The Illusion of Competence: A Mixed-Methods Analysis of Operational Bottlenecks and Structural Deficits in State-Administered Technical-Vocational Institutions

Reo Navarro Daniel, MAED, Dr. Ariel Reckonette B. Villanueva

Leon Ganzon Polytechnic College – A TESDA (Technical Education Skills and Development Authority) administered school in Panay Island

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ABSTRACT

Technical and Vocational Education and Training (TVET) play a crucial role in workforce development, employability, and economic competitiveness. Despite increasing institutional investments and high certification rates, concerns persist regarding the mismatch between formal qualifications and actual instructional competencies among vocational educators. This study aimed to investigate the operational bottlenecks and structural deficits affecting state-administered TVET institutions and to develop an explanatory framework describing the disconnect between certification and practical capability. An explanatory sequential mixed-methods research design was employed. The quantitative phase involved 108 learning facilitators from four state-administered TVET institutions in Panay Island, Philippines, selected through stratified random sampling. Descriptive statistics, Pearson correlation, and multiple regression analyses were utilized to identify significant predictors of implementation challenges. Subsequently, semi-structured interviews with six purposively selected key informants provided contextual explanations for the quantitative findings.

Results revealed that TVET implementation is burdened by serious institutional challenges ($M = 4.43$, $SD = 0.36$), with lack of learning facilitators' training emerging as the most severe concern ($M = 4.51$, $SD = 0.63$). Regression analysis indicated that lack of facilitator training, inadequate instructional materials, and weak monitoring and evaluation systems collectively explained 58% of the variance in institutional bottlenecks ($R^2 = .58$, $p < .001$). Qualitative findings further uncovered themes of professional insecurity, administrative isolation, resource deprivation, and weak industry integration. These findings culminated in the development of the Credential-Capability Paradox Framework, which explains how formally certified educators may lack sufficient practical and industrial competencies to deliver effective technical-vocational instruction. The study concludes that sustainable TVET reform requires continuous professional development, stronger industry partnerships, and competency-based institutional support systems to enhance instructional quality and graduate employability.

Keywords: Technical and Vocational Education and Training (TVET), Credential-Capability Paradox, Learning Facilitators, Institutional Bottlenecks, Graduate Employability

INTRODUCTION

"Technical and Vocational Education and Training (TVET) serve as a critical structural pillar for workforce readiness, youth employability, and macroeconomic adaptation in developing nations (UNESCO, 2022)." Globally, state-administered vocational networks—such as the Technical Education and Skills Development Authority (TESDA) in the Philippines—are legally mandated to deliver competent human capital tailored to dynamic market landscapes [2]. While macro-level assessments often celebrate high institutional graduation rates, recent scholarship warns of a widening misalignment: the emergence of "paper credentials" that lack corresponding practical mastery [3].

Prior literature on TVET implementation tends to emphasize macroeconomic funding deficits or generalized curriculum stagnation [4], [5]. However, few studies investigate the precise operational friction points

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experienced by the learning facilitators themselves using an integrated mixed-methods paradigm. This paper addresses this gap by analyzing the operational realities of state-administered TVET institutions. It exposes a hidden systemic vulnerability: the paradox of certified but functionally unequipped educators, showing how administrative support gaps compromise technical instruction.

Recent developments in artificial intelligence, digital transformation, and Industry 5.0 have further intensified the need for adaptive and resilient TVET systems. Contemporary scholarship emphasizes that vocational institutions must move beyond traditional competency frameworks and cultivate digital literacy, technological adaptability, and lifelong learning capacities among educators and learners alike. The emergence of AI-enabled workplaces and human-centered industrial ecosystems necessitates continuous professional development and stronger institutional-industry collaboration to ensure workforce relevance and graduate employability (OECD, 2025; UNESCO-UNEVOC, 2024; European Commission, 2024; ILO, 2026).

