



Similarities and differences between the actions of newly-hired engineers and engineering managers during the organizational socialization period

Yun Dong (Ms)

Yun is a Ph.D. in Human Computer Interaction. She graduated from Iowa State University. Her research interests include newly-hired engineers' practices and experience in the socialization process and engineering education.

Subhanwit Roy

Mackenzie Ann Reber (Miss)

I am a recent graduate from Grove City College (May 2022). I graduated with a B.S. in Mechanical Engineering and a minor in Chemical Engineering. I will be working as an applications engineer for ThermalTech in Pittsburgh, PA in August. My current research interests revolve around engineering education and employee proactive actions.

Similarities and Differences Between the Actions of Newly-hired Engineers and Engineering Managers during the Organizational Socialization Period

Abstract

Organizational socialization is the process of newly-hired employees adapting to the new working environment and roles in organizations. New hires and managers are the two critical members of the socialization process. Limited literature has revealed the managers' perspective. Moreover, the comparison between the socialization actions of newly-hired employees and engineering managers has not been fully explored.

Based on the proactive actions and the supportive actions identified from twenty-six newly-hired engineers and seven engineering managers, this study compares the two perspectives by following Morrison's framework of primary socialization tasks (i.e., Role Clarification, Task Mastery, Acculturation, and Social Integration). Similarities and differences between newcomers' and managers' actions during the socialization process are revealed, specifically in the context of the U.S. aerospace and defense (A&D) industry.

This study expands the research literature to reveal both perspectives of newly-hired engineers and engineering managers. This study aims to help newly-hired engineers and engineering managers reduce misunderstanding during the socialization process and inform engineering educators and college students to prepare to enter the A&D industry.

Keywords: organizational socialization, engineering management, engineering education, newcomer-manager communication

1. Introduction

The process of newly-hired employees learning the necessary behaviors and attitudes for achieving a new role and adapting to the new working environment in an organization is defined as organizational socialization [1-4]. In the organizational socialization process, newly-hired engineers, also known as newcomers, would proactively take motivated behaviors and activities during the socialization process to achieve positive socialization results, such as better adapting to the working environment and improving job performance [5-8]. Their managers, especially the immediate supervisors, play an essential role due to the support and help through managers' supportive actions in the organizational socialization process [9-11]. However, divergent opinions exist between newly-hired employees and their managers in the socialization process [9]. Previous studies have shown that employees' proactivity sometimes is not expected by their managers in the workplace [12-14], and managers' support does not always meet newly-hired employees' needs [15]. In order to narrow the gaps, both newly-hired employees' and managers' thoughts and opinions should be examined and compared to reduce misunderstandings and inconsistencies to assist new employees in adjusting to the new work environment.

Thus, it is necessary to identify the similarities and differences between newly-hired engineers and their managers. Our previous work explored managers' supportive actions and proactive actions of newly-hired engineers in the U.S. Aerospace and Defense (A&D) industry [16, 17]. This study aims to compare the proactive actions and supportive actions taken by the two roles in the A&D industry, and indicates the consistency between newly-hired engineers and engineering managers in organizational socialization and the divergent opinions from their socialization experience.

Comparing the actions of the two roles can benefit engineering education and engineering management in the A&D discipline as it reveals the similarities and differences from two different perspectives (i.e., newly-hired engineers and engineering managers). Moreover, the study may help engineering educators develop their career preparation strategies for college students and inform senior college students who plan to work in the A&D industry of the possible inconsistent opinions between their managers and themselves in the future workplace.

2. Literature Review

The prior research and literature have revealed some consistency and divergence between newly-hired employees and managers in the socialization process. However, some gaps still need further study.

2.1 Previous Studies about Managers' Support and Newcomers' Actions

Previous studies have examined the behaviors of newly-hired employees and managers in organizational socialization. In recent years, as the research area of organizational socialization pays significant attention to newly-hired employees' proactivity in the socialization process, the proactive behaviors or actions taken by individual employees have been explored by previous studies (e.g., [6], [7], [18], [19]). For example, there are seven proactive behaviors identified by Ashford and Black [6], and have been commonly applied in organizational socialization studies (e.g., [4], [8], [20]): *Information Seeking*, *Feedback Seeking*, *General Socializing*, *Networking*, *Relationship Building*, *Job Change Negotiation*, and *Positive Framing*. In the meanwhile, as another essential role of organizational socialization, managers' support to newly-hired employees has been discovered too, such as *Providing Information* [10], *Providing the Sense of Choice* [21], *Taking Hands-off Approach* [9], [11], and *Evaluating Newly-hired Employees* [10], [22].

Based on the research of behaviors and actions in organizational socialization focused on the two perspectives, previous studies examined the relationship between managers' support and newly-hired employee's socialization outcomes, primarily on how the supportive actions affect the new employee's proactivity in the socialization period. This category of studies reflects that consistency or divergence between newly-hired employees' and managers' opinions affect newly-hired employees' workplace adjustment. For instance, in their study, Ellis and other authors stated that proactive actions taken by newly-hired employees could be perceived by their managers, which are associated with managers' concordant supportive behaviors [10]. One example is that, by perceiving newly-hired engineers' proactive behavior of *Information Seeking* in task-related and social-related activities, managers support their adjustment by providing the relevant information they need. Such a relationship between newly-hired employees' proactivity and managers' concordant support contributes to a better adjustment of newly-hired employees' socialization. On the contrary, when managers have different thoughts or behave differently to newly-hired employees' expectations (e.g., breaking the promises they have made to their employees), the divergence negatively impacts the organizational socialization outcomes, such as job satisfaction and turnover rate [23].

Moreover, Rubenstein et al. stated that managers, who work as newcomers' immediate supervisors, should inquire about newcomers' needs and determine the amount and the type of support they will provide. In contrast, newly-hired employees do not always see managers' support as helpful [15]. Thus, the consistency between the two roles will contribute to newly-hired employees' socialization. In contrast, the divergence may lead to unexpected socialization outcomes. Therefore, it is significant to reveal the consistency and divergence between newly-hired employees' proactivity and managers' support in organizational socialization.

A few studies have compared the opinions of the two roles to identify such consistency and divergence. For example, Korte et al. compared the views of organizational socialization from the newly-hired employees and their managers in the engineering field [9]. The study

revealed similar and different thoughts between newly-hired employees and managers. For the similarity, newly-hired employees want their managers to provide formal onboarding training. Still, managers hope new employees learn from practice. For the difference, newly-hired employees wish to direct and meaningful guidance. And, some managers intentionally provide little advice for encouraging the newly-hired employees to conduct self-exploration. According to the study, such unexpected divergence exists between newly-hired employees and managers, negatively impacting the socialization outcomes, such as employees' learning and job performance.

In summary, the above studies revealed the consistency and divergence exist between newly-hired employees' proactivity and managers' support. The consistency contributes to the newly-hired employees' workplace adjustment, and the divergence may lead to unsatisfied socialization outcomes. Therefore, identifying the similarities and differences between newly-hired employees' and managers' opinions is meaningful for helping newly-hired employees to adapt to the new working environment, which will improve the consistency between the new employees and their managers.

