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From Summer Internship to Impactful Industry Collaboration: A Case Study on Moving Safety Research to Practice

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Abstract

This study explores a productive four-and-a-half-year research-to-practice (r2p) partnership between university researchers and a construction contractor. This collaboration led to significant advancements in ergonomic injury prevention and safety culture at the company. A notable aspect of this partnership is its transition from a student internship to an embedded "researcher-in-residence" model for r2p translation. This case study examines team formation and the establishment of trust and reciprocity as group norms, and the benefits and implementation of the "researcher-in-residence" model in fostering an impactful r2p partnership. Our research methods included in-depth interviews and focus group discussions with 25 stakeholders, from frontline employees to company executives. The findings highlight 32 actions that strengthen relationships and clarify how these actions contributed to team success and our r2p collaboration. This study offers two main contributions: (1) a guide for cultivating team excellence in researcher-industry partnerships, and (2) evidence of the impact of mutually beneficial actions and trust-building on the effectiveness of r2p initiatives.

Key Findings

- This case study demonstrates the substantial value researchers can add to their industry partners in r2p collaborations. Industry participants valued the researchers' roles in providing outside perspectives, research expertise, and serving as catalysts for internal change.
- To begin a r2p partnership that benefits both the firm and the researchers, it is essential first to alleviate industry partners' concerns about the potential risks associated with the collaboration. Demonstrating competence and maintaining effective communication will solidify researchers' credibility and foster optimism about the mutual benefits of the partnership.
- Reliability and credibility are prerequisites for researchers to integrate seamlessly into the company team and align staff with a common purpose of translating research to enhance company's safety during an r2p initiative. Trust, although time-consuming to build, can quickly erode without proper maintenance.
- Developing trust and reciprocity in team collaborations must be ongoing. Researchers can start by engaging in small-scale collaborations to solve problems identified by industry partners. As the readiness of the company and researcher teams to effectively collaborate improves, and their dynamics become more synergistic, these r2p collaborations can expand into larger projects.
- The study's research collaboration was enabled by r2p-focused external funding, which supports researchers in building partnerships with companies in solving their immediate challenges. This funding strategy is scarce yet essential and should be advocated for broader adoption to encourage more r2p initiatives.

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Introduction

In 2010, CPWR initiated a project to identify the barriers to, and increase the use of, safe work practices and equipment in the construction industry. Early in this process, CPWR found that, in addition to a lack of industry awareness of the research-based solutions, these solutions did not always “reflect industry priorities or fully incorporate workers’ and contractors’ knowledge and expertise” (CPWR 2019). Partnerships have proven instrumental in bridging academia and industry, involving a diverse network of stakeholders including government agencies, nonprofit organizations, industry representatives, and university and/or government researchers to advance construction safety research to practice (r2p; NORA Construction Sector Council, 2018).

Since then, these collaborative efforts have led to many successful industry-wide and local r2p partnerships. These partnerships have been organized to solve specific problems or improve overall safety and health practices in particular industry segments (CPWR 2019). However, sustaining such partnerships is an ongoing challenge. Can local researcher–industry collaborations enhance current r2p efforts? Strengthening local researcher–industry partnerships might help advance r2p by better aligning academic and industry perspectives on mutual safety challenges.

It is widely recognized that people are more engaged and productive when working in a harmonious team (Jehn and Shah 1997; Takeuchi et al. 2007). However, fostering a mutually beneficial university–industry collaboration is easier said than done, with building reciprocal work relationships and effective team dynamics particularly posing intricate challenges (Heaton, Day, and Britten 2015; Chang, Nixon, and Baker 2015; Kramer et al. 2010; Yin and Moore 1988; Yazdani and Wells 2018). There is an ongoing need to identify new and effective ways to strengthen and improve r2p partnerships. Contributing to researchers’ understanding of effective partnerships can help academic and industry stakeholders establish partnerships and foster harmonious and productive teams.

Objectives

This study presents findings from a successful r2p partnership between a university research team and a specialty contractor. The objective of this case study is to identify and investigate best practices for establishing reciprocal work relationships within this researcher–industry partnership and explore the value of these relationships in achieving r2p success.

The study offers a unique perspective by focusing on a local partnership. A key feature of this four-and-a-half-year r2p collaboration is its evolution from the investigator’s student internship at the company to an embedded “researcher-in-residence” model. Through in-depth interviews and focus group discussions with company personnel, the study explores the benefits and implementation of this model in fostering impactful r2p partnerships.

Previous evaluations of successful r2p partnerships have provided insights, principles, and recommendations (CPWR 2019; Chang, Nixon, and Baker 2015). This study builds on those foundations by offering practical examples with rich descriptions that complement existing relationship-building activities. These examples are particularly relevant to local r2p partnerships, an area underrepresented in the literature.

The study directly aligns with the two-pronged strategy proposed by the NORA Construction Sector Council (2018) in its *objective 13: r2p*.

1. By presenting an inspirational success story of local r2p partnership, this study encourages more researchers and industry representatives to emphasize and engage in r2p.

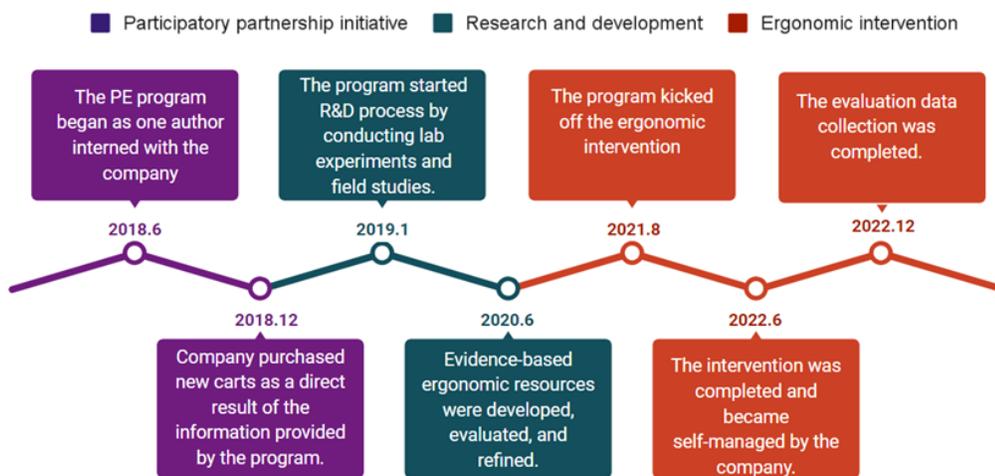
- This study provides a better understanding of the conditions and processes that lead to successful r2p partnerships, particularly how student internship programs can become incubators and catalysts for local r2p partnerships between researchers and businesses.

Methods

3.1 The Partnership Studied

This case study delves into a four-and-a-half-year r2p partnership with a medium-sized commercial roofing and waterproofing company located in the Pacific Northwest of the United States (Zhang and Lin 2024). The company, which employs over 150 field staff and 30 office personnel, is a recognized leader in safety within the industry. During the study period, it consistently ranked among the safest roofing contractors in Washington state based on experience modification rates tracked by the state's workers' compensation system. Before entering the partnership, the company's Environment, Health and Safety (EHS) team was keen to expand their technical knowledge on the risk factors and solutions related to musculoskeletal disorders (MSDs), which constituted nearly half of their claim costs. The objective of this partnership was to address overexertion injuries from material-cart handling. The partnership can be divided into three phases: Problem Definition (Purple in Figure 1), Research and Development (R&D) (Green in Figure 1), and Implementation of Ergonomic Intervention (Orange in Figure 1).

