

Identifying the Proactive Actions of Newly Hired Engineers During the Socialization Period

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Abstract

Organizational socialization is the process through which new employees learn and adapt to their new roles in organizations. However, new employees' proactive actions, in the context of engineering organizations, are not well explored. This study examines the actions newly hired engineers take during organizational socialization and identifies the actions from newly hired engineers working in the U.S. aerospace and defense (A&D) industry. By following Morrison's framework of new employees' primary tasks in socialization, we present the proactive actions taken by 10 participants. Specifically, we identified 13 actions and classified them into four categories: Relationship Developing, Knowledge Acquiring, Real Task Training, and Positive Attitude Cultivating. This study expands the research literature as it 1) explores new employees' proactive actions in the context of engineering organizations, 2) discusses and classifies the specific actions newly hired engineers proactively take during socialization, and 3) reveals how the identified actions in each category function across multiple domains. The study can provide an example of conducting qualitative research on new employees' proactivity for engineering education researchers; help engineering educators prepare students entering the A&D industry; inform managers of the newly hired engineers' insights on organizational socialization, and inform senior engineering students the actions they may need to do in the socialization period.

Keywords: proactive actions, organizational socialization, engineering management, engineering education

1. Introduction

Previous studies define organizational socialization as the process of newly hired employees learning the necessary behaviors, attitudes, and required skills and knowledge for achieving a role in an organization [1]-[4]. As its outcomes linked to employee job performance and retention [4]-[6], new employees' proactive or motivated behaviors in the socialization process [7]-[9] have been explored and defined by many scholars. According to previous studies, new employees' proactive behaviors affect short-term outcomes in the socialization process, such as better understanding their roles and jobs, mastering the required knowledge and skills, and getting socially integrated into the workgroup [6], [8], [10]. In addition, their proactive behaviors also affect long-term outcomes such as job satisfaction and job retention [7], [11], [12]. Therefore, researching proactive behaviors is important for exploring how new employees achieve successful outcomes at the workplace in order to develop training strategies for their onboarding process and improve their future career success. Existing works mainly focus on new employees' proactive behaviors in the general context

(i.e., the context includes organizations in all disciplines). However, in the context of engineering organizations, it has not been fully explored. This study examines the actions newly hired engineers took during the process of organizational socialization, specifically in the aerospace and defense (A&D) engineering organizations. The actions are identified from newly hired engineers working in the U.S. A&D industry. By following Morrison's [8] framework of the four domains (i.e., Role Clarity, Task Mastery, Acculturation, and Social Integration) of new employees' primary tasks in socialization, we interviewed twenty-six newly hired engineers with less than two years of work experience. The research team applied an open coding process to analyze the interviews. In this paper, we present the proactive actions taken by ten of the twenty-six participants.

The study's major research question is: What actions newly hired engineers proactively do to achieve success in organizational socialization? Furthermore, the study also involves the following research questions: What actions do newly hired engineers apply in multiple domains? How can we categorize the actions?

Led by the research questions, we identified thirteen actions and classified them into four categories: Relationship Developing, Knowledge Acquiring, Real Task Training, and Positive Attitude Cultivating. This study expands the research literature as it 1) explores new employees' proactive actions in the context of engineering organizations, specifically in A&D organizations, 2) discusses and classifies what specific actions newly hired engineers proactively take during socialization, and 3) reveals how the identified actions in each category function across multiple domains. This research can benefit engineering education as it shows an example of conducting a qualitative study on new employees' proactivity based on the four domains; helps engineering educators design college curriculum to facilitate students entering the A&D industry; informs engineering managers newly hired engineers' perspectives about socialization, and informs senior engineering students what they may need to do in the future as newly hired engineers.

2. Literature Review

2.1 Studies about new employees' proactive behaviors

Previous studies have focused on newly hired employees as proactive individuals during the socialization process [13], [14], and the process through which these employees initiate and complete certain behaviors or actions [5], [8], [15].