2.2 Gaps in the Literature Review

There still exist some gaps in the existing literature. First, limited studies have directly compared the different perspectives between newly-hired employees and managers on organizational socialization. Only a few previous studies compared the two perspectives (e.g., [9]). Researching the two perspectives can help build a deeper understanding of newly-hired employees and managers' consistent and divergent opinions, and help figure out how to balance the two roles to achieve the agreement. Additionally, the themes of the similarities and differences should be classified either. Managers and newly-hired employees may have similar ideas on some themes and different opinions on other themes of socialization. Specific cases of similarities and differences should be included.

Second, although previous studies have identified newly-hired employees' proactive actions and managers' supportive actions, the studies mainly focused on how managers' support affects and mediate newly-hired employees' workplace adjustment or socialization outcomes (e.g., [10], [22]). The consistency and divergence between the actions of the two roles have not been fully discussed. For example, as the studies stated, managers would provide information to newly-hired employees. However, whether the information meets the newly-hired employees' needs is not fully discovered. According to Rubenstein et al., managers' supportive actions do not always meet newly-hired employees' needs in the socialization process [15]. It is necessary to determine how managers' supportive actions match newly-hired employees' proactive actions.

Third, most of the prior studies mainly focused on a general context (e.g., [4], [8], [24], [25]), and only limited studies focused on a specific context, e.g., on the context of engineering organizations. Even though a few previous studies focused on newly-hired engineers' proactivity and managers' support in socialization (e.g., [9], [26]), the research comparing

their actions taken in the context of engineering organizations is not sufficient. Engineering disciplines have their specific professional values and norms [27]. For example, the A&D industry prefers to hire students with hands-on and lab experience from universities and internships [28]. Moreover, the A&D industry employs engineering graduates from multiple engineering majors. It offers a wide variety of positions due to the growth of jobs, insufficient graduates of aerospace engineering programs, and the changes in the supply chain [28-30]. The A&D industry recruits electrical, mechanical, manufacturing, and computer-related engineers, even more than recruiting graduates with explicit aerospace engineering degrees [30]. Therefore, organizations in the A&D industry reflect the features that many organizations may have across different engineering disciplines.

Thus, the similarities and differences between proactive actions taken by newly-hired engineers and engineering managers' supportive actions need to be explored to improve the engineering field's socialization process and improve career preparation in the engineering programs of universities and colleges.

3. Methodology

3.1 Data Collection

The study aims to detailly interpret the patterns of comparison in the specific context of the A&D industry within the U.S. Qualitative research methods are applied to focus on a particular context and identify patterns with sufficient descriptions [31]. Since the study does not consider the effect of the individual factors as variables of the participants (e.g., gender, age, working experience, position, etc.), quantitative methods were not involved. The study adopts semi-structured interviews to collect data due to observing and interacting with participants [32, 33]. The interview protocol was designed by following Morrison's four domains of new employees' primary tasks in the organizational socialization [7], including Role Clarity, Task Mastery, Acculturation, and Social Integration. The interview questions inquire about the specific actions or processes that helped the newly-hired engineers in each domain and the managers' supportive actions to help newcomers.

In total, twenty-six newly-hired engineers were invited as participants. Each participant has achieved an undergraduate engineering degree and has worked in an aerospace engineering organization for less than two years since graduation. There are seven engineering managers involved in the study too. These managers had the experience of dealing with the newcomer onboarding process. All the participants were recruited from four of the largest A&D organizations in the U.S. The size of the organizations varied from twenty to over one hundred and fifty thousand employees worldwide.

3.2 Data Analysis

The open coding process proposed by Cobin & Strauss [34] is applied as the data analysis method. To analyze the data from the manager participants, the research team coded the conceptual idea close to the research question mentioned by the participants and discussed all the results together to achieve the team agreement [35]. To analyze the newcomer participants' data, the research team first identified ten interviews of newly-hired engineers with the most detailed and descriptive information. It then also achieved the team agreement on the coding results. These results from newcomers were utilized to establish a basic codebook.

Furthermore, the research team tested the inter-rater reliability of the basic codebook on the other three selected interview transcripts. Krippendorff mentioned that coders could select parts of the full transcript to assess IRR, demonstrating that coders need to choose the codes closely relevant to the research question and appear in the text with a reasonable frequency [36]. Therefore, the coders coded the participants' responses only to the questions asking how new engineers took action in the four domains instead of coding the complete text.

Cohen's Kappa has been widely used in qualitative research for testing the agreement index among researchers' differences. The research team calculated Cohen's Kappa value as the method to measure the reliability of the codebook. Cohen's Kappa considers the agreement by chance in the measurement of agreement level between two researchers [37, 38]. It allows researchers to find the consistency of classifying the responses into multiple domains [39] and evaluate the patterns of the answers by comparing coding results under the already-established code scheme [40]. By following Cohen's Kappa calculation, two coders of the research team independently and separately coded the three selected transcripts [40]. The research team computed the kappa value by SPSS to calculate the numbers of codes seen by both coders and only seen by Coder A or Coder B. Also, the codes in the codebook did not occur in any of the three transcripts involved in the calculation. These codes were seen as not applied by both coders [39, 40]. Table 1 below shows the kappa value of coding each transcript:

Table 1. Results of Calculating Cohen's Kappa

Participant	Total number of codes	Codes applied by both coders	Codes not applied by both coders	Codes only applied by Coder A	Codes only applied by Coder B	κ value
P1	51	11	36	1	3	0.79
P2	52	11	38	1	2	0.84
P2	51	11	36	2	2	0.79

The kappa value of using the codebook to code the three selected transcripts was 0.79 for Participant 1, 0.84 for Participant 2, and 0.79 for Participant 3, so the average kappa value was 0.81, which indicated the codebook to be “strong” for one coder to do independent coding process [39, 40]. As Table 1 shows, there are more codes not applied by both coders than the codes applied by both coders. This is because some codes refer to the unique information provided by some participants, which may not be applied to others’ cases. Since the codebook analyzes all participants’ responses, the research team decided to involve all the codes in the IRR assessment.

The satisfying Cohen’s Kappa value allows one coder to code the grounded data from all the newcomer participants. When seeing new information from the other sixteen participants, which was not included in the first ten interview transcripts, the coder can make a new code. The research team determined the coding scheme, including the code name, definition, and context. Then the new code with the code scheme was updated to the codebook. This iterative process was repeated while the coder coded all the remaining sixteen transcripts. In this way, the study results cover the information from all the participants.

The coding results indicate the supportive actions from managers and the proactive actions from newcomers. Similarities and differences can be identified by comparing the code schemes from the results. The followings are the criteria for determining the similarities and differences:

1) **Similarity exists when a supportive action directly supports a proactive action. Or, it does not directly support a proactive action, however, has the same goals and takes the same or similar approaches as the proactive action.** For instance, in Social Integration, newly-hired engineers maintain a good work ethic to show they are reliable to coworkers. In this way, they acquire respect and develop a good social relationships with their coworkers through the working process. Managers, in Social Integration, would allow newcomers to naturally develop the relationship with coworkers during the work process, without interference from the managers. The goal of the proactive action (i.e., Having Good Work Ethics) and the supportive action (i.e., Allow Natural Integration) is the same, indicating newcomers should gradually improve their social relationships with coworkers by working with them.

