

FIND US AT www.t2pri.org in think2perform RESEARCH INSTITUTE

Dynamics of Engineering Leadership

Halle Horvath, Ph.D.

hen most people think about engineers, they may not immediately think of leadership. This is evident in cultural stereotypes—introverted, toughminded, with less than average social skillsand in the minimal research conducted to better understand engineering leadership. However, engineers serve in consequential roles across organizations, often closely tied to economic success and ongoing sustainability. Although engineering leadership has not garnered significant attention, it merits further study for a number of reasons.

Research suggests that leading engineers is more complex than in other disciplines (Laglera, Collado, & Montes de Oca, 2013; Robledo, Peterson, & Mumford, 2012). This is likely due to the high level of task interdependence, the diversity of expertise required, the depth of individual expertise required, and the combination of technical and socio-organizational skills needed to successfully manage these teams.

At times, engineers don't seem like the most inviting of groups, but **they forge the most genuine** work relationships I have witnessed—thosefounded on trust, respect, and care.

> Engineering work is also changing. While the work has always been creative and complex, requiring a depth and wide range of expertise, working in project teams is becoming more prevalent in organizations. Engineers now need to assimilate business knowledge, technical knowledge, and team facilitation. In addition, they are expected to act entrepreneurially, drawing on skills that aren't necessarily a part of their curriculum. As project-based organizations become more prevalent, we need to understand how engineers lead project teams. And, as the expectations on engineers broaden, we need to understand how engineering leaders engage and motivate teams to create exceptional results. Understanding the leaders' experiences in these roles can refine how we best support the development of the skills required for success.

Authentic and Intentional

Previous research indicates that engineers tend to lead in a way that is largely resistant to the dominant leadership paradigms studied in other disciplines (Rottman, Sacks, & Reeve, 2014). However, they fulfill many of the typical objectives of leadership approaches—foster teamwork and a sense of connection, engage individuals, and achieve results—and they do so in a very authentic, intentional way. From the outside, it does not appear to follow the dominant themes of leadership, but instead is driven by the outcomes required of the work, the complexities of the project, an appreciation for disagreement, and the leader's interpretation of the needs of the individuals that comprise the team.

This article is based on a qualitative study of engineering project leaders selected by their company presidents as examples of effective leaders. There were ten participants, nine males and one female, in this study. All participants held at least a bachelor's degree in engineering from various disciplines, were currently employed by a for-profit organization, and had at least one year of project leadership experience. Only one participant had less than five years' experience in leadership. Most of the participants held a master's degree in either engineering or business and had completed formal leadership training. These ten engineering leaders deeply cared about the success and career progression of their team members. They took the time to learn about them as individuals - what motivated them, what was important to them, their expertise, their style, and how these attributes could be leveraged to support the team and achieve the expected

The engineering leaders who participated in this study understood their role in bringing a variety of experts together to achieve something greater than anyone could produce alone, knowing the breadth of expertise required

results.

couldn't be housed within one individual. Perspective-taking and listening became essential. They realized achieving team effectiveness required genuine communications, constructive disagreement, and thoughtful tradeoffs.

Connect with the Individuals

While it's commonly believed engineers are not focused on the soft-skills associated with leadership, this research indicates these ten engineering leaders showed great care and respect for their team members. The engineering leaders demonstrated this through listening, leveraging strengths, and learning more about the individuals and their styles. There was also a deep sense of responsibility for the individuals on the team, especially in regard to achievement and professional development. These leaders took great strides to create trusting environments and genuine relationships by respecting expertise, providing autonomy, openly sharing information, perspective-taking, listening, building trust, and maintaining both humility and decisiveness.

This research also found that building trustbased relationships was an intentional focus of these engineering leaders, and these relationships were important to both the individuals and the project success. Trusted relationships made it easier to obtain information, leverage resources, and develop a sense of ownership across the project team. In addition, the leaders experienced a sense of pride and accomplishment from creating these relationships.

Engage Differences

The leaders expressed genuine respect for the individual differences, skills, expertise, and perspectives of the individual team members. These leaders were invested in how to motivate team members as well as leverage their capabilities. This was accompanied by an ease in acknowledging when another person was better suited for a task,

had greater expertise, or more relevant skills. The individuals in this study identified the ability to evaluate inputs from various perspectives, and interpret the information to make the best decision, as a valued leadership skill. Effective leaders used perspective-taking throughout the course of a project, which included adopting other perspectives to examine technical reviews, concerns, resource constraints, and organizational needs, and then evaluate technical trade-offs. Based on the level of uncertainty present in engineering projects, this broad perspective enhanced the leaders' ability to make decisions with incomplete information. This balance of being open to information, while also being decisive, was also valued by a number of these leaders. Furthermore, valuing others' perspectives contributed to trust-based relationships and showed commitment to the team. As one participant called it, "pairing confidence with intellectual humility."

