

FACTORS AFFECTING BID LET DATES ON TRANSPORTATION MEGA PROJECTS

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Abstract: North Carolina Department of Transportation (NCDOT) projects with construction costs of \$50 million or more, known as mega projects, make up more than 50% of their total construction expenditures while representing less than 10% of the total project count. The estimated let dates and construction expenditures for these projects can vary significantly based on the type of project, work to be accomplished, and unpredicted events. This paper presents study results of various internal and external factors that relate to bid let date delays. The research methodology involved an extensive literature review and interviews with 23 NCDOT subject matter experts and construction contractors to better understand why mega project miss their planned let dates. Results revealed several factors that affect the let date including the owner's ability to acquire the right-of-way in a timely manner, the ability to coordinate with utilities and railroads, and delays in obtaining environmental permits. The study also collected and analysed data pertaining to strategic milestones and provides insights into the likelihood of meeting a particular let date.

Keywords: Transportation mega project, contract award, let day delay

1 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) Projects with construction costs in excess of \$50 million (mega projects) comprise less than 10% of the number of centrally let awarded projects, but account for more than 50% of total construction expenditures. Mega projects influence the overall cash balance; hence, it is crucial to understand the factors affecting mega projects' let dates. The purpose of this paper is to identify internal and external factors that influence project let dates (e.g. funding, environmental permits, design, ROW, utilities, contract type, etc.) and determine their impact, in order to provide insights regarding the likelihood of projects meeting their let date, possible corrective actions to meet the original letting schedule if problems arise, and

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potential practices to accelerate a project's progress. The study's focus is mega projects due to their significant impact on the overall NCDOT financial management performance. The key factors affecting the contract awards are identified, along with recommendations for improvements to better control the contract letting dates.

2 LITERATURE REVIEW

An internal literature review was conducted to understand causes for letting delays for NCDOT projects. An NCDOT project delivery study report (Dye Management 2004) indicated that a "large minority" of projects were not delivered within the planned 12 months of the letting schedule. Permitting delays were frequently cited as the reason, but this cause is mainly systemic. Other reasons cited include the complexity of NCDOT's program and the nature of its new construction—heavily weighted towards complex, higher risk, and longer duration projects. Factors that were cited as causing delays include staff shortages, employee retention, and human resource management. Utility clearance was also cited as a bottleneck in the process.

The uniqueness and extent of North Carolina's environmental requirements was also cited as a letting delay factor. There were several high profile examples of projects where the environmental process and permitting resulted in considerable delays. Within NCDOT, and among its partners and customers, there is a general view that the length of time it takes to complete the environmental process is a major cause of project delays and overall project delivery time.

According to a 2008 performance audit report (Merritt 2008), NCDOT was not meeting let dates with 73% of the 390 projects missing their targeted construction start year. Additionally, 40% missed their start date by more than a year. The majority of these project delays were due to the permitting process, environmental reviews, and design changes. The audit concluded that NCDOT was not meeting construction schedules and costs. Of the 390 projects audited, the construction schedules were extended 21% beyond their original completion date and payments exceeded original contract amounts by 7%. From a sample of 100 projects, the predominant causes of schedule extensions were design changes and pro rata days. The largest cause of cost overruns were in construction materials pay items and design revisions. The audit was critical of separate management of projects' preconstruction and construction phases, and NCDOT's lack of performance management control activities.

Jeff Roerden (2014) conducted an NCDOT study to rank reasons for project let date delay. One hundred and twenty projects were examined which generated a spreadsheet including 659 observations for letting status, either delayed or not impacted. According to the study, planning, undocumented schedule changes, design delays, and funding issues were the most significant causes for let delay. Some of the more commonly cited planning comments related to additional study (design and environmental) and coordination time needed to identify alternatives, the preferred site becoming unavailable late in the process, delays in obtaining technical data, and reviews by other agencies taking longer than expected. Narrowing the data provided in Roerden's 2014 study, to account only for mega projects, planning was found to be the primary reason for shifting the let date. Figure 1 shows the Roerden ranking for letting delays for mega projects.