2) **Difference exists when a supportive action and a proactive action have the same goal but different approaches.** For example, in Social Integration, managers would allow newcomers to naturally develop relationships with coworkers during the work process, without interference from the managers. However, newly-hired engineers would ask people to introduce new coworkers and organizational events (i.e., Utilize Network Connection). Their goal is to let newcomers develop social relationships, but the managers want the newcomers to initiate social activities. However, the newcomers’ need is to be introduced to the existing network by others, including their managers.

3) **Difference exists when a proactive action is not supported by any supportive actions.** For instance, in Role Clarity, newly-hired engineers would enhance their understanding of the new positions by independently completing the work tasks (i.e., Undertaking Practical Tasks and Attempt Task Independently). In contrast, managers focus more on communication and introducing coworkers to the newcomers rather than assigning tasks in Role Clarity.

4) **Difference exists when a supportive action does not affect any proactive actions.** In Social Integration, managers would check newcomers' behaviors to prevent them behave inappropriately (i.e., Review New Engineers' Behaviors). This action does not support or affect any newcomers' action in Social Integration.

4. Results

In our previous work, nine supportive actions are identified from seven engineering managers in the A&D industry [16], and thirteen proactive actions taken by newcomers are identified from twenty-six participants [17], which we expanded into seventeen in the current study. The definitions of supportive and proactive actions are listed in Table 2 below. Based on the criteria demonstrated in 4.3 Methodology, similarities and differences in Role Clarity (RC), Task Mastery (TM), Acculturation (AC), and Social Integration (SI), are pointed out in the following sections.

Table 2. The overview of identified proactive actions and supportive actions

Proactive Actions of Newly-hired Engineers		
Domain	Proactive Action	Definition
All	Interact with Coworkers	Newcomers mutually communicate, ask questions, or are directly involved with coworkers.
All	Shadow/Observe Coworkers	Newcomers shadow others and observe them during their work or their coworkers' behaviors and interpersonal relationships and interactions in the organization.
All	Attend Meetings	Newcomers attend meetings held by the workgroup or the organization.
All	Attend Classes	The newcomer attended classes or training programs offered by the organization.
RC, TM, AC	Utilize Resources	Newcomers utilize technical or nontechnical pre-prepared resources, such as textbooks, guidebooks, tutorials, documentation, and manuals.
RC, TM, AC	Create Resources	Newcomers create or update organizational resources when they find current resources inadequate.
RC, TM	Undertake Practical Tasks	Newcomers participate in practical work or projects.
RC, SI	Offer to Help Others	Newcomers seek opportunities to help and/or emotionally or technically support their coworkers and offer to help.
RC	Attempt Task Independently	Newcomers try to solve their work problems or assignments on their own.
RC	Suggest Team Modification	Newcomers suggest establishing a new team or modifying the existing team.
TM, SI	Have Good Work Ethics	Newcomers try to be professional, respect coworkers, work hard, do high-quality work, and finish tasks on time.
TM	Self-Study	Newcomers learn skills and knowledge independently, without assistance or guidance from coworkers.
TM	Spend Extra Time/Efforts	Newcomers put in extra time and effort after work to learn the required skills and knowledge.
AC, SI	Consider Coworkers' Personal Attributes	Newcomers consciously consider their coworkers' interests, habits, and personalities, the relationship between themselves and their coworkers, and how to interact with them.
AC, SI	Attend Social Gatherings	Newcomers attend social gatherings to get to know and bond with coworkers.

AC, SI	Have Self-assurance	Newcomers remind themselves that their opinions are valuable, they belong at their position in the workgroup, and they are confident their abilities are sufficient for their job.
SI	Utilize Network Connections	Newcomers utilize their network connections to socially integrate with their work group or organization.
Supportive Actions of Engineering Managers		
Domain	Supportive Action	Definition
RC, AC	Communicate Regularly with New Engineers	Managers regularly communicate with new engineers to discuss their job responsibilities and expectations and set annual goals.
RC	Facilitate Coworker Interaction	Managers facilitate interactions between engineers who have had the same or similar positions or responsibilities as new engineers, and encourage interactions between them. New engineers can observe and learn how experienced engineers perform their roles and complete tasks.
TM, AC	Provide Learning Materials/ Opportunities	Managers provide new engineers with learning materials and opportunities to help them become proficient at the technical skills and knowledge required to perform their job responsibilities.
TM, AC	Assign Mentors	Managers assign mentors who assist new engineers with their work-related tasks, showing them how to acquire skills and knowledge and overcome work-related challenges.
TM	Assign Appropriate Tasks	Managers assign tasks to new engineers with a particular difficulty level to develop new skills.
TM	Encourage Workgroup Collaboration	Managers encourage new engineers and their workgroup members to collaborate to enhance their skills, such as programming, analytical, and professional skills.
SI	Allow Natural Integration	Managers allow the natural building of relationships between new engineers and members of their workgroups.
SI	Review New Engineers' Behaviors	Managers pay attention to the new engineers' actions and determine which actions prevent them from socializing with their colleagues.
SI	Encourage Social Events	Managers encourage new engineers to participate in social events or team bonding activities.

As Table 2 presents, some actions are identified in a single domain, and some are identified across multiple domains. In the following sections, the above actions are compared in each domain.

4.1 Role Clarity

There are ten newcomers' proactive actions and three managers' supportive actions stated in Role Clarity. By comparing the action definitions and the interview data from the participants, Table 3 below indicates three newcomers' proactive actions showing similarities between newly-hired engineers' and managers' opinions. However, six newcomers' proactive actions do not have concordance supportive actions from managers.

Table 3. Comparing newcomer's and managers' actions in Role Clarity

Actions with Similarities			
Newcomers' proactive actions	Managers' supportive actions	Identified common or similar opinions	Identifying criteria
Interact with Coworkers	Communicate Regularly with New Engineers	Newcomers like to interact with coworkers directly. Managers offer opportunities for interaction.	1)
	Facilitate Coworker Interaction		1)
Utilize Resources	Communicate Regularly with New Engineers	Newcomers like to seek useful resources and ask others to recommend resources through interacting with the manager and experienced coworkers.	1)
	Facilitate Coworker Interaction		1)
Shadow/Observe Coworkers	Facilitate Coworker Interaction	Newcomers understand the roles and responsibilities by observing experienced coworkers introduced by managers.	1)
Actions with Differences			
Newcomers'	Managers'	Identified different or divergent	Identifying

proactive actions	supportive actions	opinions	criteria
Undertake Practical Tasks	(None)	(None)	3)
Attempt Task Independently	(None)	(None)	3)
Offer to Help Others	(None)	(None)	3)
Attend Meetings	(None)	(None)	3)
Attend Classes	(None)	(None)	3)
Suggest Team Modification	(None)	(None)	3)
Create Resources	(None)	(None)	3)

From Table 3, we can see that newcomers like to learn and understand their roles and responsibilities through interacting with others, including managers and coworkers. To help newcomers clarify their roles as soon as possible, managers will set up regular one-on-one conversations with newcomers and introduce newcomers to interact with coworkers, especially those who worked in the same positions or had similar working experiences. The two supportive actions reflect how an engineering manager would provide opportunities for the supervised newly-hired engineers to enhance their understanding of the new job. The following quotes from some representative participants below highlight the complementary nature of the proactive and supportive actions. The “NC” below represents newcomers, and the “MN” represents managers.