Figure 1. Timeline of the r2p collaboration activities

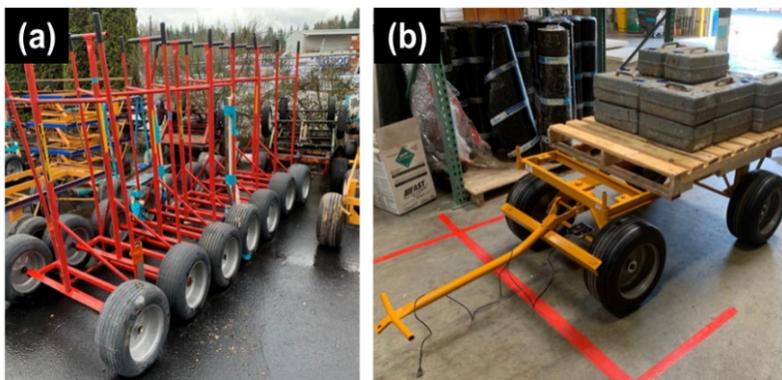


3.1.1 Phase 1: Problem Definition

The goal of addressing overexertion injuries from material-cart handling came into focus in the summer of 2018, when the investigator, then a doctoral student, interned with the company. The student's advisor approached the company to inquire about the possibility of establishing a safety internship, with the goal of providing the student with industry experience relevant to his dissertation research. During the interview, the company's EHS director recognized the student's specialization in ergonomics and highlighted the company's struggles with MSDs. They agreed that, in addition to the usual duties of an EHS assistant, the intern would also create a 15-minute ergonomic training presentation to be delivered at the conclusion of the internship. Prior to this internship, the student's advisor had worked with the company in a summer research project for field heat data collection.

The intern, who was paid and full-time, worked in the main office and interacted with various departments while performing routine safety duties. The EHS director, acting as a change champion, took the intern on weekly job visits to assist with safety inspections. During these visits, the director also allocated time for the intern, ranging from one-half to four hours per site, to perform field observation and collect preliminary data on manual material handling. The EHS director facilitated and supervised this process but did not conduct the observations or data collection herself. This data was used to draft the 15-minute ergonomic training presentation. Then, the EHS director provided platforms to rehearse and gather feedback on the presentation from safety committee and senior manager meetings. The final presentation, delivered at an all-hands meeting, was well-received by workers. It covered preliminary evidence about the risks of using aged material handling carts, which prompted management to immediately purchase three types of new carts (Figure 2a).

Figure 2. r2p partnership supported ergonomic study, 2019-2020: (a) Company purchased new carts based on the researchers' recommended cart replacement program during the Problem Definition phase; (b) Ramp in company's warehouse used to assess cart handling hazards and prevention during the R&D phase.



However, the training lacked detailed, evidence-based guidelines for proper material-cart handling techniques due to a dearth of scientific research in this area. Workers currently rely on subjective judgments when handling carts, which can be dangerous. To address this problem, preventative maintenance schedule, clear load limits, and ergonomic site setup must be established for manual cart operators under common work scenarios encountered in the roofing industry. This gap underscored the need for a targeted study to develop evidence-based cart handling guidelines to enhance worker ergonomics and reduce MSD incidence in this sector.

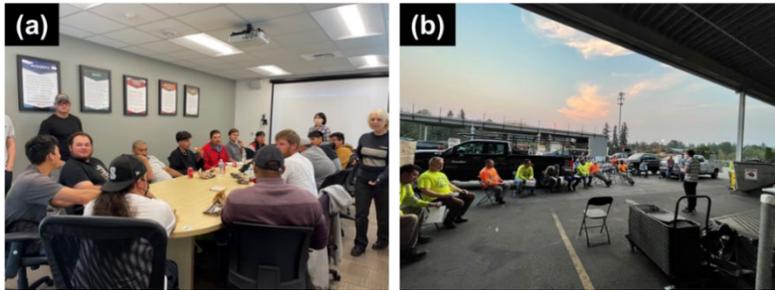
3.1.2 Phase 2: R&D

Recognizing this need, the partnership extended the summer ergonomics program in 2019 to create scientifically validated solutions for addressing ergonomic hazards associated with cart handling (Zhang, Lin, and Lin 2021). This r2p collaboration successfully continued as they secured funding from the Safety & Health Assessment & Research for Prevention (SHARP) program, a workplace safety and health research and prevention initiative within Washington State's Department of Labor & Industries (L&I).

To develop the scientifically validated solutions, the research team, with the help of the company staff, conducted both laboratory experiments and field data collection. Laboratory experiments took place within the company's warehouse (Figure 2b). In collaboration with warehouse workers, they set up three different laboratory tracks to simulate common scenarios for material cart handling in the roofing trade. Across these three tracks, they varied cart condition, tire type, physical environment-related factors (i.e., ramps, obstacles, space constraints), and load to examine how these variables interact to influence the ergonomics and productivity of cart handling.

Field data collection involved the participation of both office and field staff. This included observing workers performing material handling tasks and conducting comprehensive field surveys. The goal was to understand how carts were currently being used in the field. This usage data was critical in the process of translating laboratory research findings into evidence-based guidelines for the ergonomic use of material carts. The guidelines cover cart maintenance during daily equipment checks, specific slopes for ramps, maximum allowable obstacle heights, and appropriate load limits for various construction site scenarios.

Figure 3. r2p partnership supported ergonomic study, 2020–2021: (a) A focus group in the company's meeting room, involving 13 roofers, to evaluate an ergonomic resource. (b) Another evaluation session held during the foremen's meeting, with the company president, foremen, superintendents, and project managers.



This r2p partnership then translated guidelines into lay language and created evidence-based training booklets, toolbox talks, and other formats of resources. The EHS team played a significant role in drafting and refining these resources by providing ongoing feedback and comments regarding the format, content, and delivery of the developed materials.

In 2020, the partnership received funding from CPWR–The Center for Construction Research and Training. With the CPWR’s financial support and assistance in recruiting safety experts nationwide, the partnership assessed and refined the co-created ergonomic resources. The assessment confirmed the materials' relevance and improved their clarity, accessibility, and technical accuracy. This evaluation project engaged nearly every member of the company, from executives to entry-level workers (Figure 3), as well as a dozen safety experts in the roofing trade nationwide via CPWR’s established roofing r2p partnership.

3.1.3 Phase 3: Implementation

In 2021, the r2p collaboration transitioned into the implementation phase after securing funding from the SHARP program within Washington State L&I for a second time. Through a two-year intervention study, the partnership systematically integrated ergonomic resources into the company's operations (Zhang and Lin 2024). The EHS team and researchers divided the intervention into four components and integrated them into various safety training programs (Figure 4a and 4b) and site planning activities. The intervention components and their objectives are specified in Table 1. Throughout the intervention, employee feedback was collected through participation ratings and feedback surveys, and group discussions with change champion within the company (Figure 4c).

