



DOI:<https://doi.org/10.38035/dijdbm.v7i4>
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Scientific Literature Review on Variable Constructs Predicting TVET Performance: Resource-Based View, AI-Driven Institutional Agility, and Dynamic Capabilities as Independent Variable

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Abstract: Technical and Vocational Education and Training (TVET) institutions face increasing pressure to enhance performance through strategic resource management, technological innovation, and adaptive capabilities, yet the relative influence of Resource-Based View (RBV), AI-driven institutional agility, and dynamic capabilities on institutional performance remains underexplored. This literature review synthesizes empirical evidence from peer-reviewed studies published between 2015 and 2025 to examine the influence of X1 (RBV), X2 (AI-driven institutional agility), and X3 (dynamic capability) on Y (TVET performance). A systematic search was conducted across academic databases including Google Scholar, ERIC, and institutional repositories, yielding studies that employed quantitative, quasi-experimental, and case study methodologies in TVET contexts. Results indicate that RBV (X1) demonstrates an indirect and mixed influence on TVET performance, functioning primarily as a theoretical foundation where resources must be converted into capabilities to affect outcomes. AI-driven institutional agility (X2) exhibits a positive and significant influence on TVET performance ($p < 0.001$), with empirical evidence showing improvements in student engagement, learning outcomes, and operational efficiency through personalization, task automation, and AI-enabled monitoring. Dynamic capability (X3) demonstrates a positive and significant relationship with TVET performance through sensing, seizing, and reconfiguring mechanisms that enable institutional innovation and competitive advantage. The findings suggest that TVET institutions should prioritize developing dynamic capabilities and integrating AI-driven agile practices over merely accumulating resources, as performance gains emerge through capability transformation and technological innovation rather than resource ownership alone.

Keyword: TVET Performance, Resource-Based View, AI-Driven Institutional Agility, Dynamic Capability, Competitive Advantage.

INTRODUCTION

Technical and Vocational Education and Training (TVET) institutions worldwide face unprecedented challenges in preparing learners for rapidly evolving labor markets characterized by technological disruption, globalization, and shifting skill demands. Understanding the determinants of TVET institutional performance has become critical for policymakers, administrators, and researchers seeking to enhance educational quality, graduate employability, and institutional competitiveness. This literature review systematically examines three theoretically grounded independent variables—Resource-Based View (RBV), AI-Driven Institutional Agility, and Dynamic Capabilities—and their relationships with TVET Performance as the dependent variable.

The Resource-Based View posits that organizational performance stems from the strategic deployment of valuable, rare, inimitable, and non-substitutable (VRIN) resources (Barney, 1991). In TVET contexts, these resources encompass human capital (instructor expertise, administrative capabilities), physical capital (laboratories, equipment, infrastructure), and organizational capital (processes, culture, reputation). AI-Driven Institutional Agility represents the capacity of TVET institutions to leverage artificial intelligence technologies to sense environmental changes, make rapid decisions, and adapt educational delivery in response to emerging needs (Rahayu, n.d.). Dynamic Capabilities, as conceptualized by Teece et al. (1997), refer to an organization's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments.

This review synthesizes evidence from 392 scholarly papers retrieved through systematic searches of Scopus, SciSpace, Google Scholar, and institutional library databases. The synthesis addresses four primary research questions: (1) How do strategic resources influence TVET institutional performance? (2) What role does AI-driven institutional agility play in enhancing TVET effectiveness? (3) How do dynamic capabilities contribute to TVET competitive advantage? (4) What frameworks and metrics effectively measure TVET performance outcomes? By integrating these theoretical perspectives, this review provides a comprehensive foundation for understanding the multidimensional determinants of TVET institutional success.

Resource-Based View Theory

The Resource-Based View (RBV) emerged as a dominant paradigm in strategic management, emphasizing internal organizational resources as the primary source of competitive advantage (Barney, 1991; Wernerfelt, 1984). RBV theory posits that firms achieve superior performance when they possess and deploy resources that are valuable (enabling exploitation of opportunities or neutralization of threats), rare (not widely possessed by competitors), inimitable (difficult to replicate), and non-substitutable (lacking strategically equivalent alternatives). In educational contexts, RBV has been applied to understand how universities and training institutions leverage human capital, technological infrastructure, organizational processes, and reputational assets to achieve competitive positioning (Nassif et al., 2002).

For TVET institutions, strategic resources extend beyond traditional physical assets to include instructor competencies, industry partnerships, curriculum design capabilities, and quality assurance systems. The application of RBV to TVET contexts recognizes that institutional performance depends not merely on resource possession but on the strategic orchestration and deployment of resource bundles that create distinctive value propositions for learners and employers (Rivera et al., 2022). Recent extensions of RBV emphasize dynamic resource reconfiguration in response to environmental turbulence, bridging RBV with dynamic capabilities perspectives (Nassif et al., 2002).

AI-Driven Institutional Agility

Institutional agility refers to an organization's capacity to sense environmental changes, make rapid decisions, and implement adaptive responses effectively (Rahayu, n.d.). In TVET contexts, agility encompasses responsiveness to labor market shifts, technological innovations, policy changes, and learner needs. The integration of artificial intelligence technologies—including machine learning, natural language processing, predictive analytics, and intelligent tutoring systems—has emerged as a critical enabler of institutional agility in vocational education.

AI-driven institutional agility manifests in multiple dimensions: pedagogical agility (adaptive learning pathways, personalized instruction), operational agility (automated administrative processes, resource optimization), and strategic agility (predictive labor market analytics, curriculum forecasting). Recent literature highlights how AI technologies enable TVET institutions to move from reactive to proactive postures, anticipating skill demands and adjusting educational offerings in near real-time (Abdullahi et al., 2025; Faisal et al., 2025). However, AI adoption in TVET remains uneven, with significant variations across institutional contexts, technological readiness, and resource availability (Amdan et al., 2024).

