

A Balanced Scorecard Leadership Development Model for Undergraduate Construction and Engineering Students

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Abstract

In the rapidly evolving professional landscape of construction and engineering, characterized by the increasing integration of artificial intelligence (AI) and automation, technical competence alone is no longer sufficient for effective workforce and leadership development. This report outlines a comprehensive leadership development model designed for undergraduate students, using a strategic balanced scorecard approach to cultivate the "whole person". Drawing inspiration from the holistic "whole person" concept of military universities, the model focuses on four interconnected domains: Self-Development (cultivating ethical judgment and emotional intelligence), Teaming and Followership (fostering collaboration and conflict resolution), Physical and Mental Health (building resilience and stress management), and Technical Competencies (mastery of core principles and new technologies). This study utilizes a deductive framework-building methodology to bridge the gap between workforce needs and academic delivery. The model is delivered over a three-semester curriculum with specific courses, mentorship, and workshops, and its progress is tracked using an e-portfolio that includes defined objectives, assessments, and metrics for each category. By producing well-rounded, ethical, and resilient leaders, this model directly contributes to improving the construction industry's culture, provides a competitive advantage for graduates, and positions academic programs as a leader in preparing the next generation of construction and engineering professionals.

Keywords

Leadership development, Balanced scorecard, Construction education, Undergraduate students, Whole person concept, Workforce development.

Introduction

The modern professional environment for construction and engineering is being fundamentally reshaped by advancements in artificial intelligence (AI) and automation. While these technologies are adept at optimizing technical tasks and data analysis, they cannot replace the uniquely human capabilities essential for effective teaming and leadership: empathy, ethical judgment, collaboration, and the ability to inspire and motivate teams. Consequently, technical competence, while foundational, is no longer adequate for the next generation of industry leaders.

The urgency for integrating robust leadership education into undergraduate programs is well-established in academic literature. Research consistently shows that leadership skills, such as communication, problem-solving, and teamwork, are significant differentiators in the job market and are highly valued by employers. Despite this recognized need, traditional construction management and engineering curricula have historically emphasized technical proficiency over leadership development. Literature suggests that organizations that prioritize authentic leadership and emotional intelligence (EQ) experience higher retention rates and better project outcomes [1],[2]. By focusing on holistic development, academic programs can provide a competitive

advantage for graduates while directly improving the industry's culture [3], [4]. This paper addresses this gap by outlining a comprehensive leadership development model designed to cultivate the "whole person," preparing students to be ethical, resilient, and collaborative leaders capable of navigating the complexities of the modern construction industry.

The proposed model bridges the gap between workforce needs and academic delivery by using the Balanced Scorecard as a strategic management system [5]. This tool, initially developed by Robert Kaplan and David Norton, is a strategic management system that provides a holistic view of performance across multiple, interconnected perspectives, ensuring progress is tracked beyond single metrics. This framework (figure 1), adapted from its successful use in non-business educational contexts provides a scalable and transferable structure for a three-semester curriculum aimed at producing well-rounded construction professionals.



Figure 1: Balanced Scorecard: Leadership Development. A simple 2×2 matrix illustrating the four interconnected perspectives of the leadership development model: Self Development, Technical Skills, Teaming & Followership, and Physical & Mental Health.

Methodology

This study utilizes a deductive framework-building methodology to address the leadership development gap in leadership education[6]. The research process followed a three-phase approach:

1. **Conceptual Synthesis:** The research integrates the military university "whole person" philosophy—academic rigor combined with character development and resilience—into the construction management curriculum.
2. **Framework Adaptation:** The model is built upon the Balanced Scorecard strategic management system. This framework was adapted from a business context to an educational one to provide a holistic view of student performance.
3. **Implementation Design:** A three-semester scaffolded curriculum was developed to progress from theoretical foundations to practical application and holistic integration¹⁹. The methodology employs an **e-portfolio framework** that follows a structured five-step process: Assess, Plan, Act, Reflect, and Showcase.

Each phase is described below.

Conceptual Synthesis

The proposed model adapts developmental philosophies pioneered by U.S. military institutions. While these models originated in military contexts, their emphasis on resilience, ethics, and "Eudaimonia" (flourishing) is highly relevant to the high-stakes, high-stress environment of construction and engineering.

The proposed Balanced Scorecard model adapts the holistic 'whole person' developmental philosophies pioneered by U.S. military institutions—such as the United States Military Academy (USMA), United States Airforce Academy (USAFA), United States Naval Academy (USNA), The Citadel, and The Virginia Military Institute(VMI). Each leadership development model is described briefly.

West Point's (USMA) Leader Development System (WPLDS) is defined by three outcomes: graduates who live honorably, lead honorably, and demonstrate excellence. The system purposefully integrates academic, military, and physical development within a "culture of character growth." Unlike civilian models that separate wellness from performance, the WPLDS considers physical and mental fitness as essential components of moral courage and professional excellence [7].

USAFA's Leader of Character (LoC) Framework model is built on the "PITO" progression: Personal, Interpersonal, Team, and Organizational. It defines a leader of character as one who "lives honorably by consistently practicing virtues, lifts others to their best possible selves, and elevates performance toward a common noble purpose." This framework emphasizes the "decision-action gap," teaching students to translate internal values into outward leadership behaviors [8].

