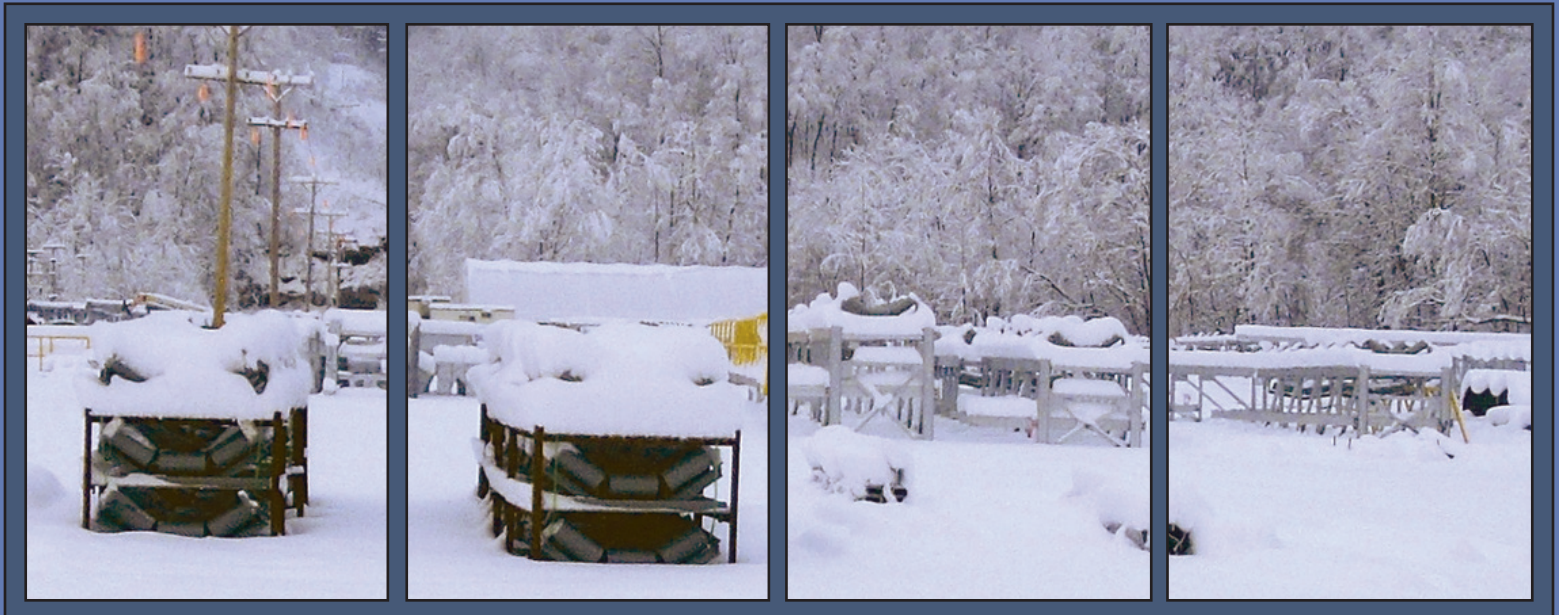


Late Deliverable Risk Catalog: A User Guide



Construction
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Implementation Resource 300-2, Version 2.0



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*Research Team 300, The True Impact of Late Deliverables
at the Construction Site*

Construction Industry Institute

Implementation Resource 300-2, Version 2.0

Volume I

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Introduction

The fact that every construction site is both temporary and unique makes the timely onsite delivery of all resources crucial to successful project outcome. Indeed, since project schedules and budgets, and construction contracts and subcontracts are all based on assumed delivery dates, overall project success is contingent upon the on-time delivery of equipment and materials. However, late deliverables to the construction site continue to create impediments to project success throughout the industry. Beyond perhaps noting the immediate impacts to cost and schedule, project teams rarely trace the full range of impacts through the entire project. It is these secondary or knock-on effects of one or more late deliverables that can exacerbate their initial effects and lead to the pushing of schedule activities to the right; such schedule changes can place undue pressure on the traditional project goals of safety, quality, cost, and schedule. Furthermore, with the additional strain placed on meeting these goals, inordinate pressure is also placed on the individuals, teams, and organizations involved in the project. Thus, Research Team (RT) 300 kept its focus on the effects of late deliverables on the five project pillars of safety, quality, cost, schedule, and organizational capacity.

