

Leading in Times of Change: A Case Study of a Female Engineer's Leadership Experiences

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The COVID-19 pandemic, which began to disrupt U.S. higher education institutions in early 2020, coupled with the research funding reductions of 2025, has produced unprecedented challenges for academic programs and engineering research collaborations. For decades, the incentive structures within U.S. engineering programs have emphasized the pursuit of federal funding as essential to supporting students, advancing discovery, and influencing engineering practice. While this model has long served higher education and the broader engineering enterprise effectively, its foundations have been tested in the current climate—one marked by pauses in new funding solicitations, shifting federal priorities, and pervasive uncertainty surrounding research investments. These disruptions have compelled engineering leaders to reconsider long-held strategies for sustaining excellence, fostering innovation, and preserving community connection amid instability.

In this context, engineering leaders in higher education have needed to adapt strategically, cultivate new forms of collaboration, and redefine their leadership identities while continuing to advance institutional and educational objectives. This qualitative research study offers an in-depth examination of one female engineering leader's lived experiences navigating those complex challenges. The study contributes reflective insights that inform leadership practice and future scholarship focused on engineering leadership during times of disruption and transformation.

Background

Despite gradual progress in gender equity, women continue to remain underrepresented in engineering and higher education leadership. Women comprise approximately 15-17% of the engineering workforce in the United States (U.S. Bureau of Labor Statistics [BLS], 2023). Women hold 14% of engineering management positions and only about 9% of director-level roles nationally. In academia, the American Society of Engineering Education (2023) reports that women account for 20.1% of engineering faculty positions. Within academia, women hold an estimated 32.8% of university leadership positions (Schaeffer, 2023) and under 40% of provost and academic dean positions at Carnegie R1 institutions (Byant, 2023). Female leaders in engineering are often subject to heightened scrutiny, entrenched in socially prescribed gender expectations and institutionalized bias. These pressures are intensified during periods of organizational uncertainty, when constrained resources, evolving policies, and institutional restructuring require leaders to demonstrate adaptive and resilient leadership capacities.

Methodology

This study employs a qualitative case study design (Yin, 2018) to illuminate the lived experiences of a female engineering leader in academia as she navigated leadership during the COVID-19 pandemic and subsequent federal funding changes. Using *testimonios* as a

qualitative, methodological approach (Delgado Bernal, 1998; Huber, 2009), the research study explores how intersectional identities inform leadership resilience, strategic adaptation, and self-efficacy under conditions of uncertainty. The study is guided by the theoretical frameworks of Social Cognitive Theory (Bandura, 1977) and Feminist Theory, which together offer a lens for examining the interplay between individual agency, context, and systemic structures in shaping leadership behaviors. Through critical thematic analysis, the research results highlight the strengths, agency, and innovative capacities developed by a woman leader in higher education facing challenging contexts.

A larger study includes longitudinal observations of the engineer's leadership over seven years, recorded through journaling and memoing, and a series of formally recorded, structured interviews and informal *testimonios*. This study also includes elements of action research, which incorporate the participants' input in the research collection, analysis, and reporting phases. Data analysis involved member checking, which includes reviewing transcripts of recordings and themes after they were analyzed. Thus, this research study continues to be conducted in collaboration with Dr. Crawford, acknowledging her as both the holder and co-creator of the knowledge derived from her experiences (Delgado Bernal, 2002).

The participant, Dr. Alice Crawford (pseudonym used with permission), identifies as a female and has served in university-level administrative roles for more than seven years following tenure as a faculty member. At the time of data collection, she was part of upper administration at a Carnegie Research One (R1) university in the United States. Dr. Crawford led multiple teams of faculty, staff, and students through successive institutional transitions and crises. Her leadership practice was grounded in principles of transparency, student-centeredness, and relational engagement—core strengths that shaped her ability to lead through disruption during the pandemic and beyond.

Results

The study examined how intersectional identities shaped leadership resilience and strategic adaptation under conditions of uncertainty. Analysis of the *testimonios* and observational data revealed three interrelated themes: (1) evolving leadership identity and gendered expectations; (2) crisis leadership grounded in transparency, access, and community; and (3) trust, prioritization, and adaptive strategy amid institutional financial constraints. Together, these findings demonstrate how an engineering leader drew on personal values, agency, and reflective practice to sustain institutional priorities and relationships through successive organizational disruptions.

Identity, Gender, and Leadership Style. Dr. Crawford's leadership identity evolved through successive professional transitions—from tenured faculty member to senior university leader. Each transition demanded a recalibration of confidence, authority, and relational engagement. Over time, she came to view leadership not as positional power but as a responsibility to foster equity and institutional trust.

