GUIDE TO PROJECT EVALUATION

Part 7: Post-completion Evaluation
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Summary
Part 7 provides guidelines for carrying out evaluation of completed transport projects to assess actual performance against stated objectives. A post-completion evaluation is the final step in project evaluation, and provides feedback on evaluation methodologies, efficiency of implementation and how effectively the project met its objectives. It closes the guidelines body of the guide to project evaluation (before the examples and applications are presented in Part 8) thus making the Austroads Guide to Project Evaluation a dynamic system of evaluation methods.

Keywords
transport project evaluation, benefit cost analysis, post-completion evaluation of projects, feedback on evaluation methodologies

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1. INTRODUCTION TO POST-COMPLETION EVALUATION

Part 7 of the Guide to Project Evaluation (the Guide) provides guidelines for carrying out post-completion evaluations on transport projects. It provides both the final step for a project evaluation process, but also acts as a feedback mechanism for the rest of the Guide. Part 7 closes the loop of the process described by the Guide to make it a dynamic system, as opposed to a linear process (eg. Part 1, Part 2, …, to Part 8). This is illustrated below.

A dynamic ‘Guide to Project Evaluation’ framework
2. BENEFITS OF CONDUCTING A POST-COMPLETION EVALUATION

Post-completion evaluations provide valuable information to an organisation about the performance of completed projects in relation to:

- how effectively the stated **objectives (purpose)** of the project were met
- how effective the project **evaluation methods** were in selecting a particular project to meet the stated objectives
- how efficient the project **implementation** process was, including the comparison of planned and actual actions, costs and resource use.

A key objective in performing a post-completion evaluation of a project is to provide a feedback mechanism to inform the selection, design, delivery and operation processes of future projects. This information is valuable in improving decision-making and project management within organisations. Some guidance on tailoring a post-completion evaluation and developing an organisational post-completion evaluation culture is provided in Commentary A.

[see Commentary A]
3. WHEN TO CONDUCT A POST-COMPLETION EVALUATION

A post-completion evaluation is not necessary for all projects, but conducting such evaluations for a percentage of projects, or very large projects, can provide valuable information to a transport agency.

Typically, post-completion evaluations should be conducted after the project has been completed and has entered a normal period of operation to allow benefits of the project to fully manifest themselves, or alternatively, for initial benefits to settle to a level that is likely to be sustained over time.

Post-completion evaluation should be considered at the stage of developing a business case for the project. This allows definition of criteria for judging the success of the project. This also enables clear mechanisms to be put into place for providing the data (and the budget) needed to measure project performance against the objectives stated in the original project brief.

3.1 Developing a post-completion evaluation program

Each agency will establish its own policy regarding the scope and type of projects that will be subject to post completion evaluation. The project selection process could, for example, include a stratified random sampling approach that would be appropriate where agencies undertake a large number of routine projects.

The following table presents typical guidelines for selecting projects for post-completion evaluation drawn from examples provided by Australian government departments and transport authorities.
### Guidelines for selecting projects for post-completion evaluation

<table>
<thead>
<tr>
<th>Guideline</th>
<th>Example Organisational Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select a representative sample of projects</td>
<td>• Post-completion evaluations are not necessary for all projects, but a sample of about 10% of an agency’s project investment should be considered.</td>
</tr>
<tr>
<td>Select large projects</td>
<td>• Projects requiring expenditure of greater than $10 million should be considered.</td>
</tr>
</tbody>
</table>
| Select projects that appear to have gone poorly or exceptionally well | • A project that is performing exceptionally well or poorly may be evaluated to provide information that could be used to guide improvements in the operation of all asset types.  
• Projects which have achieved outstanding results should be singled out for post-completion evaluation. This may identify reasons for success, such as a favourable environment or some aspect of the implementation process. |
| Select projects that will recur                 | • A post-completion evaluation of a recurring project represents a key source of information for the decision and control of similar projects in the future.  
• A post-completion evaluation may be requested when funding is being sought for similar projects.  
• Projects containing recurring steps should be subjected to post-completion evaluation so that an information base about the business process of these steps can be developed, leading to some standardisation and cost savings in future. |
| Select risky and innovative projects           | • The risks involved in a project should be considered when determining the need for post-completion evaluation. These include the risk of failure, the risks associated with new technology, and political risks.  
• All pilot projects, or projects involving innovative systems should be subjected to post-completion evaluation. |
| Select strategically important projects        | • Projects will be selected for post-completion evaluation based upon their scale, the level of risk involved, and their strategic importance.  
• Post-completion evaluations need not be limited to recently completed projects. A project that is a key service delivery resource may also be evaluated to provide information that could be used to guide improvements in the operation of all asset types. |
| Long term projects should be subjected to interim post-completion evaluations | • Major on-going programs which may involve a series of smaller capital projects should be subject to post-completion evaluations.  
• Interim post-completion evaluations are advised for any projects that have a development period of more than one year. In such cases, the evaluation should be conducted annually to ensure that project objectives remain relevant and the project continues on target. |