In order to understand fully the far-reaching impacts of late deliverables at the construction site, the Construction Industry Institute (CII), in collaboration with the Construction Users Roundtable (CURT), commissioned RT 300 to investigate how various types of late deliverables affect project cost, schedule, quality, safety, and organizational performance. The formal research objective of RT 300, whose membership included experts from leading industry owners and contractors along with distinguished university academics, was to close this gap in knowledge, increase awareness of the broader range of impacts, and focus on mechanisms for industry improvement. Specifically, RT 300 was charged with determining the most common types of late deliverables, identifying their full range of impacts on projects, and introducing tools and techniques to improved project performance.

To meet these objectives, RT 300 conducted research with two primary goals: 1) assess how late deliverables and resulting impacts are currently perceived and managed by construction industry professionals; and 2) create an extensive database of late deliverables and their impacts, for use in the construction industry. Pursuing

the first research goal, RT 300 conducted surveys, questionnaires, and case studies to determine how industry professionals view late deliverables. To accomplish the second research goal, RT 300 used these same methods to enumerate, categorize, and catalogue known late deliverables and their impacts. Consequently, the team developed the Late Deliverable Risk Catalog (LDRC)—the focus of this user guide—as an industry tool to communicate its findings to construction industry professionals and project teams.

RT 300 established two primary purposes of the LDRC, based on the results of the first research goal: 1) increase industry awareness of the full range of impacts caused by late deliverables; and 2) promote owner-contractor alignment on the those impacts. Figure 1 below shows how more than 50 industry professionals assessed the impact of late deliverables on the five project pillars of safety, quality, cost, schedule, and organizational capacity. As can be seen, the average ratings for both safety and quality were lower relative to those of the other pillars. However, the research showed that a similar number of impacts are experienced for the safety and quality pillars, although they are less often tracked and linked to late deliverables. Thus, RT 300 hopes the LDRC will enlighten the industry to unknown and unforeseen impacts of late deliverables with respect to all five project pillars.

