Cost Estimating and Cost Management Implementation Review

RESEARCH REPORT

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1. INTRODUCTION

The Minnesota Department of Transportation (MnDOT) implemented a new process for cost estimating (CE) and cost management (CM) in 2008 to provide a systematic and consistent approach to CE and CM throughout the department. The goal of the initiative was to achieve accuracy, consistency, and accountability in cost estimation and cost management efforts during the planning, programming and preconstruction phases of program delivery. To support this effort, MnDOT developed a Technical Reference Manual (TRM), comprehensive training for all districts, and a strategic implementation plan. The department also created the following vision statement for the CE and CM initiative:
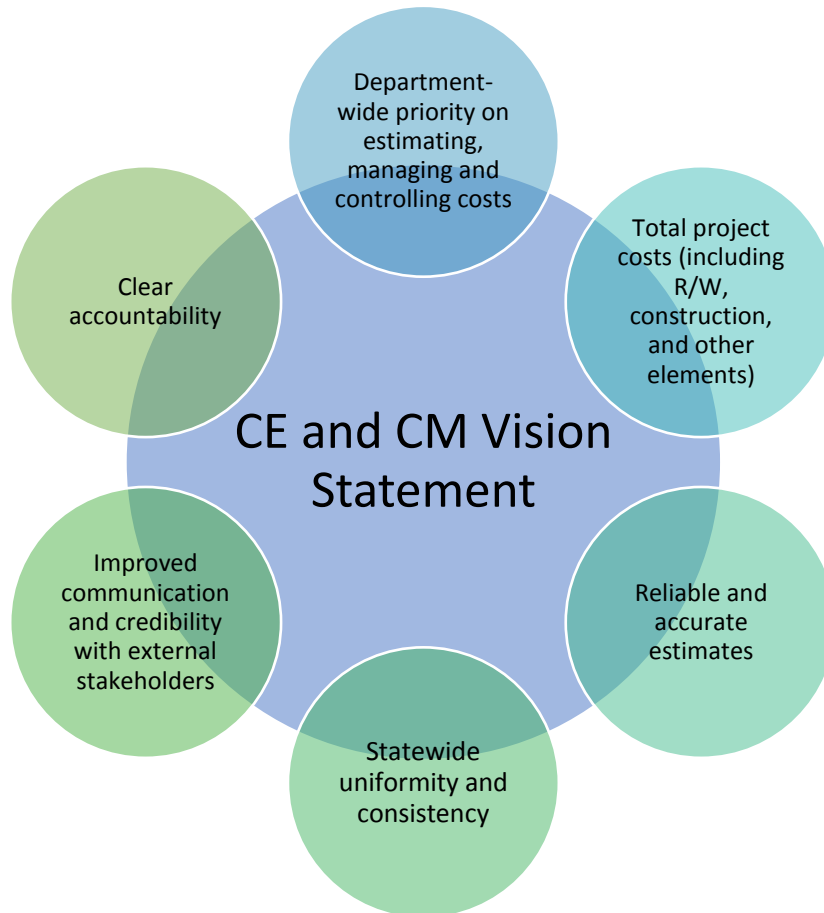
The six statements in this vision are the core of the CE and CM initiative. All aspects of the CE and CM initiative implemented in 2008 adhere to this overall vision statement. The vision statement defines MnDOT's purpose and goals for the initiative and sets the stage for this implementation review.

In February 2013, MnDOT asked the University of Colorado Boulder (CU) and Parsons Brinkerhoff (PB) to objectively review the implementation and effectiveness of the CE and CM process. The review follows the vision statement and 11 implementation strategies, shown in Table 1, to determine the effectiveness of the CE and CM implementation.

The review began with an examination of current MnDOT CE and CM information, documentation, and the department website. Next, MnDOT assembled a key contacts and oversight group to review the implementation strategies and to develop a work plan for collecting and reviewing information critical to this review. This review

collected data through a department-wide survey, a workshop with key contacts, and focus interviews with CE and CM leaders. From the data analysis, the review team is providing a summary of the major findings, making 15 recommendations for improving CE and CM. The team is also providing five suggestions for key resource investments. The following sections detail this process and the results.

Table 1 - MnDOT CE and CM implementation strategies

Strategy No.	CE and CM Implementation Strategies	No. of Action Items
1	Develop system to track and define Total Project Cost Estimate elements	7
2	Performance measures and incentives	11
3	Roles and responsibilities	13
4	Communication of CE and CM system	17
5	Resources requirements	6
6	Technical support	13
7	Integration with scoping initiative and other processes	7
8	Accurately identify inflation impacts	5
9	Identify and develop additional tools and databases	9
10	Short-term implementation (FY 2010, 2011, 2012)	9
11	Reduce the use of set-asides in the State Road Construction budget	8

2. DATA COLLECTION

MnDOT, CU, and PB conducted and initial kickoff meeting to discuss the scope of work, review the overall project goals, and determine which aspects of the 2008 implementation strategies should be included in the review. Based on this information, MnDOT and CU created a final work plan for the review. Figure 1 depicts the process of the review, data collection tools, and the results from each step.
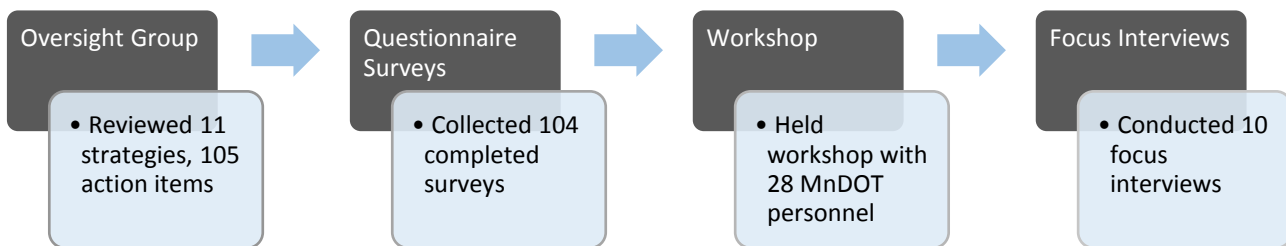

Oversight Group	Questionnaire Surveys	Workshop	Focus Interviews
• Reviewed 11 strategies, 105 action items	• Collected 104 completed surveys	• Held workshop with 28 MnDOT personnel	• Conducted 10 focus interviews

Figure 1 - Work plan and data collection summary

2.1 Key Contacts and Oversight Group

This study benefited from a key contacts and oversight group that included the individuals listed in Table 2. This group was essential to the review process. It provided pertinent information and made decisions regarding the critical areas to review.

Table 2 - Key contacts and oversight group

Key Contacts and Oversight Group Members	
Lynn Eaton	MnDOT
Mike Ginnaty	MnDOT
Tim Henkel	MnDOT
Chris Roy	MnDOT
Jean Wallace	MnDOT
Jim Weingartz	MnDOT
Glenn Schreiner	PB
Keith Molenaar	CU
Chris Harper	CU

The 2008 Strategic Implementation Plan contained 11 strategies with 105 action items. MnDOT chose to focus on the most important implementation strategies and actions rather than conduct a full audit. Therefore, the oversight group's initial task was to discuss each of the 11 strategies and associated action items to gain insights on the focus of the review. The oversight group rated all eleven strategies based on: (1) importance to the evaluation; and (2) ease of collecting data. The "importance to evaluation" scale ranged from "high" to "medium" and "low". The "ease of collecting data" scale ranged from "easy" to "moderate" and "difficult." The two ratings were combined to make an overall rating as shown in Table 3 for the 11 implementation strategies.

Table 3 - Rating of implementation strategies

Strategy Number	Importance to Evaluation	Ease of Collecting Data	Overall Rank
1	Medium	Easy	High
2	High	Easy	High
3	High	Moderate	High
4	Medium	Moderate	Medium
5	Low	Easy	Low
6	Medium	Easy	Medium
7	High	Difficult	High
8	Low	Difficult	Low
9	Medium	Moderate	Medium
10	Low	Easy	Low
11	Low	Easy	Low

As seen in Table 3, there were four strategies with an overall rating of "low" (Strategies 5, 8, 10 and 11). The oversight group did not see these four strategies as important enough to review or found that they could be very difficult to collect reliable and usable data for the analysis. The consensus of the oversight group was to remove these four strategies from the review and focus the investigation on the remaining seven.

For the next step, the reviewers, along with MnDOT, developed seven key goals related to the seven critical implementation strategies that guide the review. The goals are:

1. Investigate tracking and communication systems for TPCE elements;
2. Review quality of performance measures and associated data;
3. Verify that CE and CM roles and responsibilities are clear and precise throughout the department;
4. Review integration of CE and CM system with scoping initiative, enterprise risk management, and project management;
5. Determine department awareness and acceptance of CE and CM system;
6. Investigate knowledge support systems for CE and CM; and
7. Review current CE and CM tools, risk management tools, and risk management practices.

The reviewers then developed data collection tools based on these key goals. The next three sections outline in detail the process used to develop and collect data through a survey questionnaire, workshop, and focus interviews.

2.2 Survey Questionnaire

MnDOT is a large organization with eight regional districts and a central office. This means that MnDOT has many estimators, engineers, and project managers located across the State that deal with CE and CM first hand. The review therefore required a data collection tool that allowed for distribution to a large population of employees – a web-based survey questionnaire.

The reviewer team developed a questionnaire containing five sections. Each section focused on one of the key goals. The topic of each section is:

- Section One: MnDOT Cost Estimating and Cost Management Performance Measures
- Section Two: Cost Estimating and Cost Management Roles, Responsibilities, and Accountabilities
- Section Three: Knowledge Support Systems
- Section Four: Cost Estimating and Cost Management Tools, Risk Management Tools, and Management Practices
- Section Five: Performance of the Cost Estimating and Cost Management Process

Each section included questions for participants to rate their overall awareness, effectiveness, and usefulness of specific CE and CM aspects. Comment sections were also included for key areas to collect open-ended information. The comments were critical to understanding what currently works well and what needs improvement.

The reviewers then piloted the initial survey with the key contacts and oversight group for feedback on content and length. Since distribution of the questionnaire was to approximately 300 MnDOT employees, the survey could not be long and tedious, as this would result in a low response rate and a large time burden on the department. Piloting of the questionnaire allowed the review team to refine the questions, remove unnecessary information, and make it as concise but as thorough as possible. Appendix B contains the final version of the questionnaire.

MnDOT distributed the final version to approximately 300 MnDOT employees with 104 completed surveys received. This is a response rate of 35%. The important survey findings and comments are included in the data analysis section of this report.

2.3 Workshop

Based on the results from the key contacts and department questionnaires, the research team designed a process to collect data from a smaller, more concentrated group of MnDOT CE and CM personnel. The workshop involved a half-day meeting in Minnesota with the MnDOT personnel listed in Table 4. The workshop provided a means to collect data and lessons learned directly from MnDOT personnel.

Table 4 - MnDOT workshop attendees

Workshop Attendees			
Mike Barnes	Claudia Dumont	Eric Janssen	Jacob Rezac
Chris Berrens	Gene East	Terry Johnson	Chris Roy
Todd Broadwell	Lynn Eaton	Mary Lacho	Glenn Schreiner
Jane Butzer	Mike Ginnaty	Don Obernolte	Zachary Tess
Jon Chiglo	Tom Gostovich	Pam O'Brien	Terry Ward
Rick Dalton	Rachel Guan	Nicole Peterson	Jim Weingartz
Peter Davich	Chad Hanson	Joe Pignato	Tom Wiener

The review team designed three interactive sessions to gather information during the workshop. The first session focused on the review and approval gates process. This session asked attendees to provide the frequency and effectiveness of each of the seven gates. In addition, this session inquired about the difficulty in obtaining approval and any barriers that impede approval for each gate.

The second session reviewed the CE and CM policies. This session used open-ended questions for each of the five policies. The questions focused on gathering specific examples of when a policy *had been implemented* and if it improved CE and CM performance. In addition, the questions also gathered specific examples of when a policy *has not been implemented* and what barriers exist to implementing it in the future.