Seven proactive behaviors identified mainly in the 80s and 90s by Morrison [8], and Ashford and Black [7] have been commonly applied in organizational socialization studies (e.g., [4], [11], [16]): *Information Seeking*, *Feedback Seeking*, *General Socializing*, *Networking*, *Relationship Building*, *Job Change Negotiation*, and *Positive Framing*. Previous studies have evaluated the link between these proactive behaviors and new employees' socialization. For example, positive outcomes of *Relationship Building*, *Information Seeking*, and *Feedback Seeking* could predict a higher level of new employees understanding their roles and responsibilities [17]. Moreover, *Relationship Building*, *Information Seeking*, *Feedback*

Seeking, and *Positive Framing* were related to social integration, role clarity (i.e., understanding roles and responsibilities), job satisfaction, newcomers' intention to turnover, and the actual turnover [10], [18], [19]. Generally, proactive behaviors more relevant to the social aspect or involve social actions, such as *Feedback Seeking*, *Relationship Building*, and *General Socializing*, were indicated as more helpful for new employees in socialization [13], [20], [21], and these two proactive behaviors indirectly and positively affect the quality of the leader-member relationship [22]. The studies evaluating how proactive behaviors affect socialization showed the importance of researching new employees' proactive behaviors. In a nutshell, the seven proactive behaviors established the "baseline" in the research area. They provided an overview of how new employees adjust themselves to a new working environment in the socialization process.

Other studies have further developed the area. Cooper-Thomas and co-authors [15] expanded the proactive behaviors. Besides the ones similar to the aforementioned seven most commonly used proactive behaviors, the new behaviors were identified in a further study [16]: *Role Modeling*, *Monitoring*, *Reading*, *Direct Inquiry*, and *Changing Work Procedures*. The proactive behaviors indicated what new employees commonly do in socialization, reflect the interaction between new employees and their working environment, and how new employees change themselves for the adjustment. Therefore, the authors created a set of theoretical categories for classifying the behaviors: changing self, changing role or environment, and mutual development. These categories, respectively, indicate the behaviors that new employees apply: to adjust themselves (e.g., *Reading*), to alter the working environment (e.g., *Changing Work Procedures*), or to adjust both (e.g., *Networking*). These three categories provide a direction for categorizing proactive behaviors based on self-improvement and reciprocity between new employees and the organization.

The studies discussed above contributed to researching proactive behaviors in a general context. Recently, some studies have focused on new employees' proactivity in specific contexts. For example, in the context of STEM careers socialization, Korte et al. [23] found that new employees expect a formal development plan for adjusting to their new working position, guidance from their manager, and opportunities of undertaking work-related tasks. Harris et al. [21] revealed that, in the context of learning and adjusting to existing organizational practices, new employees proactively formulate a sense or reliable understanding of the organizational practices by adjusting or improving the practices. They also check their understanding and assumptions of the practices by asking for feedback or observing their managers' and coworkers' reactions. These studies revealed similarities in proactive behaviors in STEM with those found in a general context, such as *Feedback Seeking* and *Monitoring*. However, differences are also obvious. For instance, general context studies rarely mentioned that new employees would seek opportunities to be assigned work. Moreover, although new employees initiate *Information Seeking* when trying to make sense in the new working environment, how new employees improve or change their understanding after collecting information was not fully discussed in earlier studies. Such comparison displays a need to research new employees' proactive behaviors in specific contexts, beyond only studying in a general organizational socialization context.

2.2 Gaps in the literature

There are still some gaps in the existing literature. First, what new employees exactly do to deal with the situation of entering a new organization was not thoroughly examined. For example, *Information Seeking* was clearly defined as looking for information that informs new employees what they should do to "survive" in their new positions [7]. Still, the specific processes that new employees take to obtain the information have not been stated in detail. Moreover, according to Oxford Advanced Learner's Dictionary [24], the word "behavior" is defined as "the way that someone behaves, especially toward others" and "the way a person behaves or functions in a particular situation." Meanwhile, the term "action" is defined as "the process of doing something to make something happen or to deal with a situation." Thus, the proactive behaviors identified previously are in alignment with the definition of behavior. However, there still needs further research on the new employees' proactive "actions" with detailed measures and designs (e.g., what to do, where to do, and with whom). In other words, the processes of how they pursue success in organizational socialization need to be revealed further.

Second, the three categories of new employees' proactive behaviors [15], [16] indicate how new employees act differently in adapting to new positions. However, these categories were built based on earlier studies' proactive behaviors (e.g., [7], [13]). They could lead to ambiguity for categorizing proactive behaviors to be discovered in the future if the uncertainty of reciprocity exists. Also, these categories focused more on dividing the proactive behaviors, which may generate confusion and ambiguity into understanding how and why the behaviors can help new employees. For instance, *Role Modeling* has been classified into the category of changing role or environment, but it is not clear that in what socialization aspects this behavior can help new employees. Thus, to facilitate such understanding, how proactive behaviors function differently in specific domains needs to be discussed.

