

# Transforming the Role of the Concrete Delivery Professional: A Study on Innovative Solutions for the Ready Mixed Concrete Industry



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# Executive Summary

Currently, there is a severe shortage of concrete delivery professionals (CDPs) – the individuals who transport concrete from the plant to the construction site. In fact, according to a recent study by the National Ready Mixed Concrete Association (NRMCA), 70% of concrete producers had to turn away business because their CDP workforce was insufficient to satisfy demand.

This report presents the findings of a research project conducted by the MIT Concrete Sustainability Hub (CSHub), with funding by the Concrete Advancement Foundation, that explores both immediate and long-term innovative strategies to address the national CDP shortage and transform the role of the CDP. These solutions are organized into three categories to reflect the primary way in which the solution impacts the CDP shortage challenge: productivity, retention, and recruitment.

To arrive at these solutions, the CSHub research team employed a multi-disciplinary approach combining qualitative inputs from industry stakeholders with state-of-the-art simulation and analysis. Specifically, the team carried out twenty-five stakeholder interviews, surveyed over 500 drivers, analyzed productivity data from over 30,000 deliveries, and developed a novel CDP Recruitment and Retention simulation model of ready mixed concrete operations. Highlights of the findings are summarized in the following sections.

## Productivity Gains Required to Eliminate the National CDP Shortage

While upfront investments in recruitment and retention solutions may be a barrier for ready mixed concrete (RMC) companies, the value of 1) hiring workers to reduce the number of idle trucks and 2) retaining those workers longer can be significant and, therefore, should not be ignored. To characterize the performance of payload deliveries, telematics data consisting of 36,000 deliveries were analyzed (Figure ES1). The purpose was to explore what it would take for firms to overcome the national vacancy rate (currently 10.9% [1]) through increased productivity of the existing workforce.

Analysis showed that on average, a CDP takes 120 minutes to deliver a load of concrete. (See Figure ES 1.) Reducing this time by only 12 minutes (10%) would significantly boost

Strategies for Recruitment and Retention:

- Increase the candidate pool and leverage technology to change the perception of the job
- Reduce first year challenges through high-quality training and/or automated technologies
- Develop standardized skill set for CDPs that align with industry standards
- Support case-study demonstrations and simulation models of emerging technologies
- Increase communication with CDPs using digital platforms
- Clarify career pathway potential

productivity and nearly alleviate the shortage issue. This gain in productivity would enable each CDP to deliver an average of 3.4 loads of concrete per day, instead of 3.1. There are significant opportunities to achieve this level of productivity such as increasing the use of automation for non-value-added tasks (e.g., truck washing). Additionally, the duration of driving and waiting tasks for CDPs depends on various factors, such as traffic and scheduling. However, these tasks can be performed more efficiently with better information and communication. For example, more accurate data on traffic conditions and site readiness can help CDPs plan their routes and reduce their waiting time.