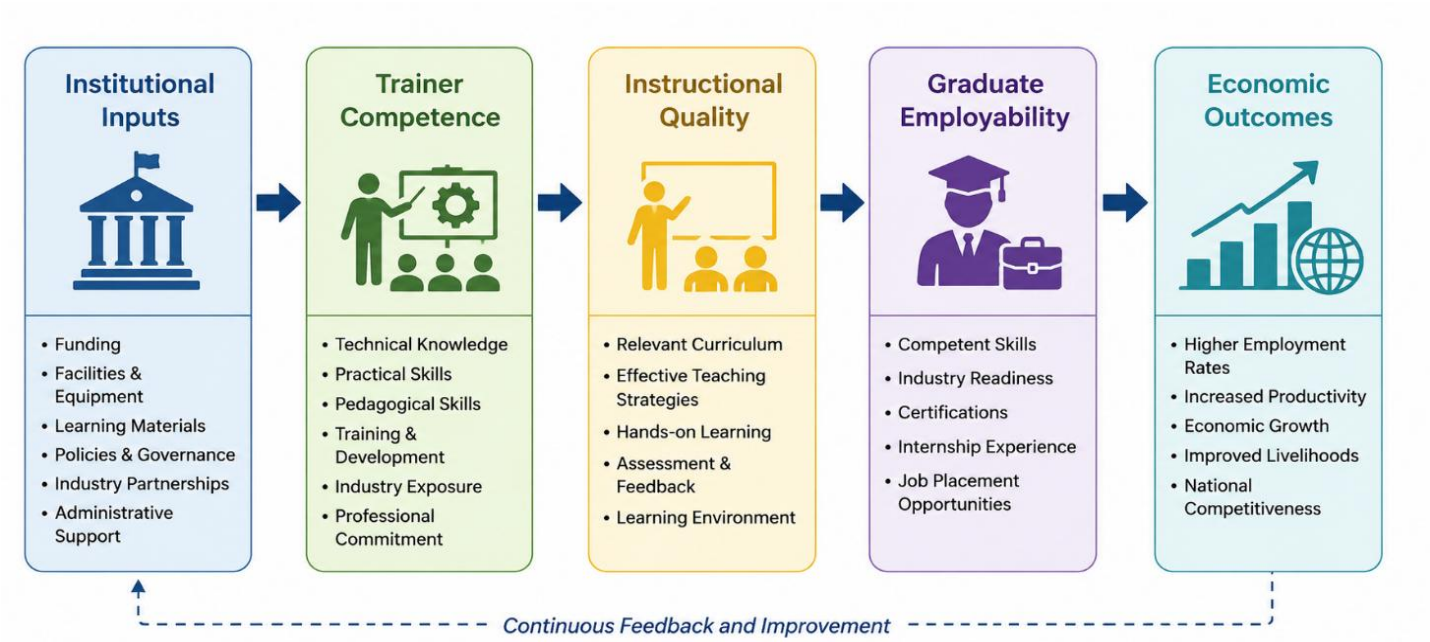
Theoretical and Conceptual Framework

To systematically analyze the structural breakdowns within TVET implementation, this study is anchored in three complementary theoretical lenses:

- **Human Capital Theory**: Proposes that targeted investments in teacher competencies directly increase educational productivity and labor market outcomes [6]. In a TVET context, if the facilitator's skill set is stagnant, the economic return on the educational investment drops drastically.
- **Systems Theory**: Views TVET institutions as interconnected systems where structural weaknesses in a single component (e.g., trainer training) inevitably compromise the integrity of the entire organization (e.g., instructional quality, graduate employability) [7].
- **Implementation Theory**: Asserts that macro-level policy outcomes depend heavily on institutional capacity and the readiness of frontline actors (facilitators) who execute the curriculum [8].

Institutional Macro-System Framework

The overarching systemic path of vocational education is conceptualized as a linear dependency structure, where downstream economic successes are fundamentally constrained by upstream institutional assets:



The Credential-Capability Paradox Model

The core phenomenon identified in this study is the Credential-Capability Paradox, defined as the institutional condition wherein learning facilitators possess formally recognized certifications but lack sufficient practical and industrial competencies to deliver effective technical-vocational instruction.

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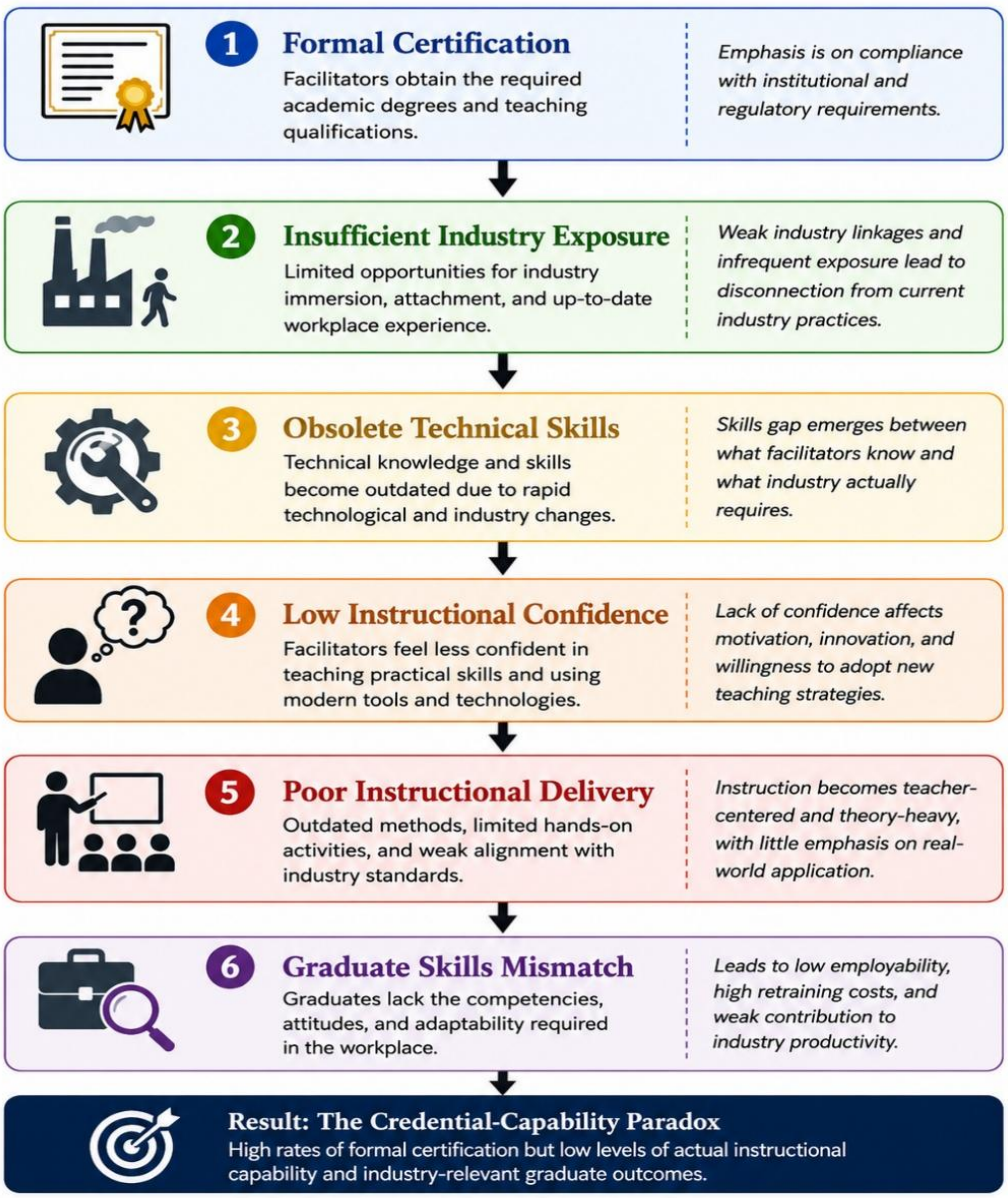
To further explain the dynamic processes underlying the Credential-Capability Paradox. The present study proposes the Credential-Capability Paradox as an explanatory framework describing the institutional condition