Third, most of the prior literature mainly focused on a general context (e.g., [4], [11], [25], [26]), and only limited studies focused on specific contexts. Even though a few previous studies focused on newly hired engineers' proactivity in socialization (e.g., [20], [23]), the research in the context of engineering organizations was largely untouched. More specifically, there is rare research about newly hired engineers' proactivity in the aerospace & defense (A&D) industry. A&D organizations employ engineering graduates from multiple engineering majors and offer a wide variety of positions [20]. In particular, A&D organizations recruit electrical, mechanical, manufacturing, computer-related engineers, along with recruiting graduates with explicit aerospace engineering degrees. Therefore, organizations in the A&D industry reflect the features that many organizations may have across different engineering disciplines. Hence, to address the above-mentioned gaps in the literature, instead of defining more proactive behaviors, this study aims to explore actions that newly hired engineers proactively take during the socialization process in A&D organizations and categorize them in accordance with how they function in different domains.

3. Methodology

3.1 Research Design

This paper derives from a larger study on the organizational socialization experiences among newly hired engineers. For the overall study, the research team applied qualitative research methods to focus on a specific context [27], identify patterns, and capture sufficient descriptions [28]. The initial semi-structured interview protocol was designed with four sections. An initial section involved questions about the overview of newly hired engineers' socialization experience. A second section inquired about participants' expectations for engineering undergraduate programs in colleges or universities and their managers or organizations. A third section of the interview protocol probed participant experiences with activities related to organizational socialization. A final section allowed the participants to share additional information with the interviewers which were not mentioned in previous responses but were relevant to the experience under investigation.

For this paper, we focus on questions from Section 2 which were designed by following Morrison's [8] framework of the four domains of new employees' proactivity in organizational socialization: Role Clarity, Task Mastery, Acculturation, and Social Integration. Each domain contained four questions. The first question inquired the participants' roles and responsibilities in the organization/learned skills and knowledge required by job performance/workplace culture/relationship with coworkers. The second question asked the actions or processes taken by the participants in each domain. The third and fourth questions asked the challenges they met and the solutions. A final question was designed at the end of Section 2 for collecting the participants' suggestions for engineering students.

Prior to participating in the interview with a semi-structured interview protocol, the participants were first required to answer the pre-established questions (e.g., "What particular actions or processes did you take to help you understand your roles and responsibilities?"), then the interviewers asked follow-up questions for requesting supplementary information and details [30] (e.g., "Were there any particular people who helped you with the action?"). These background questions allowed researchers to establish initial rapport with participants and provide them with a frame for understanding the focus of the study.

3.2 Participants Recruitment

A total of twenty-six participants were recruited from four of the largest A&D organizations in the United States. The organizations' sizes ranged from twenty thousand to over one hundred and fifty thousand employees worldwide. The participants were invited by receiving an email attached with a recruitment flyer and personal connections of two researchers in the team, who were graduate students at the Department of Aerospace Engineering. The qualifications to be interviewed were 1) having an engineering undergraduate degree, 2) being employed in an A&D organization since graduation, 3) having less than two years of

full-time work experience. All the participants have been compensated with a gift card worth 99.99 dollars from a shopping website. For the sake of confidentiality and privacy protection, all participants will be referenced using letters.

The research team tried to keep a diverse pool of participants, considering race, gender, undergraduate majors, months of working, etc. Table 1 shows the demographic information of ten participants among the twenty-six. Data from the ten participants were analyzed in this study, discussed later in the data analysis section.

Table 1. Demographic Information of the ten Participants

Participant	Race/Ethnicity	Gender	Undergraduate major	Months of working	Job title
A	White	Male	Aerospace Engineering	10	Mechanical Engineer I
B	*HLS	Female	Mechanical Engineering	27	Manufacturing Engineer
C	White	Male	Aerospace Engineering	9	Systems Engineer Associate
D	White	Female	Aerospace Engineering	17	Propulsion Engineer
E	White	Male	Aerospace Engineering	4	Supplier quality engineer
F	Asian	Female	Industrial Engineering	3	Senior Project Engineer, Manufacturing-Supply Chain
G	White	Female	Industrial Engineering	4	Industrial Engineer
H	*HLS	Male	Mechanical Engineering	10	Quality Engineer
I	White	Male	Aerospace Engineering	6	Propeller Design Engineer
J	White	Female	Aerospace Engineering	9	Mission Systems Engineer

*HLS: Hispanic, Latino, or Spanish Origin

3.3 Data Collection

Interviews were conducted as the data collection method due to their feature of observing and interacting with participants [29]. Four researchers in the team separately conducted the interviews. Among the four team members, one had an internship experience with a sizeable A&D organization. One was a graduate student who just finished their senior year of aerospace engineering undergraduate courses and looked for opportunities for A&D internships. Such A&D background helped the two interviewers empathize with the participants they were interviewing. One interview was taken face-to-face, and others were

conducted online. The average time of each interview was about 60 minutes. The interviews were audio-recorded, and then the audio recordings were transcribed into text by an external professional transcription company. After interviews, the interviewers reviewed each transcript to ensure the audio recordings were correctly transcribed into text.