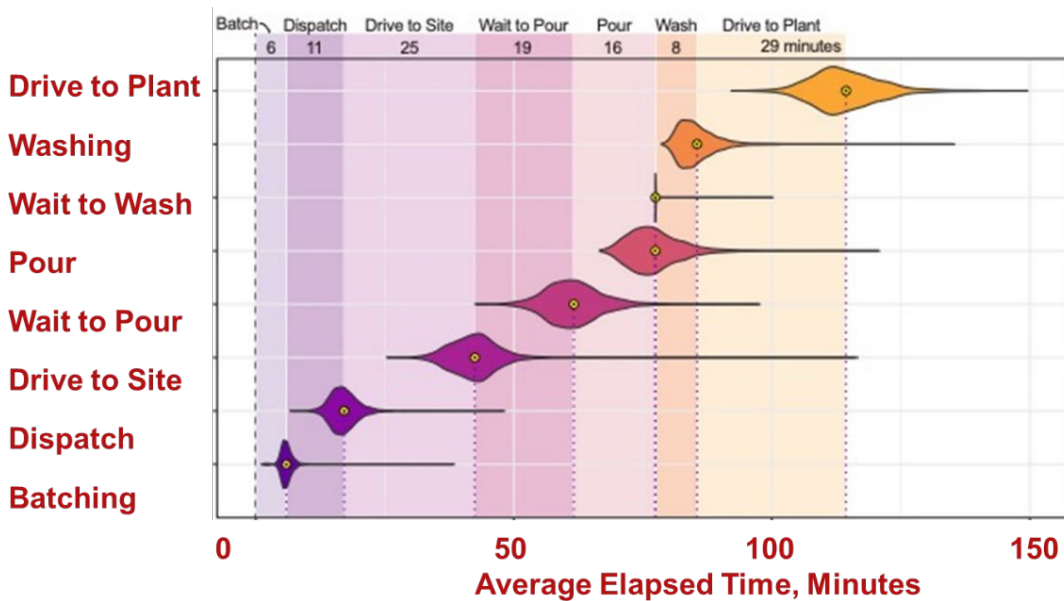


Figure ES 1 The average time (minutes) to complete each task from batching to returning to the plant.

### The Costs of Not Recruiting and Retaining CDPs

The MIT team leveraged feedback from interviews and inputs from the 2021 NRMCA National Mixer Driver Recruitment and Retention Survey to understand the costs of not hiring and not retaining CDPs at RMC companies. A CDP Recruitment and Retention simulation model was developed for a representative case study of a concrete plant, aiming to assess the real value of hiring and retaining drivers with varying levels of experience and training. The tool computed both direct and indirect costs to a company. The direct costs comprised HR, recruiting, training, and CDP wages. The indirect costs encompassed lost productivity due to shifts in CDP experience and idle trucks. A Monte Carlo simulation was used to explore the economic impact of changes in productivity, recruitment, and retention across a broad range of scenarios.

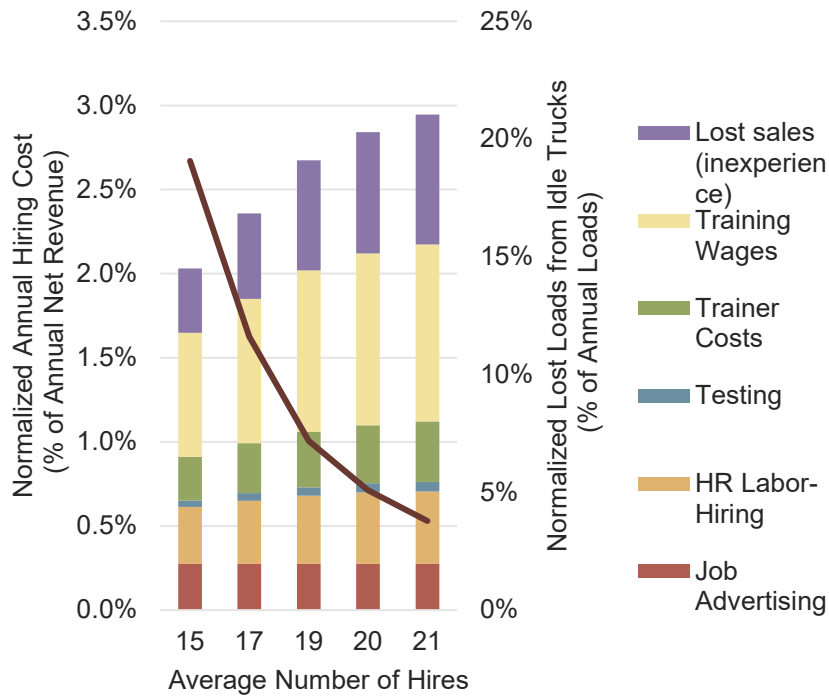


Figure ES 2 A comparison of the changes in direct costs and indirect costs per annual expected revenue. When the hiring rate increases, the hiring cost per expected revenue normalized hiring cost also rises (left axis). However, there is also a reduction in the lost sales as the number of idle trucks declines (right axis).