As Rottman, Sacks, and Reeve (2014) reported in Leadership, one key area of engineering leadership is collaborative optimization, which refers to the skilled facilitation of group process by bringing out the best in everyone. In this study, the leaders intentionally provided opportunities for their project engineers to be successful by leveraging their strengths. They were able to do this because they understood the individual strengths and weaknesses of team members, and could align those to the needs of the project and the organization.

Disagreement played a large role in building trust and creating an open environment. Disagreement was viewed as a way to enhance relationships and outcomes, not as a derailment or negative. Individual expertise, the unknowns in a project, and technical trade-offs were the main drivers of disagreement. The leaders in my study created an environment where disagreements are openly discussed, so that the underlying differences in thinking could be better understood in order to make the best decisions. When participants discussed disagreement in this study, there was an unemotional but personal approach to the resolution. The focus was on understanding the different perspectives in order to understand the problem at hand at a deeper level, and identifying potential solutions that have yet to be presented. This approach was valued for its role in bringing people together to utilize their experience and expertise, and in creating a trust-based environment. The leaders conveyed the idea that this approach was an important source of creativity and innovation. In order to gain these benefits, it is important that organizations allow for open disagreement, so that leaders can foster these discussions.

Focus on the System

Engineers work under high degrees of uncertainty, manipulating prior knowledge in order to apply it to new situations, with various unknown factors, in service of a business outcome. Engineers often have to work in cross-functional teams where a depth of knowledge in specializations is required, not only within the engineering disciplines, but also marketing, accounting, and contract professionals. This likely influences the focus on providing information and autonomy to other experts, perspective-taking to understand positions, and being decisive. These leaders were not focused on minimizing uncertainty, but instead upon continually gathering information to define the problems and solutions, while getting closer to the outcome. Leaders drew upon organizational knowledge, technical aptitude, and systems thinking to solve problems and identify solutions.

The systems thinking developed in engineering education and training was utilized not only for solving technical issues, but also to better understand people. Many of the participants discussed individual engineers in terms of being unique systems—with strengths, weaknesses, and influencers—being impacted by outside factors that require understanding. This appeared to be a new application for the passion for learning how things work. This same mindset is also applied to teams to understand the group dynamics, the outside factors influencing the group, and how the group fits into the organization and the larger market. These leaders were then able to take this vast information, and offer clarity, decisiveness, and direction to the team members to identify processes and outcomes for projects. These approaches are embedded in the engineering mindset and facilitate professionally recognized forms of influence.

Reflect and Refine

Although the engineers in this study took different paths to leadership, each encountered a learning curve. Paths included challenges stemming from taking a negative perspective, difficulty in connecting with others, being overly focused on finding the correct answer, and a lack of business perspective outside of engineering. Interestingly, once the engineers understood the difference between being an individual contributor and the multi-faceted needs of engineering leadership there was no mention of transitional struggles. It seemed that once the difference was understood. they were able to draw upon mentors, reflect on experiences, and continue to refine their approaches as they worked toward mastering leadership.

Humility and a sense of continued growth arose when discussing leadership approaches and outcomes, indicating the acceptance of an ongoing learning process. Just as in projects, where engineers continually take in information to evaluate the project's outcomes and course of action, and make adaptations when necessary, these leaders took this same approach to their leadership development. It was clear that selfreflection, and mentors, were sought out to continue to refine these skills. This group did not tend to seek out traditional leadership development, but instead focused on soliciting feedback, reflecting on their experiences and the results that were attained, and gaining perspectivetaking skills.

Most of the engineering leaders in this study commented on mentorship as having the largest influence on their leadership development. This included both formal and informal mentoring, with specific feedback both positive and negative. It was interesting to hear how negative feedback early on was reflected on, understood, and accepted. For many, the feedback clarified that if they wanted to become more than individual contributors, a change in approach was needed. The willingness to change may have been driven by the desire to progress in their careers, the desire to be better engineers, or the desire for their thinking to be heard and appreciated. Regardless of the driver, there was a deliberate effort to learn from both positive and negative experiences, to understand not only what was done, and what the results were, but also to understand the context within which it existed and what factors influenced the behaviors and results.

Developing the Skills

The participants in this study were selected by their organizational executives, which likely resulted in a sample of engineers who were considered exemplary leaders. Although this sampling likely influenced the results, it is beneficial to learn from engineers who are exceptionally effective in their leadership roles.

While the path to leadership varied, one thing was relatively consistent across participants: a difficult reflection point precipitated a focus on leadership style. In a few instances, it was a selfobservation of not achieving desired outcomes. For others, it was harsh feedback on their style and the negative impact it was having on their careers or their teams' output. In all cases, the intentional focus on developing solid leadership skills was born out of the harsh reality of ineffectiveness. These findings indicate providing engineers with a leadership context, prior to learning these skills, allows them to assimilate the learning.