“It’s pretty clear on who my workgroup was, who my coworkers were. It’s a pretty small team, so I made sure to directly interact with them, spend time with them and ask questions...” (NC)

“For the first three-month period, I think frequent one-on-one’s are important. Checking on people is critical. That gives you the opportunity to hear what their interests are and how they’re going.” (MN)

“And then the third is to introduce them to others that are already fulfilling those expectations, meaning maybe some more veteran engineers around this individual that are fulfilling those roles.” (MN)

Through the interaction, newcomers also ask others to recommend useful materials or documents to utilize for clarifying their roles. More than just facilitating newcomers’ interaction, the supportive actions also give newcomers opportunities to seek valuable resources.

“...when you have the buddy, you just ask, when does this get done? Where does this get done, and they just give you the answer on the spot...Some questions about the process, where files are kept, where memos are kept, where documentation is kept...And then you just go there and ask it, or they just point you to the documentation, and you can just go read it.” (NC)

Shadowing or observing coworkers in the work process is another newcomers’ proactive action to clarify their roles. As mentioned before, managers like to introduce newcomers to experienced coworkers who already meet organizational expectations. Newcomers can watch how these experienced coworkers complete their tasks and understand what they need to do in the same positions.

“I settled my team lead a lot since he spent 30 years in that same role and of course, he had provided me with the back history of what this job entailed...” (NC)

From the quotes from participants, we can conclude the following points. First of all, besides the proactive actions with clear manager support, some actions only taken by newcomers' proactivity without managers' lead or guidance. Newcomers in A&D organizations like to familiarize themselves with their roles and responsibilities through doing practical tasks, and sometimes they attempt to complete the task on their own. Secondly, helping others in the work process is also seen as a way of learning the roles and responsibilities. Newcomers also try to better understand their roles by proactively attending meetings and taking classes or training programs, even though managers may not assign attending these occasions as tasks to them. When newcomers get a deeper understanding of the management or the current workgroup, suggestions for changing the team or even establishing a new team could be mentioned. Thirdly, newcomers can find some organizational documents are inadequate, and they try to update the records or create new ones as needed. These proactive actions reflect the differences between what newcomers and managers pay attention to in Role Clarity. And the proactive actions, although without managers' recognition to some extent, help newly-hired engineers to facilitate their understanding of the new positions based on their proactivity.

4.2 Task Mastery

Task Mastery in organizational socialization refers to how newcomers learn the skills and knowledge required by their job performance. Table 4 below shows that, in Task Mastery, there are more complementary newcomers' proactive actions and managers' supportive actions than in Role Clarity.

Table 4. Comparing newcomer's and managers' actions in Task Mastery

Actions with Similarities			
Newcomers' proactive actions	Managers' supportive actions	Identified common or similar opinions	Identifying criteria
Interact with Coworkers	Encourage Workgroup Collaboration	Newcomers prefer to interact directly with coworkers. Managers offer opportunities to interact and introduce coworkers to newcomers.	1)
	Assign Mentor		1)
Shadow/Observe Coworkers	Encourage Workgroup Collaboration	Newcomers learn skills and knowledge by observing experienced coworkers introduced or directly assigned to work with newcomers by managers.	1)
	Assign Mentor		1)
Utilize Resources	Provide Learning Materials/ Opportunities	Newcomers seek useful resources. Some resources are provided or recommended by managers.	1)
Self-Study	Provide Learning Materials/ Opportunities	Newcomers conduct self-study by using useful resources. Some resources are provided or recommended by managers.	1)
Attend Classes	Provide Learning Materials/ Opportunities	Newcomers prefer to attend classes or training programs. Some classes are provided or recommended by managers.	1)
Undertake Practical Tasks	Assign Appropriate Tasks	Newcomers learn skills and knowledge by completing tasks. Managers assign newcomers tasks with the appropriate amount and difficulty level.	1)

Actions with Differences			
Newcomers' proactive actions	Managers' supportive actions	Identified different or divergent opinions	Identifying criteria
Attend Meetings	(None)	(None)	3)
Create Resources	(None)	(None)	3)
Spend Extra Time/Efforts	(None)	(None)	3)
Have Good Work Ethics	(None)	(None)	3)

From the interviews, it is clear that the two proactive actions of Interact with Coworkers and Shadow or Observe Coworkers are supported by managers. Managers encourage newcomers to get involved in workgroup collaboration and assign mentors to newcomers. These two supportive actions by managers provide more opportunities for newcomers to spend time with coworkers, which makes interacting with coworkers and observing how coworkers apply necessary skills and knowledge in the real working environment.

“...the senior engineer that sits right next to me... he’s extremely proficient in it, and he’s been able to help me and guide me when I’m unable to do some of the things that I know I want to do, but I can’t figure out how to do it.” (NC)

“I actually spent time just shadowing an industrial engineer on my team, who is considered an expert in all of that. I spent time gathering all of these questions I had on these different things I needed to learn and just sat at her desk for an afternoon...” (NC)

“... it’s making sure that the team knows you’re getting a new hire...while also instilling an expectation across the group that we need to help this person get up to speed as quickly as possible.” (MN)

“And then also just setting them up with the right mentor...usually they’re working with the senior engineer who’s kind of going through them with them in parallel through this process and just kind of as a checkpoint for them, helping to explain this is what we do, this is kind of why, this is why we do it.” (MN)

For helping newcomers master the skills and knowledge required by job performance, managers provide learning materials, such as organizational documents, or encourage to attend classes. Provide Learning Materials or Opportunities, as a manager action, supports newcomers to find useful learning resources and study the resources on their own. Managers also recommend newcomers take appropriate classes or training programs to benefit their learning in Task Mastery.

“...or talk to your manager to find out if there are any training classes they can get into.” (MN)

“We might have a two-week program on doing computer-aided drafting. If that skill is an expectation of mine, I’d want to make sure if they don’t have it that I get them into that two-week program.” (MN)

“...ensuring that we have documentation in place that they can reference if they’re specifically doing some kind of analysis, or doing some kind of coding, that there is documentation in place that they can reference in order to support them.” (MN)

Similar with Role Clarity, newly-hired engineers prefer to learn from practice in Task Mastery. Unlike in Role Clarity, managers prefer to have newcomers learn from practice, and they like to assign practical tasks with appropriate amount and difficulty level to newcomers,

so the tasks are challenging to newcomers to some extent. Managers want to train the newcomers through the process and figure out the challenges.