Table 1. Intervention Component Overview and Objectives (Organized by Starting Date)

Component	Duration	Activities	Goal
Awareness Campaign	August 2021 - June 2022	<ul style="list-style-type: none"> - Delivered a 45-minute comprehensive presentation training at an all-hands meeting - Showed animated stories during one foreman meeting and all safety orientations during this period. 	- Increase frontline workers' awareness and motivation to participate in the intervention
Policy Intervention	August 2021 - June 2022	<ul style="list-style-type: none"> - Updated safety document templates to include information on reducing cart handling injuries - Provided site-specific instructions and support on manual cart handling during site visits. 	- Assist the safety team in offering site-specific instructions and support
Skill Training	January 2022 - June 2022	<ul style="list-style-type: none"> - Discussed training handouts during all monthly foreman meetings during this period. - Foremen then led toolbox talks using the same materials 	- Help workers recognize ergonomic hazards associated with cart handling and ways to control them
Working Environment Redesign	January 2022 - June 2022	<ul style="list-style-type: none"> - Modified carts by installing a handle for easy push from behind - Introduced redesigned cart at a foreman meeting for feedback - Attached warning signage to carts 	<ul style="list-style-type: none"> - Assist company mechanic in cart modifications - Provide explicit prompts for ergonomic good practices covered in the skill training

Figure 4. r2p partnership supported ergonomic study, 2021–2022: (a) Three roofers volunteering for hands-on practice in an all-hands meeting; (b) 150 roofers engaged in a Kahoot game in an all-hands meeting; (c) 11 roofers completing a program survey during a lunch break.



The program achieved a significant impact in multiple areas, with detailed methodology and results provided in our peer-reviewed article (Zhang and Lin 2024):

Worker Knowledge: There was an improvement in workers' ergonomics knowledge. Quizzes revealed a statistically significant increase in mean scores, from 73% in baseline tests (42 responses) to 86% in follow-up tests (40 responses).

Worker Behaviors: Workers reported positive behavioral changes. Specifically, 88% of survey respondents (31 out of 35 workers) felt their crews were more likely to assist each other with material handling tasks, 85% indicated better planning before starting a cart handling job, and 81% reported improved housekeeping practices for easier cart movement. In total, 34 out of 35 surveyed workers reported at least one positive change in their crews' behaviors as a result of the program.

Injury Prevention: These improvements in knowledge and behavior, along with the introduction of new carts, likely prevented traumatic or soft tissue injuries associated with cart handling tasks. No cart-related injuries were reported during the study period.

Financial Savings: Altogether, the partnership estimated that our program resulted in an ROI rate of 1.99. This ROI calculation considered the financial and time costs related to cart purchase and maintenance, R&D, and deploying the intervention for our industry partner. The savings included factors such as injury prevention, increased worker productivity, and compensation received from external grants.

Overall, the partnership achieved promising r2p results, aligning with CPWR's definition of r2p (CPWR 2019). This partnership fostered favorable relational outcomes and positive perceptions of the program among company staff. Anonymous feedback was collected through a program debrief questionnaire (n=42) administered on-site within four months following the completion of the interventions (Zhang and Lin 2024). The survey results suggest that the program was perceived very positively, with a meaningful and beneficial impact on the company and its employees:

- ✓ 96% agreed or strongly agreed that the program provided useful information
- ✓ 90% agreed or strongly agreed that the information was presented concisely
- ✓ 96% expressed overall satisfaction with the program
- ✓ 98% agreed or strongly agreed that the program reflected the company's safety commitment
- ✓ 100% agreed or strongly agreed that the company demonstrated care for workers' well-being
- ✓ 96% recommended adopting similar programs in the future

The investigator's prior studies (Zhang 2021; Zhang and Lin 2024) primarily relied on anecdotal evidence from the researcher's perspective to extract lessons learned from this r2p partnership. In contrast, the present study delves deeply into this partnership from the viewpoint of industry stakeholders. This approach provides a more comprehensive account of the positive interactions and communications during the partnership, exploring its contributions to team excellence and the overall success of the r2p initiative.

3.2 Case Study Design, Participants, and Data Collection and Analysis

This case study employed interviews and focus group discussions to explore the significance of building mutually beneficial work relationships within a researcher-industry r2p partnership and its manifestation and formative process in a practical context. Here, interviewing and focus group discussions were a suitable method, which allowed for understanding the thoughts, feelings, and actions of various members of the partnership and draw lessons from different viewpoints to inform future r2p practices.

Participants: To capture a wide range of views, this research engaged 25 company staff members who were actively involved in the r2p partnership. Information about research participants and data collection methods is outlined in Table 2. This sample included all office staff and a majority of field staff who actively participated in the r2p partnership.

Table 2. Summary of interviews and a focus group with company staff

	Job title	Size	Data Collection
Office staff (n=9)	CEO	1	Individual interview via video connection in June
	President	1	Individual interview via video connection in June
	EHS director	1	Individual in-person interview in May
	EHS manager	1	Individual in-person interview in May
	Senior Project manager	1	Individual in-person interview in May
	Director of estimating	1	Individual in-person interview in May
	Client manager	1	Individual in-person interview in May
	Warehouse manager	1	Individual in-person interview in May
	Superintendent	1	Individual interview via video connection in May
Field staff (n=16)	Foreman	1	Individual interview via video connection in June
	Foreman	5	Focus group with 5 foremen and 10 roofers, in-person in June
	Roofer	10	Focus group with 5 foremen and 10 roofers, in-person in June

Data Collection: Individual interviews encompassed discussions with a variety of company personnel, including the CEO, president, EHS director, EHS manager, senior project manager, director of estimating, client manager, warehouse manager, superintendent, and a foreman. These sessions ranged between 45 to 75 minutes.

Additionally, a focus group consisting of 10 workers and 5 foremen was organized, lasting approximately 70 minutes. Strategically scheduled after an all-hands meeting at the company's main office, this approach made it easier for field crews to participate in the study while minimizing disruptions to field operations that would have occurred if conducted during work hours on-site. This scheduling was considered respectful of industry partners' time and minimized disruption to production. The focus group composition, a mix of foremen and workers, raised minimal concerns to the investigator, as the discussion centered on sharing perspectives about the successful partnership and offering advice for future collaborations, rather than on sensitive topics that might lead to criticism of the company or fellow employees. The opportunity to voluntarily participate in the focus group was advertised by the EHS Director through company email, the safety committee, and the all-hands meeting. All discussions were audio-recorded and transcribed.

Data Analysis: For the analysis phase, a directed thematic analysis was employed (Hsieh and Shannon 2005). This study leaned on established sociological theories that provided insights on team reciprocity, including group cohesion theory (Lawler, Thye, and Yoon 2000) and reciprocal exchange theory (Molm 2003). These theories guided the coding and understanding of the conditions, mechanisms, and significance of beneficial social interactions. The ATLAS.ti software was chosen for qualitative data analysis. The validity of data analysis was ensured through a process where the findings were shared with all the interviewees to minimize interpretation bias.

Potential Limitations: In our case study, the interview and focus group approach was designed to gather rich, nuanced information through direct dialogue, which allowed for immediate clarification and a deeper understanding of participants' views. This method provided invaluable insights that might not have been captured through anonymous methods. However, this study recognize the limitation of not offering an anonymous feedback option, which may have limited the candidness and constructiveness of some comments. To mitigate this, our qualitative analysis and discussions primarily focused on best practices that participants consensually perceived as beneficial. Future similar case studies should include an anonymous feedback component to explore constructive criticism, better informing future r2p activities.