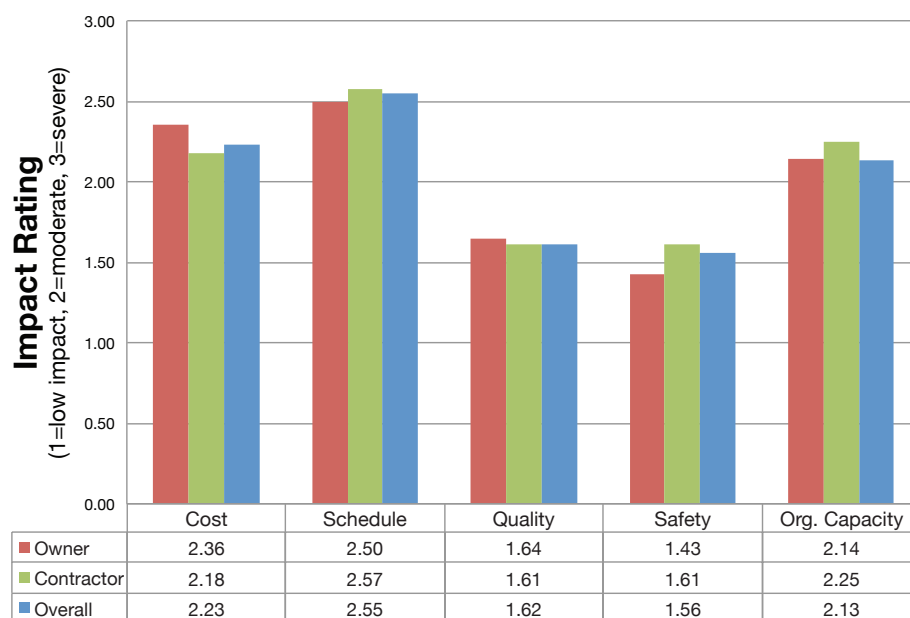


Figure 1. Project Pillar Impact Ratings

Also of note in Figure 1 is the average rating assigned to organizational capacity, defined by RT 300 as the capacity or capability of individuals and/or an organization to efficiently and effectively execute work with regard to teamwork, morale, team alignment, company alignment, relationships, and resources. While investigating this pillar was not a part of the original charter, the team's research results show that industry professionals recognize the impacts of late deliverables to the organization as a whole, and thus the investigation into this fifth pillar was warranted. Therefore, the organizational capacity pillar has been included in the LDRC to increase industry awareness of these potential impacts.

Other research results from the RT 300 investigation into industry perceptions guided the team to develop the LDRC to address owner-contractor alignment on the impacts of late deliverables. Figure 2 illustrates how contractors and owners perceive various categories of impacts from late deliverables. While the overall shape of the spider graph shows alignment between owners and contractors, the figure also makes clear that there is room to improve the owner-contractor alignment for several of the specific impact categories defined by RT 300.

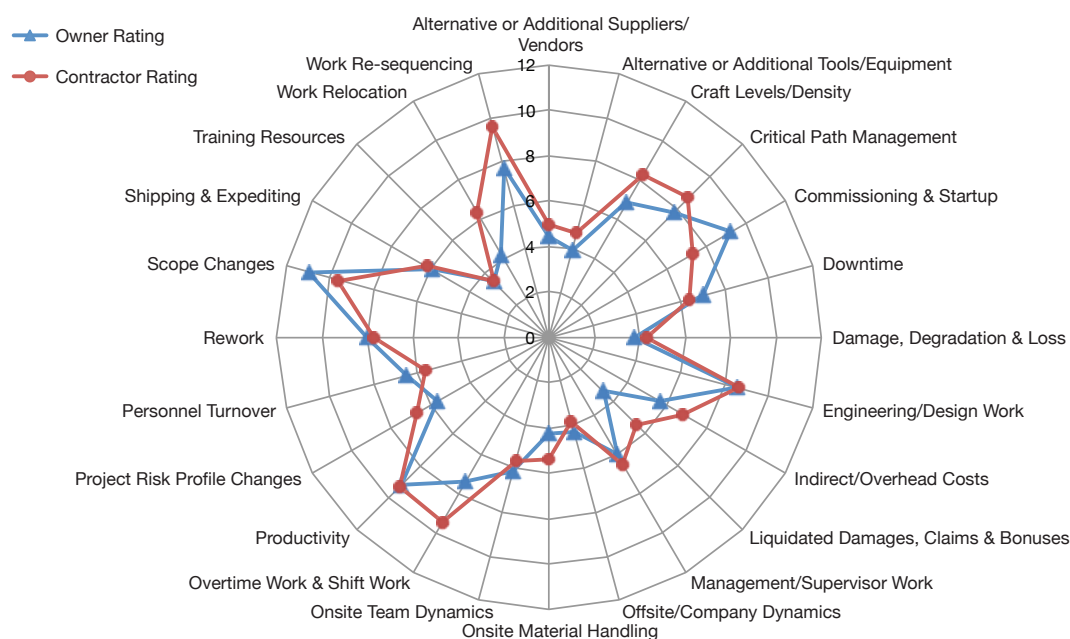


Figure 2. Owner and Contractor Ratings of Impact Types

Overall, contractors rated the site-related impacts to the field consistently higher than did owners. This assessment included the following categories: Work Relocation and Re-sequencing; Overtime and Shift Work; Critical Path Management; Alternative and Additional Tools and Equipment; and Onsite Material Handling. Meanwhile, owners showed greater concern with impacts to scope and commissioning/start-up, and less with liquidated damages than contractors. While most of these differences would be expected, they are important to understanding the viewpoints of owners and contractors, promoting alignment when late deliverables occur, and helping to create a starting point for strategies to overcome late deliverables and prevent disagreements. It is the hope of RT 300 that the Late Deliverable Risk Catalog will succeed in promoting improved alignment between owners and contractors. A more detailed look into these and other research results can be found in Research Summary (RS) 300-1, *The True Impacts of Late Deliverables at the Construction Site*, and Research Report (RR) 300-11, *The True Impacts of Late Deliverables at the Construction Site*. RR 300-11 also includes additional statistical analysis of the data presented in these graphs.