The third session of the workshop focused on the overall CE and CM processes for each phase of development. The format of the section was to complete a report card for each development phase – planning, scoping, design, and letting. Each phase listed the sub-processes critical to that phase as well as the specific steps for each sub-process. The workshop participants assigned a grade from "A" to "F" for each sub-process under each phase based on the discussion.

Open-ended discussions from the workshop included the technical reference manual as well as how to integrate emerging initiatives such as Shared Services Centers, P6 and Enterprise Risk Management. Although these emerging initiatives could assist and improve CE and CM, this review did not comment on the initiatives, as they were not part of the original implementation plan. However, the report does acknowledge that further investigation into other MnDOT initiatives should occur.

2.4 Interviews

After gathering the completed surveys and reviewing the data from the workshop, the review team assembled initial findings and reviewed them with MnDOT leadership to discuss any missing information. Table 5 lists the interviewees. All interviews took place during the second and third week of April 2013.

Table 5 - Focus interviewees

Interviewee	Title/Position	Date of Interview
Jane Butzer	District Estimator	April 9th, 2013
Jon Chiglo	Division Director	April 11th, 2013
Gene East	District Estimator	April 8th, 2013
Mike Ginnaty	Shared Services Manager	April 10th, 2013
Tim Henkel	Assistant Commissioner	April 8th, 2013
Eric Janssen	Metro Estimator	April 10th, 2013
Chris Roy	State Design Engineer	April 8th, 2013
Val Svensson	Central Office Estimator	April 8th, 2013
Jim Weingartz	Business Process Monitoring	April 16th, 2013
Tom Wiener	Project Controls Engineer	April 9th, 2013

All the interviews took from 30-45 minutes to complete. The format used included a review of 12 major initial findings collected from the survey questionnaire results and the workshop. These topics are included as part of Appendix C. The interviewees were asked to comment on each of the initial findings. The interviewers took detailed notes of the interviewee's comments. The comments confirmed the findings from the survey questionnaire and workshop. The interviews, in combination with the survey and workshop results, formed the final recommendations. Note that the initial recommendations in Appendix C were not presented in a cohesive grouping. They did not contain the same level of detail as the final recommendations. Therefore, there is not a one-to-one mapping of the initial and final recommendations.   The grouping and details of the final recommendations were developed through an iterative process of refinement after each interview discussion.

3. DATA ANALYSIS AND FINDINGS

Data analysis involved a review of the survey questionnaire responses, completed worksheets and comments from the workshop, and the notes taken during the interviews. The review team searched for patterns in the data. This section assembles the findings and recommendations into three noticeable trends. All three trends focus on a specific priority that has shown to be major features of the CE and CM process and detail the major findings and recommendations. The trends are *priority on people*, *priority on the process*, and *priority on performance*.

3.1 Priority on People

Priority on people refers to enhancing and focusing improvements for the individuals that estimate, manage, and control costs for MnDOT projects. The priority on people findings report recommendations in three areas: (1) roles, responsibilities, and accountabilities of estimators; (2) sharing of information and lessons learned; and (3) training. Each of these address a specific area that may need to be improved so that CE and CM personnel are more consistent and uniform in estimating and managing costs throughout the department.

3.1.1 Roles, Responsibilities, and Accountabilities of Estimators

The findings in roles, responsibilities and accountabilities included many comments on the inconsistency and lack of understanding of specific roles and associated responsibilities. The survey results showed that only 45% of MnDOT personnel are fully aware of their CE and CM role and responsibilities. In addition, most acknowledged in the workshop and interviews that there is a lack of accountability or lack of accountability understanding in many aspects of CE and CM. Part of the issue could be that the TRM includes the RACI (Responsible, Accountable, Consulted, Informed) diagram tool for this purpose. Only 10% of the survey responses acknowledged using this tool, but 88% agreed that it is an effective tool. Another issue is that the establishment of dedicated estimators did not occur as MnDOT intended in the initial implementation strategies. However, this review acknowledges that MnDOT has appointed district estimators in each district, which is an improvement over past CE and CM practices. However, the district estimators often have other roles that distract them from their estimating and cost control responsibilities.

3.1.2 Sharing of Information and Lessons Learned

In terms of information sharing, estimators share information informally with other districts. However, the implementation strategies included the creation of a formal process for information sharing on a regular basis. According to the survey, workshop, and interviews, no formal information sharing process was developed or implemented. The survey results also showed that only 32% of the respondents were even aware that information sharing is possible and only 18% thought that the information sharing currently occurring is effective. Some commented at the workshop that the department never made information sharing a top priority when it should have been. Similarly, there is a lack of sharing lessons learned information outside of districts. The CE and CM process framework described in the TRM offers a formal structure for sharing information and lessons learned.

3.1.3 Training

The initial training for CE and CM was comprehensive and most agreed that training did take place at initial implementation. However, numerous survey respondents and workshop attendees reported that MnDOT provided little or no additional training since the initial implementation. The lack of updates on the CE and CM website compounds the problem with the lack of training. At the time of this report, the training information on the webpage dates to 2010.

3.1.4 Recommendations

The recommendations to assist in putting a priority on people focus on four main points.

1. Refine the dedicated estimator roles and responsibilities to promote consistent understanding and application across the districts. Provide quarterly or semi-annual meetings of district estimators.

2. Update CE and CM training and consider delivering it in short courses or videos on the CE and CM website. CM training should be the focus of the update.

3. Develop new training modules with a focus on CM for project managers and the district estimators who support the managers cost control efforts. The goal of the training should be to improve cost control during scoping and detailed engineering.

4. Increase the sharing of information and lessons learned through the CE and CM department website and email bulletins. Use the CE and CM processes from the technical reference manual as an organizational structure for capturing and communicating lessons learned.

3.2 Priority on Process

Priority on process refers to enhancing overall awareness, understanding, and consistent use of the CE and CM process to improve estimating and managing program and project costs. This area is in need of improvement as only 37% of the survey responses stated that they use the formal CE and CM process on a regular basis. Priority on process reviews the following specific areas: (1) CE and CM policies; (2) scoping process; 3) review and approval gates process; 4) data management; and 5) CE and CM tools.

3.2.1 CE and CM Policies

The five CE and CM policies embody the initiative and implementation. These policies were created by MnDOT during the CE and CM process development to assist in implementation. Each policy addresses a critical CE and CM issue. Figure 2 below summarizes each of the policies. These policies incorporate the vision statement of the CE and CM process and MnDOT intended for these policies to be guidelines in performing cost estimates and managing costs.

Project Cost Estimating Policy

    To improve the reliability and accuracy of cost estimates, project cost estimation will be the responsibility of each of MnDOT's districts and MnDOT's central office.

Uncertainty, Risk and Contingency Policy

    The TPCE for each of the project development phases will include an analysis of uncertainty and risk, and associated contingency estimates.

Cost Estimate Communications Policy

    To ensure that project costs are communicated consistently and uniformly statewide. Regardless of the project development phase, the TPCE will include contingency and reflect inflation-adjusted costs.

Project Cost Management Policy

    Project-related costs will be managed against a baseline cost estimate, which is the TPCE at the time the project scoping report is approved.

Program Management Policy

    Districts will actively manage project costs to deliver MnDOT's construction program within the State Road Construction budget constraints and program priorities.

Figure 2 - CE and CM Policies

Although these policies are well defined, they are actually guidelines and not formal policies. This makes the policies difficult to enforce. Being able to enforce these policies could improve the consistency and uniformity of CE and CM throughout the department.

3.2.2 Scoping Process

Because cost and scope control are intertwined, MnDOT introduced refinements to the scoping process when implementing the new CE and CM process in 2008. As noted in the survey and by workshop and interview participants, the process has resulted in improvements in project scoping. However, there is still scoping inconsistencies between districts and a lack of uniformity in the amount of scoping needed based on project size and complexity. Comments from the survey and workshop revealed that the scoping process is too rigid for smaller and less complex projects. Some even commented that these types of projects may not need a scope report or a TPCE as these steps are time consuming and seem unnecessary.

3.2.3 Review and Approval Gates

The review and approval gates flowchart, shown in Figure 3, outlines the cost estimation review process from planning to post-letting and defines approval gates. All of the workshop attendees and interviewees acknowledged the use of the review and approval gates process, but the level of use and consistency varies between districts and project types. Some commented that there is a lack of detailed reviews and approval by management at the initial planning and scoping gates. Review sign off from management is common for new projects and fourth year STIP projects. Other reviews are possible and recommended, but infrequently occur as noted by the workshop participants. This confirms the lack of consistency between districts in annual updates of estimates in the STIP. Further, many are not sure how important management sign off is for each of the gates. This inconsistency makes the use of the gates process ineffective in its current form.
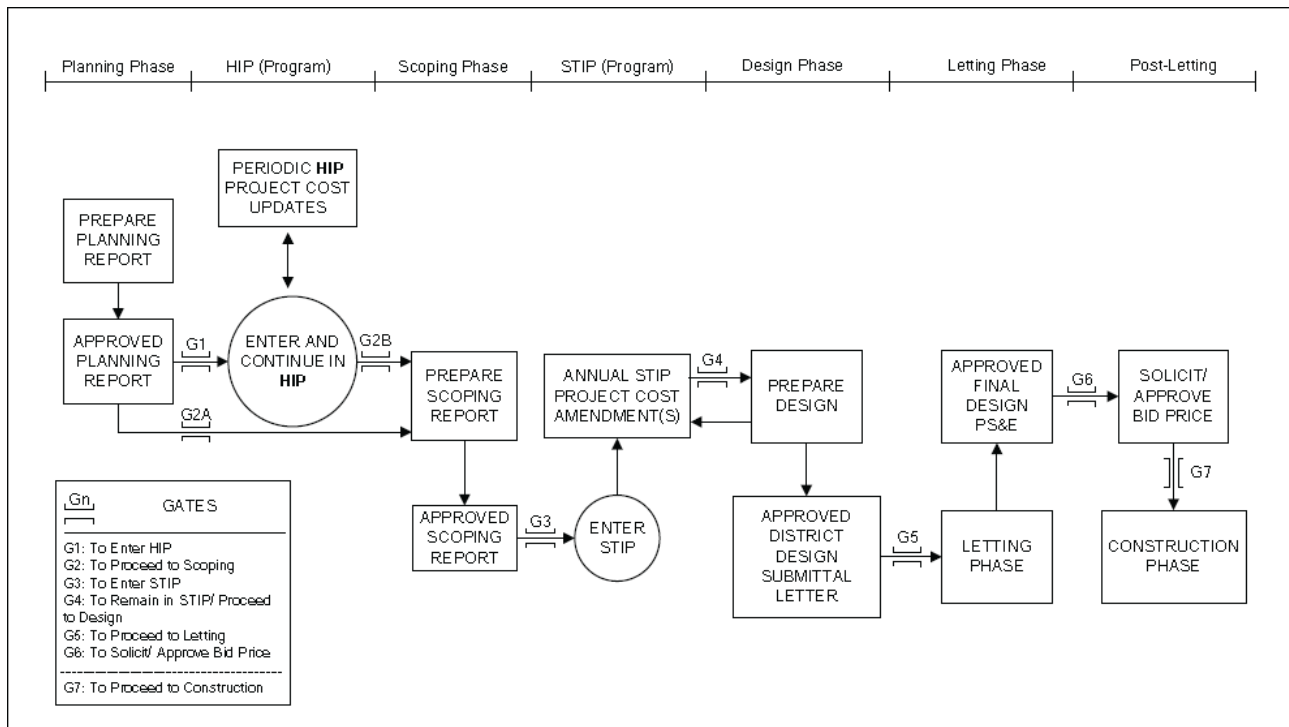

Figure 3 - Review and approval gates flowchart

3.2.4 Data Management

Data management is a critical aspect of estimating and managing costs. The initial implementation plan included introducing new data management practices, yet many did not occur. A lack of a centralized system for CE and CM data is apparent, especially for the formal "one-page" summary documents. Consistency is also an issue between districts. A lack of understanding in how data collection and management outside of an individual's district (i.e., across the department) was apparent. It was noted by survey, workshop and interview participants that MnDOT has not achieved their CE and CM data management goals. The causes ranged from a lack of information technology support to inconsistent policy implementation. The use and management of the one-page cost summary documents was the most frequently cited example of the need for additional investment.