Results

4.1 Confronting Initial Hurdles (Phase 1: Problem Definition)

Engaging in a research collaboration often represents a significant shift from a company's regular activities, and our r2p partnership was no exception. Some company staff were initially reluctant to engage due to various concerns, including uncertainties about the outcomes, data privacy, and potential disruptions to daily operations. Qualitative analysis provided further insight into these challenges:

1. **Prior Experiences and Skepticism:** Key individuals from the company had previously interacted with external groups that sometimes provided impractical "classroom concepts" or addressed questions that seemed irrelevant or overly broad. These experiences led to some initial skepticism about the value of research collaboration.
2. **Data privacy concerns:** Office staff may initially feel uneasy sharing business data with researchers. The company's director of estimating articulated this concern: "I have a lot of stuff in Excel. For somebody new, I really don't want them to see how I did this. I'm trying to protect both myself and the company." This sentiment reflects companies' natural hesitation towards sharing information with researchers until their reliability is convincingly demonstrated.
3. **Disruption to construction projects:** Field data collection presents another concern, as disruptions to construction projects can be costly. The EHS director emphasized the critical importance of respecting time constraints, commenting, "It would not take long before [field crews and general contractors] say no [to our site visits], if this is disruptive to the workplace."
4. **Lack of psychological safety among field crews:** Field crews may question researchers' motives due to a common absence of psychological safety. Researchers may be viewed as external representatives of project stakeholders looking to catch workers doing anything wrong, fostering feelings of threat or anxiety and obstructing genuine collaboration. As a result, engaging field crews initially proved difficult, as they were often perceived as reserved and less communicative.
5. **Change champion's reputation:** The commitment of the EHS director as a change champion, demonstrated in front of all company staff, was a significant endorsement. Any failure to deliver the expected results could negatively affect her professional reputation. The EHS director experienced considerable pressure, stating, "If this program had been a failure, and if they felt badly about how it was followed through, it could have hurt my reputation."

4.2 Breaking the Ice (Phase 1: Problem Definition)

In retrospect, initiating the r2p partnership through a student internship was a key factor in overcoming initial hurdles between the two groups. Initially, the goal was simply to leverage the intern's interest in ergonomics and deliver an ergonomic training presentation at the end of the summer internship. Interviews with industry partners indicate this internship was critical in starting a long-term r2p collaboration for two reasons:

- ✓ **Seamless Integration:** The small-scale project conducted alongside the intern's routine safety duties allowed the collaboration activities to be gradually incorporated into daily operations without feeling external. The president observed, "It never felt like you were here to do a research project. You were part of the team." This integration helped to normalize the research process and make it feel like a natural part of the company's workflow from the very beginning.
- ✓ **Rapport Building:** Immersion as an intern provided a direct path to building rapport with those who later participated in the study. For example, the director of estimating, who initially expressed data privacy concerns, not only shared all required data but also revised his templates to aid in collecting new information. He attributed this willingness to a sense of "camaraderie from working in the same building." This was also true for building personal connections with field crews. The EHS director observed, "They're out there working in the hot sun. You're right out there with them [and] willing to be there with them through some really difficult days." This physical presence in daily

interactions was crucial for building unity and trust between the researchers and field workers. This sentiment was echoed by other workers, who said, "Everything we do is physical... If you're physically there with us, we're about it."

Overall, the internship served as a catalyst in establishing a strong r2p partnership. However, inappropriate behavior and poor performance during the internship may backfire, dampen relationship building, and shut down further collaboration opportunities. Our qualitative analysis identified specific actions by the intern that were perceived as beneficial in breaking the ice during the initial phase of r2p collaboration:

1. Leveraging the Change Champion: Initially, the EHS director, the change champion within the company who had already established trust among employees, connected the lead researcher with the field crews. During site visits, the EHS director introduced the researcher and clearly explained the purposes of the project—collecting observational data about manual material handlings and creating an ergonomic training presentation. This helped alleviate psychological safety concerns among field crews. Additionally, the change champion strategically initiated field visits with crews known for their cooperation and openness to new ideas, ensuring positive early experiences. This then encouraged wider acceptance across sites through word-of-mouth. The EHS director observed: "That [positive experience of participation] spread as the crews talked to each other. Before long, many crews were willing to participate because it was a positive experience."
2. Inquisitive Attitude: During site visits, the researcher exhibited an inquisitive attitude, approached issues with objectivity, and focused on identifying problems. A foreman noted, "You are just trying to understand the whole thing. It is nice when a person comes out with questions and then accepts the answer for whatever it is. That's why I like working with you." This method cultivated a culture of psychological safety that encouraged open communication. The same foreman admitted, "Sometimes I'm thinking the opposite of what you're saying. [But] I'm not so critical because the relationship's there." This mutual respect and non-critical stance were crucial in keeping the communication channel open throughout our collaboration.
3. Genuine Interest, Active Listening, and Responsiveness: Actively listening with empathy reinforced the researchers' dedication to collaborative engagement. A worker captured the necessity of authentic involvement, stating, "If you're there but not soliciting our feedback, and if you don't show a genuine interest, we just think you're wasting our time." Equally critical was following through on their feedback. For instance, after some harsh comments received during the rehearsals, the researcher diligently integrated the suggestions and communicated the changes to those who provided feedback. This three-way communication conveyed deep respect and nurtured a sense of appreciation and ownership among the participants. Echoing this sentiment, the president remarked, "A lot of people just want their voices heard at the end of the day."

4.3 Small Wins, Big Trust (Phase 1: Problem Definition)

The everyday interactions during the summer internship were important for building trust and alleviating concerns about the risks inherent in r2p collaborations. However, the pivotal moment for engaging industry partners was the positive outcomes of the final presentation, such as favorable worker comments. This "win" fostered optimism about the potential benefits of a long-term collaboration, sparking enthusiasm to transform the small-scale project into an ongoing partnership. Qualitative analysis identified three specific actions by the researcher that were critical in building trust with company staff: (1) delivering tangible benefits, (2) starting with manageable but impactful issues, and (3) communicating effectively. Below is a detailed description of each:

4.3.1 Delivering Tangible Benefits

One direct result of the summer ergonomic project was the company's purchase of three types of material carts. Field crews had initially indicated the need for new material carts but struggled to justify their benefits to

management. The researcher incorporated video clips from the company's job sites into an ergonomics presentation, alongside data demonstrating the needs for the carts. Following a rehearsal of the presentation with senior managers, the information immediately convinced management of the ergonomic benefits, leading to investment in three cart types.

Notably, this issue was first raised by workers to the researcher during the earliest site visits. By successfully addressing a longstanding request, the researcher demonstrated commitment to acting on worker feedback. One worker stated, "That's my surprise, someone was taking care of us." This was echoed by many field workers who exhibited a strong emotional bond with the researcher, perceiving him as an ally.

Beyond valuing their voices, this tangible benefit led workers to accept the researcher as a team member who could drive meaningful change. This resulted in a high level of buy-in and participation from field staff. As one worker put it: "You came [in, and then] sitting in my truck is a brand-new cart, so everybody in here loves you!" Another vividly expressed, "You're like our voice. You can tell our company how we want things done and what our needs are." When field staff feel genuinely understood by the research team, they are more likely to offer honest, valuable feedback and actively engage in collaborative efforts. This set the stage for a productive, long-term partnership. From EHS team's perspective, this summer ergonomic program contributed to safety culture by raising "empowerment that they [workers] can make a personal impact in their own safety" among workers, as described by the EHS director.

