

More Than Just Nice to Have: Engineering Managers' Perceptions about the Role of Adaptability in Hiring and Promotion Decisions

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Introduction

Engineering requires proficiency in adapting to rapidly changing job roles, work expectations, and industry needs [1]. Many industry and national reports have expressed the importance for engineers to be adaptable in the workforce [2], naming it as a key competency for career mobility and advancement. However, there is a general lack of knowledge about whether and how greater adaptability translates into favorable job outcomes such as hiring and promotion specifically. The current study addresses this gap by examining engineering managers' perceptions of the link between engineering adaptability and hiring and promotion on the job.

Project Overview

Increasing understanding of what constitutes adaptability and the strategies that best cultivate its growth has significant potential for increasing U.S. productivity, innovation, and workforce competitiveness [2]; however, few engineers receive explicit training in how to be adaptable on the job [3]. This NSF-sponsored CAREER grant addresses this need by developing the means to better define, understand, measure, and teach adaptability as a formal part of engineering education, training, and development. The guiding hypothesis of this work is that adaptability development must be holistic, explicit, and properly motivated if it is to foster creative solutions to today's complex, open-ended, and ill-structured engineering challenges.

The project uses a sequential mixed-methods research approach to systematically investigate adaptability in engineering. The electronics, semiconductor, and medical device industries, chosen for their rapidly evolving product life cycles, regulatory processes, and consumer demands [4]-[6], serve as the project's context. The first phase of the project uses semi-structured interviews with engineering managers to better conceptualize 1) what adaptability in engineering workplaces looks like, i.e., identify a typology of mindsets and behaviors necessary for engineers to adapt, and 2) if adaptability is sought after and rewarded as an engineering competency on the job. The second phase of the project uses semi-structured interviews with early-career engineers to formulate an understanding of the catalysts and barriers that engineers experience to being adaptable during the critical school-to-work transition. The third phase of the project will develop survey instruments to measure adaptive mindsets and behaviors and online modules to measure and enhance the adaptability of engineering students and early-career professionals based on the project findings. Randomized-control trials will then be used to evaluate the effects of the online intervention on participants.

The current paper addresses the first of three research questions that guide the project:

- RQ1. What adaptive mindsets and behaviors are important for working engineers, and how is adaptability sought after and rewarded on the job?
- RQ2. How do early-career engineers experience catalyst and barriers to being adaptable?
- RQ3. What educational strategies can be identified to enhance the adaptability of engineering students and early-career engineers?

Research Methods

To date, semi-structured critical incident [7] interviews with engineering managers have been conducted and thematically analyzed. Research partners for this work have included two semiconductor companies (one very large and one large-sized), one medium-sized electronics company, and one medium-sized medical device company. A project liaison at each company (i.e., a senior engineering manager or another higher-up in the engineering organization) assisted the research team by identifying 4-5 engineering managers of different demographics and experience levels to interview. Interviews lasting approximately sixty minutes were conducted via video call, audio recorded, and transcribed. Each participant was offered a \$40 Amazon gift card and certificate of corporate volunteering recognition as a thank you for their time, although some managers declined the gift card and were happy to contribute to the study without a monetary incentive. Seventeen engineering managers were interviewed: five from the very large semiconductor company and four from each other company, with approximately a quarter of participants identifying as female. (Note: two additional interviews of industrial advisory board members from the Principal Investigator's institution were also conducted, but these managers worked outside the study's partner companies and were omitted from the focal sample.)

Our developed interview protocol asked managers about specific times when an engineering supervisee needed to adapt to the job and exhibited or did not exhibit adaptability. Managers were prompted to describe for each incident the circumstances surrounding the situation, the engineer's actions and reactions, the problems the engineer encountered and resources the engineer sought or used, and the outcome of the situation, including the manager's appraisal of why the engineer was successful or unsuccessful and what the engineer could have done differently. Managers were also asked about how they define adaptability on the job, how their organization promotes and rewards adaptability, and how engineers will need to continue to adapt to be successful in their organizations, now and into the future.

Interviews were transcribed and cleaned before being entered into Dedoose, a qualitative analysis software. A multi-step thematic analysis approach has since been used to analyze the interview transcripts [8]. The first step for analyzing each research question has been an inductive analysis of the data using open coding and theoretical memoing to capture managers' responses in their own words. The second step has been a deductive analysis where each transcript was read and provisionally coded for statements related to categories in the Individual Adaptability Theory (IAT) framework [9]. Codes from these two steps were then combined and sorted to create themes in an upcycling process within Dedoose.