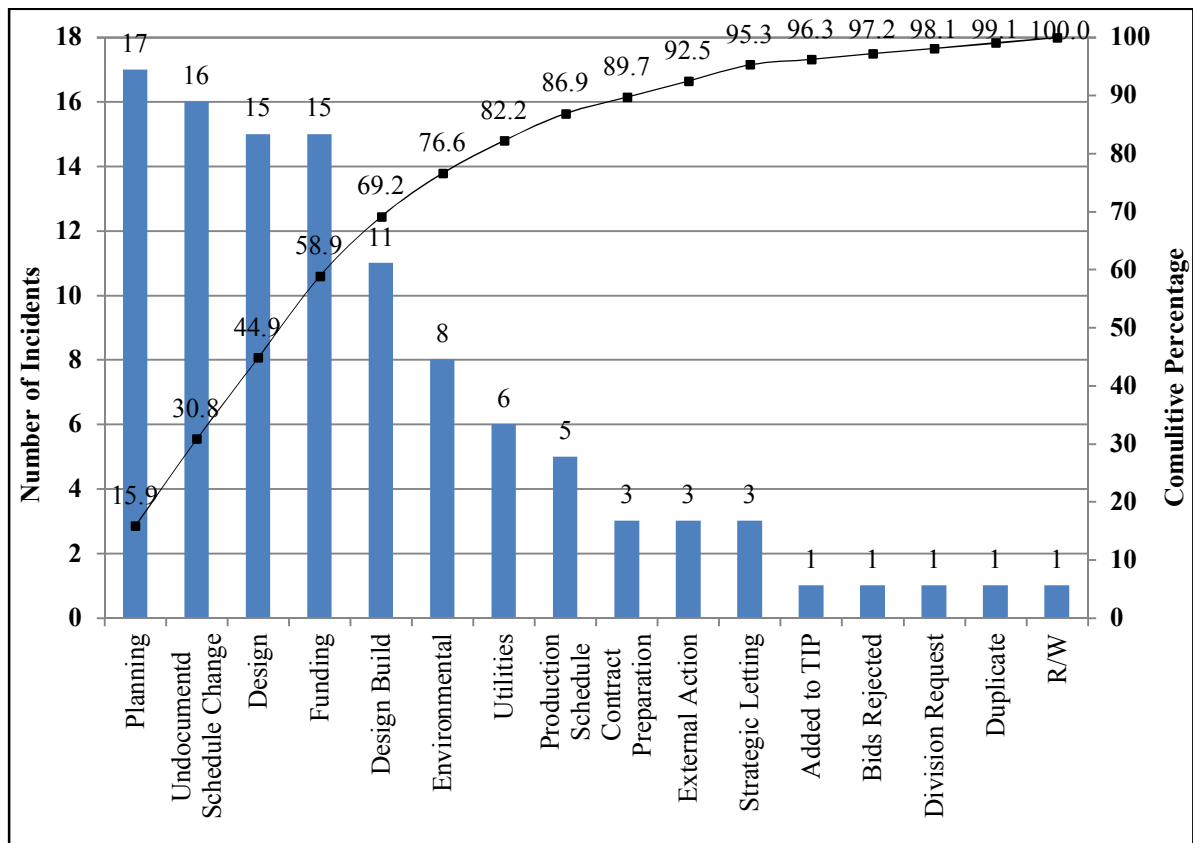


Figure 1. Causes for Letting Delays for Mega Projects (Data provided by Jeff Roerdon, 2014)

A research team from the University of North Carolina at Charlotte (Teng et al, 2013) developed a risk-based project management tool for cash flow management called Register. The UNCC team learned that projects are vulnerable for being delayed as a result of changing funding conditions due to shifts in scheduling priorities. The tool identifies the probability of a project’s funding being changed. The tool gives attention to projects that will likely be impacted by the funding change using a priority scoring method. Register can then forecast the payout curve for individual categories of projects such as bridges, rural, urban, and interstate projects. The second goal of the risk management tool was to optimize the project let schedule and produce a new let schedule based on the projected funding changes. The tool optimizes a revised let schedule with 15 built-in funding change scenarios along with a user-defined scenario. The revised let list reduces the effect of funding changes on project let delays and better accounts for such risks in budgeting, cash management, and project management.

3 METHODOLOGY

A survey instrument was created to gather appropriate information from each of the selected survey participants. In addition to collecting qualitative information from each participant, the survey afforded the opportunity to identify and then rate each delay factor on its level of importance of affecting the let date. A total of 23 experts were interviewed; both qualitative and quantitative responses to these interviews are summarized in the next section.

The study collected and analysed data pertaining to the preconstruction phase’s strategic milestones and provides insights into the likelihood of meeting a particular let date based on completion dates for strategic milestones (e.g., Location and Design Approval, Right of Way (ROW) authorization, and Final Plan to Design). For example, for new location Design-Bid-Build (DBB) projects, ROW authorization was completed as early as 98 months prior to letting and as late as 25 months prior to letting. If a current new location DBB project has not achieved ROW authorization at least 25 months before letting, then the probability of let date delay is high.