4.3.2 Starting with Manageable Issues

The tangible benefits of the ergonomics program addressed issues that were previously overlooked but impactful to the company. The CEO acknowledged this, stating: "We tend to focus on things like fall protection and eye protection. But the ergonomics program provided the opportunity to look at things on a more granular level [like material carts]." Reflecting on this experience with interviewed industry partners, we believe this strategic focus on overlooked but consequential problems was critical for two reasons:

- ✓ Achieving Rapid Trust: By focusing on manageable issues that could be addressed within the limited timeframe of the summer internship, the researcher was able to achieve quick wins and rapidly gain trust. If the researcher had instead tackled broader, more complex problems, it would have been difficult to demonstrate tangible progress and build credibility with the frontline staff in such a short period.
- ✓ Researchers' Fresh Perspectives: The results demonstrated the potential value of continuing the partnership, as researchers could bring fresh eyes to uncover additional opportunities for improvement.

4.3.3 Communicating Effectively

During the rehearsals and final presentation, the researcher clearly communicated findings to diverse audiences within the organization. This skill was highly valued. The EHS director observed the positive changes and feedback following these presentations, noting: "After your ergonomics presentation for our all-hands meeting, safety committee, and managers, the buy-in was almost instantaneous." As a result, this observation solidified her belief in the potential for a more extensive collaboration.

Diligently tailoring messages to ensure clarity reflected the researcher's dedication to the mutually beneficial partnership. As the director of estimating commented, "If only you understand it, then only you will benefit from it. When you open that data up, break down the research, and share it with people, it becomes an open book." Qualitative analysis identified specific communication strategies employed by the intern that were perceived as beneficial in building trust:

- **Tailoring Messages to the Audience:** Recognizing that various audiences have distinct priorities and viewpoints based on their roles, the researcher tailored messages accordingly. For example, during the final presentations to field crews, the researchers strategically omitted terms related to productivity metrics and costs. The CEO, noticing this approach, reflected on the differing perspectives of workers and management regarding the financial aspects of injury prevention. He commended the researchers for their audience awareness. By doing so, the CEO believed that the researcher was able to resonate with these frontline workers, which strengthened his confidence in the benefits of a long-term partnership.
- **Communicating with Contagious Passion:** During presentations, the researcher communicated with evident enthusiasm and sincerity. As the warehouse manager put it, "You actually cared about why you were doing it [and focused on] getting it done." This passion proved to be contagious, greatly influencing other participants. The EHS director, for instance, stated: "When I saw the results from that very first presentation and the workers' response, I was immediately sold on what you were doing. That made it easier for me to inform other people with excitement." The researcher's heartfelt communication style served as a catalyst for organizational buy-in.

Table 3 summarizes the advice recommended to future researchers who are interested in initiating r2p partnerships using summer internships as a bridge.

Table 3. Advice for Researchers During the Problem Definition Phase of an r2p Partnership

Theme	Advice
Leveraging Change Champions	1. Identify and leverage change champions to connect with company crews. Have them introduce researchers and clearly explain the project's purposes to alleviate psychological safety concerns among company crews, especially field crews.
Non-Disruptive Site Visits	2. Conduct weekly site visits alongside the change champions. Maintain a professional, friendly demeanor during these visits. Clearly explain the purposes of your site visits to assist change champions in introducing your team effectively to field crews. 3. Initially focus your activities on crews that are more receptive. Their positive experiences can foster wider acceptance across different sites. 4. To obtain explicit consent and foster a welcoming attitude from site crews, undertake extensive field visits.
Empathetic and Inquisitive Attitude	5. Use exploratory questioning techniques during site visits and field observations to avoid directly pointing out problems, placing blame, or giving instructions. Exhibit an inquisitive attitude by approaching issues with objectivity and focusing on identifying problems. 6. Center your approach on empathetically listening to team members' ideas and concerns during site visits. Facilitate this by asking empathetic questions like "How do you feel about this?", "What changes do you want to see?", and "Do you think this change will benefit you?"
Audience Understanding	7. Make a concerted effort to understand your audience at a personal level through site visits and daily interactions. This is crucial for identifying audience-specific nuances and tailoring your communication effectively. 8. Communicate with passion and sincerity. This enthusiasm, along with a sense of ownership, can be infectious and greatly influence change champions in your project.
Presentation and Feedback	9. Practice your presentations repeatedly in front of your target audiences, and remain open to their feedback, continuously refining your approach.

Theme	Advice
Delivering Tangible Benefits	10. Actively listen to and show genuine interest in the feedback from field staff. Follow through by incorporating their suggestions and communicating the changes made.
	11. Focus on addressing specific, manageable issues that can quickly demonstrate tangible benefits. This helps build trust and credibility with the field staff.
	12. Incorporate visual and data-driven evidence in presentations to convincingly demonstrate the benefits of your recommendations to management.

4.4 Readiness for the Next Leap (Phase 2: R&D)

The second phase—Research and Development (R&D)—was initiated approximately six months after the lead researcher's summer internship. During this phase, the research team conducted experiments in the company's warehouse and collected field data at the company's job sites. Based on the findings, evidence-based ergonomic resources were developed, evaluated, and refined through repeated trials and feedback from the company staff. The research team expanded beyond the intern/lead researcher to include his PhD advisor and four graduate research assistants. The entire R&D phase spanned more than two years, and required patience, teamwork, and sustained support from industry partners. This included time investment, provision of materials, and access to job sites. The challenges and collaborative efforts during this phase were aptly summarized by a worker who noted: "It took a lot to get the group together and do these sorts of things on the roof [construction site] and still remain productive."

Therefore, the timing of introducing research concepts and initiating the R&D process is crucial. Based on our experience, we believe the following prerequisites need to be met to commence the process:

- ✓ **Knowledge about Company Operation:** The internship allowed the lead researcher to gain a deep understanding of the company's scheduling, reporting processes, and fieldwork logistics. Because of this knowledge, he was able to conduct R&D that was integrative and minimally disruptive to the company's normal operations. For instance, to gather field data on how material carts were being used daily on-site, he suggested incorporating the survey into the company's timesheets, replacing a section that was no longer in use due to updated processes. This approach reduced the additional administrative workload and time required by the company to participate in and support the study. By easing the process of supporting our R&D, we ensured a sustained partnership with the company throughout the lengthy research phase.
- ✓ **Team Preparedness:** The lead researcher developed a sense of camaraderie with the company staff through regular communication and collaborative problem-solving. As a result, most office and field staff were honest, attentive, and patient in their communication during the R&D phase. For instance, during field data collection, some foremen not only promptly filled out surveys but also guided the researcher through their job sites, explaining the meaning behind their responses and sharing additional insights. Such proactive team dynamics were essential in ensuring the smooth, sustained implementation of the two-year R&D phase. Without these dynamics, it would have been impossible to gauge real feedback and collect valuable data to support our R&D efforts.
- ✓ **Well-defined Problems:** Management often struggles to support initiatives that are too broad or unclear. However, they are more supportive and confident when the researcher proposes research questions that address specific and well-defined challenges recognized by the industry partner. In our case, for example, the partnership focused on improving the ergonomics of carts used daily by workers. Specifically, the research team developed numeric guidelines for cart maintenance schedules, load limits, and optimizing job sites for easier cart handling. This targeted initiative was very specific and well-defined, which was commendable for the management of our industry partner.