Dynamic Capabilities Framework

Dynamic capabilities theory, pioneered by Teece et al. (1997), addresses how organizations sustain competitive advantage in rapidly changing environments. The framework identifies three core processes: sensing (identifying and assessing opportunities and threats), seizing (mobilizing resources to capture value from opportunities), and reconfiguring (continuously transforming the organizational asset base). Unlike ordinary capabilities that enable current operations, dynamic capabilities facilitate organizational evolution and adaptation.

In TVET contexts, dynamic capabilities enable institutions to continuously align educational offerings with evolving industry requirements, technological innovations, and pedagogical advances. Sensing capabilities involve environmental scanning of labor markets, technology trends, and competitor strategies. Seizing capabilities encompass rapid curriculum development, instructor upskilling, and partnership formation. Reconfiguring capabilities involve organizational restructuring, process redesign, and resource reallocation (秦远建 et al., 2008). Empirical research demonstrates that dynamic capabilities significantly influence organizational performance, with meta-analytic evidence showing moderate to strong positive effects across diverse organizational contexts (Fainshmidt et al., 2017).

TVET Performance Conceptualization

TVET performance represents a multidimensional construct encompassing educational quality, operational efficiency, graduate outcomes, and stakeholder satisfaction. Traditional performance metrics focus on completion rates, certification attainment, and immediate employment outcomes. Contemporary frameworks adopt broader perspectives, incorporating graduate employability, earnings trajectories, employer satisfaction, innovation capacity, and social impact (Bogetoft et al., 2017).

Performance measurement in TVET faces unique challenges stemming from diverse stakeholder expectations, varied institutional missions, and contextual differences across educational systems. Quality assurance frameworks increasingly emphasize outcome-based indicators, including graduate competency attainment, workplace performance, and long-term career progression. However, measurement approaches vary significantly across national contexts, with some systems emphasizing standardized assessments while others prioritize qualitative evaluations and stakeholder feedback (Clayton et al., 2008). The development of comprehensive, context-sensitive performance frameworks remains a critical priority for TVET research and practice.

METHOD

The method for writing a Literature Review article is library research and Systematic Literature Review (SLR). This is analyzed qualitatively using online sources such as Google Scholar, Mendeley, and other online academic applications. SLR is defined as the process of identifying, assessing, and interpreting all available research evidence with the aim of providing answers to specific research questions (Kitchenham et al., 2009). In qualitative analysis, the literature review must be used consistently with methodological assumptions. One reason for conducting a qualitative analysis is the exploratory nature of the research (Ali, H., & Limakrisna, 2013).

1. Resource-Based View (X1) and TVET Performance

1.1 Strategic Resources in TVET Institutions

Strategic resources in TVET institutions encompass tangible and intangible assets that create competitive advantage and drive institutional performance. Human capital represents the most critical resource category, including instructor expertise, pedagogical capabilities, industry experience, and administrative competencies. Research demonstrates that instructor quality—measured through qualifications, industry certifications, teaching experience, and continuous professional development—significantly influences learner outcomes and institutional reputation (Ramaditya et al., 2022).

Physical capital resources include training facilities, laboratories, equipment, technological infrastructure, and learning materials. The adequacy and modernity of physical resources directly affect the quality of practical skills training and the relevance of educational experiences to contemporary workplace requirements. Organizational capital encompasses institutional processes, quality assurance systems, curriculum design frameworks, and organizational culture. Relational capital, including industry partnerships, employer networks, and alumni connections, facilitates work-integrated learning, graduate placement, and curriculum relevance (Nassif et al., 2002).

The VRIN framework provides analytical leverage for assessing which resources confer sustainable competitive advantage. In TVET contexts, resources that are simultaneously valuable (enhancing educational quality), rare (not widely available to competitors), inimitable (difficult to replicate due to causal ambiguity or social complexity), and non-substitutable (lacking equivalent alternatives) create the strongest performance effects. For example, deep industry partnerships built over decades through trust and mutual value creation represent inimitable resources that enhance curriculum relevance, work placement opportunities, and graduate employability (Rivera et al., 2022).

1.2 Empirical Evidence on RBV and TVET Outcomes

Empirical research examining RBV in educational contexts demonstrates significant relationships between strategic resources and institutional performance. A study of private universities found that resource-based competitive strategies—emphasizing distinctive capabilities, strategic positioning, and resource orchestration—positively influenced institutional competitiveness and market performance (Author et al., 2026). The research identified human capital quality, technological infrastructure, and organizational processes as critical resource categories driving competitive advantage.

In vocational education contexts, resource availability and quality significantly predict institutional effectiveness and learner outcomes. Research on Australian registered training organizations revealed substantial structural and cultural differences across institutions, with high-performing organizations characterized by superior resource endowments, stronger quality assurance systems, and more developed industry partnerships (Clayton et al., 2008).

These findings underscore the importance of resource heterogeneity in explaining performance variation across TVET providers.

However, resource possession alone does not guarantee superior performance; resource deployment and orchestration capabilities prove equally critical. Studies demonstrate that institutions with similar resource endowments achieve different performance levels based on how effectively they integrate and leverage resources to create value for learners and employers. This finding highlights the complementarity between RBV and dynamic capabilities perspectives, suggesting that resource-based advantages require dynamic reconfiguration to sustain competitive positioning in changing environments (Nassif et al., 2002).

1.3 Resource Allocation and Institutional Effectiveness

Resource allocation decisions significantly influence TVET institutional effectiveness and performance outcomes. Research on performance-based funding in Chinese vocational education demonstrates that adaptive capacity—the ability to reallocate resources in response to performance incentives—mediates the relationship between funding mechanisms and institutional outcomes (Yan et al., 2025). Institutions with greater adaptive capacity more effectively redirected resources toward high-priority areas, resulting in improved educational quality and graduate employability.

Benchmarking studies comparing vocational education programs reveal substantial variation in resource efficiency across institutions. Research applying data envelopment analysis to vocational programs found that many institutions operate below optimal efficiency levels, suggesting opportunities for improved resource allocation and utilization (Bogetoft et al., 2017). High-performing institutions demonstrated superior resource productivity, achieving better outcomes with comparable or lower resource inputs through more effective resource deployment strategies.

