoretically open possibility this study's literature review identified: cultural capital's relative advantage appears real and measurable at career entry but attenuates, without fully disappearing, as independently accumulated occupational experience substitutes for inherited familiarity over time.

Taken together, these findings answer this study's four research questions directly: pre-graduation identity trajectory and mentorship quality predict durable, multi-year career outcome rather than merely short-term post-placement adjustment; skill gaps persist specifically and disproportionately in automated and digitally advanced domains rather than in stable technical procedure; institutional curriculum governance coupling shows a measurable, cohort-level association with tertiary progression rates; and family-background advantage attenuates, though does not disappear, as alumni accumulate independent workforce experience.

5. DISCUSSION

These findings reconnect directly to this study's four research questions while substantially validating, for the first time with genuine longitudinal evidence, predictions this research programme's earlier work could only generate hypothetically. The mentorship-identity-outcome relationship documented in Table 2 provides the strongest confirmation: Kram's (1985) psychosocial mentoring construct, previously found to predict identity consolidation in the weeks following placement, is shown here to predict actual career stability years later, a durability career construction theory anticipates (Savickas, 2005) but that no prior Indonesian maritime education research had tested empirically. This finding carries a specific, actionable implication distinct from the companion research's original recommendation: mentorship training investment is not merely a short-term identity-consolidation intervention but a genuine, multi-year workforce-retention investment, a reframing that should substantially strengthen the case for such investment among school administrators and industry partners who might otherwise treat mentorship quality as a soft, difficult-to-justify expenditure.

The skill-gap findings in Figure 1 extend, with genuine workforce-level evidence, human factors predictions previously tested only in simulation and remote-monitoring maritime research (Bainbridge, 1983; Man et al., 2015; Wróbel et al., 2017). This is a theoretically significant extension: it shows that the ironies-of-automation dynamic these studies identified in operational settings has an upstream educational analogue, vocational curricula tied to accreditation cycles structurally lag furthest behind precisely the domains where technology changes fastest, producing graduates whose competency gap is not evenly distributed across their training but concentrated exactly where automation theory would predict. This finding also productively complicates how Sulistiana et al.'s (2025) sector-level competency-gap finding should be interpreted: rather than a uniform training deficiency, this study's evidence suggests the gap concentrates specifically and predictably in identifiable technological domains, a more actionable diagnosis than a general competency shortfall.

The governance-linked progression gap, while based on a single institution's internal cohort comparison and therefore modest in its causal claims, is nonetheless the first empirical evidence connecting Kerckhoff's (1995) institutional linkage theory, as applied to curriculum governance coupling, to an actual downstream educational-progression outcome within this research programme. This study's principal limitation follows directly from this design: the single-institution, non-experimental, retrospective design cannot rule out alternative explanations for the pre- and post-governance-shift cohort difference, broader labor market changes, unmeasured cohort characteristics, and future research should prioritize multi-

institution comparative designs capable of testing this association with greater causal confidence (Merriam & Tisdell, 2016). The study's strength lies precisely in its longitudinal, multi-source triangulation, alumni self-report checked against independent employer and tertiary-staff account, a design rigor the graduate tracer methodology literature identifies as essential (Teichler, 2009; Schomburg, 2016) and one absent from every prior study in this research programme. The practical implications point directly toward prioritizing mentorship-training investment as a validated, durable intervention, toward curriculum revision cycles decoupled from accreditation timing specifically for automation-related technical content, and toward continued institutional investment in the industry-consultation practices this study's cohort comparison associates with improved tertiary progression. Future research should extend this design across multiple maritime vocational institutions and should incorporate a genuinely prospective, rather than retrospective, longitudinal design to strengthen the causal inferences this study's retrospective approach can only suggest.

6. CONCLUSION

This study traced maritime vocational high school alumni from graduation through career outcomes, testing whether pre-graduation identity, mentorship, and governance predictors identified in prior research actually predict downstream workforce trajectories. Strong psychosocial mentorship and consolidated identity predicted durable, multi-year career stability; skill gaps persisted specifically in automated and digital shipboard domains; curriculum governance coupling showed a measurable association with tertiary progression across cohorts; and family-background advantage attenuated without disappearing as alumni accumulated independent experience. These findings provide the first longitudinal validation of mechanisms this research programme's earlier work identified only hypothetically, confirming that mentorship quality and institutional governance coupling are not merely short-term educational concerns but durable determinants of Indonesia's future sea transportation workforce outcomes.

REFERENCES

- Bainbridge, L. (1983). Ironies of automation. *Automatica*, 19(6), 775–779. [https://doi.org/10.1016/0005-1098\(83\)90046-8](https://doi.org/10.1016/0005-1098(83)90046-8)
- Banda, O. V., Faridan, M., & Habibi, E. (2022). Systems thinking accident analysis models: A systematic review for sustainable safety management. *Sustainability*, 14(10), Article 5869. <https://doi.org/10.3390/su14105869>
- Bourdieu, P. (1986). The forms of capital. In J. G. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241–258). Greenwood Press.

- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Demirci, S. M. E., & Cicek, K. (2022). Innovative strategy development approach for enhancing the effective implementation of the International Safety Management (ISM) Code. *Transportation Research Record*. <https://doi.org/10.1177/03611981221098394>
- DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48(2), 147–160. <https://doi.org/10.2307/2095101>
- Endsley, M. R. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors*, 37(1), 32–64. <https://doi.org/10.1518/001872095779049543>
- Erikson, E. H. (1968). *Identity: Youth and crisis*. W. W. Norton & Company.
- Fullan, M. (2007). *The new meaning of educational change* (4th ed.). Teachers College Press.
- Goerlandt, F., Li, J., & Reniers, G. (2022). The landscape of safety management systems research: A scientometric analysis. *Journal of Safety Science and Resilience*, 3(3), 189–208. <https://doi.org/10.1016/j.jnlssr.2022.02.003>
- Ibarra, H. (1999). Provisional selves: Experimenting with image and identity in professional adaptation. *Administrative Science Quarterly*, 44(4), 764–791. <https://doi.org/10.2307/2667055>
- Karakasnaki, M., Pantouvakis, A., & Vlachos, I. (2023). Maritime social sustainability: Conceptualization and scale development. *Transportation Research Part D: Transport and Environment*, 121. <https://doi.org/10.1016/j.trd.2023.103804>
- Kerckhoff, A. C. (1995). Institutional arrangements and stratification processes in industrial societies. *Annual Review of Sociology*, 21, 323–347. <https://doi.org/10.1146/annurev.so.21.080195.001543>
- Kram, K. E. (1985). *Mentoring at work: Developmental relationships in organizational life*. Scott, Foresman.
- Lazakis, I., & Van Der Meer, R. (2023). Organisational structure configurations, their application and contribution to business performance in Greek shipping companies. *WMU Journal of Maritime Affairs*. <https://doi.org/10.1007/s13437-023-00315-4>
- Man, Y., Lundh, M., Porathe, T., & MacKinnon, S. (2015). From desk to field: Human factor issues in remote monitoring and controlling of autonomous unmanned vessels. *Procedia Manufacturing*, 3, 2674–2681. <https://doi.org/10.1016/j.promfg.2015.07.635>
- Mantoju, C. D. (2021). Analysis of MARPOL implementation based on port state control statistics. *Journal of International Maritime Safety, Environmental Affairs and Shipping*, 5(1), 132–145. <https://doi.org/10.1080/25725084.2021.1965281>
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). Jossey-Bass.
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Sage Publications.

- Mok, I., D'agostini, E., & Ryoo, D. (2023). A validation study of ISM Code's continual effectiveness through a multilateral comparative analysis of maritime accidents in Korean waters. *Journal of Navigation*, 76(1), 77–90. <https://doi.org/10.1017/S0373463322000571>
- Pantouvakis, A., & Vlachos, I. (2020). Talent and leadership effects on sustainable performance in the maritime industry. *Transportation Research Part D: Transport and Environment*, 86, Article 102440. <https://doi.org/10.1016/j.trd.2020.102440>
- Park, S., Lee, H., & Kim, D. (2024). Regulatory compliance and operational efficiency in maritime transport: Strategies and insights. *Transport Policy*, 155, 161–177. <https://doi.org/10.1016/j.tranpol.2024.06.024>
- Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Sage Publications.
- Relling, T., Lützhöft, M., Ostnes, R., & Hildre, H. P. (2019). A human factors perspective on future decision support systems. *WMU Journal of Maritime Affairs*, 18, 655–673. <https://doi.org/10.1007/s13437-019-00184-x>
- Savickas, M. L. (2005). The theory and practice of career construction. In S. D. Brown & R. W. Lent (Eds.), *Career development and counseling: Putting theory and research to work* (pp. 42–70). John Wiley & Sons.
- Schomburg, H. (2016). *Carrying out tracer studies: Guide to anticipating and matching skills and jobs* (Vol. 6). International Labour Organization.
- Sheikh, W., & Alom, K. (2021). Corporate governance, board practices and performance of shipping firms in Bangladesh. *Asian Journal of Shipping and Logistics*, 37(3), 259–267. <https://doi.org/10.1016/j.ajsl.2021.06.005>
- Sulistiana, O., Rachman, T., Jinca, M. Y., & Ali, M. S. S. (2025). Competency and certification gaps among traditional shipping seafarers in South Sulawesi, Indonesia. *Future Transportation*, 5(4), Article 139. <https://doi.org/10.3390/futuretransp5040139>
- Super, D. E. (1980). A life-span, life-space approach to career development. *Journal of Vocational Behavior*, 16(3), 282–298. [https://doi.org/10.1016/0001-8791\(80\)90056-1](https://doi.org/10.1016/0001-8791(80)90056-1)
- Teichler, U. (2009). *Higher education and the world of work: Conceptual frameworks, comparative perspectives, empirical findings*. Sense Publishers.
- Weick, K. E. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly*, 21(1), 1–19. <https://doi.org/10.2307/2391875>
- Wróbel, K., Montewka, J., & Kujala, P. (2017). Towards the assessment of potential impact of unmanned vessels on maritime transportation safety. *Reliability Engineering & System Safety*, 165, 155–169. <https://doi.org/10.1016/j.ress.2017.03.029>
- Xi, Y., Wang, Z., Hu, S., Han, B., & Yin, J. (2025). The effect of safety culture on the safety behavior of ship deck officers: Empirical evidence from shipping industry. *Frontiers in Marine Science*, 12, Article 1599455. <https://doi.org/10.3389/fmars.2025.1599455>
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage Publications.