in which formally certified educators possess insufficient practical and industrial competencies to effectively deliver technical-vocational instruction.

Figure 1. Process Pathway of the Credential-Capability Paradox in State-Administered TVET Institutions



As illustrated in Figure 1, formal certification alone does not guarantee instructional effectiveness. In the absence of sustained industry exposure and continuous professional development, facilitators' technical competencies gradually become obsolete. This capability erosion contributes to declining instructional confidence and weak curriculum implementation, ultimately producing graduates whose competencies are misaligned with labor market requirements. The model therefore suggests that continuous competency development and industry engagement are essential mechanisms for preventing the decoupling of certification from actual instructional capability.

The model demonstrates the sequential progression from formal credential acquisition to graduate skills mismatch and highlights the institutional mechanisms that contribute to capability deficits among learning facilitators.

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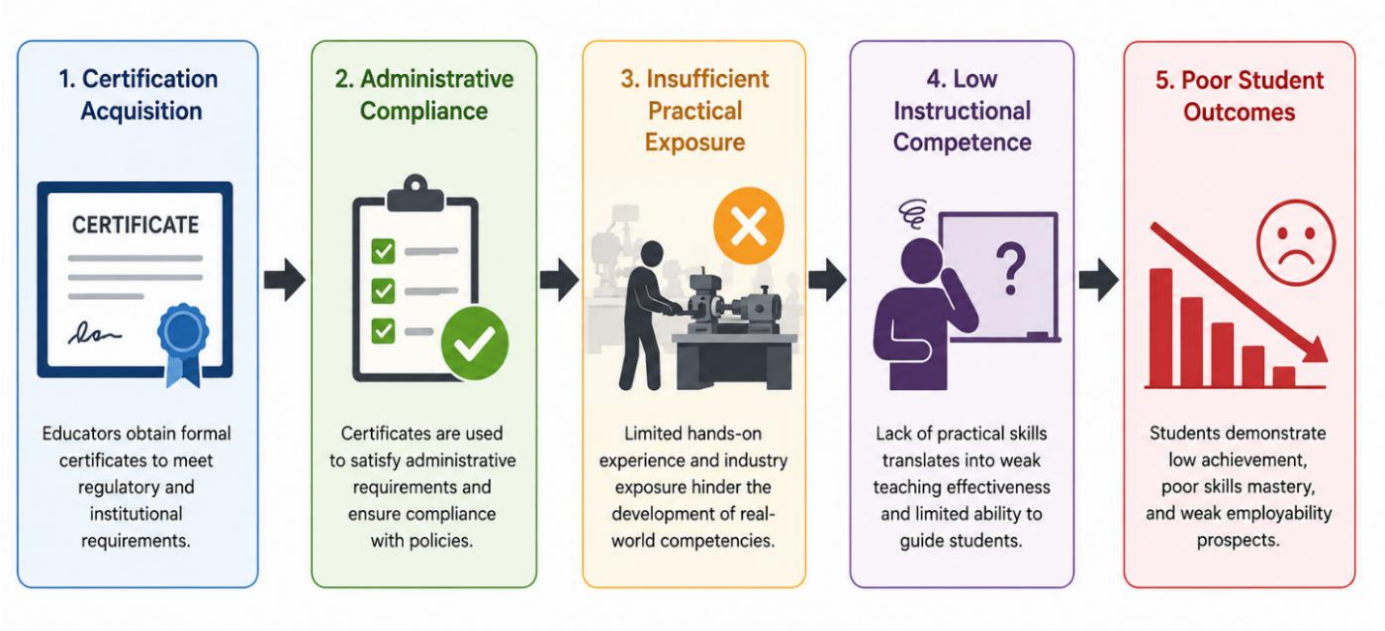
This paradox operates as a destructive cycle driven by bureaucratic demands over technical mastery:



METHODOLOGY AND RESEARCH DESIGN

This study employed an explanatory sequential mixed-methods research design. The quantitative phase mapped institutional challenges, followed by a qualitative phase to decode the structural causes driving the statistical anomalies.

Ethical Considerations

The study obtained ethical clearance from the Institutional Research Ethics Committee prior to data collection. Participation was voluntary, and all respondents provided informed consent. Confidentiality and anonymity were strictly maintained, and participants were informed of their right to withdraw from the study at any stage without penalty.

Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request and in accordance with institutional data-sharing policies.

Funding

This research received no external funding and was conducted as part of the authors' scholarly and institutional research initiatives.

Conflict of Interest

The authors declare no conflict of interest regarding the publication of this manuscript.

Quantitative Phase: Participants and Instrument

A total of **108 active learning facilitators** participated in the quantitative phase of the study, drawn from a total population of **148 Learning facilitators** from four state-administered Technical-Vocational Education and Training (TVET) institutions in Panay Island, Philippines. The sample size was determined using Slovin's formula with a 5% margin of error:

[n=\frac{N}{1+Ne^{2}}]

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where:

- (N=148) (population size)
- (e=0.05) (margin of error)

The computed sample size of 108 respondents was considered statistically adequate for representing the study population.

Stratified random sampling with proportional allocation was employed to ensure adequate representation of Learning facilitators across the participating institutions. A lottery procedure was subsequently used to select individual respondents from each institutional stratum.

The dependent variable, **Overall TVET Implementation Bottlenecks**, was operationalized as the composite mean score of the ten challenge indicators measured through the survey instrument. Composite scores were calculated by averaging individual item responses, with higher scores indicating greater institutional implementation challenges.

Table 1. Respondents

Schools	Population (N)	Sample Size (n)	Percentage (%)
A	23	17	15.74
B	38	28	25.93
C	60	43	39.81
D	27	20	18.52
Total	**148**	**108**	**100.00**

Qualitative Phase: Procedures and Trustworthiness

Following the quantitative survey, semi-structured interviews were conducted with **six key informants** selected through purposive sampling. The participants were chosen based on the following inclusion criteria:

1. Full-time teaching status in one of the participating TVET institutions;
2. Minimum of five years of continuous teaching experience;
3. Non-participation in the quantitative phase to avoid response contamination; and
4. Willingness to participate voluntarily.

Data collection continued until theoretical saturation was achieved, wherein no new categories emerged during the coding process. Interview transcripts were analyzed using open, axial, and selective coding procedures.

To establish trustworthiness, the study adopted the criteria proposed by Lincoln and Guba (1985):

- Credibility through member checking;
- Dependability through peer debriefing;
- Confirmability through audit trails; and
- Transferability through thick descriptions of the research context.

Results and Empirical Analysis

The empirical investigation reveals deep systemic vulnerabilities across all functional layers of the vocational program framework.

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Table 2. Quantitative Findings

No.	Indicators	M	SD	Verbal Description
6	Lack of learning facilitators training.	4.51	.63	Very Serious Challenges
7	Lack of knowledge in the program.	4.48	.66	Serious Challenges
8	Lack of monitoring and evaluation.	4.45	.57	Serious Challenges
2	Lack of support.	4.43	.61	Serious Challenges
3	Lack of intervention.	4.43	.58	Serious Challenges
4	Lack of technology integration.	4.43	.58	Serious Challenges
10	Lack of materials to be utilized.	4.43	.69	Serious Challenges
1	Lack of funds.	4.42	.64	Serious Challenges
5	Lack of qualified learning facilitators.	4.37	.62	Serious Challenges
9	Lack of industry partnership support.	4.31	.62	Serious Challenges
	Total	**4.43**	**.36**	

As shown in Table 2, the cumulative statistical baseline **(M = 4.43, SD = 0.36)** establishes that TVET implementation is universally burdened by serious challenges across participating institutions.