Results in this paper focus on a transcript analysis of the role adaptability plays in managers' hiring and promotion decisions. Two sequential questions from the interview data were investigated, "How does a prospective engineering applicant's adaptability factor into hiring decisions for your unit?" and "How does an engineer's adaptability factor into promotion decisions for your unit?" Coding was conducted following the abovementioned process by multiple researchers and discussed among the research team to review results and ensure interrater reliability after each coding cycle. The finalized codes were also compared across companies to identify similarities and differences in engineering managers' views of the role of adaptability in promotion and hiring.

The conventions used for quotes in this paper are as follows: All names, belonging to the participant or otherwise, have been redacted and replaced with a generic placeholder, represented by brackets, to protect anonymity. The same was done for any other information which could possibly help to identify the individual, such as the names of companies. In addition, verbiage that does not add to the meaning of the quotes were removed; for example, “um,” “uh,” “you know,” and repetitive language.

Limitations of this study include the relative lack of diversity among the involved managers. As discussed, managers were recruited with the help of project liaisons at each participating company. Women managers and/or managers of color could not be recruited at some companies despite multiple attempts on behalf of both the research study team and the project liaisons, limiting the diversity of perspectives represented in our sample. Future work could refine and expand on current understanding of managers’ perceptions about the role adaptability plays in the hiring and promotion process through the involvement of both more companies and a set of more diverse voices. Furthermore, the interviews with managers were conducted during the COVID-19 pandemic. The switch from in-person interviews to virtual (Zoom) interviews may have affected the level of rapport the research study team could build with each participant, possibly influencing participants’ responses. Changes in how and where work is performed during the pandemic could additionally have affected managers’ conceptualizations of adaptability, which could have also impacted participants’ responses. Readers should take these limitations under advisement when reviewing the findings.

Role of Adaptability in Hiring and Promotion

Of the seventeen engineering managers interviewed, seven reported that adaptability factored into both hiring and promotion decisions, six reported that it factored into only promotion decisions, three reported that it factored into only hiring decisions, and one reported that it factored into neither type of decision. Table 1 presents the codes that emerged from the transcript analysis of managers’ perceptions of how engineers’ adaptability factors into hiring and promotion decisions within their unit, and Table 2 demonstrates the number of managers who mentioned each code in their remarks about hiring and promotion, respectively.

Table 1. Codes and Definitions: Hiring and Promotion

Code	Definition	Example
Agile learning	Desire and openness to learn more; ability to learn quickly and independently; possessing a growth mindset	“Have they demonstrated a desire to look at new opportunities? Have they demonstrated the ability and skill to learn new things quickly? And in the case of one of the people on my team now, they had reached out to few different mentors ... while they were in one particular technical role, both performing that role well but in doing so also reaching out to a mentor in a different part of the business to say, I wanna learn more about this other aspect.” [Manager 15, Hiring] “...if you have one promotion, for example in a theoretical situation, and the two people are working on similar type of problems, they have

		similar job descriptions, but one is able to solve those [problems] quickly or comes up with outside the box thinking or doesn't need to be guided through every step or is guided less through every step, then they're more likely for promotion." [Manager 12, Promotion]
Comfort with ambiguity	Ability to navigate ambiguous and uncertain situations with comfort and ease	"...one of the things that I asked [was] can you give me an example of how you handle ambiguity, because ... this guy ... was very good on paper. I mean, his credentials were very good. But given that situation, he wasn't a very good fit. And so, he ... went to a different organization within the company, which was more to his liking or more suited to his mindset." [Manager 10, Hiring] "...what ends up happening as you continue to evolve, you continue to work in the space of ambiguity, which means you have to be able to adapt to all these things and all this information that's coming in to then sift through and find that solution." [Manager 18, Promotion]
Comfort with change	Ability to navigate changing job roles, situation, and responsibilities or change directions with comfort and ease	"...trying to tap on those soft skills is probably where adaptability would show through ... some of the interview questions are geared towards like, what was, like, the biggest challenge or problem that you've solved? And so, you can maybe ... you could probably listen in a question like that of like, were they afraid of the change, were they resistant to the change?" [Manager 3, Hiring] "...there are two key things to a promotion as far as the job that they've been doing. Have they done it well and delivered on those commitments and executed well to the job that they're in? And then, how well would they adapt to a new role or new responsibilities as those come along with a higher level of responsibility with a promotion?" [Manager 15, Promotion]
Creative problem solving	Ability to apply knowledge to new situations and think innovatively upon encountering an unexpected challenge or problem	"And the strategic competency is about how you take that technical knowledge and turn it into more of a product-based solution. You have to have that body of work that shows that you're a strategic thinker, you actually can take and essentially adapt this technology to different product segments or different solutions or something novel. So, one measure of that is how many patents is this person actually filed? Because essentially, that shows how you can take that knowledge base and apply it to different situations." [Manager 10, Promotion]