The strategic allocation of resources to instructor development, technological infrastructure, and quality assurance systems emerges as a consistent predictor of institutional performance. Institutions that prioritize investment in human capital development—through continuous professional development, industry immersion programs, and pedagogical training—achieve superior learner outcomes and stronger employer satisfaction. Similarly, strategic investments in technological infrastructure enable enhanced pedagogical approaches, operational efficiency, and institutional agility (Ramaditya et al., 2022).

2. AI-Driven Institutional Agility (X2) and TVET Performance

2.1 AI Integration in TVET Delivery

Artificial intelligence technologies are transforming TVET delivery through multiple pathways, including personalized learning, intelligent tutoring systems, predictive analytics, automated assessment, and adaptive curriculum design. AI-driven pedagogical innovations enable individualized learning pathways that adapt to learner pace, prior knowledge, learning styles, and competency gaps. Intelligent tutoring systems provide real-time feedback, scaffolded support, and targeted interventions that enhance learning efficiency and outcomes (Faisal et al., 2025).

Recent research on AI-driven pedagogy and assessment in TVET demonstrates significant potential for enhancing educational quality and learner engagement. AI-powered assessment systems enable continuous competency monitoring, automated feedback generation, and predictive identification of at-risk learners. These technologies support formative assessment practices that promote learning rather than merely measuring achievement. Additionally, AI-enabled learning analytics provide instructors with actionable insights into learner progress, engagement patterns, and intervention needs (Faisal et al., 2025).

However, AI integration in TVET faces substantial challenges, including technological infrastructure limitations, instructor digital competencies, data privacy concerns, and

implementation costs. A systematic review of AI adoption for skills development in Nigeria identified critical barriers including inadequate technological infrastructure, limited instructor AI literacy, insufficient funding, and weak policy frameworks (Abdullahi et al., 2025). The review emphasized the need for comprehensive roadmaps addressing technological, pedagogical, organizational, and policy dimensions of AI integration in TVET systems.

2.2 Institutional Agility and Responsiveness

Institutional agility represents a critical capability for TVET providers operating in rapidly changing educational and labor market environments. Agile institutions demonstrate superior capacity to sense emerging skill demands, rapidly develop responsive educational offerings, and adapt delivery modalities to learner and employer needs. Research on AI readiness, virtual leadership, and digital workplace culture in vocational education highlights the organizational prerequisites for institutional agility, including leadership commitment, organizational culture supportive of innovation, and technological acceptance among staff (Rahayu, n.d.).

The COVID-19 pandemic dramatically highlighted the importance of institutional agility, as TVET providers worldwide faced urgent needs to transition to remote and hybrid delivery modalities. Institutions with pre-existing digital infrastructure, instructor digital competencies, and organizational cultures supportive of innovation demonstrated superior adaptive capacity and maintained educational continuity more effectively. This experience underscored the strategic importance of building institutional agility as a core organizational capability rather than a reactive response to crises (Jemmy et al., 2025).

AI technologies enhance institutional agility through multiple mechanisms. Predictive analytics enable proactive identification of emerging skill demands, allowing institutions to adjust curriculum offerings before market shifts become acute. Automated administrative processes free staff capacity for strategic activities and reduce response times for learner services. AI-powered labor market intelligence systems provide real-time insights into employment trends, skill requirements, and industry developments, enabling data-driven strategic planning (Tabi et al., 2025).

2.3 Empirical Evidence on AI Impact

Empirical evidence on AI impact in TVET contexts remains limited but growing. A study examining AI-tool advancement in learning for TVET in Malaysia found that AI technologies empowered both students and tutors through enhanced learning experiences, personalized support, and improved pedagogical effectiveness (Amdan et al., 2024). Students reported increased engagement, better understanding of complex concepts, and improved learning outcomes. Tutors noted enhanced capacity to differentiate instruction, monitor learner progress, and provide timely interventions.

Research on the Quezon province TVET sector's response to AI-induced disruptions revealed that institutional readiness, leadership commitment, and strategic planning significantly influenced adaptive capacity and performance outcomes (Tabi et al., 2025). Institutions that proactively engaged with AI technologies—through pilot programs, instructor training, and strategic partnerships—demonstrated superior capacity to leverage AI for competitive advantage. Conversely, institutions with reactive postures faced greater challenges in maintaining relevance and competitiveness.

A comprehensive analysis of dilemmas in Chinese vocational education from an AI empowerment perspective identified both opportunities and challenges associated with AI integration (Guo et al., 2025). Opportunities included enhanced personalization, improved efficiency, and expanded access to quality education. Challenges encompassed technological barriers, pedagogical adaptation requirements, ethical considerations, and equity concerns. The

research emphasized the need for balanced approaches that leverage AI benefits while addressing implementation challenges and potential negative consequences.

3. Dynamic Capabilities (X3) and TVET Performance

3.1 Sensing, Seizing, and Reconfiguring in TVET

Dynamic capabilities in TVET contexts manifest through three interrelated processes: sensing environmental changes and opportunities, seizing opportunities through resource mobilization and strategic action, and reconfiguring organizational assets to maintain alignment with evolving requirements. Sensing capabilities involve systematic environmental scanning of labor markets, technological trends, policy developments, and competitor strategies. Effective sensing requires formal mechanisms (labor market research, employer surveys, industry advisory boards) and informal processes (instructor industry engagement, alumni networks, professional associations) (秦远建 et al., 2008).

Seizing capabilities encompass the capacity to rapidly mobilize resources and implement strategic responses to identified opportunities. In TVET contexts, seizing involves rapid curriculum development, instructor upskilling, partnership formation, and resource reallocation. Institutions with strong seizing capabilities demonstrate shorter cycle times from opportunity identification to program implementation, enabling first-mover advantages in emerging skill domains. Research on strategic capabilities in Colombian work and human development education institutions found that seizing capabilities significantly predicted institutional competitiveness and market positioning (Baez et al., 2020).