Advanced Statistical Explorations

Table 3. Correlation Matrix

Indicators	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Lack of funds	1.00									
(2) Lack of support	.52*	1.00								
(3) Lack of intervention	.48*	.61*	1.00							
(4) Lack of tech integration	.59*	.44*	.41*	1.00						
(5) Lack of qualified facilitators	.39*	.47*	.42*	.38*	1.00					
(6) Lack of facilitator training	.41*	.55*	.51*	.49*	.62*	1.00				
(7) Lack of program knowledge	.35*	.49*	.46*	.43*	.58*	.74*	1.00			

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Indicators	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(8) Lack of monitoring/eval	.44*	.58*	.68*	.39*	.45*	.53*	.48*	1.00		
(9) Lack of industry support	.50*	.52*	.49*	.51*	.41*	.46*	.42*	.55*	1.00	
(10) Lack of materials	.64*	.46*	.43*	.62*	.40*	.45*	.39*	.47*	.53*	1.00

Note: *p < .001, two-tailed.

A Pearson correlation matrix (N = 108) revealed a strong and statistically significant positive correlation between Lack of learning facilitators training and Lack of knowledge in the program (r = .74, p < .001). Furthermore, Lack of monitoring and evaluation was strongly associated with Lack of intervention (r = .68, p < .001)

Table 4. Regression Analysis

Predictor Variables	Unstandardized B	Std. Error	Standardized β	t-value	p-value
Constant	1.12	0.24	—	4.67	< .001
Lack of facilitator training (Ind. 6)	0.38	0.06	.41	6.33	< .001
Lack of materials to be utilized (Ind. 10)	0.31	0.05	.35	6.20	< .001
Lack of monitoring & evaluation (Ind. 8)	0.22	0.07	.21	3.14	= .002

Note: R^2 = .58; Adjusted R^2 = .56; F (3,104) = 48.62, p < .001.

The use of multiple regression analysis was theoretically justified because the study sought to determine the relative contribution of institutional factors in predicting overall implementation bottlenecks. Prior to model estimation, assumptions of linearity, normality, independence, homoscedasticity, and multicollinearity were tested and satisfied.

The dependent variable demonstrated high internal consistency (Cronbach's α = .91), supporting the use of a composite index as a valid measure of institutional implementation challenges.

Although stepwise regression was employed for exploratory purposes, the identified predictors were also theoretically supported by Human Capital Theory and Systems Theory, thereby minimizing concerns regarding model overfitting.

Stepwise multiple linear regression was conducted to isolate the primary structural predictors of overall implementation challenges **(R^2 = .58, Adjusted R^2 = .56, F(3,104) = 48.62, p < .001)**. The analysis revealed that lack of learning facilitators' training, lack of materials to be utilized, and lack of monitoring and evaluation emerged as statistically significant predictors, collectively accounting for **58% of the variance in institutional bottleneck severity (R^2 = .58, Adjusted R^2 = .56, F (3,104) = 48.62, p < .001)**.

To ensure the statistical validity of the regression model, standard linear assumptions were thoroughly verified. Normality of residuals was confirmed via a Shapiro-Wilk test (W = .983, p = .087) and visual inspection of a P-

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P plot. VIF values ranged from 1.22 to 2.11, indicating no problematic multicollinearity. Homoscedasticity was validated through a modified Breusch-Pagan $\chi^2 = 2.18$, $p = .34$, proving uniform variance. Finally, the independence of errors was verified by a Durbin-Watson statistic of 2.03, falling within the acceptable range of 1.5 to 2.5.

Qualitative Thematic Analysis

The qualitative transcripts were organized into four primary themes that provide context for the quantitative deficits.

Table 5. Qualitative Themes

Core Theme	Descriptive Framework	Representative Informant Quotes
Theme 1: Professional Insecurity of Trainers	The emotional and instructional anxiety caused by the gap between formal certification and hands-on skill.	*"I have an NC II certificate but possess limited practical skills and experience in this qualification. I have learned through the years, but I still find it difficult to design stimulating and productive learning environments without appropriate training.*"(Informant 1) Informant 2 further emphasized: "*Many of us hold national certifications, but our exposure to actual industry practices is already outdated. We try to keep up, but without continuous training, our competencies gradually become disconnected from industry realities."*
Theme 2: Administrative Isolation	The lack of post-policy support, interventions, and proactive evaluations from management.	*"There is a regular assessment and monitoring, however, without a structured system to assess program effectiveness, gaps in training and curriculum remain unaddressed."* (Informant 3)
Theme 3: Resource Deprivation	The lack of funding, missing technical materials, and modern machinery in training spaces.	*"We are expected to teach modern skills theoretically... replacing hands-on machine time with lectures because the funding doesn't reach the classrooms."* (Informant 4) Informant 6 similarly stated: *"The institution expects us to deliver advanced competencies using obsolete equipment and limited professional development opportunities. This creates a gap between what is required by industry and what we can realistically teach."*
Theme 4: Weak Industry Integration	Mismatched institutional expectations and low commitment from external corporate partnerships.	*"Insufficient backing from industrial partnerships can impede the growth of productive partnerships... resulting in difficulties in domains such as research, innovation, and vocational training."* (Informant 1) *"TESDA schools should continuously update the curriculum to reflect technological advancements [and] strengthen ties with industry partners..."* (Informant 5)

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The Credential-Capability Paradox Framework

The present study proposes the Credential-Capability Paradox as an explanatory framework describing the institutional condition in which formally certified educators possess insufficient practical and industrial competencies to effectively deliver technical-vocational instruction.