3.4 Data Analysis

Data analysis was conducted based on the open-coding process proposed by Strauss & Corbin [31] and followed the procedure of "segmentation of text, codebook creation, coding, assessment of reliability, codebook modification, and final coding" illustrated in [32].

3.4.1 Selection of the transcripts

After reviewing all twenty-six interview transcripts, the four interviewers identified ten interviews with the most detailed and descriptive information. When selecting the ten interviews, the interviewers also considered the interviewees' diversity (i.e., race, gender, undergraduate majors, months of working, organizations) for building a primary codebook with sufficient information.

3.4.2 Codebook creation

The structure of the primary codebook was established to follow the interview protocol, including the four domains: Role Clarity, Task Mastery, Acculturation, and Social Integration. In the codebook, the coding schemes with code names, descriptions, and example quotes [33] were determined by the researchers together. The researchers chose a short phrase to condense and capture a participant's points [34]. In the current study, up to five words were used to create a code name to concisely present each code's descriptive information. Moreover, the researchers compared codes from all the coders together, combined the ones with agreed definitions and code names, and discussed discrepancies. In total, there were forty-nine initial codes created in the primary codebook.

3.4.3 Coding

The coders coded the second selected interview transcript independently and separately with the primary codebook and then presented their codes together. Three coders discussed all the new codes and the codes with discrepancies. Most codes were discussed until there was a unanimous agreement, but the majority vote decided some codes due to the time limitation.

The coders also made new codes when seeing new information in the second transcript. For instance, the second participant mentioned she read the company's documents and materials, which helped her understand the job description. However, this information did not occur in the first selected transcript. So, a new code, "utilize organizational resources," was made. When coding the fifth selected transcript, the coders found that newly hired engineers also utilized learning resources beyond what their organizations provided. Finally, the code was

changed to "utilize resources" to capture concepts from both participants' data. The coders repeated such an iterative process for continuing coding all the ten selected transcripts, and the code schemes were all based on team discussion and agreement during this process. The coding process finally resulted in an integrated codebook, and it contains one hundred and thirty-two unique codes for all four sections. Such increment was caused by making necessary new codes according to each participant's new and individual responses. Among all the codes, there are thirteen codes closely related to the research questions, which were identified as the proactive actions taken by our participants.

4. Findings

According to the final codebook, thirteen different newly hired engineers' proactive actions were identified and are typed into four categories: 1) Relationship Developing; 2) Knowledge Acquiring; 3) Real Task Training; 4) Positive Attitude Cultivating. Table 2 shows the overview of all the identified actions in each category.

4.1 Relationship Developing

The category of Relationship Developing includes actions involving interactions between newly hired engineers and other insiders in the organization and newly hired engineers' participation in social occasions. The actions of this category help newly hired engineers in socialization in all four domains. Moreover, comparing the actions in the four domains, the actions in this category assist newly hired engineers better with Acculturation and Social Integration than with Role Clarity and Task Mastery.

Table 2: Overview of the identified actions

Relationship Developing					
Action	Definition	Role Clarity	Task Mastery	Acculturation	Social Integration
<i>Interact with coworkers</i>	Newly hired engineers mutually communicate with coworkers and ask questions.	√	√	√	√
<i>Shadow/Observe coworkers</i>	Newly hired engineers find coworkers who have experience and shadow or observe how they do their work, as well as how they interact with others.	√	√	√	
<i>Attend meetings</i>	Newly hired engineers attend meetings, classes, or professional events, in which they have opportunities to know and communicate with others.	√	√		
<i>Consider coworkers' personal attributes</i>	Newly hired engineers consider the interests, habits, and personalities of their coworkers and think about how to interact with them.			√	√
<i>Attend social gatherings</i>	Newly hired engineers attend social gatherings to get to know and bond with coworkers.			√	√