### 3.2 Evaluation capability

Independence is essential in conducting post-completion evaluations. It is important that post-completion evaluations be as balanced and objective as possible. Evaluations should not generally be conducted by the same group or person who conducted the original project to minimise the likelihood of positive bias in the evaluation or interpretation of evaluation results.

Some post-completion evaluations may involve analysis of user or stakeholder responses to the project. The quality and validity of the information provided by users or stakeholders will be heavily dependent upon how they are approached and what instruments are used.

It is likely that the post-completion evaluator will need to analyse numerical data, for example crash rates, travel times or benefits and costs in monetary terms. The nature of the data that will be required for a post-completion evaluation must be considered before a post-completion evaluation team is selected. Where a large amount of numerical data will be used, the team can be selected, at least partly, based upon their knowledge and skills in statistical analyses of data.
4. METHOD FOR POST-COMPLETION EVALUATIONS

The method for conducting post-completion evaluations needs to be tailored for each project. Post-completion evaluations may be conducted for projects ranging from relatively low cost, straightforward projects being reviewed to obtain only specific learnings, to complex and costly projects that require detailed reporting. The approach to be adopted when carrying out post-completion evaluations largely depends on:

- the specific objectives for the post-completion evaluation exercise and what the information is needed for
- the amount of resources invested in the exercise consistent with the expected benefits from it.

An approach to conducting post-completion evaluations is presented below and discussed in the following sections.

4.1 Define the purpose of the evaluation

The first step in post-completion evaluation is to determine the purpose of the evaluation and the specific aspects of project performance that will be examined. The post-completion evaluation typically investigates several different phases of the project process, for example, project development and approval, project implementation, and project outcomes. In some cases, the focus of the evaluation may be on examining only one or two of these phases.

A project with a large timescale may warrant using a multistage post-completion evaluation. If a multistage post-completion evaluation is being used, each phase should be investigated soon after the phase completion, with the recording of all important details for future information.
4.2 Define the focus of attention

The focus (purpose) of the evaluation is normally established by referring to the initially stated objectives when the project was initiated and developed (included in the project business case), along with any additional objectives included in the post-completion evaluation brief.

The table below presents a list of topics that may be included when establishing the purpose of a post-completion evaluation and defining its focus of attention.

<table>
<thead>
<tr>
<th>Project phase</th>
<th>Section</th>
<th>Topic</th>
<th>Sample question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project development and approval phase</td>
<td>Project identification</td>
<td>Project need</td>
<td>What was the need for the project?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project objectives</td>
<td>What were the project objectives?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Business case</td>
<td>How effective was the business case in presenting information for an informed decision to be made?</td>
</tr>
<tr>
<td>Project options</td>
<td>Process for determining options</td>
<td>Identification of the preferred options</td>
<td>What process was used to determine options?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>What options were considered and how was the preferred option selected?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Were all relevant alternatives identified?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Was the best option selected?</td>
</tr>
<tr>
<td>Impacts, costs and benefits</td>
<td>Process for determining the project EIA</td>
<td>Costs and benefits</td>
<td>What processes were used to assess environmental impacts?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>How appropriate were the processes for estimating social, economic and environmental costs and benefits?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>How effective was community and stakeholder consultation?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Were estimated benefits achieved?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>How appropriately were expected adverse impacts of the project addressed?</td>
</tr>
<tr>
<td>Project implementation phase</td>
<td>Process for project delivery</td>
<td>Management of contractors</td>
<td>Were there any variations to the scope or the timing of the project?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time and cost</td>
<td>How well did contractors perform and how effective was contract management and surveillance?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>What was the final cost?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>How accurate was the concept estimate?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other traffic or community impacts?</td>
</tr>
<tr>
<td>Handover</td>
<td>Management of the handover process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project outcomes phase</td>
<td>Project outcomes</td>
<td>Achievement of service standards</td>
<td>At completion, how well did the project meet expected service standards?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value for money</td>
<td>Did the project deliver overall benefits to the community?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Costs and benefits</td>
<td>Did it meet community/ stakeholder expectations?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Were there unanticipated costs or benefits?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>What was the economic performance achieved (BCR, NPV)?</td>
</tr>
</tbody>
</table>

Source: adapted from RTA (2004)
4.3 Methods of evaluation

To determine how effective a project has been in meeting its objectives, the situation after the project has been implemented needs to be compared to a base case situation. In examining the impact of a project, analysts typically adopt one (or more) of the three methods described and also illustrated in the figure below (Meyer & Miller, 2001).