\*Normalized hiring cost represents dollars spent on hiring normalized against the expected net revenue of the facility operating at the baseline hiring rate

Applying this model, the CSHub research team found that the costs to increase hiring are easily offset by the gains from more trucks operating (e.g., reductions in lost sales from idle trucks). In Figure ES 2, a 10% increase in hiring rate leads to a 3% increase in trucks operating, idle trucks drop by 22%, and expected total net revenues increases by 5%. In fact, a 28% increase in hiring should be sufficient to achieve 95% of nominal capacity. While hiring more CDPs each year increases the direct costs (hiring and wages), there are significant gains in revenue from the improved productivity from fewer idle trucks. Increasing hiring is not the

only strategy to reduce the driver shortage. Model results revealed that increasing driver retention (i.e., average driver tenure) would also provide significant productivity gains, especially for new drivers. As CDPs gain experience, their productivity increases and truck idle time decreases. While the need for better recruitment and retention is not news, the model helps us to understand specific targets and payback periods which enables better decision-making about strategies and investments to boost these areas. The MIT CDP Recruitment and Retention simulation model estimates that every additional week of average new driver retention generates about a 1% gain in net revenue per the annual expected revenue (Figure ES 3). Increasing new hire tenure by 35% provides the same value as doubling the hiring rate.

Discoveries from the CDP Recruitment and Retention simulation model demonstrate that increasing driver productivity, hiring rate, and/or driver retention are all powerful strategies to address the driver shortage. The research team turned to a novel, comprehensive survey to understand how that might be accomplished by building upon the insight from hundreds of CDPs about tasks and on-the-job conditions that contribute to job satisfaction.

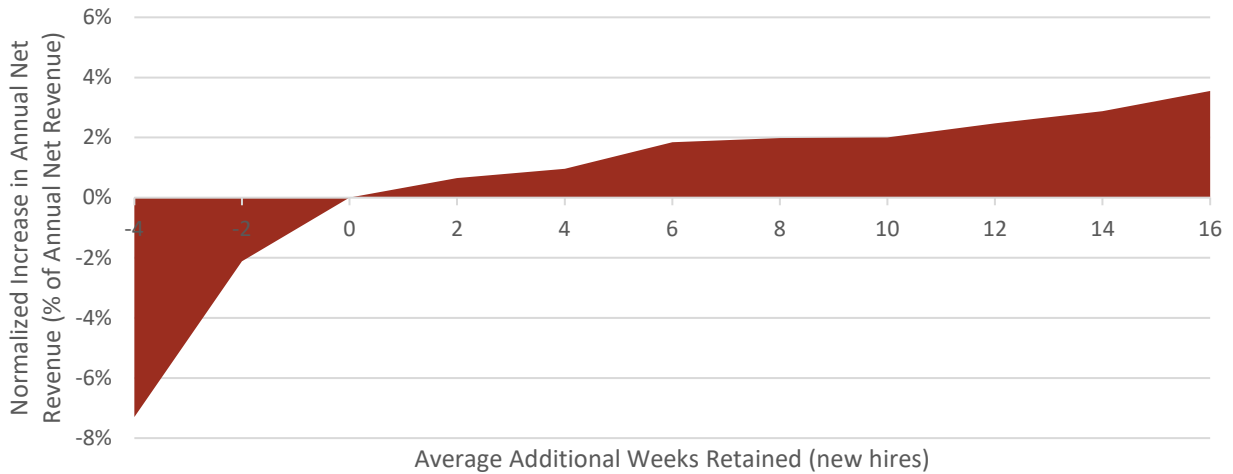


Figure ES 3 Results showing the gains in net revenue per annual expected net revenue for each additional week beyond the first 26 weeks of employment.

### CDP Responses from National Job Satisfaction Survey

While data and modeling of concrete operations reveal the impact and value of productivity, hiring, and retention, they do not alone provide insight into how those goals might be achieved. To gain those insights, the team designed a nationwide CDP job satisfaction survey.

The survey explored the factors that influence job satisfaction and dissatisfaction of both experienced and novice CDPs to identify strategic solutions that would most effectively impact recruitment, retention, and productivity. Candidate solutions were identified through expert stakeholder interviews. Over 500 CDPs from across the nation provided responses.

**Most Enjoyable Tasks for Experienced CDPs**

- Dealing with contractors
- Operating the truck
- Experiencing the variety of job types
- Income and benefits

The survey revealed that the CDPs who are satisfied with their job appreciate engaging with contractors, the day-to-day variety of the job, the income and benefits, and, most of all, actually operating the ready mixed concrete truck. (Figure ES 4 )

The survey also exposed those aspects of the CDP occupation that bring the least satisfaction. These include the irregular schedule, the timing of breaks during shifts, the lack of acknowledgment of their performance, the responsiveness of management, employee monitoring (e.g., cameras), and the physical demands (especially the handling and assembling of the chutes). Qualitative responses from CDPs made it clear that these aspects of the job are often viewed as unfair, intrusive, or physically demanding.