RT 300 has prepared this implementation resource to help practitioners successfully apply the LDRC and understand the associated research. Chapter 2 briefly outlines the research background that is described in RS 300-1 and detailed in RR 300-11. After the team performed its literature review and collected expert input, it catalogued the knowledge gathered into a relational database. It further created the LDRC to give project teams a means of easily navigating and presenting the late deliverable data relevant to their respective projects. The LDRC is described in detail in Chapter 3, along with instructions for use, deployment recommendations, and example applications. Chapter 4 presents a set of lessons learned about late deliverables, developed from the RT 300 case studies, along with several recommendations for preventing the most common types of late deliverables, and suggestions for incorporating the LDRC into company processes. Finally, Chapter 5 includes a summary of the expected benefits associated with a greater understanding of the true impacts of late deliverables to the construction site.

Research Background

The Late Deliverable Risk Catalog (LDRC) is based upon the data collected over an 18-month period by RT 300. Figure 3 summarizes the research, tool development, and validation processes. This chapter only summarizes each segment of the research that contributed to the development and testing of the LDRC. RR 300-11 presents a more detailed explanation of all phases.

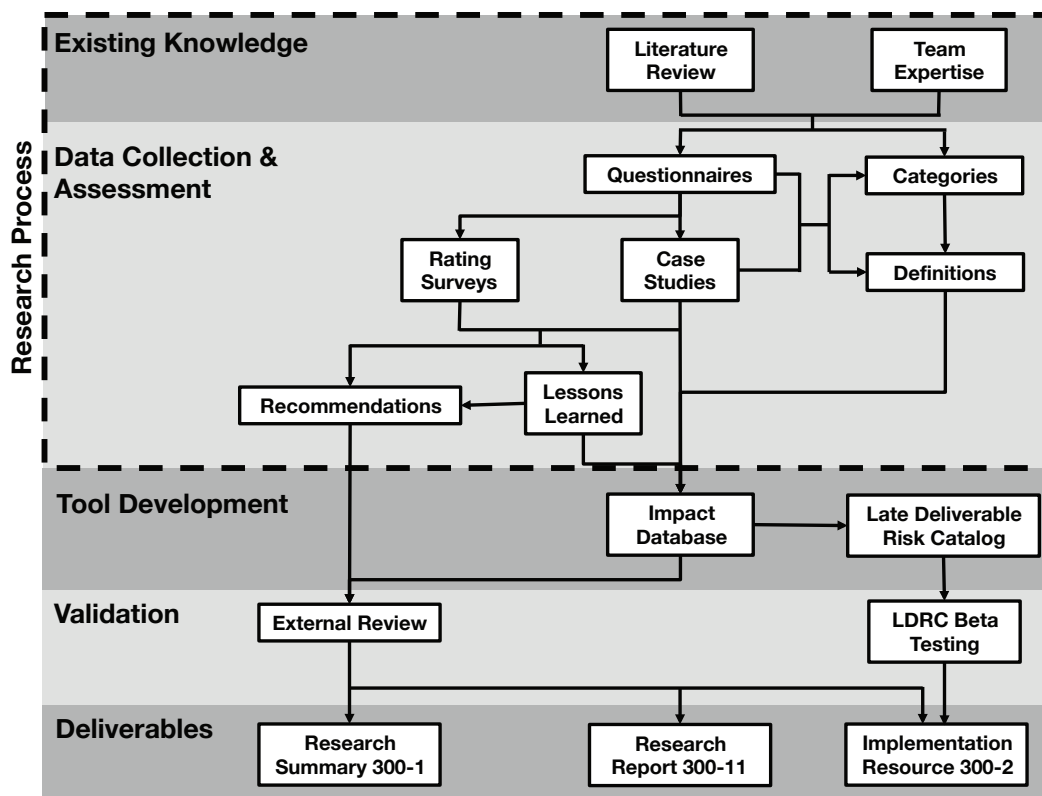


Figure 3. Research Overview

Research Process

RT 300 employed a variety of data collection methods to understand the full range of potential late deliverables and their associated impacts on construction projects. The research process consisted of two phases: 1) gathering existing knowledge; and 2) collecting and assessing new information. In order to identify, describe, and quantify the impacts of late deliverables, the research team started with a combination of existing knowledge from industry and academic literature, and from collective team expertise based on a total of 324 years in the construction industry. To complement the information compiled from existing knowledge, the team also developed several surveys and questionnaires to collect quantitative and qualitative data, and to increase the breadth of the research base. These instruments included an interactive survey presentation at the 2012 CURT National Conference and a “mini” case study questionnaire distributed to both CII and CURT members.

Each of these data collection techniques provided different information, but similarities and trends emerged in the data, allowing the research team to draw conclusions and categorize the information into a manageable set of knowledge. This included categorizing both the most common types of late deliverables and their associated impacts. Concurrently with the development of the categories, the team also created definitions to provide clarity and consistency, and to differentiate each type of late deliverable, impact, and project pillar. As the team collected additional information, it continually refined and updated the categories and definitions. The full set of definitions provides both context and examples for each category and can be found in the appendix. The 10 categories of late deliverables, the 24 categories of impacts (shown below in Table 1), and the five project pillars have also been incorporated into the LDRC, as described in the next chapter.