4 FINDINGS

This section includes a summary of findings related to predicting let date, as well as suggestions for meeting the let date provided by NCDOT participants. Figures 2 through 4 provide a snapshot of the key planning, design, and external factors that impact let dates. Figure 2 shows that incomplete documents, scope change, document change, merger/agency coordination, public involvement, scope changes caused by the public, awaiting traffic analysis, railroad coordination, and insufficient resources were the highest rated planning factors impacting the let date. Figure 3 shows that the most significant delay let factors are late input, design revision, merger and agency coordination, and threatened and endangered species. Municipal agreements, redesign and rework caused by utilities, and utilities are shown in Figure 4 as the most significant external delay factors. Interview insights and recommendations are organized in Table 1.

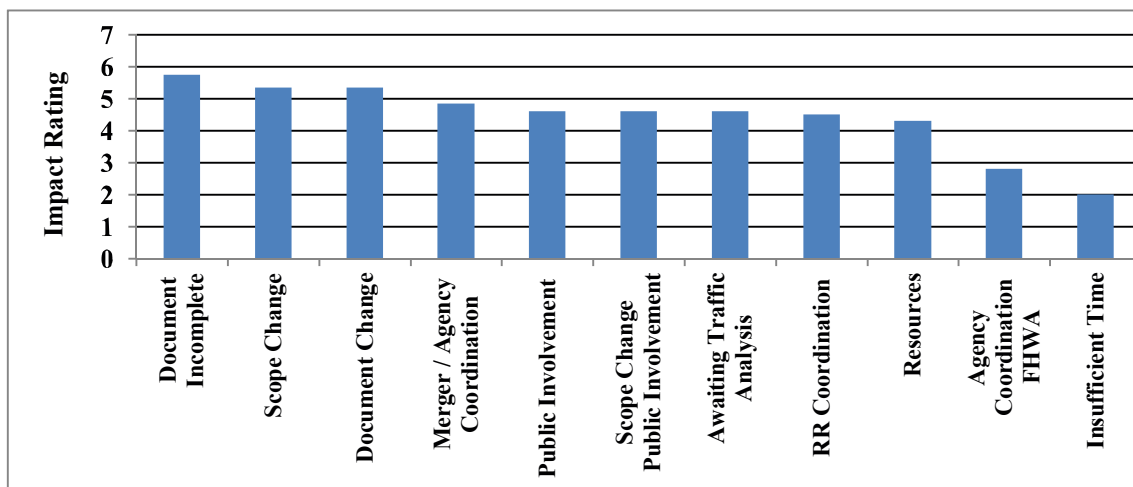


Figure 2. Planning Let Delay Factors (1=Low Impact, 7=High Impact)

5 CHECKLIST FOR MEETING LET DATE

Strategic activity milestones were identified prior to bid letting, in order to provide the necessary insights into meeting a project let date. These milestones were then used to develop a checklist to assist NCDOT in improving its chance of meeting project let dates.

The research team first divided projects into DBB and Design-Build (DB) groups because these two project types have different payout characteristics. The data on DB projects were found to be limited and fragmented; therefore, the researchers focused on DBB projects only for this analysis. Because the project data recorded activity history at different levels of detail, a set of standardized strategic milestones was selected.

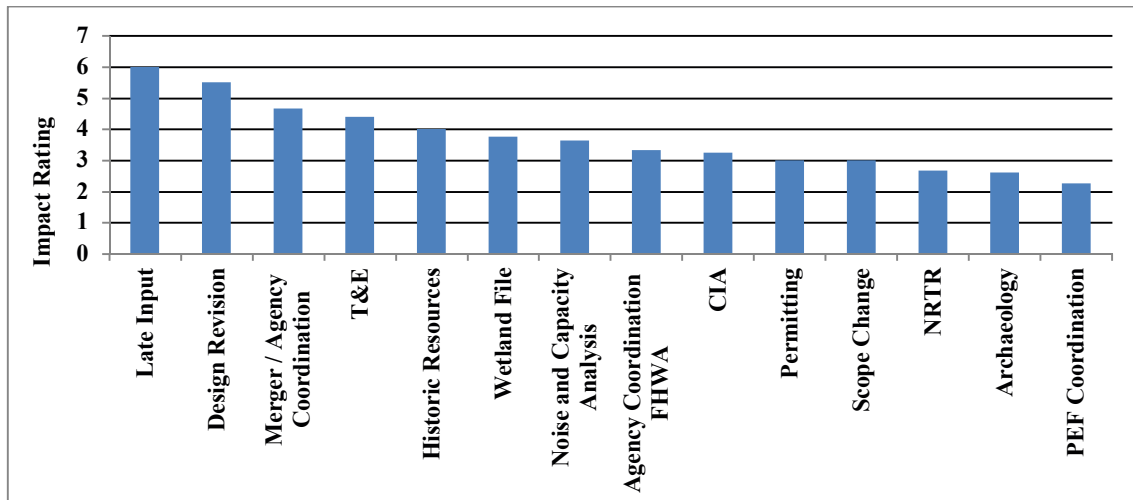


Figure 3. Design Let Delay Factors (1=Low Impact, 7=High Impact)