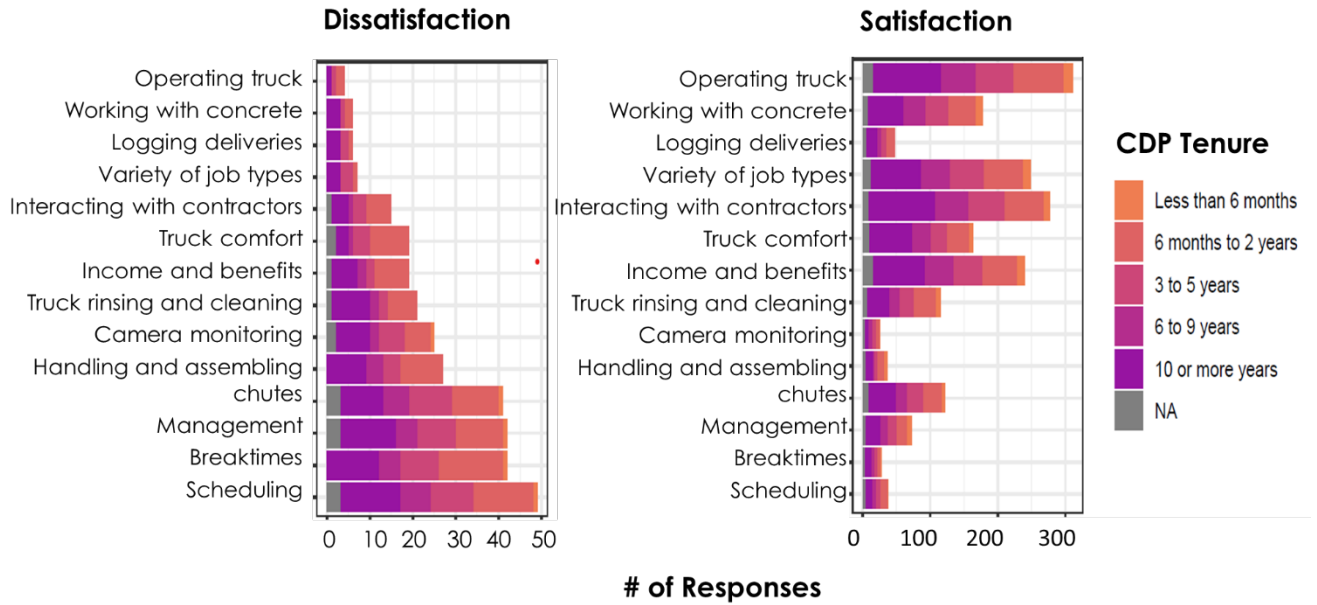


Figure ES 4 CDP survey results (n=378) indicate which factors contribute the most to job satisfaction or dissatisfaction.

To gain insight into how the CDP occupation could be made more appealing to new CDPs, existing CDPs were also asked about the most challenging tasks for first-year CDPs. The results (Figure ES 5) show that the greatest burdens for first-year CDPs are caused by learning the properties of concrete, placing concrete for more challenging pours, dealing with contractors, and driving off-road. Prioritizing and implementing solutions to reduce these frustrations for first-year CDPs will have far-reaching benefits for the ready mixed concrete industry.

**Most Challenging Tasks for First Year CDPs**

- Learning properties of concrete
- Placing concrete for more challenging pours
- Dealing with contractors
- Driving off-road