Gendered expectations strongly shaped her early leadership experiences. Like many women in male-dominated fields, she navigated the dual expectation of demonstrating competence while maintaining care for others. Early in her leadership trajectory, she described an acute desire to “earn” her authority and avoid perceived preferential treatment, particularly within organizational cultures still aligned with traditional, masculine leadership norms. She said,

“This was really important to me—that I not be too feminine...we had a project where we were [at a construction site]...and we had to go up these [tall structures]. I don’t like heights that much...and I was pregnant. And now, before I was pregnant, I went up there by myself, but I was pregnant. And I still felt like there was this expectation that I would go up on the [tall structure]...I felt like I had to prove myself. It was a female grad student that said, ‘Dr. Crawford, you’re not going up there!’...I just needed someone to tell me not to do it...You always have this thing of I have to prove that I’m not female somehow, but it shifted when I got into leadership. All of a sudden, when I got into leadership, I was no longer representing myself. I was representing other people.

As an engineering faculty member, Dr. Crawford had that expectation for herself, and even though there were other male engineers at the construction site, it took a female graduate student to demand that she take care of herself by not climbing the structure. These tensions often manifested in overextension and self-scrutiny, dynamics she later recognized as both gendered and systemic. In the member checking phase, Dr. Crawford said,

“When you are an engineer, and you become a leader, you can’t engineer a college. You have to use social science and other tools, not in your arsenal; you have to think at a higher level. You have to think of the messages you’re sending and how you create norms for the faculty that you’re in charge of and the students that you’re in charge of.”

As shown through these examples identified by Dr. Crawford, her confidence and leadership philosophy matured. She shifted her focus from proving her individual capability to advocating for others, especially protecting marginalized faculty members and students. For example, through public observations of her leadership, it was evident that she created opportunities for female faculty to take leave through established policies. She also brought in engineering education and education researchers to design more student-centered pedagogy, especially in high drop-fail-withdrawal (DFW) courses and gateway courses.

Her leadership style emphasized transparency, relational trust, and shared credit. For example, observational data captured a consistent pattern of publicly recognizing others’ contributions, seeking collaborative solutions, and balancing decisiveness with empathy. These actions reflected what she described as her leadership stance, which values kindness and firmness in her roles. These characteristics became central to her effectiveness as a leader during crises.

Leadership During the COVID-19 Pandemic: Health, Access, and Community. Leadership during the COVID-19 pandemic emphasized the importance of transparent communication and

collective problem-solving. Under Dr. Crawford's leadership, health, safety, and student access became institutional priorities. Guided by the principle that "programs and students must come first," her team rapidly implemented remote work policies, mental health supports, and logistical measures such as outdoor internet-access hubs and technology distribution for those lacking devices to connect to learning resources.

These actions fostered community cohesion and mutual trust during a time of intense uncertainty. Faculty and staff rallied around a shared mission of student success, which aligned departmental goals and strengthened cross-campus collaboration. One department under her leadership created a Professional Learning Community that met to discuss student concerns as they arose during the pandemic. Through this group, they shared stories of the students' struggles such as having additional caretaker responsibilities and using shared spaces for Zoom meetings. The group brainstormed ways to incorporate creative ways to support the students and reached out to Dr. Crawford for her support to connect the group to institutional resources. Dr. Crawford later reflected that, despite the disruption, the pandemic cultivated a sense of institutional solidarity—a quality that was notably less evident during subsequent federal funding cuts.

Financial Cuts, Institutional Trust, and Leadership Prioritization. Institutional trust became significantly more strained during the wave of financial reductions that followed the post-pandemic years and 2025's federal funding cuts. Anticipated budget cuts triggered rapid reallocations and, in some cases, staff layoffs. Dr. Crawford prioritized protecting academic programs and student-facing services, often absorbing reductions at various administrative levels to shield core educational functions.

However, inconsistencies in communication between upper and mid-level administration eroded trust among College leadership and other academic leaders. Uncertainty over whether reallocated funds were mandated externally or repurposed internally contributed to perceptions of inequity and opacity. Some affected staff were later rehired, but the short-term impact on morale and relational trust lingered.

Dr. Crawford's reflections highlighted the tension between visible, external-facing achievements valued by upper administration and the less visible operational work necessary to sustain faculty and student well-being. She emphasized that effective crisis management required trusted leaders at different levels and reliable internal communication—resources that were not always in place. Without such foundations, she observed that operational support suffers without trusted leadership.

Discussion

This study shows how an engineering leader's intersectional identity shaped her resilience, adaptability, and leadership practice during a period of sustained institutional disruption. The findings reveal that leadership development is not a static outcome of professional experience, but a continual process influenced by institutional context, gendered expectations, and

social/reflective learning. The participant's narrative underscores how authentic and relational leadership practices can both challenge and coexist within traditional hierarchical structures of engineering education.