<i>Offer to help others</i>	Newly hired engineers seek opportunities to help their coworkers technically or emotionally.	√	√
Knowledge Acquiring			
<i>Utilize resources</i>	Newly hired engineers utilize technical or nontechnical prepared resources to learn required knowledge and skills.	√	√
<i>Self-study</i>	Newly hired engineers learn skills and knowledge only on their own, without assistance from coworkers.		√
<i>Attend classes</i>	Newly hired engineers attend classes or training programs offered by the organization.		√
Real Task Training			
<i>Undertake practical tasks</i>	Newly hired engineers proactively participate in work tasks or projects to gain experience or knowledge.	√	√
<i>Attempt task independently</i>	Newly hired engineers complete their work tasks, understand the roles or methods of the jobs on their own.	√	
Positive Attitude Cultivating			
<i>Have good work ethics</i>	Newly hired engineers maintain professionalism by working hard, doing high-quality work, and finishing tasks on time.	√	√
<i>Have self-assurance</i>	Newly hired engineers remind themselves that their opinions are valuable and to be self-confident in the position.		√

Identified actions:

- Interact with coworkers (in all domains): Newly hired engineers mutually communicate with others in the organization, such as their managers and coworkers inside or outside the workgroup, including asking questions or was directly involved with coworkers. Through interaction between them and others, newly hired engineers get information about what their roles expect, how to enhance work-related abilities, the culture of the workgroup and the organization, along with socializing with others.

"I did reach out to a lot of people within my program that I'd previously known to help aid me into the stuff that I should be expecting that all this stuff that I need to be doing and stuff I just need to know before I come out of there."

(Participant C)

"So, I would say the specific actions or tasks that I did to learn more about that IE or industrial engineering position when I first started, was asking my manager and my other coworkers within my team what help they needed, what processes were they currently working on and was there room for improvement on those?" (Participant F)

- Shadow or observe coworkers (in Role Clarity, Task Mastery, and Acculturation): Newly hired engineers try to learn from their coworkers by shadowing (e.g., follow and try to copy what senior coworkers did in a specific task or their working process) or observing (e.g., watch how senior coworkers did and learn from them, but not just copy from them) their coworkers' working steps and processes. Sometimes the observation also includes the interpersonal relationships and interactions among their coworkers, so the newly hired engineers can learn from senior employees to socialize with others in the organization.

"I learn a lot better by actually physically seeing something than looking at something on a computer. I ended up spending a lot of time either with other industrial engineers, having them show me things in the factory on the manufacturing floor, or I would find a mechanic or manufacturing manager who was able to better show me around and show me exactly what they were doing, what I would be doing." (Participant G)

- Attend meetings (in Role Clarity and Task Mastery): Newly hired engineers attend meetings held by the workgroup or the organization. In such meetings, they learn more about their roles and responsibilities and how the workgroup works as a whole. They also utilize organizational or workgroup meetings to update the required skills or knowledge.

"But a part of that process that I've learned is knowing or determining what language is sometimes negotiated or we might get pushed back on. So being part of those conversations and contracts is always in those meetings, but just listening in on them is a really good learning experience." (Participant F)

- Consider coworkers' personal attributes (in Acculturation and Social Integration): Newly hired engineers consciously consider the interests, habits, and personalities of their coworkers, as well as the relationship between themselves and their coworkers, and then think about how to interact with them based on these personal attributes. The action helps newly hired engineers make the interactions smoother and enables them to better communicate with others, so that they can better learn the workplace culture from others and develop social relationships.

"Understand where they were coming from. Mainly just put myself in their shoes and try to understand their point of view and yeah, just trying to understand the why's and the how's they do stuff like they do or like they used to do. And try to understand it a little bit from their side and also understand that you as a younger engineer, you don't have the experience that they have, but you're bringing the new, you're bringing the innovation so having both parties to understand that they need each other." (Participant B)

- Attend social gatherings (in Acculturation and Social Integration): Newly hired engineers attend social gatherings to get to know others from a personal aspect and develop relationships with others. Sometimes newly hired engineers plan new social events by

themselves and invite others. This action offers more opportunities for newly hired engineers to communicate with others and experience the culture of the workgroup and the organization.

"And say really putting myself out there. Saying, 'Hey, the other night, the other week, and you mentioned you liked kayaking or something. I like that too. Would you like to go sometime?' Or maybe if they're real, real introverted, they might just talk with them about it the first time. The next time I see them, invite them, and just kind of the progression of building that relationship at a slow or fast rate is something I have to gauge." (Participant E)

- Offer to help others (in Role Clarity and Social Integration): Newly hired engineers proactively seek opportunities to help and/or emotionally or technically support their coworkers and offer help. In the category of Relationship Developing, this action is identified in the domain of Social Integration.