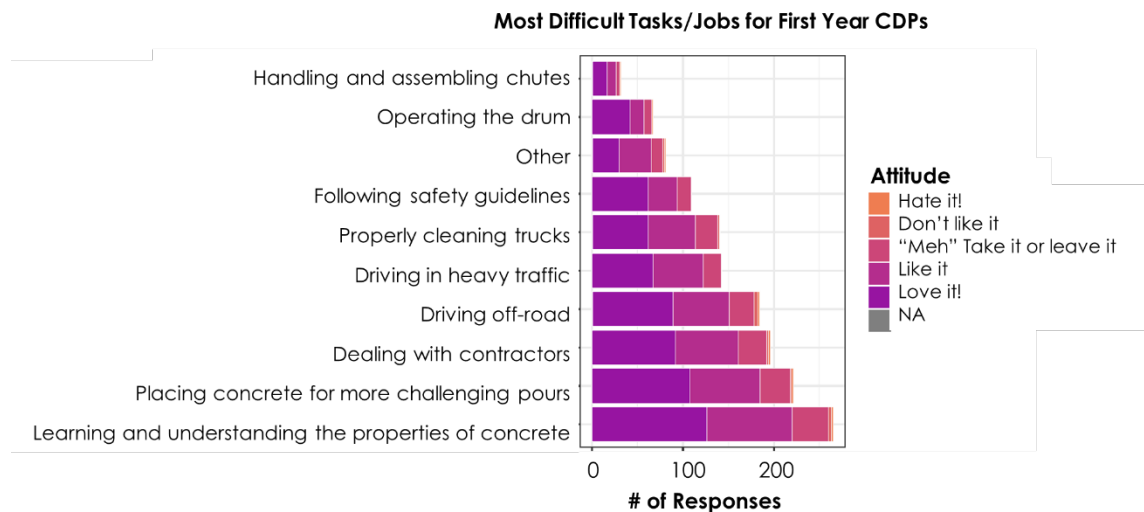


Figure ES 5 Survey results for the main challenges faced by first-year CDPs.

## Barriers Preventing Widespread Adoption of Technological and Operational Solutions

To explore the challenges and opportunities associated with adopting transformative technological and operational solutions, the research team engaged with stakeholders from across the industry (n=55, Figure ES 8) at an in-person workshop hosted by the MIT CSHub in March 2023. The group included representatives from technology companies, research scientists, operations and human resources managers from ready mixed concrete companies, among other stakeholders.

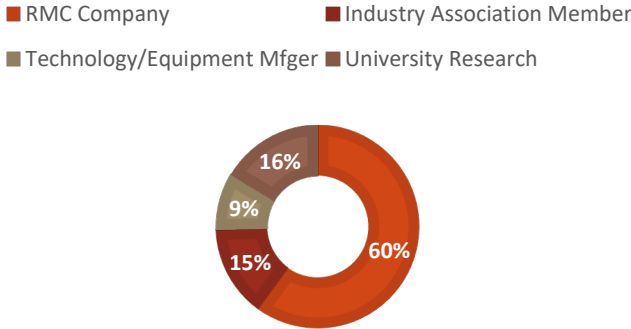


Figure ES 6 Attendees of the CDP Workshop in March 2023 and their affiliations.

The attendees were introduced to emerging technologies that could help with productivity, recruitment, and retention challenges. Presented with the CSHub's findings from its study, the group was tasked to identify opportunities and barriers that must be resolved before full-scale implementation.

Workshop participants reinforced the importance of training – particularly for challenging pours, driving, and concrete properties – and interfacing with contractors, as key challenges for new CDPs. Inconsistent schedules and management engagement were affirmed as a challenge facing all CDPs and operations. Participants acknowledged the potential of existing and emerging technologies, but they also identified the upfront investment as a major barrier to adoption and the need for case study demonstrations at RMC operations. In the following section, recommendations for each of the three key challenge areas will be discussed.

### Recommendations

The research team combined insights from data analysis, simulation models, driver survey results, and expert feedback to develop a comprehensive list of potential technological and operational solutions to eliminate the CDP shortage. These solutions vary in their implementation time and complexity. Moreover, some solutions address more than one challenge at the same time.

### Technology can make the CDP job more attractive, increase retention, and improve productivity

The trucking industry and many related industries are facing an extreme shortage of qualified candidates. Therefore, the industry must invest in advanced technologies that can achieve higher productivity and sustainability.



### Truck Technologies

Technology can help the concrete industry overcome the problems of retaining and recruiting CDPs by changing the nature of their work. For example, technology can lower the physical and skill demands of the job. Automation and sensor technologies are also cost-efficient technologies that improve repetitive processes and more difficult tasks for CDPs. Software technology and sensors can provide more information for the CDP when interfacing with the customer on quality issues. Technology also eliminates and reduces activities that do not add value, such as downtime, waste, errors, or redundancy, which improves the quality and efficiency of the work.