3.2.5 CE and CM Tools

The CE and CM process included a specific set of tools in the TRM for assisting with estimating and managing costs on a project. The technical reference manual contains a large number of tools that are used only by estimators,

making cost management tools difficult to access. The survey results showed that 32 of the tools are used "rarely" or "never" and are not thoroughly understood. Further, many stated that there are too many tools to sort through, which is because only 15 tools are used "sometimes" out of a total of 47 tools. None of the tools were found to be used "often" in the survey results.

3.2.6 Recommendations

The recommendations to assist in putting a priority on process focus on five main points.

1. Formalize and enforce the project and program cost management policies department-wide.

2. Invest in a centralized CE and CM data system to improve cost management.

3. Review and refine the scoping process to address smaller, non-complex projects.

4. Investigate the possibility of removing the scope report requirement for small and low complexity type projects.

5. Review and refine CE and CM tools. Post the tools by user role on the CE and CM website and continuously update them as originally planned.

6. Refine the TRM guidance for project managers and non-estimating staff. Consider creating a complementary guide for CM focusing on project managers.

3.3 Priority on Performance

Priority on performance refers to concentrating on improving the many aspects that affect success in estimating, managing and controlling costs. Priority on performance focuses on the areas of: (1) risk and risk management; (2) contingency and contingency management; and (3) CE and CM performance measures. MnDOT management considers risk and contingency major uncertainties in the CE and CM process and therefore are critical to the overall performance of CE and CM.

3.3.1 Risk and Risk Management

A common understanding of the importance of risk and risk management is pervasive throughout the department. However, the consensus of data showed inconsistencies and a lack of uniformity in the application and use of risk management. While the TRM has specific instructions on how to link risks and contingency, there was not a clear understanding of the process with the survey or workshop participants. Likewise, it was noted that the risk management process should be more scalable. Few participants were aware of the scalable process provided in the TRM. One interview comment stated that MnDOT needs to formally define risks and the department's risk tolerance. The introduction of enterprise risk management in MnDOT also seems to have obscured the process of project risk management.

Perhaps the most significant implementation issue with risk management relates to establishing a project baseline and retiring risks. There is little consistency and guidance available for retiring risks and management contingency. Several interview comments stated that there is a lack of clarity in retiring risks, which makes it difficult to be consistent from district to district and even project to project.

3.3.2 Contingency and Contingency Management

The most common issue with contingency and contingency management is the lack of consistency in separating contingency from estimate line item and relating it to project risks. Many still see estimates with contingency imbedded with the actual line item and are not separate. Yet, in cases where the contingency is a separate item, there is a lack of understanding on how to release this contingency back to the program once a risk has been retired. These issues make the discipline of using a baseline estimate for cost management difficult to implement.

3.3.3 Cost Estimating and Cost Management Performance Measures

CE and CM performance measures play an important role in illustrating how well the department is doing in terms of estimating and managing costs. Specific CE and CM performance measures were developed and included in the implementation. Most of the current CE and CM performance measures focus on whether important documentation has been completed or not (e.g. Engineer's estimate vs. low bid, use of the TPCE form). Although these performance measures collect and provide information, there is a lack of understanding in the meaning of the data. One interviewee stated that some of the performance measures are arbitrary. For example, one performance measure asks if a TPCE has been completed for a project. An estimator can acknowledge completion of the TPCE, but that TPCE can be of low quality. So, even though it is complete, it is probably not acceptable.

Of note is that 77% of survey respondents could not provide or were unsure of specific performance measures. Many of the workshop participants commented that there is a lack of measures available to understand early estimating completed during the planning phase. Further, sharing of performance measure information is inconsistent at best. Based on the survey results, only 40% are aware that MnDOT should share performance measure information. 82% of respondents thought that MnDOT does not do an effective job of sharing performance measure information. The lack of personnel understanding the performance of CE and CM is a concern.

3.3.4 Recommendations

1. Increase resources, training and guidance for risk management and contingency.

2. Promote consistency in the application of cost baselines when projects enter the STIP.

3. Provide additional specific guidance in proper development and management of contingency.

4. Revising or introduce additional estimating performance measures to better identify strengths and weaknesses in the CE and CM process.

5. Focus additional performance measures on the quality of project documents being completed.

4. IMPLICATIONS FOR RESOURCES

The recommendations provide MnDOT with actions to improve department-wide CE and CM. Some of the recommendations require only prioritization, or better focus, on consistency and uniformity in the CE and CM process. However, some of the recommendations will require additional resources. An examination of the recommendations across the people, process and performance recommendations identifies the following key implications for resources.

1. *Invest in District Estimators* – MnDOT must provide district estimators with time focus on estimating and supporting project managers in cost control. Many district estimators are not truly dedicated because they have multiple job functions. MnDOT will need to commit to providing time for dedicated district estimators to focus on their CE and CM role. If district estimators actively participate in both cost estimating and support of project managers with estimate updating and project controls, this is a full-time role.

2. *Develop Training and Improve Information Sharing* – MnDOT should invest in additional training that focuses on the cost control aspects of the CE and CM process. Investment can focus in short courses and website videos, periodic CE and CM meetings for estimators and project managers, and improvements to the CE and CM website to update tools.

3. *Invest in CE and CM Policies* – MnDOT should take time to formalize the CE and CM policies and make them enforceable. The policies in the technical reference manual are comprehensive and reflect best practices across the nation. However, they are lengthy and used only as guidance. MnDOT should focus on shorter and more widely communicated policies that focus on cost control.

4. *Invest in CE and CM Data Management* – To measure and improve the CE and CM process, MnDOT must invest in better data management and cost control systems. In the five years since the CE and CM implementation, the department did not complete the CM portions of the data management system and it is hampering efforts to manage and communicate project costs.

5. *Invest in Risk Management* – MnDOT should continue to invest in risk management efforts that result in better contingency management across programs and projects. These efforts should include the development of scalable risk management tools and a clear communication of how risk-based contingencies are managed across projects and programs.

Overall, the CE and CM initiative represents vast improvement over past practices at MnDOT. It has made the department a national leader in highway estimating. The largest area for improvement that remains is in the area of cost control. In summary, this review assists MnDOT with understanding how well the department understands and utilizes the CE and CM process. Thirty-five significant findings surfaced in the review, which resulted in 15 recommendations and 5 key resource investments. The department should review all the findings, recommendations and potential investments to determine the final actions in fulfilling the 2008 CE and CM vision.

APPENDIX A – SURVEY QUESTIONNAIRE

MnDOT CE and CM Implementation Review Questionnaire

In 2008, the Minnesota Department of Transportation (MnDOT) implemented a new process for cost estimating (CE) and cost management (CM) to provide a systematic and consistent approach to CE and CM throughout the department. To support this effort, MnDOT developed a strategic implementation plan that included the development of a Technical Reference Manual and training in all districts. The department also created an implementation strategy with the following vision:

- *Department-wide priority on estimating, managing and controlling costs*
- *Total project costs (including R/W, construction, and other elements)*
- *Reliable and accurate estimates*
- *Statewide uniformity and consistency*
- *Improved communication and credibility with external stakeholders*
- *Clear Accountabilitiy*

With the help of the University of Colorado and Parsons Brinkerhoff, MnDOT is embarking on an implementation review to determine the effectiveness of the process and any additional resource needs. As someone who relies on the CE and CM process, we are asking for your assistance. Your individual privacy will be maintained in all published and written data resulting from this study. You will receive no compensation for your participation. Completing the questionnaire will take **approximately 20 minutes.**

I understand the above information and voluntarily consent to participate in the MnDOT CE and CM Implementation Review Questionnaire.

○ YES
○ NO

0% [   ] 100%

MnDOT CE and CM Implementation Review Questionnaire

The questionnaire contains five sections which correspond to the 2008 MnDOT CE and CM implementation plan. The questions will ask you to **rate your awareness**, and **rate the effectiveness** of strategies or implementation actions for the CE and CM process. In addition, some of the questions ask about the frequency with which you use various elements of the CE and CM process. Please refer to the following definitions for each scale:

AWARENESS SCALE: For questions relating to your awareness of CE and CM

0) *Not Applicable* - Not applicable or do not have the knowledge to reply
1) *Very Unaware* - To my knowledge, I received no information
2) *Unaware* - Information was not well communicated and/or the details were vague
3) *Neither Aware nor Unaware* - Information was communicated but not necessary
4) *Aware* - Information was communicated through multiple sources
5) *Very Aware* - Information was communicated and resources were readily available

EFFECTIVENESS SCALE: For questions relating to effectiveness of CE and CM

0) *Not Applicable* - Not applicable or do not have the knowledge to reply
1) *Very Ineffective* - Do not see the value and it made your job more difficult/tedious
2) *Ineffective* - Provides Minimal Benefits
3) *No Change* - No difference from prior to the CE and CM implementation
4) *Effective* - Mostly useful with opportunity for minor improvements
5) *Very Effective* - Very useful and had made my position more effective

FREQUENCY SCALE: For questions relating to how often you use CE and CM

Never - Used on 0% of projects
Rarely - Used on 1% to 33% of projects
Sometimes - Used on 34% to 66% of projects
Often - Used on 67% to 100% of projects

0% ▭▭▭▭▭ 100%
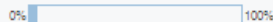
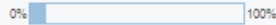# MnDOT CE and CM Implementation Review Questionnaire

SECTION I : MnDOT Cost Estimating and Cost Management Performance Measures

This section asks questions about the use of MnDOT's **performance measures** and reporting program for the CE and CM process, **sharing performance measure** information, and **performance incentives** for CE and CM.

PERFORMANCE MEASURES

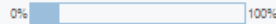Are MnDOT **CE and CM performance measures** relevant to your position?

○ YES

○ NO

○ Not Sure

0%   100%

MnDOT CE and CM Implementation Review Questionnaire

Please provide at least one, but no more than three **examples of MnDOT CE and CM performance measures** and rate the effectiveness of each measure.

a) MnDOT CE and CM Performance Measure 1:

Please rate the effectiveness of performance measure 1:

○ Not Applicable
○ Very Ineffective
○ Ineffective
○ No Change
○ Effective
○ Very Effective
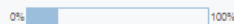
b) MnDOT CE and CM Performance Measure 2:

Please rate the effectiveness of performance measure 2:

○ Not Applicable
○ Very Ineffective
○ Ineffective
○ No Change
○ Effective
○ Very Effective

c) MnDOT CE and CM Performance Measure 3:

Please rate the effectiveness of performance measure 3:

○ Not Applicable
○ Very Ineffective
○ Ineffective
○ No Change
○ Effective
○ Very Effective

0%　　　100%

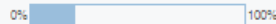# MnDOT CE and CM Implementation Review Questionnaire

SHARING PERFORMANCE MEASURES RESULTS

What is your awareness of **MnDOT CE and CM performance measures information being shared**?

○ Not Applicable

○ Very Unaware

○ Unaware

○ Neither Aware nor Unaware

○ Aware

○ Very Aware

Please rate the effectiveness of the department in **sharing MnDOT CE and CM performance measures information**:

○ Not Applicable

○ Very Ineffective

○ Ineffective

○ No Change
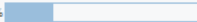
○ Effective

○ Very Effective

0% ▭▭ 100%

MnDOT CE and CM Implementation Review Questionnaire

PERFORMANCE MEASURES INCENTIVES

Are you aware of **incentives** being provided by the department for **CE and CM performance**?

○ YES
○ NO
○ Not Sure

b) Do you have any recommendations for **incentives** in regards to **CE and CM performance**?

0% [_____] 100%

MnDOT CE and CM Implementation Review Questionnaire

SECTION II : Cost Estimating and Cost Management Roles, Responsibilities, and Accountabilities

This section asks questions about the roles, responsibilities, and accountabilities relating to CE and CM.

What is your **role** in regards to the **CE and CM process**?

○ Management
○ Estimating
○ Project Management
○ Other (Please Specify):

What is your awareness of your **CE and CM roles, responsibilities, and accountabilities**?