The framework consists of four interrelated dimensions:

Antecedents

- Insufficient professional development;
- Limited industry immersion;
- Weak institutional support systems;
- Resource deficiencies.

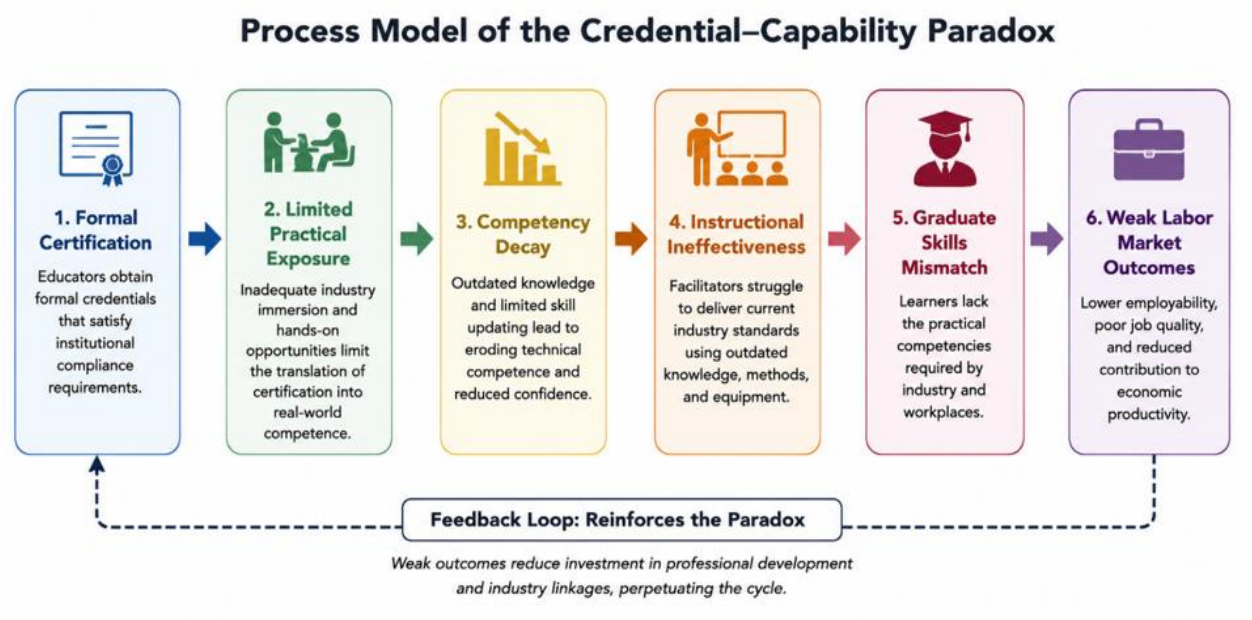
Mechanisms

- Reliance on paper credentials;
- Reduced confidence in instructional delivery;
- Declining technological adaptability;
- Weak curriculum implementation.

Process Pathway of the Credential-Capability Paradox

The qualitative evidence suggests that the Credential-Capability Paradox operates through a sequential process. First, facilitators obtain formal certifications that satisfy institutional compliance requirements but may not require sustained practical assessments or regular competency updating. Second, inadequate opportunities for continuous professional development and industry immersion limit the translation of certification into authentic technical competence. Third, instructional confidence declines as facilitators struggle to deliver rapidly changing industry standards using outdated knowledge and equipment. Finally, weakened instructional delivery contributes to reduced learner competence, skills mismatch, and diminished graduate employability.

The process model may be summarized as follows:



The findings suggest that certain forms of certification may be particularly susceptible to the Credential-Capability Paradox. These include certifications requiring minimal practical assessment, certifications that are not periodically updated to reflect technological advancements, and certifications in rapidly evolving technical fields such as information technology, automation, and advanced manufacturing. Likewise, the competencies

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most vulnerable to capability deficits include hands-on technical skills, industry-specific knowledge, technological adaptability, and the ability to design authentic work-based learning experiences.

Consequences

- Lower instructional quality;
- Reduced learner competence;
- Weak industry responsiveness;
- Poor graduate employability.

Boundary Conditions

- Availability of continuous professional development;
- Strength of industry partnerships;
- Institutional governance capacity;
- National TVET policy support.

Although the present study was not designed to statistically test the moderating effects of the boundary conditions, qualitative evidence suggests that these factors may influence the severity of the Credential-Capability Paradox. Informants from institutions reporting stronger industry collaborations and more frequent professional development activities exhibited relatively lower perceptions of professional insecurity and instructional inadequacy. Conversely, institutions characterized by limited industry engagement and weak developmental support mechanisms demonstrated stronger manifestations of the paradox. These observations warrant future investigations employing structural equation modeling or hierarchical linear modeling to examine the moderating influence of institutional and policy conditions.

The framework extends Human Capital Theory by arguing that formal certification alone does not constitute educational capital unless accompanied by continuous competency development and industrial exposure.