“And then, finally, have I assigned that individual computer-aided drafting statement of work so they can learn from that experience?” (MN)

“Challenge them. Give them assignments that bring out the task of presenting their work to others outside. Basically, beat up on their comfort level a bit.” (MN)

Although we see more commons in Task Mastery than in Role Clarity, there still exist newcomers’ proactive actions not supported by managers. Newcomers describe attending team meetings as an opportunity they could help coworkers to do technical projects and enhance their experience skills, but managers’ supportive actions, such as organizing more meetings involving more teamwork, are not found in manager participants’ answers. A similar situation can be seen in creating resources. Another proactive action reflects that some learning materials offered by the organization are not updated. The current study did not discovered how managers deal with outdated materials. The other two proactive actions, spending extra time or effort on learning and having good work ethics, are grown from newcomers’ self-proactivity. Thus, the two proactive actions do not connect with any managers’ supportive actions.

4.3 Acculturation

Actions in Acculturation indicate how newcomers adapt to the organizational culture and how managers assist them. Table 5 below displays the similarities and differences between newcomers’ proactive actions and managers’ supportive actions in Acculturation.

Table 5. Comparing newcomers’ and managers’ actions in Acculturation

Actions with Similarities			
Newcomers’ proactive actions	Managers’ supportive actions	Identified common or similar opinions	Identifying criteria
Interact with Coworkers	Communicate Regularly with New Engineers	Newcomers learn the organizational culture directly from managers or the mentor assigned by managers.	1)
	Assign Mentor		1)
Shadow/Observe Coworkers	Assign Mentor	Newcomers learn the organizational culture through observing the experienced coworkers, who are introduced directly or assigned by managers.	1)
Attend Meetings	Provide Learning Materials/ Opportunities	Newcomers attend meetings held by the workgroup or the organization. Managers organize some of the meetings and ask newcomers to attend.	1)
Attend Social Gatherings	Provide Learning Materials/ Opportunities	Newcomers like to seek social gatherings to learn about the organizational culture. Managers organize some social gatherings to support newcomers.	1)
Actions with Differences			
Newcomers’ proactive actions	Managers’ supportive actions	Identified different or divergent opinions	Identifying criteria
Utilize Resources	Provide Learning Materials/ Opportunities	Newcomers prefer to seek useful resources to learn the organizational culture. However, managers provide limited materials, such as a poster.	2)
Attend Classes	Provide Learning Materials/ Opportunities	Newcomers like to seek useful classes to learn the organizational culture. However, managers do not provide or indicate culture-relevant classes.	3)
Create Resources	(None)	(None)	3)

Consider Coworkers' Personal Attributes	(None)	(None)	3)
Have Self-Assurance	(None)	(None)	3)

To support newcomers learn the organizational culture, managers would set regular conversations with them and check the level of their cultural recognition. Managers also assign senior coworkers as mentors to newcomers, so newcomers can have a “model” to watch, learn, and directly inquire from the mentors.

“As far as taking steps to try to improve the culture, just trying to talk with everybody in a friendly and happy manner.” (NC)

“You see how people handle certain situations that, after they handled it a certain way, and you’re kind of watching.” (NC)

“I mean, one way you could ask somebody to learn it is having them come back to me in two weeks and tell me what it is.” (MN)

“I need to assign someone who is more outgoing and more willing to be a teacher, so that you can partner them with that new engineer to help them kind of learn the culture of the group.” (MN)

Meetings and social gatherings held by the organization or workgroup are other ways of learning the culture for newcomers. In alignment with newcomers’ opinions, managers like to ask newcomers to attend the meetings and organize some social events. They see these as good opportunities to get newcomers immersed in the culture.

“We also have team meetings with our manager, and the kind of walks us through if there’s a change in culture or if we’re trying to change the culture or just kind of getting an understanding of how the team feels. We have open discussion meetings.” (NC)

“I guess specific examples were my manager, two people above me organized a beer night with invites about 40 people...” (NC)

“If you have customers in town for meetings, invite your new hires...at least be in the room to hear what the customers are talking about, hear how your more experienced individuals are talking and answering customers’ questions.” (MN)

From the above, we can see that differences identified in Acculturation are related to the limitations of the supportive action: Providing Learning Materials or Opportunities. According to the participants of newly-hired engineers, they like to learn the organizational culture by utilizing appropriate resources, taking organization offered classes, and attending social events held ~~held~~ by the organization. However, even though managers are aware of providing learning materials and opportunities for newcomers to immerse into the organizational culture, some newcomers’ needs are not supported. What newcomers expect may be more than what managers provide.

“It kind of feeds into the same thing as being educated about the whole industry and making sure that I understand some of the cool things that are going on.” (NC)

“It’s on a piece of paper and we hang it on the wall, but it doesn’t say “culture.” It actually talks about the behaviors.” (MN)

The above quotes reflect both managers and newcomers agree on learning the culture from interaction and coworkers, but they have divergent opinions on the number of learning resources and classes. Besides, there are three proactive actions not supported by managers' actions: Creating resources, considering coworkers' personal attributes, and having self-assurance. According to the definitions in Table 3, the three proactive actions, similar to the ones in Task Mastery, are all based on newcomers' own proactivity, so they are initiated by newcomers' proactivity and need to be supported by managers.

4.4 Social Integration

Finally, Table 6 indicates the similarities and differences most relevant to newcomers' and managers' opinions of how newcomers get socially accepted into the working environment.

Table 6. Comparing newcomer's and managers' actions in Social Integration

Actions with Similarities			
Newcomers' proactive actions	Managers' supportive actions	Identified common or similar opinions	Identifying criteria
Attend Social Gatherings	Encourage Social Events	Newcomers like to attend social gatherings to develop networks and get familiar with coworkers. Managers organize some events and encourage newcomers to plan social events by themselves.	1)
Attend Meetings	Allow Natural Integration	Newcomers utilize attending meetings as opportunities to know more people. It naturally develops newcomers' networks.	1)
Attend Classes	Allow Natural Integration	Newcomers utilize attending classes as opportunities to know more people. It naturally develops newcomers' network.	1)
Offer to Help Others	Allow Natural Integration	Newcomers utilize helping others as opportunities to enhance their social relationships with coworkers. It naturally enhances the relationship between newcomers and coworkers.	1)
Have Good Work Ethics	Allow Natural Integration	Newcomers try to acquire respect from coworkers by acting professionally and hard working. It naturally enhances the relationship between newcomers and coworkers.	1)
Actions with Differences and Limited Connections			
Newcomers' proactive actions	Managers' supportive actions	Identified different or divergent opinions	
Utilize Network Connection	Allow Natural Integration	Newcomers like to ask known people to make an introduction to others and social events. However, managers expect natural social integration and would not introduce coworkers for a social reason.	2)
Interact with Coworkers	Allow Natural Integration	Newcomers like to interact with coworkers to develop social relationships. However, managers expect natural social integration.	2)
Shadow/ Observe Coworkers	Allow Natural Integration	Newcomers like to observe how others are socially active in the working environment. However, managers expect natural social integration.	2)
Have Self-Assurance	(None)	(None)	3)
Consider Coworkers' Personal Attributes	(None)	(None)	3)
(None)	Review New Engineers' Behaviors	(None)	4)

The most obvious similarity in Social Integration is identified between Attend Social Gathering and Encourage Social Events. Both newcomers and managers think social gatherings are important opportunities for newcomers to develop their social relationships with coworkers.