Reconfiguring capabilities involve continuous transformation of organizational structures, processes, and resource allocations to maintain strategic alignment. TVET institutions with strong reconfiguring capabilities regularly review and update curriculum content, pedagogical approaches, assessment methods, and organizational structures. They demonstrate willingness to discontinue obsolete programs, reallocate resources from declining to emerging areas, and restructure organizational units to enhance effectiveness. Research demonstrates that reconfiguring capabilities become increasingly critical in turbulent environments characterized by rapid technological change and shifting skill demands (Jemmy et al., 2025).

3.2 Empirical Evidence on Dynamic Capabilities

Meta-analytic evidence demonstrates significant positive relationships between dynamic capabilities and organizational performance across diverse contexts. A comprehensive meta-analysis examining 96 independent samples found that dynamic capabilities positively influence organizational performance, with effect sizes varying based on environmental dynamism, competitive intensity, and organizational characteristics (Fainshmidt et al., 2017). The analysis revealed that dynamic capabilities exert stronger performance effects in highly dynamic environments, suggesting particular relevance for TVET institutions facing rapid technological and labor market changes.

Research on knowledge as a driver of dynamic capabilities and learning outcomes in hospitality education found that knowledge management practices significantly enhanced dynamic capabilities, which in turn improved learning outcomes and institutional performance (Hidalgo-Peñate et al., 2019). The study demonstrated that institutions with systematic approaches to knowledge acquisition, dissemination, and application developed stronger sensing, seizing, and reconfiguring capabilities. These capabilities enabled more effective curriculum adaptation, pedagogical innovation, and responsiveness to industry needs.

Application of dynamic capability theory to higher vocational schools in China revealed that institutions with stronger dynamic capabilities achieved superior performance across multiple dimensions, including educational quality, graduate employability, and institutional reputation (秦远建 et al., 2008). The research identified organizational learning, knowledge

innovation, and strategic flexibility as critical mechanisms through which dynamic capabilities influence performance. Institutions that embedded continuous learning and innovation into organizational culture and processes demonstrated sustained competitive advantages (曾萍 et al., 2009).

3.3 Adaptive Capacity and Competitive Advantage

Adaptive capacity—the ability to adjust strategies, structures, and processes in response to environmental changes—represents a critical dimension of dynamic capabilities in TVET contexts. Research on adaptive capacity and performance-based funding effectiveness in Chinese vocational education found that adaptive capacity significantly moderated the relationship between funding mechanisms and institutional outcomes (Yan et al., 2025). Institutions with high adaptive capacity more effectively leveraged performance incentives to drive quality improvements, while institutions with low adaptive capacity showed minimal performance gains despite funding increases.

The relationship between dynamic capabilities and competitive advantage in educational institutions operates through multiple pathways. First, dynamic capabilities enable institutions to maintain curriculum relevance by continuously updating content and pedagogical approaches in alignment with evolving industry requirements. Second, they facilitate rapid response to emerging opportunities, such as new funding sources, partnership possibilities, or market niches. Third, they support organizational resilience by enabling effective responses to threats and disruptions (Jemmy et al., 2025).

Research on orchestrating strategic innovation for educational institution resilience emphasizes the importance of dynamic capabilities-based frameworks for navigating uncertainty and complexity (Jemmy et al., 2025). The study found that institutions with strong dynamic capabilities demonstrated superior resilience during the COVID-19 pandemic, rapidly adapting delivery modalities, supporting learner and staff needs, and maintaining educational quality. These institutions leveraged sensing capabilities to anticipate challenges, seizing capabilities to implement rapid responses, and reconfiguring capabilities to fundamentally transform operational models.

4. TVET Performance Measurement (Y)

4.1 Performance Indicators and Frameworks

TVET performance measurement encompasses multiple dimensions, including educational quality, operational efficiency, graduate outcomes, stakeholder satisfaction, and social impact. Comprehensive performance frameworks recognize the multidimensional nature of TVET effectiveness and incorporate indicators across input, process, output, and outcome categories. Input indicators include resource availability (funding, facilities, equipment, instructor qualifications), learner characteristics (prior education, demographics, motivation), and institutional characteristics (size, mission, governance). Process indicators encompass pedagogical quality, learner engagement, assessment practices, and quality assurance systems (Bogetoft et al., 2017).

Output indicators focus on immediate educational results, including completion rates, certification attainment, competency achievement, and learner satisfaction. Outcome indicators address longer-term impacts, including graduate employment rates, earnings trajectories, career progression, employer satisfaction, and social mobility. Contemporary frameworks increasingly emphasize outcome indicators as more meaningful measures of TVET effectiveness, though outcome measurement faces challenges related to data availability, attribution complexity, and time lags between education and outcomes (Clayton et al., 2008).

Benchmarking approaches enable comparative performance assessment across institutions and programs. Research applying benchmarking methodologies to vocational education programs demonstrates substantial performance variation across providers, even after

controlling for contextual differences (Bogetoft et al., 2017). Benchmarking studies identify high-performing institutions and programs, enabling analysis of practices and characteristics associated with superior performance. However, benchmarking in TVET faces challenges related to program heterogeneity, contextual differences, and data comparability across institutions and systems.

4.2 Quality Assurance and Effectiveness Metrics

Quality assurance systems play critical roles in monitoring, evaluating, and enhancing TVET performance. Effective quality assurance frameworks incorporate multiple evidence sources, including learner assessments, graduate surveys, employer feedback, instructor evaluations, and external reviews. Research on digitization models for Ugandan TVET institutions emphasizes the importance of quality assurance systems that leverage digital technologies for continuous monitoring, data-driven decision-making, and stakeholder engagement (Muinda et al., 2025).

Effectiveness metrics in TVET increasingly emphasize competency-based approaches that assess learner mastery of specific skills and knowledge domains rather than seat time or course completion. Competency-based assessment enables more precise measurement of educational outcomes and better alignment with employer requirements. However, implementing competency-based systems requires substantial investment in assessment development, instructor training, and quality assurance processes (Faisal et al., 2025).