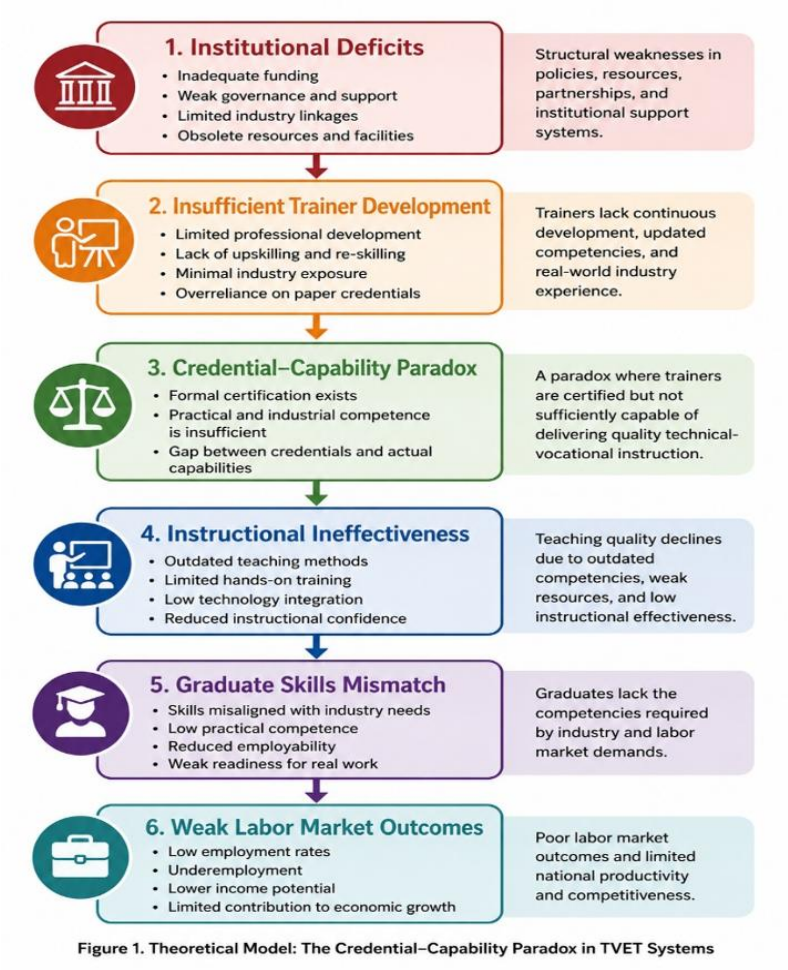

Figure 1. Theoretical Model: The Credential–Capability Paradox in TVET Systems

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DISCUSSION

Unpacking the Bottlenecks

The convergence of our quantitative and qualitative data clearly demonstrates that the *Credential-Capability Paradox* is the central structural flaw in the TVET system. When the lack of learning facilitators' training escalates into a **Very Serious Challenge (M = 4.51, SD = 0.63)**, it undermines the institutional inputs of the TVET system and compromises instructional effectiveness. This directly aligns with global findings by UNESCO, which note that sub-Saharan and Southeast Asian vocational programs often over-emphasize initial paperwork certification while failing to fund continuous industrial re-skilling pipelines [9].

The global prevalence of this paradox is heavily documented across macro-regional vocational contexts. In Southeast Asia, empirical studies confirm that rapid economic shifts frequently outpace public trainer re-skilling programs, causing severe skill gaps in manufacturing sectors [12], [13]. This systemic issue mirrors challenges observed in many developing-country TVET systems, where investments in formal certification and compliance mechanisms have not always translated into improved graduate readiness because instructors often lack continuous industry exposure and opportunities for professional development. International reports consistently emphasize that sustainable improvements in TVET quality require stronger industry engagement, lifelong learning opportunities for educators, and institutional support systems that align training provision with rapidly changing labor market demands (UNESCO, 2022; ILO, 2023; OECD, 2024).

Furthermore, the statistical clustering of resource and governance gaps **(Overall M = 4.43, SD = 0.36)** highlights that administrative monitoring frequently operates as a compliance checklist rather than a developmental mechanism. As documented in International Labour Organization (ILO) skills development reports, when monitoring lacks targeted interventions, training quality detaches from industrial reality [10]. This explains why the lack of industry partnership support (M = 4.31, SD = 0.62) persists as a serious institutional concern. As noted by OECD research, private sector partners show less interest in collaborating with state institutions when instructors themselves lack up-to-date technological literacy.[11].

The present findings extend Human Capital Theory by demonstrating that investments in formal certification alone do not necessarily translate into productive educational outcomes unless accompanied by sustained industrial re-skilling opportunities. Similarly, the study enriches Systems Theory by illustrating how deficiencies in a single institutional component—trainer competence—can propagate dysfunction across the entire educational ecosystem. Finally, the study contributes to Implementation Theory by empirically showing that the effectiveness of policy reforms ultimately depends on the competencies and preparedness of frontline educational actors.