○ Not Applicable
○ Very Unaware
○ Unaware
○ Neither Aware nor Unaware
○ Aware
○ Very Aware

Please provide any comments you have in regards to your awareness of **CE and CM roles, responsibilities, and accountabilities**:

How effective are your **roles, responsibilities, and accountabilities** in regards to the **CE and CM process**?

○ Not Applicable
○ Very Ineffective
○ Ineffective
○ No Change
○ Effective
○ Very Effective

Please provide any comments you have in regards to effectiveness of **CE and CM roles, responsibilities, and accountabilities**:

What do you recommend for **improving** the understanding of **roles, responsibilities, and accountabilities** for the **CE and CM process**?
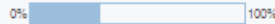
0%   100%

MnDOT CE and CM Implementation Review Questionnaire

The Technical Reference Manual provides information on specific CE and CM process.

Have you used the Technical Reference Manual to find information on the CE and CM process?
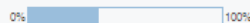
○ YES
○ NO
○ Not Sure

0% [____] 100%

MnDOT CE and CM Implementation Review Questionnaire

Please rate how effective the Technical Reference Manual is in terms of understanding the CE and CM process:

○ Not Applicable
○ Very Ineffective
○ Ineffective
○ No Change
○ Effective
○ Very Effective

Please provide any comments or suggestions on the Technical Reference Manual in terms of understanding the CE and CM process:
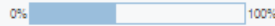
[   ]

0% [____] 100%

MnDOT CE and CM Implementation Review Questionnaire

SECTION III : Knowledge Support Systems

This section asks questions about the knowledge support systems available as resources for the CE and CM process. (Training, information sharing, meetings, updates, etc.)

When the CE and CM process was introduced, MnDOT provided training workshops.

How aware were you of the **training opportunities** that MnDOT provided?

- ○ Not Applicable
- ○ Very Unaware
- ○ Unaware
- ○ Neither Aware nor Unaware
- ○ Aware
- ○ Very Aware

Based on your position in 2008, were any of the **training workshops required**?

- ○ YES
- ○ NO

Did you attend any of the **CE and CM training workshops** provided by the department?

- ○ YES
- ○ NO

Please rate the effectiveness of the **training workshops** that you attended:

- ○ Not Applicable
- ○ Very Ineffective
- ○ Ineffective
- ○ No Change
- ○ Effective
- ○ Very Effective

Please provide any comments you have in regards to the **effectiveness of training**:

If you **did not attend training**, please explain why:

0% 100%

MnDOT CE and CM Implementation Review Questionnaire

To help with understanding the CE and CM process, MnDOT has encouraged **information sharing** throughout the department.

How aware are you of information related to CE and CM being **shared** throughout the department?

- ○ Not Applicable
- ○ Very Unaware
- ○ Unaware
- ○ Neither Aware nor Unaware
- ○ Aware
- ○ Very Aware

Please rate how effective **information sharing** is for CE and CM:

- ○ Not Applicable
- ○ Very Ineffective
- ○ Ineffective
- ○ No Change
- ○ Effective
- ○ Very Effective

How often is CE and CM information being shared/exchanged?

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Frequently

Are you able to provide **information sharing/exchange examples** and rate the effectiveness of each?

- ○ YES
- ○ NO
- ○ Not Sure

0% [========   ] 100%

MnDOT CE and CM Implementation Review Questionnaire

Please provide at least one, but no more than three, examples of information sharing/ exchange and rate the effectiveness of each:

a) Information sharing/exchange example 1:

Please rate the effectiveness of information sharing/exchange **example 1**:

- ○ Not Applicable
- ○ Very Ineffective
- ○ Ineffective
- ○ No Change
- ○ Effective
- ○ Very Effective

b) Information sharing/exchange example 2:

Please rate the effectiveness of information sharing/exchange **example 2**:

- ○ Not Applicable
- ○ Very Ineffective
- ○ Ineffective
- ○ No Change
- ○ Effective
- ○ Very Effective

c) Information sharing/exchange example 3:

Please rate the effectiveness of information sharing/exchange **example 3**:

- ○ Not Applicable
- ○ Very Ineffective
- ○ Ineffective
- ○ No Change
- ○ Effective
- ○ Very Effective

0%   100%

MnDOT CE and CM Implementation Review Questionnaire

SECTION IV : Cost Estimating and Cost Management Tools, Risk Management Tools and Management Practices

This section asks questions about the CE and CM tools, risk management tools and management practices used to assist with cost estimating and cost management tasks

The Technical Reference Manual provided **47 various tools** for use with CE and CM. The list below outlines those tools. For each of the 47 tools, please specify how often you have used the tool.

ALL SUB-PROCESSES TOOLS

	Have you used this tool?			
	Never	Rarely	Sometimes	Often
Project Estimate File	○	○	○	○
Recognition of Complexity	○	○	○	○
RACI	○	○	○	○

DETERMINE ESTIMATE BASIS TOOLS

	Have you used this tool?			
	Never	Rarely	Sometimes	Often
Summary of Key Project Definition Elements	○	○	○	○
Scoping Documents	○	○	○	○
Checklist	○	○	○	○
Environmental Checklist	○	○	○	○

PREPARE BASE ESTIMATE TOOLS

	Have you used this tool?			
	Never	Rarely	Sometimes	Often
Historical Data	○	○	○	○
Market Conditions	○	○	○	○
Cost/Parameter Using Similar Projects	○	○	○	○
Cost/Parameter Using Typical Sections	○	○	○	○
Trns*port TRACER	○	○	○	○
Analogous or Similar Project	○	○	○	○
Historical Bid Based	○	○	○	○
Historical Percentages	○	○	○	○
Parametric Estimating	○	○	○	○
Spreadsheet Template	○	○	○	○
Trns*port PES	○	○	○	○
Cost Based	○	○	○	○
Historical Bid Based	○	○	○	○
Trns*port CES	○	○	○	○

REVIEW AND APPROVE ESTIMATES TOOLS

	Have you used this tool?			
	Never	Rarely	Sometimes	Often
Estimation Checklist	○	○	○	○
Formal Committee	○	○	○	○
In-house / Peer	○	○	○	○
Round Table Estimate Review	○	○	○	○
Expert Team	○	○	○	○

0% 100%

MnDOT CE and CM Implementation Review Questionnaire

RISK AND CONTINGENCY TOOLS

	Have you used this tool?			
	Never	Rarely	Sometimes	Often
Year-of-Construction Costs	○	○	○	○
Red Flag Items	○	○	○	○
Risk Checklists	○	○	○	○
Assumption Analysis	○	○	○	○
Expert Interviews	○	○	○	○
Crawford Slip Method	○	○	○	○
Risk Management Plan	○	○	○	○
Contingency Percentage	○	○	○	○
Contingency Identified	○	○	○	○
Estimate Ranges - Three-point Estimates	○	○	○	○
Estimate Ranges - Monte Carlo Analysis	○	○	○	○
Risk Workshops	○	○	○	○
Probabilty - Impact Matrix	○	○	○	○
Risk Register	○	○	○	○

DETERMINE ESTIMATE COMMUNICATION APPROACH

	Have you used this tool?			
	Never	Rarely	Sometimes	Often
Communication of Uncertainty	○	○	○	○
Communication within MnDOT	○	○	○	○
Proactive Conveyance of Information to the Public	○	○	○	○
Simple Spreadsheet	○	○	○	○

COST MANAGEMENT TOOLS

	Have you used this tool?			
	Never	Rarely	Sometimes	Often
Variance Reports on Cost and Schedule	○	○	○	○
Cost Control Reports	○	○	○	○
Project Change Request Form	○	○	○	○

0% ▭ 100%

MnDOT CE and CM Implementation Review Questionnaire

NEW AND REVISED TOOLS

Are you aware of any new or revised tools that MnDOT has introduced that are not a part of the list above?

○ YES
○ NO
○ Not Sure

If you are aware of any new and revised tools, please list them here:

Please provide any suggestions you may have for new tools or revisions of existing tools:

0% _____ 100%

MnDOT CE and CM Implementation Review Questionnaire

SECTION V : Performance of the Cost Estimating and Cost Management Process

This section asks questions about the overall performance of the MnDOT CE and CM process and how it can be improved.

Please rate how effective MnDOT has been in **revising and improving the CE and CM process** since its introduction in 2008:

○ No Applicable
○ Very Ineffective
○ Ineffective
○ No Change
○ Effective
○ Very Effective

Now that the CE and CM process has been in place for more than four years, please rate how effective the process is today:

○ Not Applicable
○ Very Ineffective
○ Ineffective
○ No Change
○ Effective
○ Very Effective

On what percentage of your projects, do you use the formal CE and CM process?

Never (0.0%); Rarely (1% to 33%); Sometimes (34% to 66%); Often (67% to 100%)

○ Never
○ Rarely
○ Sometimes
○ Often

Please provide any recommendations that you have that would help improve the current CE and CM process:

Please rate the effectiveness of the Technical Reference Manual:

○ Not Applicable
○ Very Ineffective
○ Ineffective
○ No Change
○ Effective
○ Very Effective

On what percentage of your project cost estimates, do you refer to the Technical Reference Manual?

Never (0.0%); Rarely (1% to 33%); Sometimes (34% to 66%); Often (67% to 100%)

○ Never
○ Rarely
○ Sometimes
○ Often

Please provide any recommendations that you have that would improve the Technical Reference Manual:

0%   100%

MnDOT CE and CM Implementation Review Questionnaire

Please complete the following information (We are collecting names and information only to avoid duplication when aggregating results. We will not share this information with anyone.)

Name

Job Title

Office Location

Email Address

Phone (Optional)

0%   100%

MnDOT CE and CM Implementation Review Questionnaire

We thank you for your time spent taking this survey.
Your response has been recorded.

0%   100%

APPENDIX B – WORKSHOP

IMPLEMENTATION REVIEW WORKSHOP

Date: Wednesday, February 27, 2013

Time: 9:00 am – 2:00 pm

Location: MnDOT Bridge Office

                     3485 Hadley Avenue North

                     Oakdale, MN 55128-3307

Background and Purpose:

In 2008, the Minnesota Department of Transportation (MnDOT) implemented a new process for cost estimating (CE) and cost management (CM) to provide a systematic and consistent approach to throughout the department. To support this effort, MnDOT developed a strategic implementation plan that included the development of a Technical Reference Manual and training in all districts. The University of Colorado and Parsons Brinkerhoff are currently conducting a review of the CE and CM process implementation. The goal of this workshop is to discuss the effectiveness of the CE and CM implementation to date and determine if any further implementation work is needed.

Meeting Agenda:

9:00-9:30   CE and CM Process Overview and Discussion of Workshop Goals

9:30-10:30   CE and CM Gated Process

10:30-10:45   Break

10:45-12:00   CE and CM Policy Implementation

12:00-12:30   Lunch

12:30-1:30   CE and CM Process by Development Phase

1:30-2:00   CE and CM Wrap-up and Relationship with other ongoing MnDOT Efforts

MNDOT PROJECT COST ESTIMATION AND COST MANAGEMENT POLICIES

Background and Purpose:

In 2008, the Minnesota Department of Transportation (MnDOT) implemented a new process for cost estimating (CE) and cost management (CM) to provide a systematic and consistent approach to throughout the department. The basis for the CE and CM process came from MnDOT managements' vision for cost estimation and cost management. This vision further developed into five specific CE and CM policies. The following policies helped to facilitate improved cost estimation and cost management throughout Planning, Scoping, Design, and Letting.

MnDOT Management Policies:

1. Project Cost Estimation Policy
2. Uncertainty, Risk, and Contingency Policy
3. Communications Policy
4. Project Cost Management Policy
5. Project Management Policy

PROJECT COST ESTIMATION POLICY

Objective

To improve the reliability and accuracy of cost estimates, project cost estimation will be the responsibility of each of MnDOT's Districts and MnDOT's Central Office.

Summary

- Districts will have dedicated estimators.
- Estimates will be Total Project Cost Estimates (TPCE).
- A Project Estimate File will be established and maintained for the life of the project.
- Estimates will be reported in year-of-construction costs at the midpoint of construction.
- Management approval will be required at all gates in the cost estimation process.

Questions

1. Please provide specific examples where this policy has been implemented and share whether the policy has improved CE and CM performance.