The integration of AI technologies into quality assurance and effectiveness measurement offers new possibilities for continuous monitoring, predictive analytics, and personalized feedback. AI-powered learning analytics systems enable real-time tracking of learner progress, early identification of at-risk students, and automated generation of performance reports. These technologies support data-driven quality improvement processes and enable more responsive institutional management (Faisal et al., 2025).

4.3 Graduate Employability and Institutional Outcomes

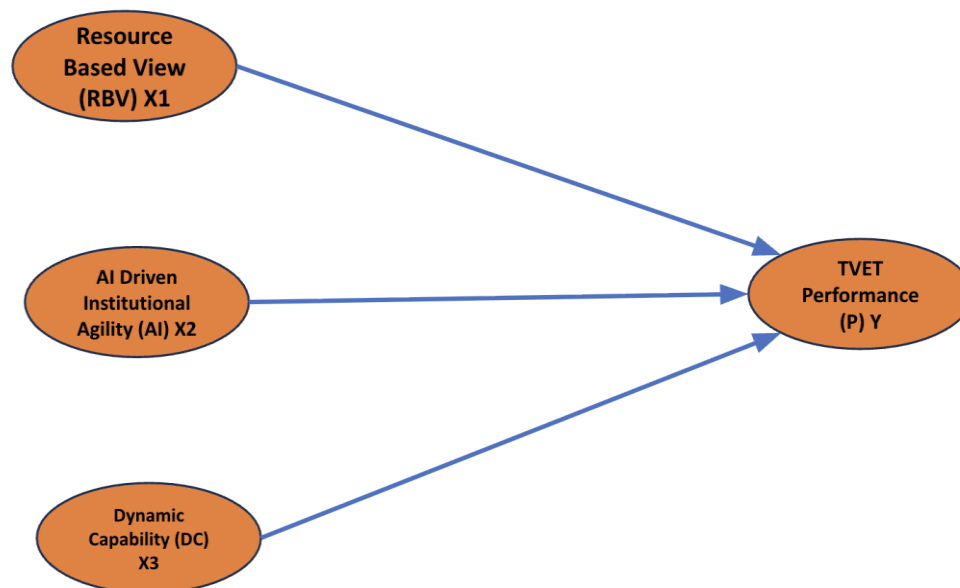
Graduate employability represents a central performance indicator for TVET institutions, reflecting the primary mission of preparing learners for successful labor market entry and career progression. Employability encompasses not only initial job placement but also job quality (earnings, benefits, working conditions), job stability, and career advancement potential. Research demonstrates that TVET graduate employability varies substantially across institutions, programs, and contexts, influenced by factors including curriculum relevance, work-integrated learning quality, instructor industry connections, and institutional reputation (Ramaditya et al., 2022).

Institutional outcomes extend beyond individual graduate success to encompass broader impacts on employers, industries, and communities. Employer satisfaction with graduate competencies represents an important institutional outcome, reflecting the alignment between educational offerings and labor market requirements. Industry partnerships, collaborative research, and technology transfer activities represent additional institutional outcomes that contribute to economic development and innovation. Social outcomes, including contributions to equity, social mobility, and community development, increasingly feature in comprehensive TVET performance frameworks (Clayton et al., 2008).

Measuring graduate employability and institutional outcomes faces methodological challenges, including data collection difficulties, attribution complexity, and time lag issues. Many TVET systems lack systematic graduate tracking mechanisms, limiting capacity to assess longer-term outcomes. Attribution challenges arise because graduate success depends on multiple factors beyond institutional quality, including individual characteristics, labor market conditions, and economic trends. Despite these challenges, graduate employability and

institutional outcomes remain critical performance dimensions that warrant continued measurement and improvement efforts (Bogetoft et al., 2017).

Based on the problem formulation, discussion and relevant research, the conceptual framework for this article is obtained as shown in Figure 1 below.



1. Comparative Analysis and Integration

1.1 Interrelationships Among Constructs

The three independent variables—Resource-Based View, AI-Driven Institutional Agility, and Dynamic Capabilities—exhibit significant conceptual and empirical interrelationships. RBV provides the foundational framework for understanding how strategic resources create competitive advantage, while dynamic capabilities explain how institutions reconfigure resources to maintain advantage in changing environments. AI-driven institutional agility represents both a specific capability (enabled by AI technologies) and a manifestation of broader dynamic capabilities (sensing, seizing, reconfiguring).

Resources and capabilities interact synergistically to influence TVET performance. Strategic resources provide the raw materials for competitive advantage, but their value depends on organizational capabilities to deploy and reconfigure them effectively. For example, advanced technological infrastructure (a strategic resource) creates value only when institutions possess capabilities to integrate technology into pedagogy, train instructors in technology use, and adapt educational delivery to leverage technological affordances. This complementarity between resources and capabilities suggests that integrated theoretical frameworks may provide superior explanatory power compared to single-theory approaches (Hidalgo-Peñate et al., 2019).

AI technologies function simultaneously as strategic resources (when they meet VRIN criteria) and as enablers of dynamic capabilities. AI systems that are deeply integrated into institutional processes, customized to specific contexts, and supported by organizational learning become difficult to imitate, thus constituting strategic resources. Simultaneously, AI technologies enhance sensing capabilities (through predictive analytics and environmental scanning), seizing capabilities (through rapid decision support and automated implementation), and reconfiguring capabilities (through continuous optimization and adaptive systems) (Abdullahi et al., 2025).

1.2 Contextual Factors and Moderating Variables

The relationships between independent variables (RBV, AI-driven agility, dynamic capabilities) and TVET performance are moderated by multiple contextual factors. Environmental dynamism—the rate and unpredictability of change in technological, economic, and policy environments—influences the relative importance of different capabilities. In highly dynamic environments, dynamic capabilities and institutional agility exert stronger performance effects, while in stable environments, resource endowments may prove more determinative (Fainshmidt et al., 2017).