Policy Implications for TESDA and Public TVET Institutions

The findings suggest that TVET reform should move beyond credential-based compliance systems and adopt competency-based developmental frameworks. Public TVET institutions and TESDA should institutionalize mandatory industry immersion programs, periodic trainer recertification, and continuous professional development mechanisms that emphasize authentic industrial competencies rather than documentary compliance.

Furthermore, institutional monitoring systems should be redesigned to function as developmental support mechanisms capable of identifying competency gaps and providing targeted interventions. Strengthening industry partnerships and investing in digital transformation initiatives may significantly reduce the Credential-Capability Paradox and improve graduate employability and workforce responsiveness.

Future investigations may also employ structural equation modeling and cross-national comparative designs to further validate the Credential-Capability Paradox framework and examine its applicability across different TVET governance systems.

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Future studies may employ longitudinal designs to examine the evolution of the Credential-Capability Paradox over time and investigate the effects of professional development interventions on reducing capability deficits. Cross-national comparative studies may explore how different TVET governance structures influence the paradox. Researchers may also utilize structural equation modeling to empirically test the hypothesized relationships among antecedents, mechanisms, consequences, and boundary conditions and employ hierarchical linear modeling to examine institutional-level moderating effects.

For the Philippine context, the findings suggest the need to revisit existing TESDA policies governing trainer certification, recertification, and industry immersion requirements. Institutional reforms may include periodic competency validation, mandatory industry attachments, and performance-based professional development systems that prioritize demonstrable instructional capability rather than documentary compliance alone. Such reforms may help address persistent skills mismatches and strengthen the responsiveness of the Philippine TVET system to emerging labor market demands.

Stakeholder Implications

For learning facilitators, the Credential-Capability Paradox may contribute to professional insecurity, declining job satisfaction, burnout, and reduced instructional confidence. For learners, the paradox may result in inadequate workplace preparedness, lower employability, and constrained career progression. For industry partners, persistent competency gaps among graduates may increase recruitment and training costs and limit access to skilled labor. At the societal level, the paradox may weaken economic competitiveness and impede workforce development efforts in developing economies.

Although the present study did not conduct institution-level inferential comparisons, preliminary observations suggest that variations in resource availability, industry engagement, and professional development opportunities may contribute to differing manifestations of the Credential-Capability Paradox across institutions. Future studies should conduct comparative analyses to identify institution-specific patterns and best practices that may mitigate capability deficits among learning facilitators.

CONCLUSION

This study cuts through administrative jargon to expose the structural failures within public TVET implementation. Its main scholarly contribution is defining and modeling the **Credential-Capability Paradox**, proving that formal qualifications often mask real-world instructional deficits. The mixed-methods data demonstrates that funding physical infrastructure yields minimal returns if instructors remain isolated from continuous professional development.

The study contributes theoretically by introducing the Credential-Capability Paradox as a framework for understanding the disconnect between formal qualifications and actual instructional competence in TVET systems. Methodologically, the explanatory sequential mixed-methods design demonstrates the value of integrating statistical analyses with lived experiences to uncover institutional bottlenecks. From a policy perspective, the findings underscore the need for continuous trainer upskilling, stronger industry partnerships, and developmental monitoring systems capable of aligning public vocational education with rapidly changing labor market demands.

The findings of this study acquire greater significance in the context of Industry 5.0 and the accelerating adoption of artificial intelligence in education and work environments. The inability of TVET institutions to continuously develop trainer competencies may further widen the gap between formal certification and actual capability, thereby exacerbating the Credential-Capability Paradox. Without sustained investments in digital transformation and lifelong learning systems, public vocational institutions risk producing graduates whose competencies are increasingly misaligned with emerging labor market demands.

Ultimately, the sustainability of public TVET systems depends not merely on certifying educators but on continuously cultivating the competencies required to navigate rapidly changing technological and industrial landscapes.

LIMITATIONS

Although the study focused on state-administered TVET institutions in Panay Island, the findings may hold relevance for other developing countries with similarly centralized vocational governance structures and persistent resource constraints. The Credential-Capability Paradox is likely to be more pronounced in public institutions where compliance-based accountability systems dominate professional development mechanisms. Conversely, private institutions with stronger market incentives and closer industry linkages may exhibit weaker manifestations of the paradox. Future cross-national comparative studies are necessary to determine the extent to which the framework applies across Southeast Asia and other developing regions.

This study has several limitations that should be considered when interpreting the findings. First, the study was geographically confined to state-administered TVET institutions in Panay Island, which may limit the generalizability of the findings to other regions and national contexts. Second, the study relied on self-reported perceptions of learning facilitators, which may be subject to response bias. Third, the cross-sectional nature of the research design restricts causal inferences regarding the relationships among institutional variables. Future studies may employ longitudinal designs, incorporate multiple stakeholder perspectives, and validate the Credential-Capability Paradox model across diverse educational systems and international settings.

Although the explanatory sequential mixed-methods design enhanced the depth of interpretation, the relatively small qualitative sample and regional focus may limit the transferability of the findings to other national TVET contexts.

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