“It was just kind of understanding how to converse with people of different ages, different backgrounds, that kind of thing. But then, to jump in and really get to know people, I say going to various events, going to holiday parties and bowling events and volleyball games and happy hours. Happy hours were huge because we really get to know people outside of work, and you get to understand them without that crazy, heavy work setting.” (NC)

“I’d probably encourage my team that they’re inclusive, make sure that ‘If you guys are going out for lunch, it’d be really good if you invite the new hire.’ Or, ‘Hey, if you’re going to go grab a coffee and go look at an airplane, bring them along, let them learn something.’” (MN)

Moreover, managers think newcomers should be naturally integrated into the work environment instead of having managers interfere too much.

“I don’t think there’s anything a manager should do in order to encourage that. I think it should happen naturally more or less. But in general, I would say that the managers shouldn’t really be doing a lot there, they should just try to let it happen naturally for starters as opposed to trying to force anything.” (MN)

“I can obviously have a manager-led lunch or a manager-led coffee hour, but that’s going to be not as organic as the individual working to integrate themselves into the way the group does.” (MN)

As Table 6 presents, there are four proactive actions in alignment with Allow Natural Integration. By taking the four proactive actions, newcomers can facilitate social relationships without seeing socializing with others as the goal. For example, newcomers attend meetings and classes to learn their roles, required skills and knowledge, and the organizational culture. Still, they also utilize the meetings and classes as opportunities to know more people in the organization. In this way, newcomers develop their network and improve their social relationships in the organization.

“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.” (NC)

“I attended or when I started attending a lot of meetings and that’s where I really got to know people. And then when we have people from our other [the organization’s name] sites coming to [the location name], I can be like ‘Hi, I’m [the participant’s name]. I talked to you on the video teleconference just last week. It’s nice to finally meet you in person.’ And then just kind of feel that connection with them.” (NC)

Besides, Offer to Help Others and Have Good Work Ethics are the other two proactive actions that align with Allow Natural Integration. These two proactive actions are both taken by newcomers in other domains but simultaneously help newcomers develop their social

relationships. In Role Clarity, newcomers proactively offer to help coworkers, and try to get a deeper understanding through helping others. By doing so, newcomers show a friendly attitude to others, which facilitates a good relationship with coworkers. In Task Mastery, newcomers try to keep a hardworking and positive learning attitude for mastering skills and knowledge, and maintain high-quality work (i.e., having good work ethics). This action makes newcomers more professional and reliable in coworkers' view, and it is easier for coworkers to trust the newcomer. The two proactive actions develop the relationship between newcomers and other coworkers in the natural development of learning.

“Just trying to get involved in the team as much as possible. And showing them that I can handle the work they're giving me and that they can trust me to learn a new skill and be able to do something else and that sort of thing.” (NC)

“...get my hands dirty, do the work, be proactive, and be running around doing stuff. So we both need each other. We need that balance in the department to succeed. So, it's just a matter of, you know, communicating and letting them know and showing that you are trustworthy and committed to doing your job and that you're willing to.” (NC)

Beyond similarities between the four proactive actions and Allow Natural Integration, differences are identified between Utilize Network Connections and the same supportive action too. Utilizing the newcomers' network connections indicates that, newcomers prefer to ask the people they already know in the organization to introduce social events and other coworkers. However, managers like to take the “hands-off approach” in Social Integration, and let newcomers develop their social acceptance by themselves, instead of introducing newcomers to others or facilitating their interaction.

“I have a good friend that graduated a few years before me and she is actually in the HR department, so she was also able to help me find different [the organization's name] events to get involved with and different volunteer groups as well. So, just more leaning on friends who had been there longer than I have.” (NC)

Furthermore, newcomers' proactive actions identified in Social Integration are not supported by managers' actions. Although newcomers like to enhance their social relationships by interacting with coworkers and observing others on social occasions, managers do not plan to guide them to know more people or socialize with others. So, Interact with Coworkers and Shadow or Observing Coworkers are not supported by supportive actions in Social Integration, reflecting the differences between newcomers and managers. Meanwhile, Have Self-Assurance and Consider Coworkers' Personal Attributes are taken by newcomers based on their proactivity, so they do not need managers' support.

Additionally, reviewing newcomers' behaviors is a managers' supportive action. This action is taken on the manager side. It means to check whether the newcomers' behaviors appropriately in the process of being socially accepted by coworkers and ensure newcomers are not prevented from getting socially accepted by their own behaviors. This supportive action helps newcomers socially integrated in general, instead of supporting certain proactive actions.

“Talk to them if they’re sloppy, or lazy, or they smell, or they can’t keep their hair clean. Just try and help them with the ... probably the things that people do that are evil to each other in.” (MN)

From the above, we can see that both newcomers and managers stated the importance of participating in social gatherings and facilitating social relationships in daily work. However, newcomers still need introductions from others when getting familiar with the new workplace, but managers may not initiate enough support of interaction with the newcomers.

5. Discussion

The above research results show the similarities and differences between proactive and supportive actions. The comparison will help identify the gaps between newly-hired employees and managers during socialization.

5.1 The similarities and differences reflected in the action comparisons

Comparing the actions of newly-hired engineers and engineering managers for new engineers to achieve Role Clarity, Task Mastery, Acculturation, and Social Integration, there are supportive and complementary actions and different actions between these two groups of engineers. In terms of supportive actions, both newly-hired engineers and managers encourage social-related actions in Role Clarity, such as interacting with the managers and coworkers and observing coworkers. Moreover, newcomers may acquire important resources by socializing with others, encouraged by managers. However, managers show little or no support to help newcomers learn and understand their roles from practice (e.g., managers offer opportunities to undertake practical tasks, attempt tasks independently, and learn through assisting others), classes, and meetings. Additionally, managers in the study do not show supportive actions in Undertake Practical Tasks, Attempt Task Independently, Offer to Help Others, Attend Meetings, Attend Classes, Suggest Team Modification, and Create Resources. Such situation indicates that managers may not directly show the encouragement of these proactive actions to newcomers.

In Task Mastery, both newcomers and managers agree with the value of learning the required skills and knowledge to complete their tasks and responsibilities through social-related actions (e.g., interacting with coworkers and observing coworkers). Agreement in the action also exists when newcomers need to learn the skills and knowledge by studying the learning resources, attending classes, and practicing real work projects. However, managers in the study do not direct newcomers to participate in valuable meetings, such as annual organizational meetings or customer meetings. These meetings were stated as helpful by newly-hired engineers. Moreover, the managers may not update organizational documents for learning as much as needed. Newcomers indicate they would initiate these two activities to master the required skills and knowledge. This result identifies differences in the actions required to achieve Task Mastery. In addition, newcomers would proactively spend time after work to learn, and maintain good work ethics in the learning process.

In Acculturation, both newcomers and managers see the value of learning the organizational culture by socializing with others and observing how others react in the workplace. Nonetheless, differences exist between newcomers' and managers' opinions about the learning resources and classes that newcomers need to learn and take to understand the organizational culture. These results show that some newly-hired engineers' needs may not get managers' attention. Moreover, two proactive actions (i.e., Consider Coworkers' Personal Attributes and Have Self-Assurance) initiated by newcomers are not supported by any managers' supportive actions.