"We obviously went or are going through hard times at work, stressful times, times where we have to pick each other up, help each other out." (Participant A)

However, the same action identified in Role Clarity is categorized in the category of Real Task Training because the primary outcome of the action becomes learning the roles and responsibilities during the process of helping others.

"Really how I approached that position was, if there was a process and people found that it would take a long time to do a task that they needed help on, I would learn about that task, ask them questions and brainstorm and figure out with them how to make it better. So how to improve it." (Participant F)

4.2 Knowledge Acquiring

This category includes actions by newly hired engineers that directly involve acquiring knowledge from learning materials and self-initiated activities. The learning materials include books, papers, organizational documents, and open resources online, etc. Actions in this category help newly hired engineers get a deeper understanding of their roles, responsibilities, and the workplace culture, as well as master required skills and knowledge.

Identified actions:

- Utilize resources (in Role Clarity and Task Mastery): Newly hired engineers utilize technical or nontechnical pre-prepared resources, such as guidebooks, tutorials, organizational documentation, manuals, and open resources online. By taking this action, newly hired engineers can find informative resources about their roles and responsibilities and learn skills and knowledge.

"If I have this side of a square or something or I have the side of a polygon, and I have this angle, and then I may find some obscure paper that shows a good way to relate these two properties or something like that. Then we have, I think it's called Engineering Workbench, and it's where a lot of publications that [the organization's name] has bought for engineering standards like SAE [Society of Automotive Engineers], ASME [American Society of Mechanical Engineers], stuff like that, lots of those papers and standards." (Participant I)

- Self-study (in Task Mastery): Newly hired engineers learned skills and knowledge on their own, without assistance or guidance from coworkers. Unlike utilizing resources, this action focuses on the independent attribute of newly hired engineers when they study.

"Self-study becomes a better problem solver when issues arose." (Participant A)

"So a lot of it is just research on my own or taking the time during the day to dig into something to really envelop yourself in it." (Participant C)

- Attend classes (in Task Mastery and Social Integration): Newly hired engineers proactively attend classes, training programs, or other learning opportunities held by their organizations for learning required skills and knowledge. Sometimes they also utilize such opportunities as a way to know more people and build personal connections.

"I took the project management classes, then some random classes through that global learning portal that I had mentioned. The classes were mainly on how to actively listen and the best way to approach a confrontation. Stuff like that."

"They are offered by the company, but sometimes I find them by myself."

(Participant A)

"Make small conversation on the drive over, or those presentations, or for the 3D printing class, or for a different class. There's a class coming up, the topic is something that we both kind of work on. You want to take it and work on it together? And do the homework together, take the class together kind of stuff."

(Participant E)

4.3 Real Task Training

This category includes the actions that newly hired engineers take to practice work tasks or undergo task training, such as trying to solve problems and learning knowledge or skills through the process of doing tasks. Actions in this category only assist newly hired engineers with Role Clarity and Task Mastery.

Identified actions:

- Undertake practical tasks (in Role Clarity and Task Mastery): Newly hired engineers

proactively participate in challenging work or projects to gain experience or knowledge. Through the process, they get a deeper understanding of what they are expected to do at their position, as well as master the required skills and knowledge. Sometimes they learn things through helping lead the team.

"I'm a big proponent of learn [sic] by doing, so just any opportunity to try a different task or help with the different part of the system or facility was an opportunity to learn about the role and the work I've been doing. Definitely, I made it a point, regardless of what task I'm doing, to try and understand why I'm doing it, and then look into that deeper, later, just from an engineering knowledge gain perspective." (Participant A)

- Attempt task independently (in Role Clarity): Newly hired engineers complete their work tasks or try to understand the roles or methods of the jobs on their own. Unlike "self-study" in the category of Knowledge Acquiring, this action focuses on the independent aspect of doing a task.

"Then after about a month or so of that, then I started to be able to become more independent, understand the methods and the rules and everything that we use and going about the drawings, everything like that." (Participant I)

4.4 Positive Attitude Cultivating

This category includes the actions that help newly hired engineers cultivate positive working attitudes. Positive working attitudes refer to working hard, maintaining professionalism at work, being self-confident, being positive about participating and speaking in professional conversation, etc. Actions in this category are more helpful for newly hired engineers in the domains of Acculturation and Social Integration.