2. Please provide specific examples where the policy has not been implemented and share any barriers to implementing the policy.

UNCERTAINTY, RISK AND CONTINGENCY POLICY

Objective
The total project cost estimate for each of the project development phases will include an analysis of uncertainty and risk, and associated contingency and estimates.

Summary
- The Total Project Cost Estimate (TPCE) will identify risks and estimate contingencies.
- Project teams will use a risk analysis to estimate the contingency amount in the TPCE.
- Contingency estimates will not be incorporated into individual item costs until the beginning of the Letting Phase.
- There is no program contingency and all contingency is therefore at the project level.
- Unused contingency will be returned to the program.

Questions
1. Please provide specific examples where this policy has been implemented and share whether the policy has improved CE and CM performance.

2. Please provide specific examples where the policy has not been implemented and share any barriers to implementing the policy.

COST ESTIMATE COMMUNICATION POLICY

Objective

To ensure that project costs are communicated consistently and uniformly statewide, regardless of the project development phase, the Total Project Cost Estimate (TPCE) will include contingency and reflect inflation-adjusted costs.

Summary

- All projects will have a Project Summary Report (one-pager).
- MnDOT is only committed to projects that are a part of the STIP.
- Projects that are outside the STIP will be estimated and shown in ranges.

Questions

1. Please provide specific examples where this policy has been implemented and share whether the policy has improved CE and CM performance.

2. Please provide specific examples where the policy has not been implemented and share any barriers to implementing the policy.

PROJECT COST MANAGEMENT POLICY

Objective

Project-related costs will be managed against a Baseline Cost Estimate, which is the Total Project Cost Estimate (TPCE) at the time the project Scoping Report is approved.

Summary

- Projects will be managed against a Baseline Cost Estimate established at the time the project is included in the STIP.
- Once established, the project Baseline Cost Estimate will remain unchanged, so long as the original project purpose and need contained in the Scoping Report does not change.
- The Scoping Report will clearly communicate what the project definition includes and what it does not include.
- Projects with major changes will have a new Scoping Report.
- Projects with minor changes will have a Project Change Request Form.
- Use of contingency requires approval from program management

Questions

1. Please provide specific examples where this policy has been implemented and share whether the policy has improved CE and CM performance.

2. Please provide specific examples where the policy has not been implemented and share any barriers to implementing the policy.

PROGRAM MANAGEMENT POLICY

Objective

Districts will actively manage project costs to deliver MnDOT's construction program within the State Road Construction budget constraints and program priorities.

Summary

- Projects will be allowed to enter the HIP after a planning-level project cost estimate.
- Projects cannot be in STIP without an approved Scoping Report.
- Project-related costs are managed against an established Baseline Cost Estimate, which is the Total Project Cost Estimate at the time the project Scoping Report is approved.
- Scoping marks the end of discovery.
- After a Scope Change, a STIP Review and a Program Evaluation and Modification will be required at the District level if the TPCE is likely to exceed the Baseline Cost Estimate.
- If at the conclusion of the STIP Review and Program Evaluation and Modification process, the new TPCE exceeds the Baseline Cost Estimate, the District should down-scope the project so that the TPCE is less than or equal to the Baseline Cost Estimate.

Questions

1. Please provide specific examples where this policy has been implemented and share whether the policy has improved CE and CM performance.

2. Please provide specific examples where the policy has not been implemented and share any barriers to implementing the policy.

MNDOT PROJECT COST ESTIMATE REVIEW AND APPROVAL GATES

To achieve consistent and accurate cost estimates, project cost estimates are prepared and coincide with critical points ("gates") during the project development phases. The figure below shows the gates in the various project development phases as provided in the Technical Reference Manual.
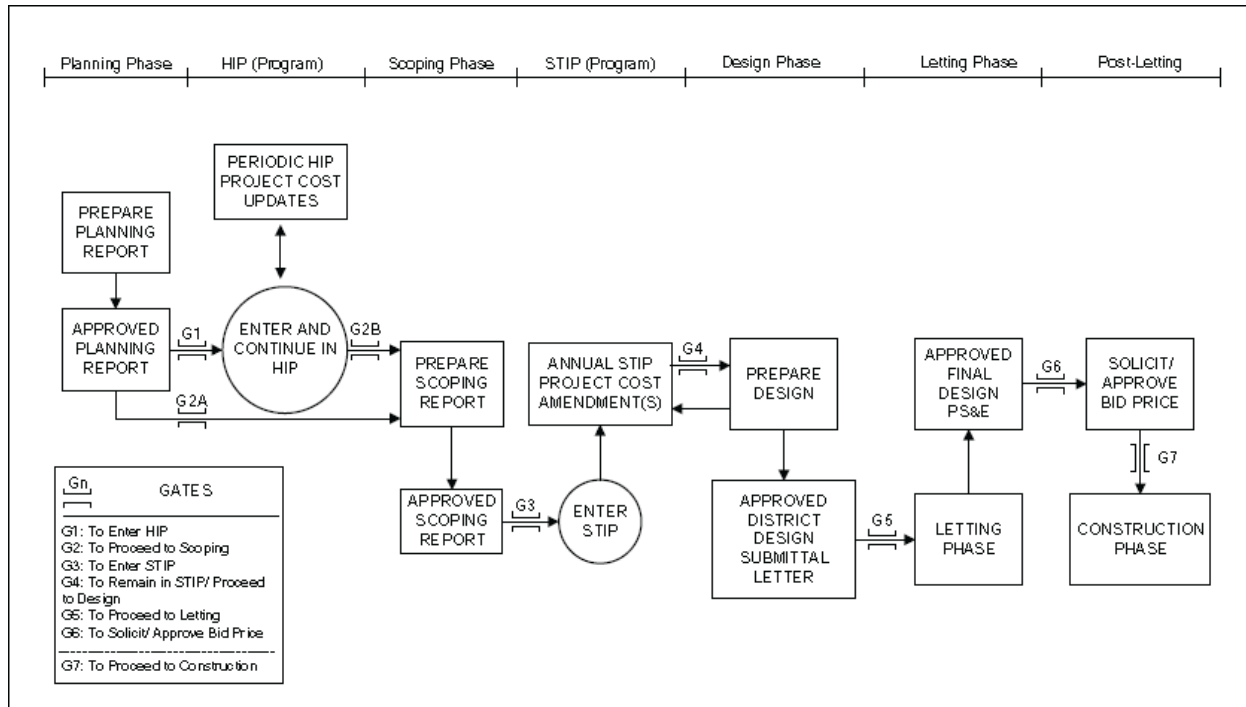
Figure B 1 - Project Development and associated review and approval gates

MnDOT's Project development procedure includes seven gates that will require a Total Project Cost Estimate (TPCE), which will need to be approved by appropriate management staff before the project is allowed to move into the next phase. Some of the gates are embedded in reports or design milestones at critical process steps (e.g., Planning Report, Scoping Report, Final Design PS&E).

Planning Phase Estimate Review and Approval Gates

At the planning phase of project development, conceptual estimating techniques, such as center lane miles, square foot of bridge deck area, or historical percentages, are used to determine potential funds and prioritize needs for long-range plans. The planning phase includes gates G1 and G2. In some cases, G1 may not be needed if a project does not enter the Highway Improvement Plan (HIP) and proceeds directly to scoping.

How frequently is an estimate approval documented when passing through gate G1?

☐ Never (0% of projects)

☐ Rarely (1% - 33% of projects)

☐ Sometimes (34% - 66% of projects)

☐ Often (67% - 100% of projects)

How effective is gate G1 in managing the cost estimate process during the planning phase and determining approval for further project definition early in the scoping phase?

☐ Very ineffective

☐ Ineffective

☐ No change

☐ Effective

☐ Very effective

☐ Other, please explain: _____

_____

How difficult is it to obtain approval of an estimate to cross through gate G1?

☐ Not Sure

☐ Very difficult

☐ Difficult

☐ Neither difficult nor easy

☐ Easy

☐ Very easy

What are some barriers to gaining approval for gate G1?

How frequently is an estimate approval documented when passing through gate G2?

- ☐ Never (0% of projects)
- ☐ Rarely (1% - 33% of projects)
- ☐ Sometimes (34% - 66% of projects)
- ☐ Often (67% - 100% of projects)

How effective is gate G2 in managing the cost estimate process during the planning phase and obtaining approval of an estimate for final project definition in scoping phase?

- ☐ Very ineffective
- ☐ Ineffective
- ☐ No change
- ☐ Effective
- ☐ Very effective
- ☐ Other, please explain: _____

_____

How difficult is it to obtain approval of an estimate to cross through gate G2?

- ☐ Not Sure
- ☐ Very difficult
- ☐ Difficult
- ☐ Neither difficult nor easy
- ☐ Easy
- ☐ Very easy

What are some barriers to gaining approval for gate G2?

Scoping Phase Estimate Review and Approval Gates

At the scoping phase of project development, scoping estimating techniques, such as historical bid-based, cost-based estimating, LWD, or historical percentages, are used to establish a baseline cost for projects in the HIP that will be moved in the STIP. The scoping phase includes gate G3, which is one of the most critical gates as this is when a project can become a part of the STIP. This action approves the baseline scope, cost, and schedule for the project and forms the basis for cost management. Projects that become a part of the STIP program are committed projects.

How frequently is an estimate approval documented when passing through gate G3?

- ☐ Never (0% of projects)
- ☐ Rarely (1% - 33% of projects)
- ☐ Sometimes (34% - 66% of projects)
- ☐ Often (67% - 100% of projects)

How effective is gate G3 in managing the cost estimate process during the scoping phase and obtaining approval of the baseline cost estimate for managing the project during the design phase?

- ☐ Very ineffective
- ☐ Ineffective
- ☐ No change
- ☐ Effective
- ☐ Very effective
- ☐ Other, please explain: _____

How difficult is it to obtain approval of an estimate to cross through gate G3?

- ☐ Not Sure
- ☐ Very difficult
- ☐ Difficult
- ☐ Neither difficult nor easy
- ☐ Easy
- ☐ Very easy

What are some barriers to gaining approval for gate G3?

Design Phase Estimate Review and Approval Gates

At the design phase of project development, design estimates are revised and updated using historical-based and deterministic cost-based techniques. The design phase includes gates G4 and G5. Gate G4 approval moves a project through the STIP and design is refined and more details are included. Gate G5 approval then moves a project into the letting phase and one step closer to beginning construction.

How frequently is an estimate approval documented when passing through gate G4?

- ☐ Never (0% of projects)
- ☐ Rarely (1% - 33% of projects)
- ☐ Sometimes (34% - 66% of projects)
- ☐ Often (67% - 100% of projects)

How effective is gate G4 in managing cost estimate updates during the design phase and obtaining approval of changes in cost?

- ☐ Very ineffective
- ☐ Ineffective
- ☐ No change
- ☐ Effective
- ☐ Very effective
- ☐ Other, please explain: _____

How difficult is it to obtain approval of an estimate to cross through gate G4?

- ☐ Not Sure
- ☐ Very difficult
- ☐ Difficult
- ☐ Neither difficult nor easy
- ☐ Easy
- ☐ Very easy

What are some barriers to gaining approval for gate G4?

How frequently is an estimate approval documented when passing through gate G5?

- ☐ Never (0% of projects)
- ☐ Rarely (1% - 33% of projects)
- ☐ Sometimes (34% - 66% of projects)
- ☐ Often (67% - 100% of projects)

How effective is gate G5 in managing the cost estimate process during the design phase and obtaining approval of the final construction cost estimate for letting preparation?

- ☐ Very ineffective
- ☐ Ineffective
- ☐ No change
- ☐ Effective
- ☐ Very effective
- ☐ Other, please explain: _____

_____

How difficult is it to obtain approval of an estimate to cross through gate G5?

- ☐ Not Sure
- ☐ Very difficult
- ☐ Difficult
- ☐ Neither difficult nor easy
- ☐ Easy
- ☐ Very easy

What are some barriers to gaining approval for gate G5?