- ✓ Solve Key Stakeholder Pain Points: To address pain points, the partnership implemented a comprehensive strategy that included both management actions and worker training. For example, our ergonomic evidence went beyond just informing the purchase of new carts; the partnership also generated worker training materials on maintenance practices and optimized job site setups. By addressing the concerns and needs of both management and workers, the initiative garnered support from both groups. As one worker explained, our collaboration aimed to "Save the company money, save our backs." This approach illustrates how tackling mutual problems can create a more sustainable partnership, ultimately benefiting all parties involved.
- ✓ Management Commitment: When workers observed the researcher gaining management's trust and endorsement, they saw an opportunity to express their concerns and influence meaningful changes. As one worker succinctly expressed, "Researchers can earn our support by getting the support of our company to help us out." In our case, management commitment was demonstrated in management's actions, such as investing in new carts and recognizing the researcher's initiatives during various meetings and emails. These actions showed workers that management was committed to their well-being and the r2p initiative, which encouraged them to engage more openly with the researcher. Workers saw the researcher as a credible ally capable of effectively communicating field issues to management. Thus, by bridging the gap between workers and management, the researcher gained worker support.

4.5 Deeper Research Collaboration (Phase 2: R&D)

Given the long-term nature of R&D and its potentially delayed rewards, maintaining a strong partnership can be challenging. However, qualitative analysis revealed that certain actions taken by the research team were essential for keeping industry partners engaged throughout the process. These actions included securing external funding as investment and maintaining a transparent research process.

4.5.1 Impact of External Funding on Partnership Engagement

The research team obtained funding from Washington State's SHARP program and allocated a portion of it to purchase additional experimental carts, supplementing the original three types already provided by the company. These carts, along with new carts previously purchased by the company, were provided to field crews for use at no cost. This investment had three notable impacts on our partnership:

- ✓ Demonstrating Dedication to Mutual Success: Providing carts to the field crews helped build a sense of unity and reciprocity. In return, researchers were granted greater site access and received more candid feedback. A worker highlighted this sentiment, saying, "You provided us with carts, which made our whole life different." This act demonstrated our dedication to their success and reinforced their trust in our partnership, facilitating a subsequent exchange of resources.
- ✓ Enhancing Program Visibility: The tangible benefits of the carts increased the program's visibility, fostering a sense of responsibility among workers to contribute to the research. A foreman noted, "We considered those carts yours. We used them as we needed them, but [to] help with the research." This sense of ownership was crucial in maintaining active participation in research activities.
- ✓ Strengthening Management Commitment: The external funding accelerated the R&D process, creating a "positive pressure" for ongoing commitment and involvement from management.

In addition to materials carts, we continually showed our appreciation for the field team's involvement by providing rewards such as gift cards and complimentary meals. This consistent approach was highly appreciated by the field crews. The EHS Director, acting as the change champion, also endorsed these measures because they facilitated advocacy for the research activities and made it easier to recruit participants.

4.5.2 Transparent Research Process

During the R&D phase, the research team conducted experiments in the company's warehouse, where many company staff observed the experimental process, reviewed preliminary results, and provided feedback. Monthly site visits for collecting field data also fully engaged the EHS team. Researchers and the EHS Director then worked closely to convert these findings into evidence-based materials, with workers witnessing the improvement of materials through participatory feedback. Regular meetings were conducted to update progress. As the client manager put it: "You were always open to letting us know where things stood, what you were working on, and why you were doing it." This transparent process, open to everyone, resulted in several benefits:

- ✓ Fostering Credibility: This transparency assured industry partners of the research's validity. The EHS Director praised the process, stating, "The information gathering was [conducted] very professionally. It was unbiased. You weren't swaying the data or anything you were doing for any reason. You could see that it was solid research."
- ✓ Enhancing Quality: The transparency of the process allowed everyone to share participatory feedback and reinforce mutual understanding. This greatly enhanced the quality of our evidence-based training materials. For example, one foreman reflected, "When you did the [training] video, I didn't like one part of it [.....]. Then you changed it, and the video was much improved the next time I saw it. I felt much better about it."
- ✓ Raising Ownership: The open nature of the research process mobilized the company's collective knowledge to solve identified problems. The director of estimating, who assisted in modifying timesheets and collecting field data, highlighted this collaborative effort: "All I'm giving you is the ingredients, and you come back and make this a pie. It's delicious." The transparency of the process enabled everyone to contribute, giving a sense of accomplishment and reinforcing teamwork.

To maintain transparency in collaborative activities, researchers must act professionally and thoughtfully. Without this careful approach, transparency could backfire and damage the partnership. Qualitative analysis identified specific actions by researchers that were crucial in our case to ensure that transparency remained a positive force in collaborative efforts. These actions can be categorized into (1) manners of conduct and (2) mindsets that promote effective collaboration:

1. **Manners of Conduct** demonstrate researchers' dedication to fostering positive interactions and maintaining partnership. As the EHS director put it: "All of the researchers (including the intern/lead researcher, his PhD advisor, and four graduate research assistants) who came here presented themselves professionally and respectfully and with positive attitudes. That really does make it easier to work with." Specifically, the following manners of conduct were highlighted by interviewed industry partners:
 - ✓ Non-disruptive and Respectful Field Visits: The top management of our partner firm appreciated our approach to site visits, which were "brief and routine, with focused questions." This method was perceived as effective in maintaining long-term engagement and promoting sustainability.
 - ✓ Presence and Visibility: Beyond site visits, company management valued the researchers' active participation in team meetings and company presentations whenever opportunities arose. Simply showing their faces was seen as indicative of the researchers' genuine interest in the company's success and dedication to collaboration.
2. **Researchers' Mindsets** are equally important in promoting collaboration. A rigid research plan that is adhered to without changes can be problematic. It inhibits the growing understanding of industry needs. Researchers are unlikely to fully understand those needs until they have worked with industry partners for a sufficient time. Therefore, flexibility and willingness to adapt are crucial for the success of collaborative research. Positive mindsets recognized in our case include:

- ✓ **Receptivity to Industry Partners' Feedback:** Our transparent research process allowed for open and immediate feedback from the company, which was crucial for refining our study design. Initially, we focused solely on cart preventative maintenance. However, with more site visits and feedback, we expanded our research to include various aspects of cart handling, such as optimized site setup and ergonomic work practices. As one field worker insightfully stated, "Every day we come across new challenges, so the more you're there, the more challenges you're able to see and address." This r2p collaboration was a beneficial learning process, evolving our researchers' understanding of how to meet field needs. This evolution was because we remained receptive to industry input.
- ✓ **Inquisitiveness:** During site visits, we centered our approach on empathetically listening to team members' ideas and concerns by asking questions like "How do you feel about this?", "What changes do you want to see?", and "Do you think this change will benefit you?"
- ✓ **Responsiveness:** It was equally important to communicate these understandings and resultant changes back to those who provided feedback. This three-way communication conveyed respect and appreciation for their input, nurturing a sense of ownership in the collaborative effort.

Table 4 below summarizes the advice recommended to future researchers who are interested in initiating R&D collaboration during a r2p partnership.