Identified actions:

- Have good work ethics (in Task Mastery and Social Integration): Newly hired engineers try to be professional and respect coworkers, work hard, do high-quality work, and finish tasks on time. When taking this action, newly hired engineers proactively seek work to do, which gets them more familiar with their roles and responsibilities, as well as the skills and knowledge they need to utilize. Besides, having good work ethics helps prove to coworkers that the newly hired engineers are reliable.

"I guess the biggest thing is just keep asking for work to do. I mean this... I've had five internships during school. So I've done the onboarding process a bunch of times, and I kind of knew what to do by the time I started full time. But really just trying to get involved as much as I can. That's kind of like how I was in school when you know, just taking on leadership positions and getting involved in clubs and that kind of thing. Keep asking for work to do

and see where you can help out. It's really beneficial." (Participant J)

- Have self-assurance (in Acculturation and Social Integration): Newly hired engineers remind themselves that their opinions were valuable, they belonged at their positions in the workgroup, and they believe their abilities are sufficient for their job performance.

"Just make sure that I spoke up during our different staff meetings that we have. Making sure that I put myself out there and joined in their conversations and things like that, just really basic things that I did."

(Participant G)

4.5 Summary of the results

In summary, newly hired engineers learn from coworkers by interacting, shadowing, or observing them. Before communicating with others, they consider the questions they are going to ask and others' personal attributes. They proactively help others in the workplace and also attend work-related meetings, classes, or social gatherings. Newly hired engineers utilize various resources, spend time learning after work, and initiate self-study or try to solve problems independently. Sometimes they learn and practice through the process of doing work tasks and helping others. Finally, they remind themselves to have good work ethics and be self-confident to speak their thoughts to the team.

5. Discussion

The identified proactive actions highlighted what newly hired engineers exactly do in the socialization process. The value of the study, implications, and limitations are discussed in this section.

5.1 Specific actions and processes in organizational socialization

The results of the current study state newly hired engineers' specific actions and processes in socialization and reveal newly hired engineers' approaches to accomplish proactive behaviors. For example, offering to help others and considering coworkers' personal attributes are two approaches newly hired engineers take to build good relationships with coworkers. Interacting with coworkers is the approach to seek information and feedback from others (i.e., *Information Seeking* and *Feedback Seeking*). Attending meetings, attending classes, and attending social gatherings implies that the newly hired engineers prefer to know more people and socialize with others (i.e., *General Socializing*, *Relationship Building*, and *Networking*) by participating in different social opportunities. Having good work ethics, such as doing high-quality work and finishing tasks on time, is how they initiate self-improvement at work (i.e., *Positive Framing*). Moreover, by shadowing or observing coworkers, newly hired engineers see their coworkers, especially the ones who had experience in similar positions, as models, so they can learn from them (i.e., *Role Modeling*). Generally, these examples demonstrate that the results are relevant and in alignment with the proactive

behaviors identified in the previous studies, and show what newly hired engineers exactly do when they try to take the initiatives in the socialization process.

5.2 Actions taken across multiple domains of organizational socialization

The four domains (i.e., Role Clarity, Task Mastery, Acculturation, Social Integration) of organizational socialization [8] clearly define the function of each identified proactive action. The results of this study show that the thirteen identified proactive actions function in multiple domains. For instance, "interact with coworkers" as a proactive action is found in all four domains, which reveals that interaction at the workplace plays an important role in socialization. Moreover, the shadowing or observing coworkers' action is found in the domains of Role Clarity, Task Mastery, and Acculturation, which implies that newly hired engineers may see it as a useful approach for achieving success in these three domains of socialization. Furthermore, the results reveal that newly hired engineers would take certain actions in both Role Clarity and Task Mastery, such as attending meetings, utilizing resources, and undertaking practical tasks. Newly hired engineers are also likely to consider coworkers' personal attributes, attend social gatherings, and have self-assurance for both Acculturation and Social Integration. These actions identified in multiple domains imply that newly hired engineers sometimes prefer to use the same approaches to pursue different socialization goals.

5.3 The four categories of the proactive actions

Based on the definitions of the identified proactive actions, we categorize them into four categories, showing how the sets of actions contribute to newly hired engineers' socialization process across multiple domains. As Table 3 shows, the actions in Relationship Developing are equally taken in the four domains, indicating the importance of this set of actions in the whole socialization process. Not surprisingly, Knowledge Acquiring and Real Task Training's actions mostly assist newly hired engineers in the Role Clarity and Task Mastery domains. Moreover, actions in Positive Attitude Cultivating help newly hired engineers in Task Mastery, Acculturation, and Social Integration, but contribute more to Social Integration than the other two domains. The four categories provide a higher-level understanding of newly hired engineers' socialization process.