Letting Phase Estimate Review and Approval Gates

At the letting phase of project development, cost-based and historical bid-based estimates using CES techniques are used to develop the engineer's estimate. The engineer's estimate is then used for comparison to bids received. The letting phase includes gates G6 and G7. Gate G6 establishes that a bid has been solicited for the project. Finally, G7 is crossed when the project is approved to proceed with construction.

How frequently is an estimate approval documented when passing through gate G6?

- ☐ Never (0% of projects)
- ☐ Rarely (1% - 33% of projects)
- ☐ Sometimes (34% - 66% of projects)
- ☐ Often (67% - 100% of projects)

How effective is gate G6 in managing the cost estimate process during the letting phase and obtaining approval of the engineer's estimate for contractor letting?

- ☐ Very ineffective
- ☐ Ineffective
- ☐ No change
- ☐ Effective
- ☐ Very effective
- ☐ Other, please explain: _____

_____

How difficult is it to obtain approval of an estimate to cross through gate G6?

- ☐ Not Sure
- ☐ Very difficult
- ☐ Difficult
- ☐ Neither difficult nor easy
- ☐ Easy
- ☐ Very easy

What are some barriers to gaining approval for gate G6?

How frequently is an estimate approval documented when passing through gate G7?

- ☐ Never (0% of projects)
- ☐ Rarely (1% - 33% of projects)
- ☐ Sometimes (34% - 66% of projects)
- ☐ Often (67% - 100% of projects)

How effective is gate G7 in managing the cost estimate process at the end of the letting phase and obtaining approval for obligating funds and approving the construction contract to proceed with construction?

- ☐ Very ineffective
- ☐ Ineffective
- ☐ No change
- ☐ Effective
- ☐ Very effective
- ☐ Other, please explain: _____

_____

How difficult is it to obtain approval of an estimate to cross through gate G7?

- ☐ Not Sure
- ☐ Very difficult
- ☐ Difficult
- ☐ Neither difficult nor easy
- ☐ Easy
- ☐ Very easy

What are some barriers to gaining approval for gate G7?

MNDOT COST ESTIMATE AND COST MANAGEMENT PROCESS REPORT CARD

Introduction

This workshop will use a report card format to guide the review. The MnDOT Cost Estimating (CE) and Cost Management (CM) process form the basis of the review. While it is unlikely that we will report the letter grade in the final review, the report card format provides a framework for discussions and will help us focus on the strengths and weaknesses of the process in our discussions.

Figure B 2 presents a hierarchical layout of the CE and CM process during the four project development phases. Each phase is provided in more detail on the following pages.
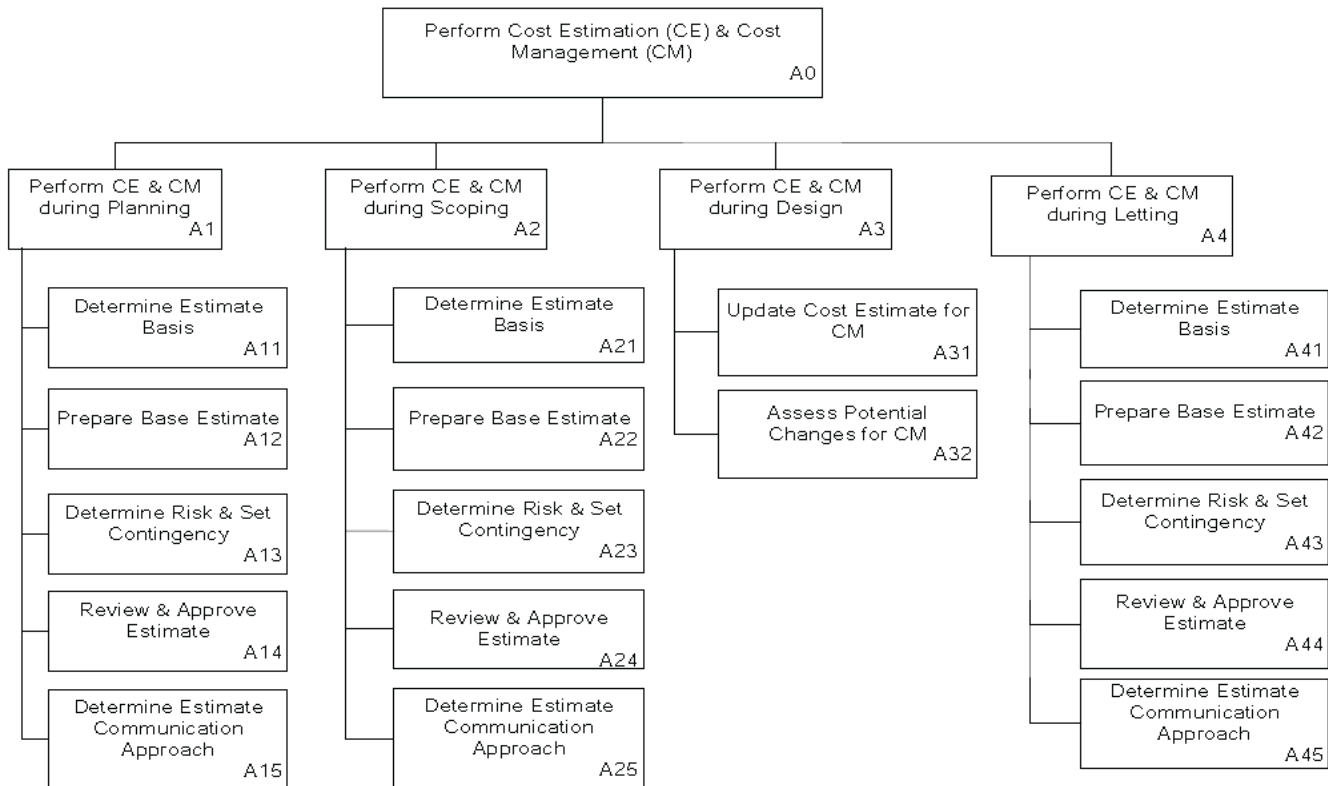
Figure B 2 - Hierarchical layout of the CE and CM process during project development phases

Planning Phase – CE and CM Process

Planning level cost estimates can have a significant effect on the overall transportation program. A key part of the planning phase is to identify needs and to develop project cost estimates. Conceptual cost estimates prepared during planning have a fundamental purpose to provide an order of magnitude estimate. Figure B 3 depicts the five key estimate sub-processes.

Figure B 3 - Planning Phase CE and CM Process

Planning Phase Report Card

Please use the following scale of evaluation:

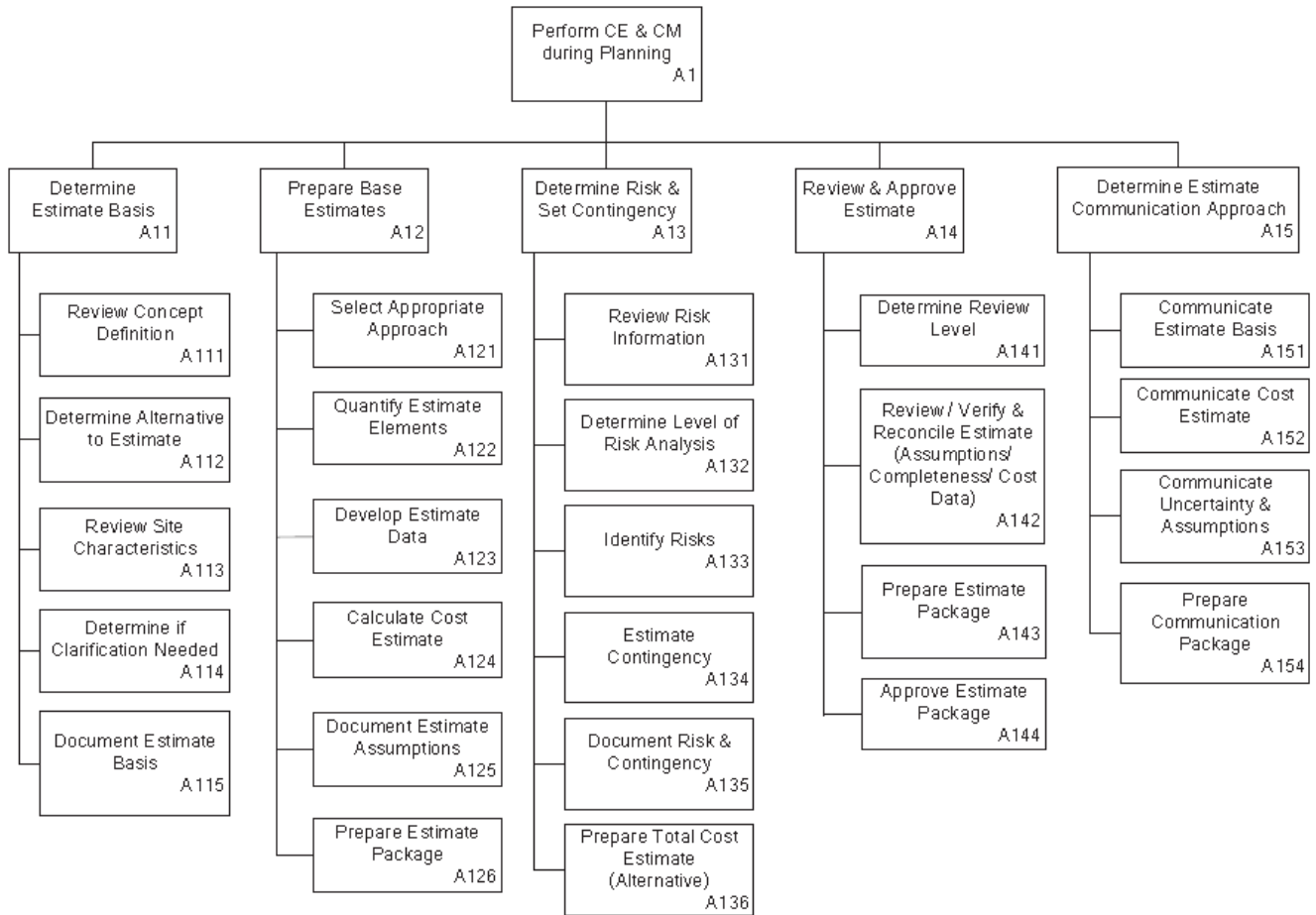| Grade	Description
A	Excellent Treatment of Issue
B	Very Good Treatment of Issue
C	Good Treatment of Issue
D	Fair Treatment of Issue
F	Poor Treatment of Issue

Planning Sub-process	Planning Sub-process Steps	Grade	Comments and Action Items
Determine Estimate Basis	1. Review concept definition 2. Determine alternative to estimate 3. Review site characteristics 4. Determine if clarification is needed 5. Document planning estimate basis	_____	
Prepare Base Estimate	1. Select appropriate estimation approach 2. Determine estimate components and qualify 3. Develop estimate data 4. Calculate cost estimate 5. Document estimate assumptions 6. Prepare estimate package	_____	
Determine Risk and Set Contingency	1. Review risk information 2. Determine level of risk analysis 3. Identify risks 4. Estimate contingency 5. Document risk and contingency basis 6. Prepare the Total Project Cost Estimate	_____	

Planning Sub-process	Planning Sub-process Steps	Grade	Comments and Action Items
Review and Approve Estimates	1. Determine level of review 2. Review/Verify and reconcile estimate 3. Prepare estimate package 4. Approve estimate package	_____	
Determine Estimate Communication Approach	1. Communicate estimate basis 2. Communicate cost estimate 3. Communicate uncertainty and assumptions 4. Prepare communication package	_____	