### Training and Engagement Technologies

In addition to truck and concrete specific technologies, many companies are also innovating in the recruitment, retention, and training space. Scheduling applications are becoming increasingly popular for many industries. For example, bid-for-schedule applications allow workers to bid on specific shifts at certain rates depending on the demand for the shift. This type of tool could also allow companies to evaluate and implement surge pricing models with customers for high demand shift times.

Virtual reality (VR) and augmented reality (AR) technologies have gained popularity for training and on-the-job assistance across industries. In the RMC industry, VR systems have been proven to improve the safety of the job by simulating one of the most dangerous events – a rollover incident. VR can help train CDPs in many different scenarios. AR could be used on-the-job to aid CDPs with maintenance and troubleshooting.

### **Investing in New Technology Provides Strong Economic Returns**

There are a number of technological solutions that could reduce the key challenges faced by CDPs. Truck washing is one solution already present in the marketplace that would both reduce physical demands and eliminate parts of the job that are sources of dissatisfaction. As noted earlier, however, many firms are hesitant to adopt these solutions because of the upfront cost and the lack of case specific analyses to support the business decision.

The CDP Recruitment and Retention simulation model allows us to provide insight into those business cases. Automation technologies not only increase the attractiveness of the job (increasing both recruitment and retention), but also increase driver productivity. As shown later in the report, in a labor constrained environment, a 1% change in productivity can provide up to a 1% increase in expected annual net revenue. That means that a firm could invest more than 5% of their expected annual net revenues in a new technology for every 1% gain in productivity and still come out ahead. (Assumes 10% real discount rate and technology lifetime of eight years).

As an example, some vendors suggest that something as simple as an automated truck washer could reduce batch-to-batch cycle time by 10 minutes. That 9% increase in productivity (See Figure ES 1.) would provide a positive return on investment, as long as the upfront investment was less than 50% of annual expected net revenue.

Gamification tools are particularly effective for younger generations since K-12 teachers have been using games in their classes. Gamification allows companies to provide feedback on targeted performance enhancing behaviors. It has helped encourage positive behavior and performance in the RMC industry and increased retention rates. Gamification also reduces the engagement required by management to recognize workers and provides a fun way to interact with CDPs.

### **CDP retention can be addressed through technology and management engagement**

Roughly 40% of CDPs quit within the first year of employment, and results from the simulator showed every additional week of average retention generates additional value per year (Figure ES 3). Therefore, the industry must target solutions that reduce first year challenges for CDPs and increase the ways in which CDPs have more involvement in their scheduling, professional development, and improving communication with management.

#### **Enhancing Careerlong Engagement**

The survey responses from the CDPs revealed that job satisfaction is mainly influenced by two factors: inconsistent scheduling and poor managerial relationships. Flexible scheduling tools such as bid-for-schedule applications could help address scheduling challenges by providing more flexible options and increased wages for unpopular shifts. However, as the industry works to build this technological solution, near-term solutions include: 1) rotating schedules between senior and new CDPs to allow for equality in scheduling and 2) fixed schedule hours.

The next step to improving CDP retention is to increase engagement between CDPs and managers using digital platforms. NRMCA has several resources that companies can use to measure and improve employee engagement, such as the NRMCA 90-day check-in, an exit interview questionnaire, and job satisfaction survey.

As aforementioned, CDPs want to have career growth. As the industry works to define the standardized set of skills for the CDP occupation it should extend this action by creating standardized skill sets for other positions at a concrete producing plant (e.g., batch plant operator, CDP trainer, etc.). This action can help define skill overlap and increases transparency for CDPs to recognize how their skill levels translate into other careers, promoting professional development. It also creates a clear career pathway for CDPs who want to advance within the industry or transition to other sectors.

#### **Reducing First Year Challenges**

To reduce first year challenges, one strategy is to standardize training when onboarding new hires and to develop competency-based assessments. A key element of training is to ensure that the trainee understands the hierarchal structure of these skills and competencies, because while specific skills may not directly translate into other occupations within the industry, competencies do. By learning how to articulate their skills in terms of competencies, CDPs can broaden their career horizons, as competencies are more transferable than specific skills.