Table 4. Advice for Researchers During the R&D Phase of an r2p Partnership with Industry Partners

Theme	Advice
Well-Defined Problems	1. Propose research questions addressing specific, well-defined challenges recognized by the industry partner to solve stakeholders' pain points.
Ongoing Engagement and Visibility	2. Attend company meetings consistently, such as quarterly all-hands and monthly safety committee meetings. 3. Greet and engage in conversations with all company staff, including those not yet involved in the collaboration. 4. Integrate field data collection into routine activities, such as the EHS team's safety inspections. Conduct brief, routine site visits with focused questions. Maintain a professional, respectful, and empathetic demeanor to foster long-term engagement.
Communication	5. Provide regular updates to management and change champions about ongoing actions. 6. Consistently share intermediary results and forthcoming plans within the company. 7. Use simple language, incorporate visual aids, and focus on being concise and directly relevant in your communication.
Tangible Benefits and Appreciation	8. Secure external funding to support the project, and provide tangible benefits like gift cards, complimentary meals, and new equipment.
Maintaining Transparency, Receptivity, and Responsiveness	9. Act professionally and thoughtfully to ensure transparency in collaborative activities. 10. Remain flexible and receptive to industry partners' feedback. Use this feedback to progressively refine your research design and adapt to the evolving needs of the industry. 11. Communicate changes and updates based on feedback to those who provided it. This three-way communication conveys respect, appreciation, and nurtures a sense of ownership.

4.6 Intervention Rollout and Reaping r2p Benefits (Phase 3: Implementation)

The third phase—Implementation—was initiated smoothly following the R&D phase. This study observed that, once industry partners reviewed, recognized, and appreciated the outputs from the R&D phase, transitioning into implementation became a natural progression. The sense of ownership created a shared goal of fully realizing the collective R&D outcomes and reaping the benefits. The president enthusiastically stated, “You're sharing the results as you go... It's really fun and inspiring to see what you're producing as we go along. This inspires me to make this huge piece of our safety program moving forward.” Echoing this sentiment, the operations manager characterized the partnership as a "growing together" journey, from sowing seeds to bringing them to fruition. The CEO also observed that continuous involvement in research collaboration sparked curiosity among workers about “what the outcomes were.”

Despite this positive engagement, the transition to implementation did not come without challenges. Changing the status quo, even with established trust and team dynamics, posed difficulties. In our study, we incorporated new protocols and practices regarding material cart handling into the company's safety policies, training programs, and inventory logistics. Qualitative analysis identified two specific strategies by researchers that were perceived crucial to the successful implementation in our case: (1) high-level safety integration and (2) gradual implementation.

4.6.1 High-Level Safety Integration

Our intervention focused on changing the use of material carts. In construction, we have numerous equipment, machinery, and work practices; material cart use was just one of them. However, during the intervention, we linked these specific changes to wider facets of safety practices and management, categorizing them under high-level themes. For instance, we connected the preventative maintenance of material carts to the inspection of various other equipment and machinery. When introducing cart maintenance in a foremen meeting, the EHS team also discussed inspecting fall protection harnesses and forklifts. These interconnected changes promoted a holistic approach to workplace safety.

Our qualitative analysis revealed that this high-level, integrated strategy enabled the program to generate value beyond material cart handling. As the president stated, “You came in to help fortify our safety culture and keep these guys safe, save money, which puts more money in their pocket. It checked all the boxes.” Specifically, the broader value generated by the program includes:

- ✓ **Fostering Safety Mindset:** Workers appreciated the emphasis on changing their "thought process." For example, when introducing cart load limits, we highlighted the importance of teamwork not just in sharing the load during cart handling tasks but also in many other tasks. One mentioned, "It started a mentality of being more of a helpful crew instead of a lone wolf." Another highlighted the benefits of pre-task planning, emphasized as one of the key themes of our intervention, stating, "It made us reflect on what we were doing and find the safest way to do it."
- ✓ **Expanding Management Involvement:** Our integrated strategy involved almost every senior and mid-level manager during the intervention. For example, the preventative maintenance of carts raised a question about the lack of communication between the field and the shop regarding which carts needed maintenance and when. This sparked a conversation that eventually extended to various tools and equipment. Further discussions during a safety committee meeting between management and field representatives led to establishing improved communication protocols.
- ✓ **Enhancing Collective Responsibility for Safety:** Our integrated strategy's expanded involvement provided a clear way for managers to demonstrate their commitment to safety. This was critical because, while the company's managerial ethos always emphasized safety, previous efforts were limited by departmental isolation. The client manager highlighted this common organizational challenge: “Sometimes it's easy to fall into silos, you work in your little areas, you don't talk and get things done.” However, he noted that this initiative acted as a “team builder” that encouraged

cross-departmental collaboration toward safety. The EHS Director echoed this sentiment, noting that the program's success increased her confidence in securing top management commitment, setting new safety standards, and fostering cross-departmental support for new safety initiatives.

- ✓ Promoting Team Communication: The emphasis on collective responsibility for safety naturally led to enhanced communication within the team. For example, the superintendent noted improved communication between the field and the shop regarding maintenance: "We've been working towards more efficient communication [as a result of the program]. This program let the shop team know if anything needs to be serviced and let workers know when carts come back, they should not put them in a pile somewhere [without informing the shop team]."

4.6.2 Gradual Implementation

The final phase of our r2p project focused on implementing evidence-based solutions. Our second strategy for implementation involved a phased approach, breaking down the implementation process into manageable steps over time. For example, the company's safety management protocols were updated through policy interventions. The safety team incorporated a selection of pertinent ergonomics-related questions into their regular meeting agendas with project teams, preserving the flow and original function of these gatherings. This facilitated the institutionalization of intervention activities. Furthermore, skill training was delivered in manageable portions during toolbox talks, foremen meetings, and all-hands meetings.

Our qualitative analysis underscored the perceived effectiveness of this gradual implementation for several reasons:

- ✓ Alignment with Existing Routines: This approach aligned well with the fast-paced environment and existing routines of the organization, thereby minimizing the administrative burden on the company and ensuring feasibility and sustainability. Because our activities were highly integrated into the company's daily routines, their implementation was minimally affected by the COVID-19 pandemic, demonstrating resilience. This integration not only shielded us from immediate impacts but also prepared us to respond proactively to potential challenges and unforeseen disruptions.
- ✓ Immediate Benefits as Foundation for Future Implementation: The initial stages demonstrated immediate benefits and positive outcomes, setting a robust foundation for broader future implementations. For instance, following toolbox talks, some workers contacted the EHS team requesting additional copies of the materials because they recognized the value of the information. This response significantly elevated the EHS team's motivation and confidence.
- ✓ Increased Curiosity and Ownership: The CEO observed that worker engagement was notably strengthened, stating, "Because the project spanned a longer duration, it took little chunks of time over a broader period. This approach ingrained the information in people." This gradual approach fostered an environment of continuous learning and adaptation, which was crucial for driving lasting change.
- ✓ Enhanced Intervention Effectiveness: The strategic decision to extend the timeline rather than condense the implementation into a single week was pivotal. As the CEO remarked, "It would've been very easy to condense it all into one week, but I don't think that would've had the same impact on our team as the extended timeline did." The repeated exposure to ergonomic information enhanced the overall effectiveness of the interventions, leading to sustainable improvements.

In addition to the two strategies we adopted, Table 5 summarized nine specific actions taken by our research teams that were perceived as valuable during the implementation phase.