4.3.1 Compare points in time

For comparison at different points in time, selected variables taken to be indicators of the impact of the project are measured at different points in time. Typically at least one round of measurements is taken before the project is implemented and compared with measurement taken at some point after implementation is complete. Several rounds of post-completion measurements are sometimes made, in order to determine how the impacts from a project change over time.

Example: compare crash rates at a site before and after works aiming to improve safety are completed.

4.3.2 Compare geographic regions or groups

Comparison of different geographic regions or population groups might be adopted when it is not possible to obtain pre-implementation data (a circumstance that can be avoided by considering post-completion evaluation in project planning stage). Ideally, however, this approach will be used to augment the validity of comparisons made at different points in time by providing control data. Data obtained from a site that is matched to the project site (using a set of appropriate factors) can highlight changes in the measured variables that would have taken place at the project site even if the project had not been implemented. Thus, such changes are correctly attributed to ‘exogenous influences,’ (described below) and not to the project.

Example: compare the patronage of an upgraded bus service with patronage of a bus service in a similar area that has not been upgraded.

4.3.3 Compare real and predicted situations

Comparison between real and hypothetical systems can be undertaken to evaluate the effectiveness of the hypothetical system. Often quantitative analysis (predictive modelling) is used in the project evaluation and selection processes. It is often possible to predict with some degree of accuracy the likely outcomes of a project using well developed predictive models. Post-completion evaluations, when predicted outcomes are compared with actual outcomes, contribute to improving the prediction model, and thus the project evaluation process through which the project was originally selected. This method also includes comparing predicted BCR or NPV with the actual outcomes.

Example: compare predicted travel times calculated before project implementation with real travel times after implementation.
Methods of comparison for post-completion evaluations

A post evaluation is conducted on Region A after a transport project has been implemented. The evaluation can be done using 3 methods of comparison:

1. **Different points in time**

   Compare:
   - the state of region A before the implementation
   - the state of region A after the implementation of the project.

2. **Different geographic regions or groups**

   Compare:
   - the state of region A after the implementation of the project
   - the similar Region B that did not have the project implemented.

3. **Real and hypothetical situations**

   Compare:
   - the state of region A after the implementation of the project
   - the modelled state of region A after the implementation.

Source: Adapted from Billheimer and Lave (1975, cited in Meyer & Miller, 2001).
4.4 Collect data

At this point, all data collected before or during the project implementation that will be used in the post-completion is reviewed and decision is made about what new data are needed. This requires specifying the characteristics of the data so that what is collected is useful and comparable to other datasets that are used. This may include:

- specifying dates and times for data to be collected
- specifying levels of accuracy of data and collection equipment
- specifying volumes of data or sample sizes
- other specifications particular to a type of data.

4.5 Analyse data

Regardless of the types of comparisons undertaken during post-completion evaluation, one of the major challenges for the analyst performing post-completion evaluations is establishing the causality between project implementation and the resulting effects. Data collection grounded in an experimental design is the most effective way to isolate causality, and enhance the validity of the evaluation approach. Some factors that may make determining the impact of a project difficult include:

**Exogenous influences:** Any influences that are external to the project are considered exogenous influences on the project outcomes. A wide range of factors can impact on the sorts of variables that may be of interest in post-completion evaluations. These include changes in any aspect of the transport system, changes in weather conditions, and changes in the economic climate.

**Maturation of the area of project influence.** The natural evolution of a geographic area may account for changes observed following the implementation of a transport project. Care should be taken to separate long term trends from changes identified as an effect of a transport project.

**Human factors testing.** When a post-completion evaluation includes measuring human factors it must be recognised that apparent changes in behaviours or beliefs may result from the behaviour or belief measurement process rather than the transport project. There is a large body of literature which suggests that those who are aware that they are being observed often alter their behaviour as a result.

**Instrumentation.** A change in the instruments used to collect post-completion evaluation data can result in changes in the data that is collected. If different data collection methods are used at different sites that are to be compared, or at different times that are to be compared, any differences that are identified must be properly assigned to the collection method and to the project.