The USNA mission explicitly states the goal to develop midshipmen "morally, mentally, and physically." Its literature emphasizes "Eudaimonia" (the good life/flourishing) and "Performance Psychology Fundamentals." The model integrates technical engineering rigor with "humanities-based leadership," ensuring that technological mastery is tempered by ethical judgment and interpersonal civility [9].

The Citadel utilizes a Principled Leadership model, which focuses on seven characteristics (e.g., leading with humility, serving others before self). The model oversees a scaffolded 4-year journey: Year 1 (Prepare/Followership), Year 2 (Serve/Engagement), Year 3 (Lead/Teamwork), and Year 4 (Command/Vision). This model is highly aligned with the three-semester plan in your paper, as it transitions from self-discipline to organizational responsibility [10].

VMI's model is centered on the "Citizen-Soldier" tradition, which posits that a rigorous, adversarial environment creates a "common bond" and foundational resilience. Their "VMI Leader Journey" highlights a systematic approach where the Single-Sanction Honor System serves as the primary seat of character development, supported by intense physical training and a "useful" (technical/scientific) education. Center for Leadership and Ethics [11].

The Balanced Scorecard model adapts these military philosophies into a civilian academic context for construction and engineering students. By organizing leadership attributes into Self-Development, Teaming and Followership, Physical and Mental Health, and Technical Competencies, the curriculum mirrors the multi-pillar approaches used by these elite institutions to produce leaders capable of navigating complex, high-stakes environments

Framework Adaptation: the balanced scorecard model

As noted, the leadership development model uses the Balanced Scorecard approach to organize key leadership attributes into four interconnected categories. This structure is inspired by the military university philosophy of the "whole person"—integrating academic rigor with character development and resilience. The four perspectives of the leadership development balanced scorecard are: Self-Development, Teaming and Followership, Physical and Mental Health, and Technical Competencies.

The model framework provided in table 1 provides an overview for Perspective, Objectives, Assessment tools, and Metrics for each category. This framework can be expanded and aligned with specific academic program requirements.

Table 1: Balanced Scorecard Framework for Undergraduate Leadership Development

Category	Perspective	Key Objectives	Assessment Tools	Core Metrics
Self-Development	Cultivating self-awareness, growth, and an ethical compass.	Enhance EQ; Develop strong ethical code; Improve communication.	360-Degree Feedback; EQ Test; Reflection Journal.	Average 360-score improvement; % increase in

Category	Perspective	Key Objectives	Assessment Tools	Core Metrics
				EQ; module completion.
Teaming & Followership	Fostering collaboration, communication, and contribution.	Conflict resolution; Active listening; Effective followership.	Team Project Evaluations; Followership Self-Assessment.	Peer-review scores; Workshop completion.
Physical & Mental Health	Building resilience, stress management, and well-being.	Promote physical fitness; Time management; Growth mindset.	Well-being Surveys; Fitness Tracking.	Participation rate; Personal fitness plan; Stress levels.
Technical Competencies	Mastery of core principles and new technologies.	Mastery of technical concepts; Software proficiency (BIM/AI).	Capstone Evaluation; Industry Certifications; Portfolio.	Capstone final score; Number of certifications; GPA.

Results: the 3-semester implementation plan and e-portfolio

Implementation Design

The model is designed for seamless integration into an undergraduate curriculum over three academic semesters.

Semester 1: Foundation (Self-Development & Teaming) Courses: Introduction to Leadership (focusing on self-awareness, EQ, and communication) and Ethics in Engineering and Construction (on professional responsibility and ethical decision-making). **Support:** Students are assigned a faculty mentor and an industry professional. **Feedback:** Initial 360-degree feedback and a baseline EQ test are administered. Mandatory workshops are held on public speaking and active listening.

Semester 2: Application (Technical & Followership) Courses: Project Management & Teambuilding (featuring multi-disciplinary team projects) and specialized Technical Electives (developing software proficiency). **Support:** Mentors guide students in applying skills to complex project work. **Feedback:** Mid-semester peer reviews for team projects and a followership self-assessment are conducted. Workshops focus on conflict resolution and project management software.

Semester 3: Capstone & Integration (Holistic) Courses: Senior Capstone Project (applying all technical, leadership, and teaming skills) and a Professional Development Seminar (covering negotiation and career planning). **Support:** Mentorship shifts to career preparation, including resume review and interview practice. **Feedback:** Final 360-degree feedback, a second EQ test to

measure growth, and the comprehensive capstone evaluation are completed. Workshops cover stress management, time management, and financial literacy.

e-portfolio framework

The e-portfolio is the comprehensive digital tool used for reflection, tracking and documentation of student growth. This moves development beyond a simple resume to provide an evidence-based narrative of their development journey [12],[13],[14]. For each balanced scorecard category, the portfolio serves a structured five-step purpose: Assess, Plan, Act, Reflect, and Showcase.