In Social Integration, the same view is identified among newcomers' and managers' opinions that social gatherings are helpful for newcomers getting socially accepted. Besides, newcomers agree with managers in developing social integration naturally. Newcomers take proactive actions to benefit them in Social Integration and simultaneously facilitate their organizational socialization in the other three domains. This finding aligns with previous studies that managers sometimes want to take a hands-off approach and provide little support to leave more space for newcomers to achieve successful socialization results through their initiatives (e.g., [9], [11]). However, by allowing newcomers to integrate into the workplace's social environment naturally, managers may not recognize the newcomers' need of being introduced to managers' current network. In Social Integration, managers still keep a "hands-off" approach while newcomers seek opportunities to communicate and observe others. And similar to the above domains, two proactive actions (i.e., Consider Coworkers' Personal Attributes and Have Self-assurance) taken by newcomers are not supported or encouraged by managers.

In general, similarities between newly-hired engineers and engineering managers can be identified in their social-related actions. Most of the newcomers' social-related actions are supported by managers' actions. This finding aligns with the previous research that social-related proactive behaviors offer more help in newcomer socialization (e.g., [8], [10], [19]). Furthermore, according to the social-related actions, newly-hired engineers and managers agree on learning from other insiders within the same organization. Other insiders, especially those who had working experience at the same or similar position that newcomers currently have, are seen as a good "model" to enhance the understanding of the position and learn the job required skills. Having a good "model" also helps newcomers learn and adapt to the organizational culture. The differences between the two groups are also revealed because of newcomers' unrecognized needs (e.g., updating the outdated documents, asking people to introduce to more coworkers and social events, etc.) and managers' insufficient support (e.g., learning materials for adapting to the culture). Newly-hired engineers initiate some proactive actions in all four domains based on their proactivity. These actions might not need the support from managers, though they could help newcomers achieve better socialization outcomes if managers showed encouragement to these proactive actions. This phenomenon means the significance of the managers' supportive actions to the new engineers.

5.2 Implications for engineering education

The results of the study benefit the fields of engineering education and engineering management in the area of the A&D industry, particularly for 1) researchers of engineering education; 2) engineering educators and students in colleges and universities; 3) engineering managers.

The study brings out an insight for engineering educators and students. The results inform them that new engineers may obtain sufficient support from their managers when there is consistency. New engineers may meet with challenges when they have different ideas from their managers about what to do during the socialization process.

In curricula design of the aerospace discipline, educators may need to offer communication skills training to facilitate students' motivation and communication strategies. Such training clarifies new engineers' needs with their managers and understands what managers expect from them. Moreover, since newly-hired engineers sometimes need to utilize learning resources or complete tasks on their own in the socialization process, schools should offer them the training in independent learning. Writing skills are also crucial for engineering students because they need to create some documentation for their adjustment on their own. On the other hand, the study aware engineering students of the similar and different opinions between newcomers and managers in the A&D industry, which can help them avoid misunderstandings between the two roles when they are at the early stage of the job.

For current newcomers and managers in engineering organizations, the study shows the perspectives of newly-hired engineers on how they complete the socialization process. Managers may use the survey to check whether their expectations align with the newly-hired engineers' initiatives and find out what support the new engineers need but were unrecognized before. 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 onboarding training experience (e.g., newly-hired engineers' challenges in each socialization domain). Besides, newcomers who currently work in the A&D industry may use the research results to clarify the support they could receive from their managers. They can also find out the possible reasons when their expected support are still missing in some aspects, such as having someone to introduce the social events held by the organization.

5.3 Limitations and future studies

In the study, we did not evaluate some factors of the participants' attributes, such as gender, working experience, positions, etc. In contrast, participants' characteristics may lead to different actions or behaviors in an organization [41]. Future studies can extend the current research and examine the association between factors of personal attributes (e.g., gender, personalities, job titles, etc.) and the actions. Another limitation is that the participants were recruited from the four largest A&D organizations in the U.S. Future studies could involve participants with more diverse backgrounds and from varied organizations. In this way, the

collection of participants' responses could more widely represent newly-hired engineers in this field.

Moreover, with the current study results, future studies could conduct deeper explorations about the reasons that caused these similarities and differences. For example, do the managers and newcomers see different values in the same action? Why are managers not aware of some newcomers' needs in taking action? Studies to such research questions could help us find more guidance to assist newcomer management in the A&D industry.

6. Conclusion

This study identified the similarities and differences between newcomers' proactive actions and managers' supportive actions in organizational socialization, specifically in the context of A&D organizations. The comparison results are classified into four socialization domains: Role Clarity, Task Mastery, Acculturation, and Social Integration, reflecting the consistency and divergence between newly-hired engineers' and engineering managers' opinions on the socialization process. The study fulfilled the gap of lacking the direct comparison between newcomers' and managers' views on socialization tasks for pursuing satisfactory outcomes, and provided an example of taking both newcomers and managers into account when researching engineering socialization. The study can benefit engineering education researchers, engineering educators, and engineering students for preparing future careers in the A&D industry, as well as helping engineering managers who work with newly-hired engineers during the socialization period.

7. References

- [1] C. D. Fisher, "Organizational socialization: An integrative review," *Research in Personnel and Human Resource Management*, vol. 4, pp. 101-145, 1986.
- [2] J. Van Maanen and E.H. Schein, "Toward a theory of organizational socialization," *Research in Organizational Behavior*, vol. 1, pp. 209-264, 1979.
- [3] J. A. Haueter, T. H. Macan, and J. Winter, "Measurement of newcomer socialization: Construct validation of a multidimensional scale," *Journal of Vocational Behavior*, vol. 63, pp. 20-39, 2003.
- [4] T. N. Bauer, T. Bodner, B. Erdogan, D. M. Truxillo, and J. S. Tucker, "Newcomer adjustment during organizational socialization: A meta-analytic review of antecedents, outcomes, and methods," *Journal of Applied Psychology*, vol. 92, pp. 707-721, 2007.
- [5] S. Nifadkar, A. S. Tsui, and B. E. Ashforth, "The way you make me feel and behave: Supervisor-triggered newcomer affect and approach-avoidance behavior," *Academy of Management Journal*, vol. 55, pp. 1146-1168, 2012.
- [6] E. W. Morrison, "Longitudinal study of the effects of information seeking on newcomer socialization," *Journal of Applied Psychology*, vol. 78, pp. 173-183, 1993.
- [7] S. J. Ashford and J. S. Black, "Proactivity during organizational entry: The role of desire for control," *Journal of Applied Psychology*, vol. 81, pp. 199-214, 1996.
- [8] A. M. Saks, J. A. Gruman, and H. D. Cooper-Thomas, "The neglected role of proactive behavior and outcomes in newcomer socialization," *Journal of Vocational Behavior*, vol. 79, pp. 36-46, 2011.
- [9] R. Korte, S. Brunhaver, and S. Sheppard, "(Mis) interpretations of organizational socialization: The expectations and experiences of newcomers and managers. Human Resource Development Quarterly," *Human Resource Development Quarterly*, vol 26, pp. 185-208, 2015.
- [10] A. M. Ellis, S. S. Nifadkar, T. N. Bauer, and B. Erdogan, "Newcomer adjustment: Examining the role of managers' perception of newcomer proactive behavior during organizational socialization," *Journal of Applied Psychology*, vol. 102, no. 6, pp. 993-1001, 2017.
- [11] L. Harris, H. D. Cooper-Thomas, P. Smith, and R. Smollan, "Reclaiming the social in socialization: A practice-based understanding of newcomer adjustment," *Human Resource Development Quarterly*, vol. 31, pp. 1-19, 2020.
- [12] A. M. Grant, S. Parker, and C. Collins, "Getting credit for proactive behavior: Supervisor reactions depend on what you value and how you feel," *Personnel Psychology*, vol. 62, no. 1, pp. 31-55, 2009.
- [13] W. Lam, X. Huang, and E. Snape, "Feedback-seeking behavior and leader-member exchange: Do supervisor-attributed motives matter?" *Academy of Management Journal*, vol. 50, no. 2, pp. 348-363, 2007.
- [14] S. K. Parker, H. M. Williams, and N. Turner, "Modeling the antecedents of proactive behavior at work," *Journal of Applied Psychology*, vol. 91, no. 3, pp. 636-652, 2006.
- [15] A. L. Rubenstein, J. D. Kammeyer-Mueller, and T. G. Thundiyil, "The comparative effects of supervisor helping motives on newcomer adjustment and socialization outcomes," *Journal of Applied Psychology*, vol. 105, no. 12, pp. 1466-1489, 2020.
- [16] Y. Dong, B. Ahn, and U. J. Tobey, "Exploring engineering managers' perspectives on the actions of engineering managers and newly hired engineers during the new engineers' socialization period," *Engineering. Management. Journal.*, pp. 1-14, 2021.