**Regression to the mean.** Regression to the mean is a statistical measure used to describe the fact that deviant or extreme values sometimes occur when a variable is repeatedly measured. Such values are likely to be interspersed by less extreme values (Campbell, 1974). Awareness of the impact of regression to the mean on post-completion evaluation results is especially important when projects are implemented to address extreme values on a variable, for example, crash rates, that is used as a criterion for project success¹.

¹ Explaining ‘regression to the mean’: Assume that a site was selected for treatment based on a higher than normal number of crashes. If this was a random occurrence, it is likely that crashes will reduce (‘regress to the mean’) after treatment regardless of whether the treatment was effective. In this case, there will be a tendency to find a non-causal correlation between treatments and falls in the mean of crashes.
Selection of a survey sample. When user responses to a project are important, the method by which a participant sample is selected becomes important. Consideration must be afforded to selecting a sample of users that is representative of all users. (Campbell and Stanley 1966, as cited in Meyer & Miller 2001).

The causality issues presented above by no means constitute an exhaustive list of factors that can make causality difficult to infer from post-completion evaluation results. Those factors which pose most threat to any particular post-completion evaluation will differ depending upon the variables that are measured. The best way to minimise the threat of confounding factors is to employ a sound experimental design when conducting the post-completion evaluation. A detailed coverage of sound experimental design is beyond the scope of Part 7. However, the interested reader should have little difficulty identifying one of the numerous texts that are devoted solely to the subject of experimental design.
5. THE POST-COMPLETION EVALUATION REPORT

The following table shows a list of items that might be included within the scope of a post-completion evaluation report.

<table>
<thead>
<tr>
<th>List of items included in a post-completion evaluation report</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project selection</strong></td>
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<tr>
<td><strong>Benefits and costs</strong></td>
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<tr>
<td><strong>Strategic merit</strong></td>
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<td><strong>Implementation</strong></td>
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<td><strong>Project outcomes</strong></td>
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<td></td>
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<tr>
<td><strong>Project success</strong></td>
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</tbody>
</table>

Post-completion evaluation reports should be presented in an objective manner. If unfavourable results are reported, it is important for the emphasis of the report to remain on what can be learned from past mistakes rather than on placing blame.

5.1 Communication of findings

For a post-completion evaluation to produce benefits, its results must be communicated to those who are involved in project planning and evaluation and those who were/are involved in the management or operation of the project. Project operators can use the information gathered during a post-completion evaluation to inform their project management practices. Those required to evaluate similar options in future will be able to use the information gathered to inform their decisions. Thus the post-completion evaluation creates a feedback mechanism through which project evaluation practices, discussed throughout this Guide, can be improved.
6. EXAMPLES

Four examples of post-completion evaluation are presented in Commentary B. Each has been undertaken for a different purpose, as follows:

- the first example is an *outcome-focused* post-completion evaluation of Adelaide’s O-Bahn public transport project
- the second example is a *process-focused* post-completion review of three road upgrade projects undertaken in Tasmania
- the third example involves the comparison of actual and predicted hypothetical outcomes of trunk road schemes in the United Kingdom
- the fourth example is an *outcome-focused* post-completion evaluation of the Federal Government’s black spot program.

[see Commentary B]
COMMENTARIES

COMMENTARY A: BENEFITS OF POST-COMPLETION EVALUATION

A.1 Tailoring a post-completion evaluation

As the stated objectives are likely to vary between projects, post-completion evaluations must be tailored to address the objectives of each project. Project outcomes may differ from what was expected. Post-completion evaluations should be tailored to allow evaluators to determine the cause of these discrepancies and to answer questions such as:

- Is the final scope the same as the planned scope?
- How do expected project impacts and actual impacts compare?
- How do final costs and benefits compare?
- How successful were the actions taken to improve the transport system?
- How can we ensure that the lessons learned in this project are not forgotten?

In addition to providing information on project outcomes, post-completion evaluations are a useful feedback mechanism to decision makers offering the following:

- guidance on the effectiveness of the planning and evaluation strategy through which the project was selected
- an indication of the appropriateness of performed sensitivity or risk analysis
- information about the effectiveness of implementation methods, or why problems have arisen during the implementation of the project
- identification of systemic deficiencies in project planning, selection or evaluation
- information about the project itself that could affect the way in which it is operated or managed.