Scoping Phase – CE and CM Process

The development of cost estimates is a key part of the scoping process. While a number of cost estimates are often prepared during the scoping process, the most critical estimate is the estimate that supports programming the project in the STIP. Thus, the main purpose of the scoping cost estimate is to develop the baseline cost estimate from which project costs will be managed during the design phase. The cost estimating and cost management process for the scoping phase is shown in Figure B 4 below.
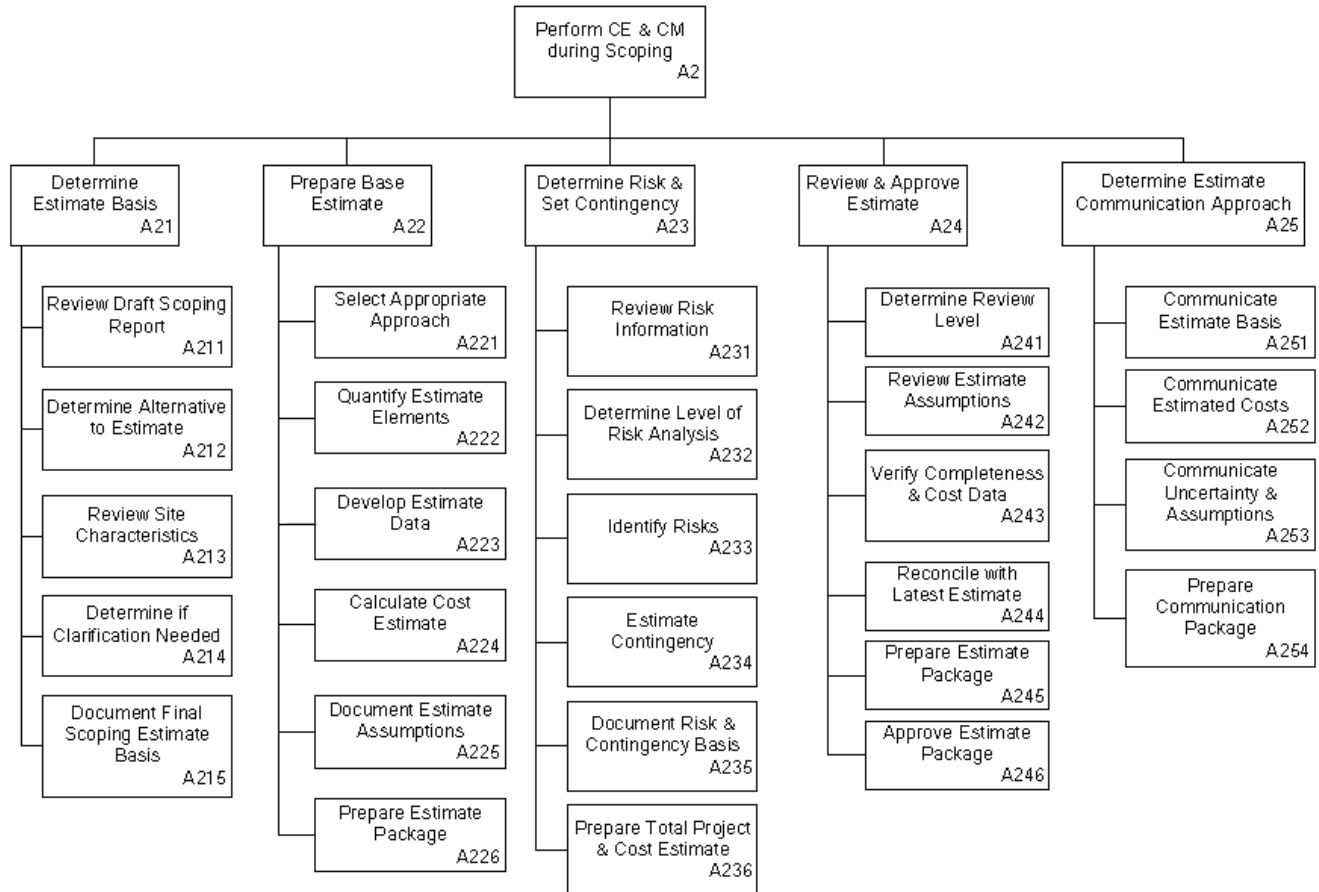

Figure B 4 - Scoping Phase CE and CM Process

Scoping Phase Report Card

Please use the following scale of evaluation:

Grade	Description
A	Excellent Treatment of Issue
B	Very Good Treatment of Issue
C	Good Treatment of Issue
D	Fair Treatment of Issue
F	Poor Treatment of Issue

Scoping Sub-process	Scoping Sub-process Steps	Grade	Comments and Action Items
Determine Estimate Basis	1. Review draft scoping report 2. Determine alternative to estimate 3. Review site characteristics 4. Determine if clarification is needed 5. Document scoping estimate basis	_____	
Prepare Base Estimate	1. Select appropriate estimation approach 2. Quantify estimate elements 3. Develop estimate data 4. Calculate cost estimate 5. Document estimate assumptions 6. Prepare estimate package	_____	
Determine Risk and Set Contingency	1. Review risk information 2. Determine level of risk analysis 3. Identify risks 4. Estimate contingency 5. Document risk and contingency basis 6. Prepare the Total Project Cost Estimate	_____	

Scoping Sub-process	Scoping Sub-process Steps	Grade	Comments and Action Items
Review and Approve Estimates	1. Determine level of review 2. Review estimate assumptions 3. Verify completeness and cost data 4. Prepare estimate package 5. Approve estimate package	_____	
Determine Estimate Communication Approach	1. Communicate estimate basis 2. Communicate cost estimate 3. Communicate uncertainty and assumptions 4. Prepare communication package	_____	

Design Phase – CE and CM Process

Cost estimating and cost management in the design phase are divided into two parts: Updating the project cost estimate, and assessing potential changes as a result of deviations in the baseline project definition and budget. This division reflects two different approaches to cost management, one through estimate updates and the other through the identification and analysis of individual potential changes. These two processes are further decomposed into sub-processes and their corresponding steps, as shown in Figure B 5 below.
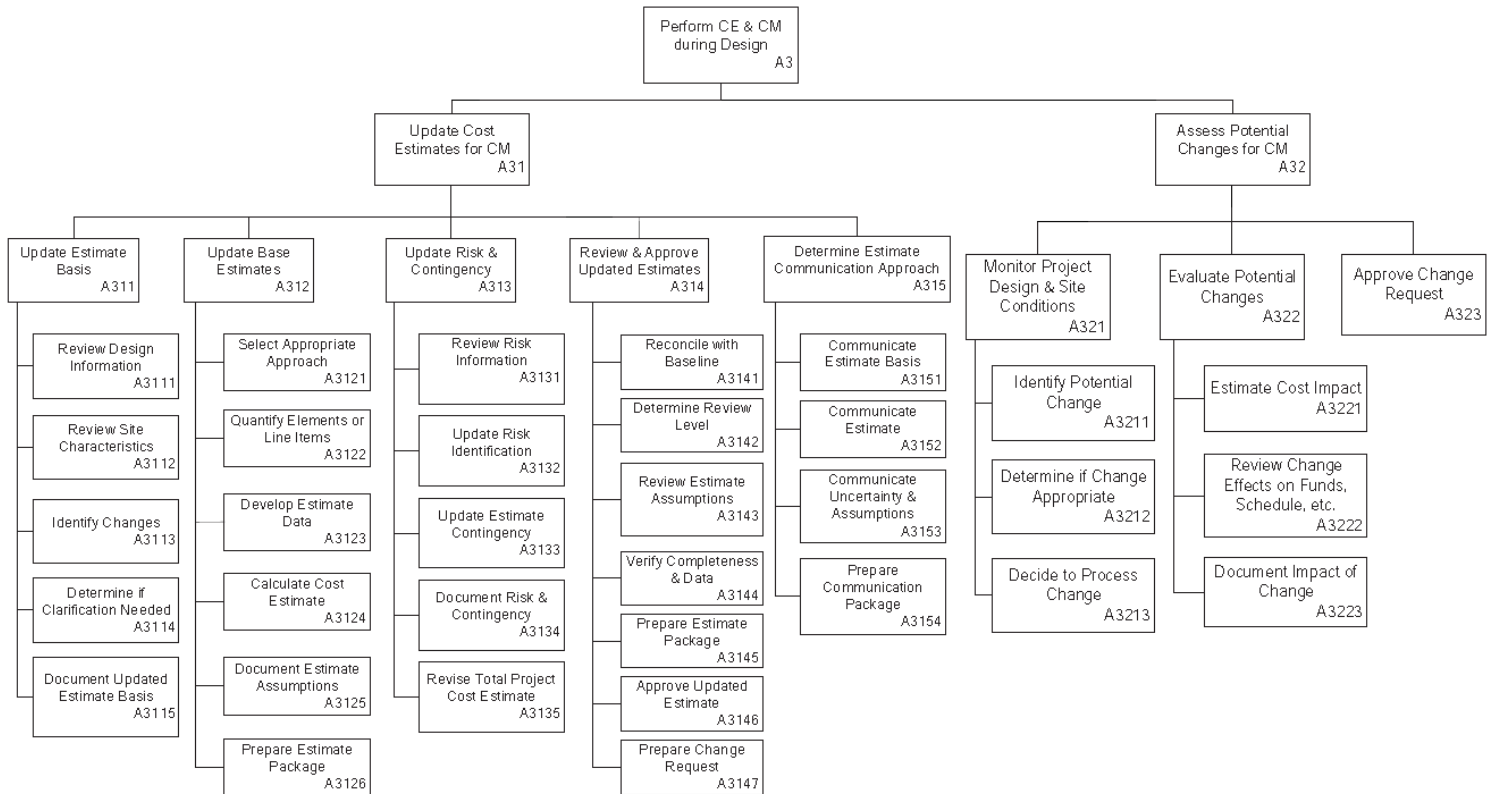

Figure B 5 - Design Phase CE and CM Process

Design Phase Report Card

Please use the following scale of evaluation:

Grade	Description
A	Excellent Treatment of Issue
B	Very Good Treatment of Issue
C	Good Treatment of Issue
D	Fair Treatment of Issue
F	Poor Treatment of Issue

Cost Management through Cost Estimate Updates Process

Design Sub-process	Design Sub-process Steps	Grade	Comments and Action Items
Update Estimate Basis	1. Review design information 2. Review site characteristics 3. Identify changes 4. Determine if clarification is needed 5. Document updated estimate basis	_____	
Update Base Estimate	1. Select appropriate estimation approach 2. Quantify estimate elements and items 3. Develop estimate data 4. Calculate cost estimate 5. Document estimate assumptions 6. Prepare estimate package	_____	
Update Risk and Contingency	1. Review risk information 2. Update risk identification 3. Update contingency estimate 4. Document risk and contingency 5. Revise the Total Project Cost Estimate	_____	

Design Sub-process	Design Sub-process Steps	Grade	Comments and Action Items
Review and Approve Updated Estimates	1. Reconcile with latest estimate 2. Determine level of review 3. Review estimate assumptions 4. Verify completeness and cost data 5. Prepare estimate package 6. Approve updated estimate package 7. Prepare project change request	_____	
Determine Estimate Communication Approach	1. Communicate estimate basis 2. Communicate estimated costs 3. Communicate uncertainty and assumptions 4. Prepare communication package	_____	

Cost Management through Assessment of Changes Process

Design Sub-process	Design Sub-process Steps	Grade	Comments and Action Items
Monitor Project Design and Site Conditions	1. Identify potential change 2. Determine if change is appropriate 3. Decide to process change	_____	
Evaluate Potential Change	1. Estimate cost impact 2. Review impact of change 3. Document impact of change	_____	
Approve Project Change Request	1. Decision to approve or not approve the change request	_____	