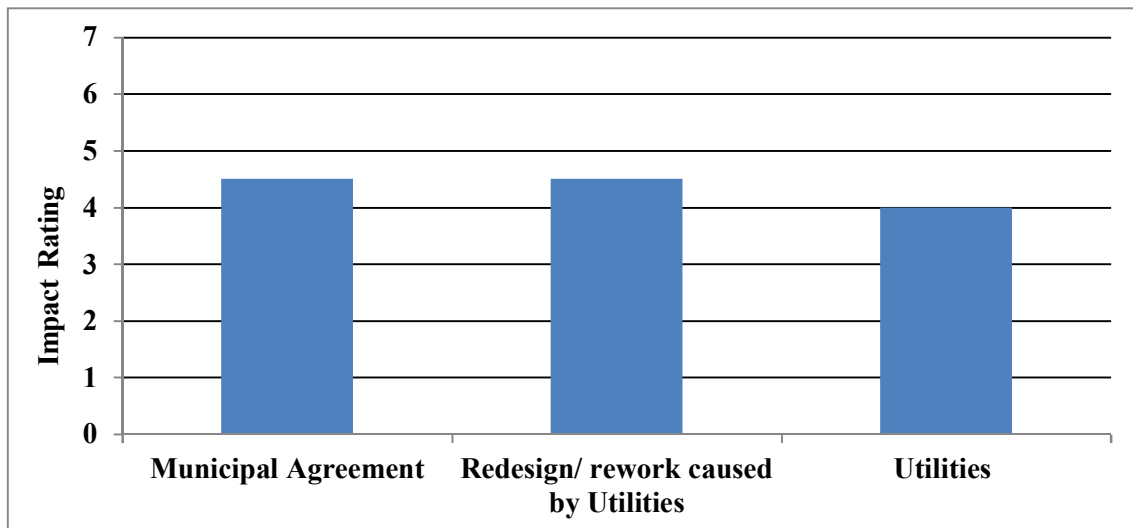


Figure 4. External Let Delay Factors (1=Low Impact, 7=High Impact)

The research team identified the completion date of each activity and used each project’s actual let date as a comparison point to calculate how many months before the actual let date the respective activities were completed. Figure 5 combines the completion dates for 13 DBB projects. The number on the left end of each horizontal bar represents the earliest completion month from the let date. The number on the right side of each bar represents the latest completion month. Each of the aforementioned strategic milestones should be checked at some point before the latest completion month of the milestone, both to prevent that activity from delaying the project, and to increase the likelihood of meeting the project’s let date.

Based on the milestone dates, a checklist for DBB new location projects was created (see Tables 2). If strategic milestones are accomplished before the latest date for each milestone, the probability of meeting the let date increases.

Table 1. Main Findings and Recommendations for Predicting the Let Date

	Issues Identified	Recommendations for Improvements	Responsible Party
Predicting the Let Date	<ul style="list-style-type: none"> - Obtaining right of way is completed toward the end of preconstruction 	<ul style="list-style-type: none"> - Procure the ROW authorization early - Provide the negotiator with a clear set of plans - Acquire approval for the ROW funds in advance 	Right of Way Unit
	<ul style="list-style-type: none"> - Utility firms' delay in moving utilities could affect the let date and delay construction start 	<ul style="list-style-type: none"> - Provide the utility companies with hard dates to relocate their utilities - Provide the utility companies with a list of contractors to relocate their utilities - Provide utility company with a clear set of plans 	Utilities Unit Utility Companies
	<ul style="list-style-type: none"> - Coordination and reaching an agreement with railroad administration could result in project delays 	<ul style="list-style-type: none"> - Involve the railroad early in the design process - Include railroad consultants' in the scoping phase of the design phase to avoid redesign 	Rail Division
	<ul style="list-style-type: none"> - Environmental permits could delay the let date 	<ul style="list-style-type: none"> - Make an early decision on the required permits - Initiate communications early with involved parties to acquire the permits - Permit applications can begin parallel to the design process - Apply the "pencils down concept" when permits are issued: no scope change, and no change in plans before let date 	Project Development and Environmental Analysis

6 CONCLUSION

This research has made a significant contribution to identifying causes of project delays and a possible approach to meeting the let dates for NCDOT mega projects. A literature review of relevant studies related to NCDOT project delivery was conducted to identify different internal and external factors that influence let date delays. The research team then used the gathered data to create an interview questionnaire guide, which was distributed to 23 NCDOT experts. The findings were summarized to rank major factors influencing meeting the let date and insights for improvements.