Table 1. Late Deliverable and Project Impact Categories

Late Deliverable Categories		Project Impact Categories	
1	Engineering Documents, Approvals, and Responses	1	Scope Changes
2	Engineered Equipment	13	Management/Supervisor Work
3	Fabricated Materials	2	Productivity
4	External Permits	14	Personnel Turnover
5	Prefabricated Assemblies	3	Engineering/Design Work
6	Project Execution Planning	15	Procurement, Logistics, and Expediting
7	Human Resources	4	Work Re-sequencing
8	Utilities & Infrastructure	16	Onsite Team Dynamics
9	Bulk Materials	5	Overtime and Shift Work
10	Construction Equipment	17	Work Relocation
		6	Critical Path Management
		18	Onsite Material Handling
		7	Commissioning and Start-Up
		19	Alternative or Additional Suppliers and Vendors
		8	Rework
		20	Liquidated Damages, Claims, and Bonuses
		9	Craft Levels/Density
		21	Alternative or Additional Tools and Equipment
		10	Downtime
		22	Offsite/Company Dynamics
		11	Project Risk Profile Changes
		23	Damage, Degradation, and Loss
		12	Indirect/Overhead Costs
		24	Training Resources

As the range of impacts and late deliverables expanded, the research team also implemented case studies on recently or nearly completed construction projects to increase the depth of understanding on the topic. The team chose its case studies such that they would represent each of its 10 late deliverable categories. Table 2 shows the late deliverable category addressed in each case study, along with the secondary selection criteria the team used to maintain variety in the case studies. The LDRC includes the information regarding specific impacts that was gathered in these case studies. Volume II of this implementation resource presents summaries that provide a narrative for each case study.

After completing the case studies, the research team used the 2013 CURT National Conference as an additional opportunity to collect data concerning late deliverables, this time regarding the commonality and severity of the previously developed categories of late deliverables and impacts. In a short five-question survey, respondents were asked to rate the commonality and severity of each late deliverable type and impact category on a scale of one to four. Table 1 provides the resulting average ratings, with rankings of both lists by relative importance as found in the survey. These findings showed the research team, among other things, which deliverables should be most closely tracked and which impacts should be most closely monitored and mitigated. (See Chapter 4 for more detail on tracking and mitigation.)

The final portion of the research phase involved creating a set of lessons learned and recommendations to accompany the LDRC. The research team used the case studies it conducted to develop the lessons learned; they address the prevention of late deliverables and the mitigation of their impacts. Once the team had developed these lessons learned, it used them—along with the data from the rating survey—to develop a set of recommendations for avoiding the most common types of late deliverables. All of these lessons learned and recommendations can be found in Chapter 4.