5.4 Features of the actions in the context of A&D organizations

When comparing the results to the proactive behaviors in previous studies, it is evident that some aspects are common between newly hired engineers and new employees in other disciplines. The study results indicate that newly hired engineers and other new employees prefer to build good social relationships with others in the same working environment, participate in social activities, be positive at work, learn from others, ask questions, and proactively look for useful information learning from it.

However, some unique features of newly hired engineers' actions, especially in the A&D context, can be seen in the current study. For example, the two proactive actions, i.e., offering help to others and considering coworkers' personal attributes, were rarely discussed in the previous studies. Offering to help others is relevant to *Relationship Building* mentioned in previous studies. On top of that, the same action is also identified in the domain of Role Clarity. This indicates that newly hired engineers in the A&D context want not only to be friendly to others but also enhance the understanding of their own roles by helping others. Besides, considering coworkers' personal attributes indicates newly hired engineers' proactivity of seeking social strategies depending on individual differences of their coworkers.

Another example is the attending classes action, which implies newly hired engineers' view on networking. According to the participants' responses, the classes or training programs they attended were offered by their organizations, and the original purpose of designing these classes was to make newly hired engineers master the required skills and knowledge in a short time. This action works simultaneously in the Task Mastery domain and the Social Integration domain, showing that newly hired engineers in A&D organizations utilize these career opportunities to build interpersonal connections with coworkers.

5.5 Implications for engineering education

The study can benefit aerospace engineering education and engineering management, particularly for 1) engineering education researchers; 2) engineering educators in colleges and universities; 3) engineering managers; 4) undergraduate students majoring in engineering programs and who plan to enter an A&D company.

- For engineering researchers, the study provides an example of applying Morrison's [8] framework of the four domains into researching new employees' proactivity in organizational socialization and a set of steps of conducting a qualitative study in identifying specific actions.
- For engineering educators, the study brings out a list of actions newly hired engineers take in the real working environment, which may assist educators in preparing students for job entry and designing training curriculum on campus. For instance, the action "interact with coworkers" is taken by newly hired engineers in all of the four domains for achieving success. Besides, all the actions in the Relationship Developing category contribute to all four domains. This indicates an insight for educators that new engineers may rely on social-related actions more than the other proactive actions. Educators may facilitate students' motivation to interact with others and skills of communication.
- For managers in engineering organizations, the study shows the perspectives of newly hired engineers' on how newly hired engineers complete the socialization process. Managers may use the study to check whether there is consistency or divergence among their expectations of newly hired engineers and newly hired engineers' initiatives. Managers could also conduct similar investigations to facilitate their understanding of newly hired engineers at the particular workplace, such as new engineers' behavioral habits or socialization

experience (e.g., newly hired engineers' challenges in each socialization domain).

- For engineering students, the list of actions can help them prepare themselves before working in the A&D industry. Engineering students may check what actions or sets of actions could help them in particular domains of socialization and determine the actions they may take in the future in organizational socialization. For example, they may notice attending classes brings opportunities for networking in the organization and find out paying more attention to the actions in Knowledge Acquiring and Real Task Training help them better clarify their roles and master necessary skills and knowledge.

5.6 Limitations and future studies

In the study, we did not investigate the effectiveness of the identified proactive actions, so we are not claiming these actions will lead newly hired engineers to success. This is because the study aims at exploring the actions rather than assessing the effectiveness. Future studies can extend the current research and examine the association between the actions and successful socialization outcomes. Another limitation is the small sample size. In total, we selected ten participants out of twenty-six as they offered the most information among all the participants. Further studies could involve a larger number of participants and compare similarities and differences between the group's actions.

6. Conclusion

This study identified thirteen proactive actions taken by the newly hired engineers in the organizational socialization process. The actions were identified according to the four socialization domains: Role Clarity, Task Mastery, Acculturation, and Social Integration. Relationship Developing, Knowledge Acquiring, Real Task Training, and Positive Attitude Cultivating are the four categories into which the proactive actions were classified. The study results expand the literature on indicating the specific processes new employees proactively take in socialization within the context of A&D organizations and listing four categories for understanding how the actions simultaneously work in multiple domains. The findings can benefit engineering education researchers, aerospace engineering educators, managers who work with newly hired engineers in the A&D industry, and engineering students who will enter an A&D organization.

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