Interpersonal flexibility	Ability to effectively navigate interaction and conflict with others and to consider others' viewpoints	“There's almost always a question in an interview of like, well, when was the last time you navigated a conflict and what was the conflict? And so ... the only way you might pick up on adaptability is if someone gives them a response they're not expecting and, how do they respond to it? And if they get another response they're not expecting, how do they respond to it?” [Manager 3, Hiring] “I think that's a very important trait as a leader and it should absolutely be considered in promotions, because ... the [greater] number of people you're leading or [in] larger groups of people, you're gonna find more diversity within them. And so, you have to be adaptable as a leader, not only just to changing situations in your job and your responsibility or what your goals are, but how you lead people.” [Manager 5, Promotion]
Task flexibility	Ability to take on and manage multiple or new tasks, including those that may be outside one's typical roles and responsibilities	“I think subconsciously we get at it [adaptability] from a couple of different ways. If we're hiring for [new hire program], we will talk with them [job candidates] about their different interests ... to try and gauge like, are they solidly in this quality engineering camp or are they really, really only gonna be able to be a design engineer, and how much would we be able to move them around the organization?” [Manager 4, Hiring] “...it's the people that you can rely on like, can you do this? And they're like, yeah, I'll do that. And you know that you could trust them to figure something out and get something done, and it doesn't have to be the thing that's in their job description. They know what needs to be done and they'll do it. So those people tend to get promoted and raised to the top.” [Manager 8, Promotion]

Table 2. Results of Content Analysis: Hiring and Promotion

		Number of Participants									
		Hiring					Promotion				
Code	Company:	A ¹	B	C	D	Total	A	B	C	D	Total
Agile learning		0	1	1	3	5	1	0	1	0	2
Comfort with ambiguity		0	0	0	1	1	3	0	1	0	4
Comfort with change		2	0	0	1	3	2	0	2	1	5
Creative problem solving		0	0	0	1	1	0	0	2	1	3
Interpersonal flexibility		1	0	0	1	2	1	1	1	1	4
Task flexibility		2	1	0	1	4	1	1	0	1	3

¹Company A: medium-sized medical device company, Company B: medium-sized electronics company, Company C: large-sized semiconductor company, Company D: very large-sized semiconductor company

Regarding which aspects of adaptability most relate to hiring and promotion, responses appear to be differentiated according to the ease with which managers could identify them. Managers can observe engineers working on the job to see how well they creatively solve problems, handle change and ambiguity, and work with other people, making it unsurprising that they mentioned these aspects more in the context of promotion than in the context of hiring. By contrast, managers were more likely to list agile learning and task flexibility among their hiring criteria than among their promotion criteria. Such competencies may be easier for candidates to instantiate with examples and managers to assess during a job interview due to their more cognitive nature. Separately, the mentions of agile learning, comfort with ambiguity, comfort with change, interpersonal flexibility, and task flexibility across multiple companies support congruity in employers' conceptualizations of adaptability. At the same time, managers from the semiconductor companies were the only managers who reported engineers' creative problem-solving as a factor in their hiring and promotion decisions. Future work will examine the extent to which creative problem-solving emerges as a code across interviews from the four companies and why only semiconductor companies list creative problem-solving as an important trait in the hiring and promotion processes of their engineers.

Future Work

The next phase of this work will use semi-structured critical incident interviews of early-career engineers to explore the catalysts and barriers they experience to being adaptable in the workplace. Thirty early-career engineers with between 1-7 years of working experience and varying demographic backgrounds will be recruited with the help of company liaisons and engineering alumni associations. Each interview will last 60-75 minutes, be conducted virtually, and be audio-recorded and transcribed. Engineers will be prompted to recall times when they have needed to respond to a difficult or unexpected work situation using one of the six adaptive behaviors identified in our previous study of engineering managers. Specifically, they will be asked to reflect on their actions and reactions to the situation, the problems or barriers they faced

along the way, and the resources on which they drew from their work environment or prior work, school, and life experiences. Combined with the manager interviews, they are expected to lead to a rich, more complete understanding of engineering professionals' adaptability demands, assets, and challenges. Subsequent phases of the project will develop survey instruments and online modules to measure and enhance the adaptability of engineers.

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