Identity, Agency, and Adaptive Leadership. Dr. Crawford's experience demonstrates the dynamic nature of leadership identity as it evolved across career stages and institutional contexts. Framed through Social Cognitive Theory (Bandura, 1977), her trajectory illustrates how self-efficacy develops through mastery experiences, observation, and reflection under challenges. As she transitioned from faculty to senior administration, she redefined her role from proving her competence to fostering collective success—a shift consistent with feminist leadership models that prioritize collaboration, equity, and shared power.

The progression of her leadership stance represents an important reframing of what effective leadership looks like in engineering contexts, where technical expertise is often prioritized over relational and emotional knowledge. By recognizing leadership as socially constructed and involving empathy and transparency, Dr. Crawford embodied adaptive leadership behaviors necessary to sustain institutional trust during times of instability.

Gendered Leadership in Engineering Education. Engineering education remains a field shaped by masculine organizational cultures that value competitiveness, independence, “rigor”, and technical rationality. Within this culture, women leaders frequently navigate the tension between demonstrating competence and maintaining approachability. The study's findings reaffirm this tension and showcase how gendered challenges can catalyze innovation in leadership practice. Dr. Crawford's deliberate use of transparency (i.e., sharing data and pathways openly about how decisions were made), emotional insight (i.e., awareness that her leadership decisions fostered a supportive culture within the college), and relational accountability (i.e., sharing credit, ensuring programs benefited students, and building relationships with faculty based on respect) suggests that gendered expectations, while constraining, can also serve as a foundation for developing distinct, effective modes of leadership, especially during challenging times.

Her experience reinforces feminist theoretical perspectives that view leadership not as an individual possession but as a collective and socially negotiated process. Female engineering leaders, when supported, can model inclusive forms of decision-making that broaden definitions of leadership success and challenge stereotypes currently existing within engineering cultures of rigor.

Crisis and Institutional Learning. Both the COVID-19 pandemic and the 2025 federal funding cuts tested the capacity of engineering programs. Consistent with prior leadership on crisis leadership (Fernandez & Shaw, 2020), Dr. Crawford's response emphasizes that transparent communication and shared purpose are essential to maintaining community and continuity. The pandemic context uniquely revealed the institution's potential for collaboration, while funding

cuts exposed sensitivities in trust and communication between faculty, mid-level administrators, and upper-level administrators.

From an institutional perspective, the differences underscore the need for sustained practices of inclusive and reflective leadership, not only during moments of crisis, but as an ongoing organizational practice. Crisis leadership can produce powerful short-term unity, but resilience in the long-term depends on strategically reconfiguring structures that incentivize collaboration and trust-building.

Conclusion

Dr. Crawford exemplifies leadership grounded in transparency, empathy, advocacy, and collaboration—qualities that challenge some leadership cultures in engineering. For engineering education leaders, her experience provides a reminder that leadership during uncertain times is about cultivating trust, purpose, and shared humanity.

For engineering education leaders looking to make systemic and sustainable changes in the culture within engineering departments and colleges, it becomes essential to intentionally design practices that support this type of engineering leadership at every level. Practices include valuing relationship-building as an important core leadership competency, acknowledging and resisting gendered leadership norms, evaluating and redefining success measures in higher education leadership, and developing reflective leadership practices across the institution.

References

- American Society of Engineering Education [ASEE]. (2023). Engineering and Engineering Technology by the Numbers, Tables 84 and 85. <https://ira.asee.org/by-the-numbers/>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191-215.
- Bryant, J. (2023). Percentage of women presidents at elite research universities is increasing, report finds. *Best Colleges*. <https://www.bestcolleges.com/news/analysis/number-of-women-presidents-increase-at-elite-research-institutions/>
- Delgado Bernal, D. (1998). Using a Chicana feminist epistemology in educational research. *Harvard Educational Review*, 68(4), 555-583.
- Delgado Bernal, D. (2002). Critical race theory, Latino critical theory, and critical race-gendered epistemologies: Recognizing students of color as holders and creators of knowledge. *Qualitative Inquiry*, 8(1), 105-126.
- Fernandez, A. A., & Shaw, G. P. (2020). Academic leadership in a time of crisis: The coronavirus and COVID-19. *Journal of Leadership Studies*, 14(1), 39-45.

Huber, L. P. (2009). Disrupting apartheid of knowledge: *Testimonio* as methodology in Latina/o critical race research in education. *Journal of Qualitative Studies in Education*, 22(6), 639-654.

Schaeffer, K. (2023). The data on women leaders: Fact sheet. Pew Research Center.
<https://www.pewresearch.org/social-trends/fact-sheet/the-data-on-women-leaders/>

U.S. Bureau of Labor Statistics (BLS). (2023).

Yin, R. K. (2018). Case study research and applications: Design and methods (6th ed.). San Francisco, CA: Sage.