Table 5. Advice for Researchers During the Implementation Phase of an r2p Partnership

Theme	Advice
Tailoring and Integration	1. Recognize the company's existing safety events and tailor your program to match their pace. Integrate your intervention activities into these established events.
Planning and Execution	2. Create a well-defined execution plan and continually deliver tangible benefits to the company. Given that company staff often have multiple responsibilities and limited time, a clear and actionable plan is crucial. In our case, this approach ensured efficient use of time and built confidence in collaborative efforts. The EHS manager emphasized the benefits of this approach, noting, "All the information that you put out is easy to grasp. If anyone asks a question, there isn't any information I'm unable to answer."
Engagement and Communication	3. Manage the duration of your interventions to ensure they are digestible. For instance, during a one-hour foremen's meeting, design your intervention segments to last 10-15 minutes. Additionally, consider organizing interactive sessions with field workers during lunch breaks to respect their schedule constraints. This relaxed setting can facilitate more thoughtful input. 4. Provide regular updates to management and change champions and solicit their feedback to ensure ongoing involvement and support.
Relevance and Customization	5. Choose intervention topics that are directly relevant to the subjects addressed at these events. For example, if discussing preventative maintenance at a foremen's meeting, extend your focus beyond materials carts to include forklifts and fall protection equipment. 6. Tailor your intervention materials to fit their context of use. Develop distinct materials for different formats, such as concise, bullet-pointed tips for Toolbox talks and a game format to enhance engagement in larger group settings.
Appreciation and Feedback	7. Show appreciation for the field team's involvement by providing tangible rewards, such as gift cards and complimentary meals. 8. Monitor the progress of your project by conducting periodic surveys and share the results transparently with all team members for ongoing adjustment. 9. Actively adjust your research and implementation strategies in response to constructive feedback to ensure your project remains responsive and dynamic.

4.7 Industry Partner Characteristics

The previous section discussed various actions that our partnership undertook to enhance our collaboration. Central to all these actions is the necessity for researchers to possess a deep and genuine interest in addressing practical challenges, rather than just an enthusiasm for technological or theoretical research. Several industry partner characteristics were crucial in fostering researchers' heartfelt commitment:

4.7.1 The Change-embracing Culture of Our Industry Partner

Our partner's progressive mindset shone through in their unique approach to internship programs. Unlike conventional internships focused on routine tasks, they allowed our lead researcher, in the role of the EHS intern, significant research time and flexibility. This move emphasized their belief in research's transformative

power. During the internship, the lead researcher observed firsthand the physical strains workers face. This experience increased the lead researcher's empathy for field workers in a way that cannot be achieved through mere statistical analysis. This attitude became particularly noticeable during interactions with practitioners. By showing a strong, sincere commitment to helping company address their challenges, we significantly changed the dynamics of the partnership.

Moreover, our industry partner's culture of embracing change was also reflected in their patience. Despite differences in viewpoints and the inevitable setbacks, they remained open to listening and evolving together. Recognizing that meaningful R&D requires time, they provided constructive feedback throughout the process and allowed the research to progress organically. For example, the initial R&D output was cardstock training handouts. These materials, however, were underutilized, as workers tended not to engage with handouts. The EHS director proposed various creative ways to present the information, such as through animated stories and informational tags, tailored to different training scenarios where workers are more likely to absorb the content. Developing these tailored materials was a collaborative effort that took over a year, but this investment paid off, ultimately leading to the seamless and effective implementation of our ergonomic program. Such a patient and open-minded stance in a fast-paced industry is rare and was instrumental in our project's success.

4.7.2 Proficiency in Implementing Changes by Our Industry Partners

The proficiency of our industry partners in enacting change was most apparent in the role of the EHS director. As a change champion, her enthusiasm for positive changes, coupled with strong relationships with field and office staff, was crucial. Recognized within the company as a change advocate, her leadership accelerated the change process.

Top management's involvement and support were also critical in facilitating the project's success through a top-down approach. Additionally, our partner firm's relatively flat organizational structure, typical of small and medium-sized contractors, facilitated direct communication with top management, streamlining the change process.

4.7.3 External Research Funding that Prioritizes r2p

Our partnership greatly benefited from funding by Washington State Labor and Industries SHARP program. Their philosophy, which prioritizes collaborative research with individual industry partners to tackle real-world issues, sharpened our project's focus. This clarity of purpose steered us towards a primary goal: collaborating closely with industry partners to tackle their unique challenges. We considered research publications as a secondary outcome, arising organically from our problem-solving endeavors.

During the R&D phase of our partnership, we received financial and staff support from CPWR. This significantly aided the researchers in completing the ergonomics study and developing and disseminating the r2p materials. The support from CPWR included contributions from r2p staff and the r2p Roofing Partnership, which involved reviewing and editing materials and calculating ROI. CPWR's commitment to r2p and unwavering support for applied studies like ours has been critical in moving research findings to practice.

As demonstrated by this and past successful partnerships, the availability of funding for research on issues prioritized by potential end-users is essential. Problem-driven funding significantly strengthens support from industry partners, enhances r2p collaborations, and aligns academic pursuits with the immediate challenges facing industry practitioners. This funding strategy is currently scarce yet essential and should be advocated for broader adoption to encourage more r2p initiatives.

Changes That Resulted in Deviation from The Methods

Not Applicable

Future Funding Plans

We plan to secure intramural funding from Texas A&M University's Construction Industry Advisory Council (CIAC). This funding will support the expansion of collaborations with CIAC members, employing the reciprocal collaboration model developed through this case study. Additionally, we aim to obtain extramural funding from NIOSH R03 to foster national-level collaborations, further applying and refining the reciprocal collaboration model derived from our current research.

Presentation/Publications Planned

Our goal is to publish a journal paper detailing the findings from this project. We are targeting reputable journals in the field, such as Safety Science or Safety Research, as potential publication venues.

Dissemination Plan

We intend to submit a proposal to present our findings at key industry conferences, including the 2024 ASSP Region III PDC, the ASSP 2025 Expo, and the BCSP 2025 Global Learning Summit. Additionally, we will remain vigilant for other safety-related conference opportunities to disseminate our research findings effectively.

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Appendix – Questions Asked During the Semi-Structured Individual Interviews and Focus Group

1. Tell us about your experience in the construction industry.
2. Have you ever been involved in any research projects before? If so, could you share your experience with us?
3. Tell us about how you were involved in the partnership between Snyder and the University of Washington. What was your role? What are your overall impressions of it?
4. How would you describe the relationships between researchers and company staff? What role does teamwork dynamics play in the Snyder-UW partnership?
5. Based on your experience, what are some ways that researchers can earn support and build good relationships with companies?
6. Imagine a researcher trying to team up with Snyder. What do you think would happen if the researcher did the following things:
 - a. Make frequent site visits to engage with practitioners
 - b. Listen to their needs and concerns with empathy
 - c. Continually solicit and value their feedback
 - d. Demonstrate a genuine interest in understanding their perspectives
 - e. Communicate clearly and concisely
 - f. Avoid using jargon and speak in practitioners' language
 - g. Offer to purchase equipment and tools for the company's use at no cost
 - h. Express appreciation for participants through providing food and gift cards
7. Do you think the lessons we discussed are replicable? What do you think might affect how well they can be applied in different situations?
8. Out of everything we've discussed today, what stands out to you as the most important point? What do you consider the most significant thing you've heard in our conversation?