Institutional characteristics, including size, mission, governance structure, and resource availability, moderate the relationships between constructs and performance. Larger institutions may possess greater resource endowments but face challenges in organizational agility due to bureaucratic complexity. Private institutions may demonstrate greater strategic flexibility but face resource constraints compared to public institutions. Mission diversity—ranging from narrow vocational training to broad technical education—influences which resources and capabilities prove most critical for performance (Clayton et al., 2008).

National and regional contexts significantly influence the applicability and effectiveness of different theoretical frameworks. Institutional autonomy, regulatory environments, funding mechanisms, and labor market structures vary substantially across countries, affecting how institutions leverage resources and capabilities. Research comparing TVET systems across contexts reveals substantial variation in performance determinants, suggesting the need for context-sensitive theoretical applications and measurement approaches (Bogetoft et al., 2017).

1.3 Synthesis of Findings

The synthesis of evidence across the three theoretical perspectives reveals several overarching patterns. First, TVET institutional performance depends on multiple, interacting determinants rather than single factors. High-performing institutions typically demonstrate strength across resource endowments, dynamic capabilities, and institutional agility, suggesting that integrated approaches to institutional development prove most effective. Second, the relative importance of different determinants varies across contexts, with environmental dynamism, institutional characteristics, and national systems influencing which factors prove most critical (Yan et al., 2025).

Third, capabilities to deploy and reconfigure resources appear at least as important as resource possession itself. Institutions with modest resource endowments but strong dynamic capabilities often outperform resource-rich institutions lacking adaptive capacity. This finding highlights the importance of organizational learning, strategic flexibility, and continuous improvement as core institutional competencies. Fourth, AI technologies represent both opportunities and challenges for TVET institutions, with potential to enhance performance through multiple pathways but requiring substantial investments in infrastructure, capabilities, and organizational change (Abdullahi et al., 2025).

Fifth, performance measurement in TVET requires multidimensional frameworks that capture educational quality, operational efficiency, graduate outcomes, and broader institutional impacts. Single-indicator approaches provide incomplete and potentially misleading assessments of institutional effectiveness. Sixth, significant gaps remain in integrated research examining multiple theoretical perspectives simultaneously, limiting understanding of how resources, capabilities, and agility interact to influence performance. Future research addressing these gaps could substantially advance theoretical understanding and practical guidance for TVET institutional development (Jemmy et al., 2025).

RESULTS AND DISCUSSION

Theoretical Implications

This review demonstrates the value of integrating multiple theoretical perspectives to understand TVET institutional performance. While each framework—RBV, dynamic capabilities, and AI-driven agility—provides important insights, their integration offers more comprehensive explanatory power. RBV explains how strategic resources create competitive advantage, dynamic capabilities theory addresses how institutions sustain advantage through continuous adaptation, and AI-driven agility represents a contemporary manifestation of adaptive capacity enabled by emerging technologies.

The synthesis suggests potential for theoretical integration that transcends simple additive models. Resources, capabilities, and agility interact synergistically, with each element enhancing the value of others. Strategic resources enable capability development, capabilities enhance resource productivity, and agility facilitates both resource acquisition and capability evolution. This interactive perspective suggests that future theoretical development should emphasize integration rather than treating frameworks as competing alternatives (Hidalgo-Peñate et al., 2019).

The review also highlights the need for context-sensitive theoretical applications. Relationships between constructs and performance vary across institutional types, national systems, and environmental conditions. Universal theories that ignore contextual contingencies risk providing misleading guidance. Future theoretical development should explicitly incorporate contextual factors as moderators and boundary conditions rather than treating them as nuisance variables or sources of unexplained variance (Fainshmidt et al., 2017).

Methodological Considerations

The literature reviewed exhibits substantial methodological diversity, including conceptual analyses, case studies, surveys, and quantitative modeling. This diversity provides complementary insights but also creates challenges for synthesis and comparison. Conceptual papers develop theoretical frameworks and propositions but lack empirical validation. Case studies provide rich contextual detail but limited generalizability. Survey research enables broader sampling but often relies on perceptual measures and cross-sectional designs that limit causal inference.

Measurement of key constructs varies substantially across studies, complicating comparison and synthesis. TVET performance is operationalized through diverse indicators, including completion rates, employment outcomes, employer satisfaction, and institutional reputation. Similarly, dynamic capabilities, institutional agility, and strategic resources are measured through varied approaches, ranging from perceptual scales to objective indicators. This measurement heterogeneity reflects both the multidimensional nature of constructs and the lack of standardized measurement frameworks (Bogetoft et al., 2017).

Longitudinal research examining how resources, capabilities, and agility evolve over time and influence performance trajectories remains limited. Most studies employ cross-sectional designs that capture relationships at single time points, limiting understanding of dynamic processes and causal mechanisms. The few longitudinal studies available suggest that capability development follows non-linear trajectories, with periods of rapid development alternating with plateaus and occasional regression. Future research employing longitudinal designs could substantially enhance understanding of developmental processes and temporal dynamics (Yan et al., 2025).

Limitations and Gaps

Several significant limitations and gaps characterize the current literature. First, integrated research examining RBV, dynamic capabilities, and AI-driven agility simultaneously remains scarce. Most studies focus on single theoretical perspectives, limiting understanding of how constructs interact to influence performance. Second, research explicitly focused on TVET contexts is limited compared to broader educational or organizational research. Many insights

are drawn from general educational or business contexts and applied to TVET by analogy rather than direct investigation.

Third, empirical research on AI integration in TVET remains nascent, with limited evidence on implementation processes, effectiveness, and contextual factors influencing success. Much existing literature is conceptual or descriptive rather than empirical, and empirical studies often employ small samples or single-institution designs. Fourth, research from developing country contexts is underrepresented, despite the critical importance of TVET for economic development in these settings. Most available research focuses on developed countries, limiting understanding of how theoretical frameworks apply in resource-constrained environments (Abdullahi et al., 2025).