Stereotypes aside, these engineering leaders are able to connect with the individuals on their team, rally support when needed, and create an environment of collaboration and teamwork to achieve astonishing results.

It led me to ask what am I missing?

The path to knowledge was just as diverse. Some of the participants attended graduate school after working for a few years, and some sought out leadership training. Those who pursued an MBA commented on the benefits of working with a diverse group of professionals with different perspectives and knowledge. These experiences set the stage for effective teamwork, and for understanding how to draw upon different expertise to complete a project. Most participants credited mentors— both from formal mentoring programs and informal relationships developed with senior engineering leaders—as the largest influence on the development of their leadership skills. Regardless of the path, the leaders reported leadership skills were developed through selfreflection and mentorship, both of which required a consistent, conscious effort to learn from their experiences.

There has been much discussion around teaching leadership skills to students as part of their undergraduate curriculum. But, will they value these leadership skills, and will they know how to apply them to future situations? In many ways, this is contrary to how the participants identified the need for these skills and how they pursued their leadership development. For curriculum to be successful, engineers will need to understand how these skills will apply to future situations, and how a lack of these skills may hold them back from achieving results. There was a genuineness to the participants' soft skills that was palpable, which could be attributed to the conditions under which they were developed. Learning the skills and how to apply them may prove to have a very different look than learning them in response to an internal desire to be effective and forge authentic relationships. For the participants, authenticity influenced their experiences as leaders and the results they realized.

Mentors Wanted

The most immediate takeaway from this study is the importance of mentoring for engineers. This is supported by engineers' respect for knowledge and contributions, as well as their strong professional identity. Mentoring programs, which include self-reflection, could serve as the foundation for leadership development in organizations. This approach to skills development is aligned with the engineering profession, and draws upon the respect and commitment engineers have for successful colleagues. These mentoring programs should focus on developing a broader business perspective, self-awareness, and the leadership approaches and skills required to be an effective project leader. If organizations wish to develop engineering leaders, they should invest in mentoring and self-reflective practices to develop an engineering leadership mindset and the skills required to effectively manage complex projects. In the end, engineers who are drawn to leadership positions and responsibility of leadership will enjoy the challenge and pride that comes with finding their own effective approach.

Overall, to develop engineering leaders, companies should invest in mentoring and self-reflective practices.

References

1. Laglera, J. M., Collado, J. C., & Montes de Oca, J. M. (2013). Effects of Leadership on Engineers: A Structural Equation Model. *Engineering Management Journal*, 25(4), 7-16

2. Robledo, I. C., Peterson, D. R., & Mumford, M. D. (2012). Leadership of scientists and engineers: A three vector model. *Journal of Organizational Behavior*, 33(1), 140-147. doi:10.1002/ job.739

3. Rottman, C., Sacks, R., & Reeve, D. (2014). Engineering leadership: Grounding leadership theory in engineer's' professional identities. *Leadership*, 0(0), 1-23.



Halle Horvath, PhD, MPH, SHRM-CP, is a Human Resource Professional with over ten years of experience in organizational and employee development, human resources, and operations management. She is currently the VP,

People and Process for Neundorfer, Inc., an engineering firm in the air pollution control industry.

ENGAGE & BENEFIT WITH think² perform **RESEARCH INSTITUTE**

ALL t2pRI FOLLOWERS BENEFIT FROM:

- > t2pRI research and Thought-Leader findings on t2pRI website
- > Curated research news available via the e-newsletter
- > t2pRI Insights magazine

WAYS

ENGAGE

- > t2pRI Thought-Leader Interview
- > Invitations to Senior Leader Spotlight Speaker & training events

1. Build the Institute's capacity.

• Contribute to the Institute's efforts to build resources e.g, speakers, events, videos, etc.

2. Sponsor a Fellow.*

- Invest in leadership education.
- Obtain updates and findings; contribute to the field.

3. Collaborate on a Research Study.*

- YOU identify the issue and question.
- YOU shape the study to your organization's needs.
- YOU benefit from the direct collaboration with researchers.
- 4. Demonstrate your commitment to purposeful and moral leadership as a corporate sponsor.*
 - Be recognized at all Research Institute events.
 - Complimentary participation for up to TEN employees at Institute events.

*For further information, contact Executive Director Kate Berman at kberman@t2pri.org or 612-843-5006.

MAKE YOUR COMMITMENT NOW!

- 1. DONATE ONLINE at www.t2pri.org
- 2. **DIRECT A GIFT** from your Donor Advised Fund to the "think2perform Research Institute."
- **3. COMPLETE & RETURN** your donation in the enclosed envelope.