

Building Social Infrastructure for Achieving Change at Scale

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Engineering education research has emerged as a tool for making systemic and sustainable changes in the formation of engineers that are able to meet current and future national priorities and global challenges. However, the social infrastructure available to engineering education researchers is not yet robust enough to consistently support the development of diverse and deep collaborations sufficient to achieve true systemic change.

In this project, we consider three groups of researchers based on relative social infrastructure strength: those who are connected to a department of engineering education; those who are connected to a center or other non-department, formalized group on their campus; and those who have neither connection (“lone wolves”). Researchers on any given campus might have access to any combination of infrastructure types.

This project is directed toward identifying and amplifying social infrastructure elements that support the needs of lone wolves while sustaining the department- and center-based infrastructures. Lone wolf researchers often work in roles that are highly intertwined with the practice of engineering education; finding better ways to network and support strengthens the links between research and practice, facilitating systemic and lasting change.

Here we report work-in-progress results from our first six months of the project, in which we collected representations of organizational infrastructure, such as faculty workload policies, from college and university web sites. These policies and procedures have been coded for traits related to an individual’s access to infrastructure and connectedness to engineering education research networks, with a view to that trait’s impact on strengthening engineering education research networks (see Table 1 for additional detail). These data are analyzed first to document the organizational landscape and to provide a framework for the analysis of future interviews, which will focus on problems of faculty reward structures and diversity in engineering.

For our data collection on organizational infrastructure, we targeted all colleges and universities with ABET-accredited programs regardless of commission (i.e. engineering, engineering technology, applied science, and computing). This database, with over 700 institutional entries, is being offered to the community as a valuable resource for years to come. The sample of institutions are those in the United States with at least one ABET accredited degree, through any ABET commission. In addition to the information gathered from the institution’s online presence, the database also contains three rounds of Carnegie classification data for increased stratification when data mining.

For our immediate subject of interest, we are coding the collected policies and procedures for the traits in Table 1 and analyzing them to determine the likelihood that the trait is positive or negative for strengthening engineering education research networks. In this way we seek to document the organizational landscape and provide a framework for the analysis of interview data to be collected in the next phase of our research.

Table 1. Relative Traits of interconnectedness and access to infrastructure for EER researchers, divided by lone wolf, center member, and department member.

Trait		Lone Wolf	EER Center	EER Department
Access to Infrastructure	PhD Program in EER	No	Maybe	Yes
	Specific courses are available for graduate students in EER methods	Maybe, but not in eng. college	Maybe	Yes
	EER journals are available in library	Maybe	Likely	Yes
	EER counts like research in other engineering fields in the faculty workload model	Maybe	Likely	Yes
	EER faculty are expected to teach classes in another engineering field	Yes	Likely	No
	EER faculty are expected to conduct research in another engineering field	Often	Maybe	No
Interconnectedness (Access to Network)	Campus resources are available to attend EER conferences at the same rate as non-EER conferences	Maybe	Likely	Yes
	EER seminars are regularly held on campus	Rarely	Likely	Likely
	EER faculty have the opportunity for regular interactions with other EER people on campus	Maybe	Likely	Yes

Our project advances knowledge through our view that faculty behavior is formed not only by personal motivation and institutional reward structures but also by current economic and policy frameworks in higher education. Our newly created database enables our team and other researchers to map the landscape of organizational infrastructure across ABET-accredited universities and colleges of all types. In the next phase of the project, we will use this mapping to inform our interviews with faculty as we seek to ascertain and strengthen their access to engineering education research infrastructure.

Ultimately the results of this project will identify mechanisms to strengthen networks, modify communities' infrastructure, and develop leadership that supports both researchers and practitioners in engineering education. Such an infrastructure will facilitate the work of lone wolves and other engineering education researchers in their roles as change agents, driving effective strategies to translate research into practice and building movement-level approaches for achieving change at scale. Building power among lone wolves to organize change is an essential step in achieving any number of impact goals for engineering education research,

including increased participation of underrepresented groups, STEM workforce development, and faculty and administrative transformation toward improved classroom practice.