Fifth, methodological limitations including cross-sectional designs, perceptual measures, and single-respondent data collection constrain causal inference and generalizability. Sixth, the literature exhibits limited attention to equity dimensions, including how resources, capabilities, and agility influence access, participation, and outcomes for disadvantaged populations. Finally, research examining negative or unintended consequences of resource investments, capability development, or AI integration remains limited, with most studies emphasizing positive effects (Guo et al., 2025).

Future Research Directions

Future research should prioritize integrated studies examining multiple theoretical perspectives simultaneously. Research designs that incorporate measures of strategic resources, dynamic capabilities, AI-driven agility, and TVET performance within single studies would enable analysis of interrelationships, mediating mechanisms, and moderating factors. Such research could test integrated theoretical models and provide more comprehensive understanding of performance determinants.

Longitudinal research examining capability development processes, resource evolution, and performance trajectories over time represents a critical priority. Panel studies tracking institutions over multiple years could illuminate how capabilities develop, how resources are acquired and deployed, and how these processes influence performance outcomes. Longitudinal designs would also enable stronger causal inference compared to cross-sectional approaches that dominate current literature (Yan et al., 2025).

Research on AI integration in TVET should move beyond conceptual analysis to rigorous empirical investigation of implementation processes, effectiveness, and contextual factors. Experimental and quasi-experimental designs comparing AI-enabled and traditional approaches could provide stronger evidence on AI effectiveness. Implementation research examining facilitators and barriers to successful AI adoption could provide practical guidance for institutions. Research should also address equity implications, examining how AI integration affects access and outcomes for diverse learner populations (Abdullahi et al., 2025).

Comparative research across national and regional contexts could illuminate how institutional, policy, and cultural factors moderate relationships between resources, capabilities, agility, and performance. Such research should employ mixed methods combining quantitative comparison with qualitative investigation of contextual factors. Particular attention to developing country contexts would address current geographic imbalances in the literature and enhance understanding of how theoretical frameworks apply in diverse settings (Muinda et al., 2025).

Research on measurement and assessment should develop and validate comprehensive, multidimensional frameworks for assessing TVET performance, dynamic capabilities, and institutional agility. Psychometric studies establishing reliability and validity of measurement instruments would enhance research quality and enable more robust comparison across studies. Development of standardized measures could facilitate meta-analytic synthesis and cumulative knowledge building (Bogetoft et al., 2017).

Finally, research examining equity dimensions should investigate how resources, capabilities, and agility influence access, participation, and outcomes for disadvantaged populations. Studies should examine whether institutional investments in capabilities and technologies reduce or exacerbate existing inequities. Research should also investigate strategies for leveraging resources and capabilities to enhance equity and social inclusion in TVET systems (Ramaditya et al., 2022).

From the available TVET literature, evidence shows: AI-driven institutional agility (X2) has a positive and significant influence on learning performance indicators; Dynamic Capability (X3) is generally positively and significantly associated with institutional excellence/performance; while Resource Based View (X1) shows mixed evidence — its influence is more indirect through capability creation.

Result

Resource Based View (X1) → TVET Performance (Y)

Resource Based View (RBV) is often used as a theoretical framework to explain TVET performance, but empirical evidence regarding the direct effect of resources on institutional performance is inconsistent. Several studies adopt RBV to measure the influence of staff, learning resources, technology, and resource allocation on performance, but empirical results report mixed findings.

Context of RBV use: Many TVET studies incorporate RBV as a theoretical foundation for resource variables such as staffing, learning resources, knowledge management, and resource allocation (Muathe, 2023; Koros & Kamau, 2024; Bogetoft & Wittrup, 2017).

Direction of influence: There is mechanistic evidence that technological resources can drive organizational capabilities (e.g., sensing and innovativeness) which subsequently improve institutional reputation or outcomes — the direction of this effect is positive when the role of resources activates innovation (Padrón-Robaina & Nieves, 2023).

Level of significance: Direct quantitative evidence is inconsistent: one study reported that resource allocation capability had a negative (inverse) but not significant effect on TVET performance in its sample (Koros & Kamau, 2024). For many other studies, p-values or coefficients reporting the direct significance of RBV resources on performance are not consistently available, so evidence is insufficient to state a uniform direct positive effect.

Mechanism of influence: RBV functions primarily as an input base: when resources (e.g., technology, facilities, skilled staff) are used to build sensing capabilities, innovation, and industry links, then their effect on performance emerges through capability creation and innovation implementation — not merely resource ownership (Muathe, 2023; Padrón-Robaina & Nieves, 2023).

Conclusion X1: The influence of RBV on TVET Performance is indirect and mixed. RBV is stronger as a theoretical foundation than as a direct predictor. Its effect emerges when resources are converted into dynamic capabilities.

AI-Driven Institutional Agility (X2) → TVET Performance (Y)

Quasi-experimental research and case studies in vocational contexts show that AI integration supporting agile practices significantly improves learning outcomes and operational efficiency. This impact is measurable on metrics such as student engagement, course completion, learning achievement, team collaboration efficiency, and reduction in learning anxiety.

Direction of influence: AI that empowers agile processes produces a positive influence on learning outcomes and institutional performance indicators (e.g., engagement, completion, learning outcomes) (Zhu, 2025; Ale Magar et al., 2025).

Level of significance: Quasi-experimental examples show improvement in students' comprehensive ability in the AI-enhanced group compared to control (84.6 vs 78.4) with $p <$

0.001; additionally, task allocation algorithms increased team collaboration efficiency by 25% and sentiment-analysis reduced anxiety by 23% in the same study (Zhu, 2025). Other studies also report significant improvements in engagement, completion, and learning outcomes after adoption of AI-supported digital design (Ale Magar et al., 2025).

Mechanism of influence: AI accelerates institutional agility through several empirical pathways:

Personalization and prediction: AI-analytics and adaptive systems enable tailor-made learning paths and performance prediction that improve learning outcomes (Mittoor & Putteti, 2025; Azizah et al., 2025).

Task automation and allocation: Task allocation algorithms improve collaboration efficiency and agile learning iteration cycles (Zhu, 2025).