In addition to standardizing training, as the candidate pool expands, the industry will encounter more employees who lack a CDL or ready mixed concrete experience. To address this challenge, firms should consider integrating virtual reality and/or gamification of the learning outcomes as additional tools that can enhance learning. These tools can complement each other and create a more engaging and effective learning environment for the employees.

### **Improving CDP recruitment requires expanding the candidate pool and increasing the job appeal**

#### **Change the perception of the job**

The adoption of more automated technology and processes also expands the CDP candidate pool by lowering the physical requirements of the job. In turn, this may attract more female applicants and extend the working years of older employees. Automation also reduces the risk of accidents that occur when performing these tasks. Furthermore, automation can enhance productivity by streamlining the workflow and reducing errors and non-value-added time.

In addition to changing the perception of the job via technology adoption, all companies in the RMC industry should consider following the NRMCA's rebranding of the occupation by eliminating the term "driver" from the job title and description and instead using CDP.

#### **Expand the candidate pool**

To increase the candidate pool, the industry needs to establish a standardized set of skills demonstrating the technical nature of the job. This would help facilitate the access of foreign workers who need to demonstrate their technical qualifications for a visa application. Other recruitment populations include younger workers (18–21-year-olds) and drivers without RMC knowledge. One operational strategy to recruit these workers is to develop a new position, a concrete delivery technician. The goal of creating this position is to support the CDP and eventually move into a CDP role, creating a career pathway for younger workers or workers without RMC experience. This operational solution could help new CDPs to adjust to other aspects of their work, such as understanding the properties of concrete and interacting with contractors, by reducing the stress associated with the first-year challenges.

We used the MIT CDP Recruitment and Replacement Cost Simulator to evaluate the economic feasibility of employing concrete delivery technicians/technologists to support new hires at selected job sites. The results demonstrate that if the introduction of the technician role increases training and ramp-up speed while also increasing the average retention time of CDPs, this will result in cost savings. At less than a 10% increase in tenure, the use of a technician resulted in increased net revenue. This result suggests that the deployment of delivery technicians could help companies increase their net revenue if the position enables longer retainment of CDPs and reduced training needed for CDPs. It also enables a pathway for younger individuals to enter the industry when there may be other age-related hurdles to moving directly into a CDP role.

## **Additional research and outreach can help address the CDP shortage**

In conclusion, there are several additional areas of research and outreach that the CSHub research team believes can assist in addressing the CDP shortage.

Concrete producers operate in a highly competitive market, and as a result, they often need to have a clear understanding of the value proposition of new solutions, such as a bid-for-schedule app or emerging technologies (e.g., augmented reality). To increase buyer confidence, this study has demonstrated the value of investing in new technologies and adopting emerging solutions through the CDP Recruitment and Retention simulation model. However, during the CDP workshop, it was made clear that case study demonstrations from early adopters of new technologies would help other companies to understand the risks and benefits. These case studies could enable potential users to make informed decisions, which could encourage widespread adoption of existing and emerging technologies. NRMCA and state ready mixed concrete associations regularly provide opportunities for sharing case studies and best practices among peers in an environment that assures antitrust compliance.

The development of additional models and tools is an important element. The existing CDP Recruitment and Retention simulation model could be expanded to a common platform to explore the effects of new solutions on cost and productivity. A proof-of-concept bid-for-schedule simulator could be developed to test the functionality of allowing CDPs to select their preferred shifts based on their availability, preferences, and seniority, which can enhance their satisfaction, autonomy, and work-life balance. Building a prototype could provide insights into the optimal design and the return on investment for a more permanent and scalable solution.

As the RMC industry undergoes these changes, there is a high demand for data. Few studies beyond those performed by the NRMCA have analyzed the CDP shortage, unlike the long-haul trucking industry. The creation of a CDP data hub, a centralized system for CDP data, can facilitate empirical analyses that can shed light on the CDP shortage and produce significant value for decision-makers.

The RMC industry faces a serious challenge of retaining and recruiting CDPs who are vital for the construction of infrastructure that supports economic growth. The industry needs to explore and adopt transformative technologies and operational solutions that can enhance the CDPs' skills, satisfaction, and performance.

Taking a systems approach to assessing the situation from multiple angles, this report identifies potential solutions that could be implemented near-term and long-term. We recommend that the industry stakeholders consider these solutions to build a sustainable workforce.