Planning let delay factors appear to have the greatest impact on delaying project awards. Incomplete documents, scope changes, and document changes are ranked as other major impact factors that affect the let date. With regards to design, it was found that late input, design revisions, and merger/agency coordination have the most significant effect on let date delay. This research resulted in the creation of checklists for DBB new location.

The checklist was generated by analyzing the activity timelines of strategic milestones. Meeting the deadline for each milestone in the checklist will increase the likelihood of meeting the let date. Each checklist will enable decision makers to take actions regarding shifting or keeping the original let date with more certainty counter measure of their outcome.

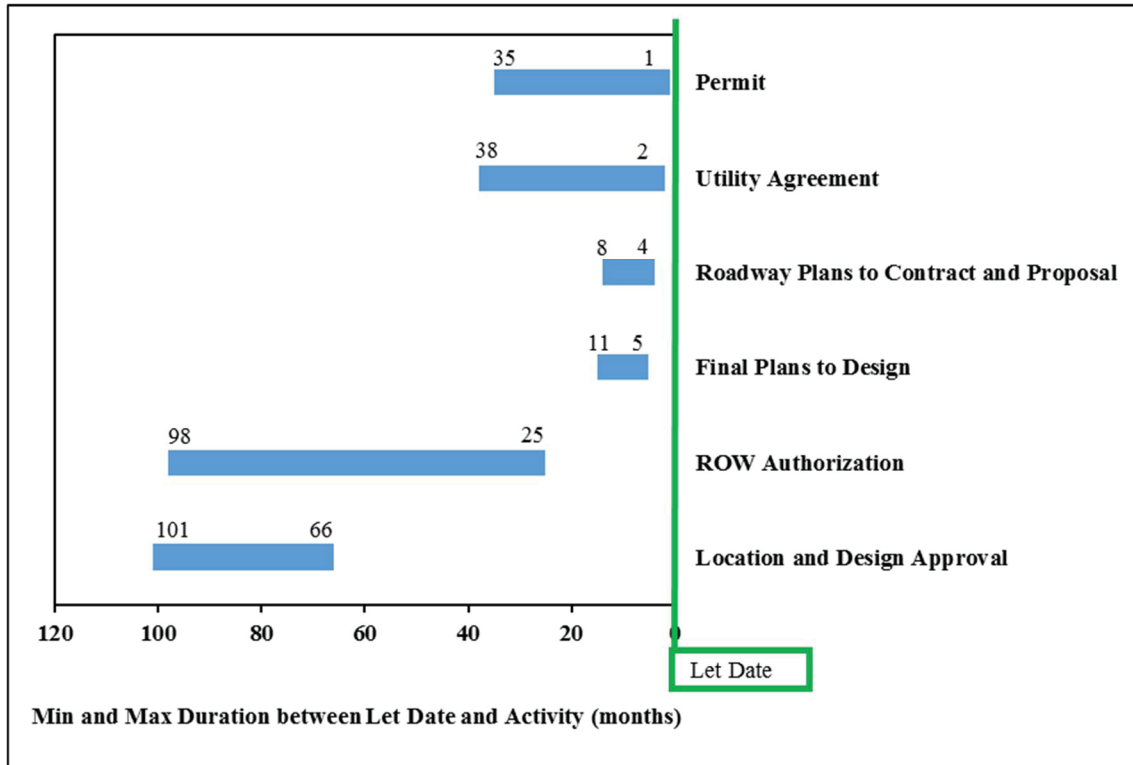


Figure 5 Strategic Milestones Analyses for DBB New Location Projects

Table 2 Checklist for DBB New Location Projects

No.	Description	Yes	No
1	Does the NCDOT have Location and Design Approval at least 66 months before the let date?		
2	Does the NCDOT have ROW Authorization at least 25 months before the let date?		
3	Does the NCDOT have Final Plans to Design at least 5 months before the let date?		
4	Does the NCDOT have Roadway Plans to Contract and Proposal at least 4 months before the let date?		
5	Does the NCDOT have the Utility Agreement at least 2 months prior to the let date?		
6	Does the NCDOT have the Permit at least 1 month before the let date?		

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