- [17] Y. Dong, S. Roy, L. D. Baber, and B. Ahn, "Identifying the proactive actions of newly hired engineers during the socialization period," in *2021 ASEE Virtual Annual Conference Content Access*, 2021.
- [18] A. E. Reichers, "An interactionist perspective on newcomer socialization rates," *Academy of Management Review*, vol. 12, pp. 278-287, 1987.
- [19] H. D. Cooper-Thomas, N. Anderson, and M. Cash, "Investigating organizational socialization: a fresh look at newcomer adjustment strategies," *Personnel Review*, vol. 41, pp. 41–55, 2012.
- [20] H. D. Cooper-Thomas, N. L. Paterson, M. J. Stadler, and A. M. Saks, "The relative importance of proactive behaviors and outcomes for predicting newcomer learning, well-being, and work engagement," *Journal of Vocational Behavior*, vol. 84, pp. 318-331, 2014.
- [21] P. P. Baard, E. L. Deci, and R. M. Ryan, "Intrinsic need satisfaction: A motivational basis of performance and Well-being in two work Settings¹," *Journal of Applied Psychology*, vol. 34, no. 10, pp. 2045–2068, 2004.
- [22] L. Dufour, M. Andiappan, and A. Banoun, "Support or evaluate? The multifaceted role of supervisors during the newcomer socialization process," *European. Management. Journal.*, 2021.
- [23] C. Woodrow and D. E. Guest, "Pathways through organizational socialization: A longitudinal qualitative study based on the psychological contract," *Journal of Occupational and Organizational Psychology*, vol. 93, no. 1, pp. 110–133, 2020.
- [24] C. H. Wu and S. K. Parker, "The role of leader support in facilitating proactive work behavior: A perspective from attachment theory," *Journal of Management*, vol. 34, pp. 1025-1049, 2014.
- [25] T. Xian, L. Xiao, G. Zheng, J. Lin, B. Chen, and D. Chen, "The Impacts of Organizational Socialization Strategy and Proactive Behaviors on the Adaption of Newcomers," *4th International Conference on Economics, Management, Law and Education (EMLE 2018), Moscow, Russia, December 25-26th, 2018*, pp. 317-324.
- [26] R. F. Korte, S. Brunhaver, and S. M. Zehr, "The socialization of STEM professionals into STEM careers: A study of newly hired engineers." *Advances in Developing Human Resources*, vol. 21, pp. 92-113, 2019.
- [27] N. R. Kowtha, "Engineering the engineers: Socialization tactics and new engineer adjustment in organizations," *IEEE Transactions on Engineering Management*, vol. 55, no. 1, pp. 67–81, 2008.
- [28] J. Jordan and K. Joslyn, "Aerospace education without an aerospace department: A case study for an interdisciplinary, hands-on project," in *ASCEND 2020*, 2020.
- [29] L. Davis, B. Ahn, Y. Dong, and R. N. Campbell, "Factors that affect retention and satisfaction among newly hired aerospace engineers," in *12th ASEE Annual Conference, Montreal, Canada, June 21-24th, 2020*.
- [30] J. H. McMasters and R. M. Cummings, "Airplane design-past, present, and future," *Journal of Aircraft*, vol. 39, no. 1, pp. 10–17, 2002.
- [31] S. Sofaer, "Qualitative methods: what are they and why use them?" *Health services research*, vol. 34, pp. 1101-1118, 1999.
- [32] M. Q. Patton, *Qualitative Research and Evaluation Methods*, 4th ed., Newbury Park, California: Sage Publications, 2015.
- [33] S. B. Merriam and E. J. Tisdell, *Qualitative Research: A Guide to Design and Implementation*, 4th ed., San Francisco, California: Jossey-Bass, 2015.
- [34] J. M. Corbin and A. Strauss, "Grounded theory research: Procedures, canons, and evaluative criteria," *Qualitative Sociology*, vol. 13, no. 1, pp. 3–21, 1990.
- [35] J. A. Holton, "The coding process and its challenges," in *Sage Handbook of Grounded*

Theory, A. Bryant and K. Charmaz Ed. Thousand Oaks, California: Sage Publications, 2007, pp. 266-289.

[36] K. Krippendorff, "Reliability in content analysis: Some common misconceptions and recommendations," *Human Resource Management*, vol. 30, no. 3, pp. 411–433, 2004.

[37] J. Cohen, "A coefficient of agreement for nominal scales," *Education and Psychology Measurement*, vol. 20, no. 1, pp. 37–46, 1960.

[38] J. T. DeCuir-Gunby, P. L. Marshall, and A. W. McCulloch, "Developing and using a codebook for the analysis of interview data: An example from a professional development research project," *Field Methods*, vol. 23, no. 2, pp. 136–155, 2011.

[39] F. M. Leiva, F. J. M. Ríos, and T. L. Martínez, "Assessment of inter-judge reliability in the open-ended questions coding process," *Quality and Quantity*, vol. 40, no. 4, pp. 519–537, 2006.

[40] M. A. Hughes and D. E. Garrett, "Intercoder reliability estimation approaches in marketing: A generalizability theory framework for quantitative data," *Journal of Marketing Research*, vol. 27, no. 2, pp. 185–195, 1990.

[41] T. N. Bauer and B. Erdogan, "Organizational socialization: The effective onboarding of new employees," in *APA Handbook of Industrial and Organizational Psychology, Vol 3: Maintaining, Expanding, and Contracting the Organization*, vol. 3, Washington: American Psychological Association, 2011, pp. 51–64.