The e-portfolio requires artifacts and metrics, such as a video recording of a safety briefing for the Self-Development category, a simple team morale survey for Teaming and Followership, fitness tracker screenshots for Physical and Mental Health, and a copy of a new certification for Technical Competencies.

Discussion

The proposed balanced scorecard model provides a strategic and holistic framework that directly addresses the documented imperative to move beyond purely technical training in construction and engineering education. By deliberately integrating dimensions like Physical and Mental Health and Self-Development alongside traditional Technical Competencies, the model ensures students are prepared for the full spectrum of demands in a physically and mentally rigorous industry.

The model's design, using clear objectives, assessments, and metrics, allows for measurable progress and continuous improvement, enhancing accountability for both the student and the academic program. The structured, three-semester approach provides a scaffolded learning experience, progressing from theoretical foundations to practical application and, finally, to holistic integration in the capstone environment. While inspired by military models, this framework is designed for scalability across diverse civilian institutions. The use of standard metrics (GPA, 360-feedback, fitness trackers) allows programs to implement the model with varying levels of resource investment. The structured three-semester approach is scaffolded to ensure that leadership training does not overwhelm existing technical requirements but rather complements them.

Crucially, the benefits of this model extend beyond the individual student. By graduating leaders who are emotionally intelligent, ethical, and prioritize team well-being, the program can directly contribute to improving the construction industry's culture. Furthermore, this unique focus on comprehensive leadership provides a competitive advantage for graduates and positions the academic program as a leader in preparing the next generation of construction professionals.

Conclusion

The implementation of a Balanced Scorecard (BSC) leadership model represents a fundamental shift in undergraduate construction and engineering education, moving from a narrow focus on

technical proficiency to a holistic "whole person" developmental approach. By integrating workforce development principles directly into the curriculum, this model addresses the industry's urgent need for leaders who possess the human-centric skills—empathy, ethics, and resilience—that artificial intelligence and automation cannot replicate.

The structured three-semester plan and the e-portfolio framework provide a measurable, evidence-based pathway for students to document their growth in self-awareness, teaming, and mental well-being alongside their technical mastery. The implementation model can be modified based on specific academic unit needs and resources. This strategic alignment ensures that graduates are not only technically competent but are also "industry-ready" professionals capable of navigating the complexities of modern project environments.

Ultimately, this model serves as a blueprint for academic programs to produce ethical and resilient leaders who can improve the culture of the construction industry. By prioritizing long-term professional sustainability and emotional intelligence, the program provides its graduates with a distinct competitive advantage and positions itself as a leader in workforce development for the next generation.

Acknowledgments

The author would like to acknowledge the institutional support provided during the sabbatical year 2024-2025 by the Civil Engineering Department at The Citadel in Charleston, SC, and the Architectural and Civil Engineering departments at the University of Colorado, Boulder, CO.

Declaration of interest statement

The author reports there are no competing interests to declare.

References

- [1] Amato, R. C., & Amato Neto, J. (2009). *Abilities and competences in leadership: concepts and discussions*. POMS 20th Annual Conference.
- [2] n.a. (2013). *Nurturing Leadership Capability for Construction Management Majored Students*. [Unpublished Paper].
- [3] Ofori, G., & Toor, S. (2012). Authenticity in leadership for construction. *Construction Management and Economics*, 30(9), 749-764.
- [4] Songer, A.D., and Chinowsky, P. (2008). Leadership Behavior in Construction Executives. *Construction Information Quarterly*, 10(2), 59-66.
- [5] Kaplan, R., & Norton, D. (1996). *The Balanced Scorecard: Translating Strategy into Action*. Harvard Business School Press.

- [6] K. M. Eisenhardt and M. E. Graebner, "Theory Building From Cases: Opportunities And Challenges," *Academy of Management Journal*, vol. 50, pp. 25-32, 2007.
- [7] United States Military Academy. (2025). *Developing Leaders of Character (DLC)*. West Point, NY.
- [8] USAF Academy. (2021). *Developing Leaders of Character for the 21st Century: A Conceptual Framework*.
- [9] United States Naval Academy. (2019). *Life Skills Handbook*. Annapolis, MD.
- [10] Krause Center for Leadership and Ethics. (2023). *The Citadel Leadership Development Model*.
- [11] Center for Leadership and Ethics. (2020). *A VMI Guide to Leadership & Ethics*. Lexington, VA.
- [12] D. Giles and M. Bell, "The use of eportfolios as a pedagogical tool for leadership preparation and development in education," *Journal of Applied Research in Higher Education*, vol. 7, no. 2, pp. 443-452, 2015. DOI: 10.1108/JARHE-12-2012-0070.
- [13] P. M. Janosik and T. E. Frank, "Electronic Portfolios as Capstone Experiences in a Graduate Program in Organizational Leadership," *Journal of Leadership Education*, vol. 15, no. 3, pp. 43-51, 2016. DOI: 10.12806/V15/I3/A5.
- [14] J. Součková, "ePortfolio as a strategy to enhance self-directed learning skills for personal and professional development: A policy perspective," in *Digital Resilience in the 21st Century*, Edmonton, AB: Open Education Alberta, 2024. [Online]. Available: Pressbooks.