Letting Phase – CE and CM Process

The final project design forms the basis for the letting phase engineer's estimate. In the letting phase, cost management covers the important step of obtaining appropriate approval for the engineer's estimate. Letting cost estimating and cost management is divided into sub-processes and steps shown in Figure B 6 below.
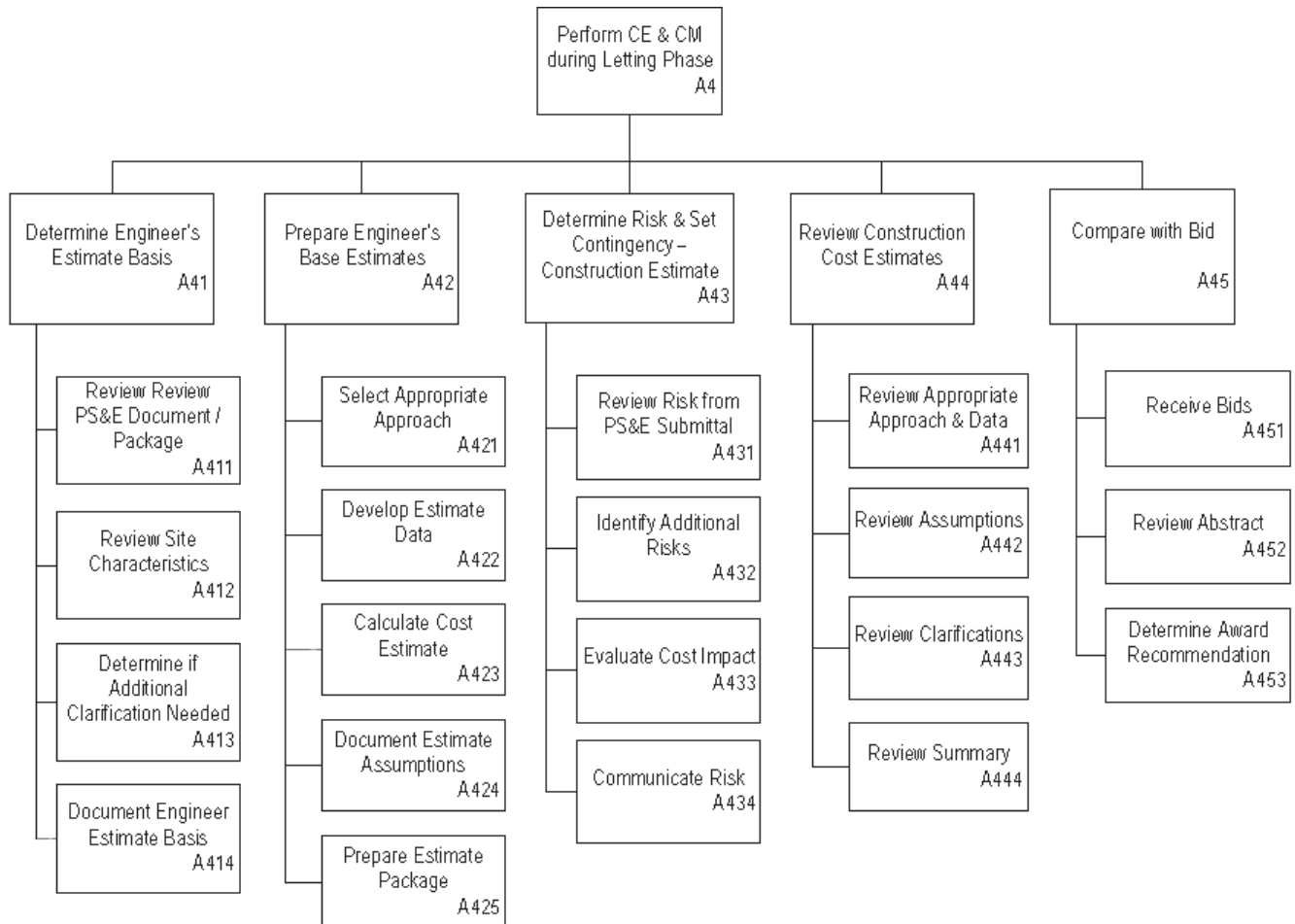

Figure B 6 - Letting Phase CE and CM Process

Letting Phase Report Card

Please use the following scale of evaluation:

Grade	Description
A	Excellent Treatment of Issue
B	Very Good Treatment of Issue
C	Good Treatment of Issue
D	Fair Treatment of Issue
F	Poor Treatment of Issue

Letting Sub-process	Letting Sub-process Steps	Grade	Comments and Action Items
Determine Engineer's Estimate Basis	1. Review PS&E document package 2. Review site characteristics 3. Determine if clarification is needed 4. Document engineer's estimate basis	_____	
Prepare Engineer's Base Estimate	1. Select appropriate estimation approach 2. Develop estimate data 3. Calculate cost estimate 4. Document estimate assumptions 5. Prepare estimate package	_____	
Determine Risk and Set Contingency for Construction	1. Review risk information from PS&E submittal 2. Identify additional risks 3. Evaluate cost impact 4. Communicate risk	_____	

Letting Sub-process	Letting Sub-process Steps	Grade	Comments and Action Items
Review Construction Cost Estimates	1. Determine level of review 2. Review appropriate approach and data 3. Review assumptions 4. Review clarifications 5. Review summary	_____	
Compare with Bids	1. Receive bids 2. Review abstract 3. Determine award recommendation	_____	

APPENDIX C – FOCUS INTERVIEWS

Mn/DOT CE & CM Implementation Review - Interviews

Interview Goals and Agenda

Our interview will discuss the following topics:

1. Review *initial* findings and discuss recommendations
2. Discuss Final Report

Overview

In February, MnDOT, Parsons-Brinckerhoff and the University of Colorado began a review of the Cost Estimating (CE) and Cost Management (CM) process that was implemented throughout MnDOT in 2008. The goal of this review is to analyze the performance of the system five years after implementation and to make recommendations to MnDOT management. A key contacts and oversight group was formed to guide the review. Data collection for this review includes questionnaire surveys, a workshop and individual interviews as seen in the figure below.
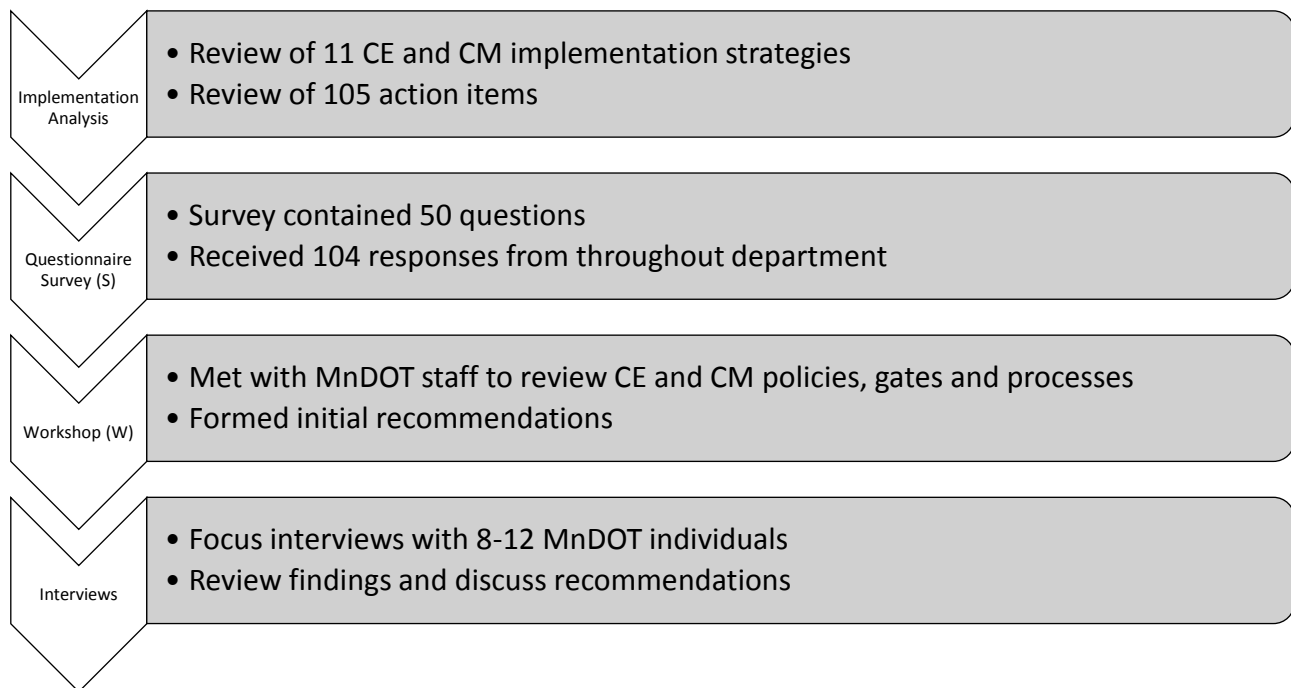
Implementation Analysis
- Review of 11 CE and CM implementation strategies
- Review of 105 action items

Questionnaire Survey (S)
- Survey contained 50 questions
- Received 104 responses from throughout department

Workshop (W)
- Met with MnDOT staff to review CE and CM policies, gates and processes
- Formed initial recommendations

Interviews
- Focus interviews with 8-12 MnDOT individuals
- Review findings and discuss recommendations

Figure C 1 - Data Collection Process

Initial Findings and Recommendations

The interactions with the key contacts and oversight group, the questionnaire and workshop have provided extensive information on the CE and CM implementation. These data have led to *initial* recommendations for the overall CE and CM process. The outline on the following two pages summarizes the highlights from the data and our initial recommendations. This interview will focus on discussing the findings and discussing any gaps or trends.

NOTE: S = Survey source; W = Workshop source

Estimator Roles

Positives:	District estimators are in place (W)
Negatives:	Inconsistency in role of dedicated estimators across districts (S/W)
Recommendations:	Improve the understanding of CE and CM roles throughout the department (S)
	Refine and support roles of dedicated estimators for each district (S/W)

CE and CM Process

Positives:	Implemented the Total Project Cost Estimate process (W)
	Using ranges to report costs early in project development (W)
	Understanding and communication of baseline cost estimates (W)
Negatives:	Lacking consistency on developing 30-60-90 estimates (W)
	Lacking consistency in the use and maintained of the project estimate file (W)
	Managing projects to budget vs. scope and estimate (W)
Recommendations:	Continue to provide training and support for CE and CM processes (S)
	Provide concise guides that support CE and CM processes (also see TRM) (S/W)

Contingency

Positives:	Awareness that contingency is project based vs. program based (W)
Negatives:	Lack of understanding and managing contingency (S/W)
Recommendations:	Provide guidance for contingency development and use (W)
	Enforce contingency policies (W)

Technical Reference Manual (TRM)

Positives:	Department-wide awareness of this CE and CM resource (S/W)
Negatives:	The TRM is too long for non-estimators, particularly for project managers (S/W)
Recommendations:	Develop a concise TRM or summary documents (S/W)

CE and CM Terminology

Positives:	Consistency in CE and CM vocabulary and usage (W)
Negatives:	Need consistent definitions for cost changes and risk management (W)
Recommendations:	Provide definitions that are consistently used throughout the department (W)

Scoping Process

Positives:	Improvements in project scoping (W)
Negatives:	Scoping requirements and process is too rigid for some projects (W)
Recommendations:	Provide flexibility in scoping requirements and changes (W)

Cost Summary Reports

Positives:	Using the "one-pager" summary report (W)
Negatives:	Not used consistently on all projects (W)
Recommendations:	Enforce use on all projects to improve consistency (W)

Risk & Risk Management

Positives: Understanding of risk management processes (S/W)

Negatives: Inconsistent application of risk management and tools (W)

Recommendations: Enforce the requirements for completing risk analysis on all projects (W)

                  Refine the process for choosing appropriate risk management effort (W)

                  Develop a formal process and guidance for retiring risks (W)

Review and Approval Gates Process

Positives: Using the estimate review and approval gates in most cases (W)

Negatives: Inconsistent application of gates in some management reviews (W)

Recommendations: Enforce more rigorous use of gates and implement new controls (e.g. gate 8) (W)

                  Increase awareness and accountability for reviews and management approval (W)

CE and CM Performance Measures

Positives: Awareness that CE and CM performance measures are available & in use (S)

Negatives: Unsure of accuracy and consistency of performance measures (S)

Recommendations: Refine performance measures to be comparable to project goals (W)

                  Develop qualitative performance measures that help tell the story (S/W)

                  Improve performance measures for cost changes (W)

                  Increase awareness/use of incentive program for above average performance (S)

CE and CM Tools

Positives: Some tools are commonly used and are helpful (S)

Negatives: Some tools are not utilized appropriately or consistently (S)

Recommendations: Refine the tools to be more MnDOT specific (S/W)

                  Provide examples on how to use tools (W)

                  Eliminate unused tools (S)

                  Make the list of tools more concise (S)

Information Sharing

Positives: An informal exchange of CE and CM information regularly occurs (S)

Negatives: Low awareness in sharing of information between districts (S)

Recommendations: Increase department-wide CE and CM information sharing and effectiveness (S)