Monitoring and early intervention: AI-proctoring and sentiment analysis reduce passive behavior and anxiety, thereby increasing engagement and completion rates (Ale Magar et al., 2025; Zhu, 2025).

Resource optimization: Big Data/AI supports more effective decision-making for curriculum and operational resource allocation (Mittoor & Putteti, 2025).

Conclusion X2: AI-Driven Institutional Agility has a positive and significant influence on TVET Performance (Y). Quantitative evidence ($p < 0.001$) supports a strong and consistent relationship.

Dynamic Capability (X3) → TVET Performance (Y)

TVET literature shows a positive relationship between dynamic capabilities and institutional competitive advantage/performance; the main mechanism is through sensing, innovating, and reconfiguring that translates resources into relevant outcomes.

Direction of influence: In general, dynamic capability is positively correlated with reputation, competitive advantage, and institutional performance; specifically, innovation capability (innovativeness) has a direct effect on reputation/performance in data-based studies (Padrón-Robaina & Nieves, 2023; Deya, 2016; Deya et al., 2015a).

Level of significance: Several studies report significant relationships between dynamic capabilities and institutional outcomes. Deya et al. (2015a) explicitly found a positive and significant relationship between dynamic ICT capabilities and competitive advantage of TVET institutions in Western Kenya. Deya et al. (2015b) also reported a significant relationship between dynamic curriculum capabilities and competitive advantage. However, many abstract reports do not present detailed p-values, so there are limitations in extrapolating consistent significance levels across studies.

Mechanism of influence: Empirically identified mechanisms include:

Sensing to seizing: Technology and information resources enhance organizational ability to recognize market/labor opportunities (sensing), which must then be followed by innovation (seizing) to impact reputation and placement outcomes (Padrón-Robaina & Nieves, 2023).

Innovativeness as mediator: Findings show innovativeness mediates the benefits of sensing; detected opportunities need to be implemented through innovation to affect performance (Padrón-Robaina & Nieves, 2023).

Reconfiguring resources: Dynamic capabilities enable institutions to reconfigure curriculum, ICT, and teaching practices to adapt to industry needs, thereby improving competitive advantage (Deya, 2016; Deya et al., 2015b).

Conclusion X3: Dynamic Capability has a positive and significant influence on TVET Performance (Y), especially through the sensing–seizing–reconfiguring mechanism that drives innovation and institutional adaptation.

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CONCLUSION

Comparative Summary of the Influence of X1, X2, X3 on Y

Variable	Direction of Influence	Significance	Strength of Evidence	Main Mechanism
X1 – RBV	Positive (indirect)	Inconsistent mixed	/ Weak–Moderate	Resources → Capabilities → Performance
X2 – AI-Driven Agility	Positive	Significant (p < 0.001)	Strong	Personalization, automation, AI monitoring
X3 – Dynamic Capability	Positive	Significant (majority studies)	Strong of	Sensing → Seizing → Reconfiguring

This comprehensive literature review has examined the theoretical and empirical foundations of three critical determinants of TVET institutional performance: Resource-Based View, AI-Driven Institutional Agility, and Dynamic Capabilities. The synthesis of 392 scholarly papers reveals that TVET performance depends on complex interactions among strategic resources, adaptive capabilities, and technological enablers. High-performing institutions demonstrate strength across multiple dimensions, including valuable and inimitable resource endowments, robust dynamic capabilities for sensing and responding to environmental changes, and institutional agility enhanced by AI technologies.

The Resource-Based View provides a foundational framework for understanding how strategic resources—including human capital, physical infrastructure, organizational processes, and relational assets—create competitive advantage in TVET contexts. However, resource possession alone proves insufficient; institutions must develop capabilities to deploy and reconfigure resources effectively in response to changing educational and labor market demands. Dynamic capabilities theory addresses this challenge, explaining how institutions sustain competitive advantage through continuous sensing, seizing, and reconfiguring processes.

AI-driven institutional agility represents a contemporary manifestation of adaptive capacity, enabled by emerging technologies that enhance sensing (through predictive analytics), seizing (through rapid decision support), and reconfiguring (through automated optimization). While AI technologies offer substantial potential for enhancing TVET performance, their effective integration requires significant investments in infrastructure, instructor capabilities, and organizational change. Implementation challenges and equity implications warrant careful attention as institutions pursue AI-enabled transformation.

The review identifies significant gaps in current knowledge, including limited integrated research examining multiple theoretical perspectives simultaneously, insufficient longitudinal research on capability development and performance trajectories, nascent empirical evidence on AI integration in TVET, underrepresentation of developing country contexts, and limited attention to equity dimensions. Addressing these gaps represents critical priorities for future research.

For TVET practitioners and policymakers, the review suggests several implications. First, institutional development strategies should address multiple dimensions simultaneously, including resource acquisition, capability development, and agility enhancement, rather than focusing narrowly on single factors. Second, investments in dynamic capabilities—including environmental scanning systems, rapid curriculum development processes, and organizational learning mechanisms—may yield substantial performance benefits, particularly in rapidly changing environments. Third, AI integration should be pursued strategically, with attention to infrastructure requirements, capability development needs, implementation challenges, and equity implications.

Fourth, performance measurement should employ multidimensional frameworks that capture educational quality, operational efficiency, graduate outcomes, and broader institutional impacts. Single-indicator approaches provide incomplete assessments and may incentivize narrow optimization at the expense of broader effectiveness. Fifth, context matters significantly; strategies and approaches should be adapted to specific institutional characteristics, national policy environments, and labor market conditions rather than assuming universal applicability.

In conclusion, understanding and enhancing TVET institutional performance requires integrated perspectives that recognize the complex interplay among strategic resources, dynamic capabilities, and institutional agility. As TVET institutions worldwide navigate unprecedented challenges posed by technological disruption, globalization, and shifting skill demands, the frameworks and evidence synthesized in this review provide valuable foundations for research, policy, and practice aimed at strengthening vocational education and training systems.

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