A.2 Fostering a ‘post-completion evaluation’ culture

Post-completion evaluations are likely to encourage organisational processes that focus on learning about project performance. It is just as important to know if implemented projects achieved what they intended, as it is to know if projects were not successful. Similarly, these evaluations would greatly assist in recognising important factors for success in the planning, evaluation and implementation of new projects. Learnings from post-completion evaluations, for example, should help to reduce the risk of pursuing projects with a low probability of success at significant cost to the community.
COMMENTARY B: EXAMPLES

The examples cited below have each been developed for a different purpose, and as such, none of them includes all of the elements that ideally would be incorporated into a comprehensive post-completion evaluation report. Nonetheless, the examples do highlight the types of variables that are investigated during post-completion evaluations and what lessons can be learned from the process.

B.1 Adelaide’s O-Bahn Busway

The Adelaide O-Bahn Busway (pictured below) opened in 1986. The O-Bahn system involves the fitting of guide rollers to the front wheels of a conventional bus, which can then be driven either normally or on a guide-rail track that bypasses, for example, points of traffic congestion. A total of 12 km of Busway track were constructed, running between the edge of the Adelaide CBD and the north-eastern suburbs.

The main objectives of the project were to:

- increase accessibility between the north-eastern suburbs and the CBD by significantly reducing travel-times and improving the reliability of bus schedules
- reduce congestion on the existing road network.

The O-Bahn post-completion evaluations as described by Wayte (1991) were focussed on the performance of the O-Bahn system and the outcomes of the project. In addition to the performance of the O-Bahn system, a series of before and after studies were conducted to assess user response to the system (Pak-Poy & Kneebone Pty Ltd, 1990; Denis Johnston & Associates Pty Ltd, 1988, as cited in Wayte, 1991). Specifically, the following variables were assessed:

**Technical performance of the O-Bahn system.** The technical performance of the O-Bahn was evaluated against design expectations. Events such as stoppages caused by the guidance technology, ride quality, and vehicle breakdown were considered.

**Safety performance of the O-Bahn system.** The number of accidents that occurred per kilometre of travel on the O-Bahn was compared with the accident rate of conventional buses. This is similar to the ‘comparison of different groups’ method described earlier, whereby conventional buses (a group among which no project implementation had taken place) were compared with O-Bahn buses (a group among which the project was implemented).

**Financial performance of the O-Bahn system.** The budget set for the project was compared with actual expenditure, and the estimated costs of some elements of a conventional Busway were compared with the costs of the O-Bahn to evaluate the financial performance of the project.

**Patronage.** One of the variables measured in the assessment of patronage impacts was passenger volumes on the Busway corridor prior to its conversion to the O-Bahn system compared with passenger volumes after the conversion. In order to account for exogenous impacts on these figures (such as population growth), changes in bus patronage in Adelaide during the same time period were used as a comparison benchmark.

In defining the focus of attention (purpose) for the evaluation, it was noted that it is important for post-completion evaluations to provide clues as to why measured project outcomes have occurred. To investigate why new passengers were attracted to the Busway, a survey of Busway passengers was undertaken.

**Reductions in motor vehicle volumes.** An objective of the O-Bahn project was to reduce congestion on the existing road network. Congestion was not investigated directly but factors assumed to be related to traffic congestion were investigated. Based upon observed increases in patronage before and after the implementation of the O-Bahn system on the route, and on passenger reports of prior mode of transport, the decrease in the number of vehicles travelling the route was calculated.

**Changes in travel-time.** An objective of the O-Bahn project was to reduce the time taken to travel between the north-eastern suburbs and the Adelaide CBD. Bus travel-time measurements were taken before and after the implementation of the O-Bahn system so that it could be determined whether this objective had been met.

The post-completion evaluation of the O-Bahn, as described by Wayte (1991) employed comparisons of factors at different points in time (patronage and travel time before and after O-Bahn implementation) and for different groups (accident rates of O-Bahn and conventional buses). An attempt was also made to determine the reasons for some of the changes that took place (opinion survey of O-Bahn passengers) and to address project objectives (travel times and traffic congestion).
B.2 Road upgrades at Lauderdale, Margate and Devonport (Tasmania)

The Tasmanian Department of Infrastructure Energy and Resources (DIER) attempts to ‘debrief’ up to six key projects each financial year, a process which involves a range of stakeholders, including project managers, contract staff, project designers and project sponsors. The aim of the DIER project debrief process is to seek and communicate the learning opportunities that arise during the implementation of their projects.

The table below presents a summary of the implementation issues, identified through the debrief process, that were encountered during three road upgrade projects undertaken by DIER. Adherence to the predicted timelines, budget, and technical specifications were considered key project success factors (DIER, 2004).

<table>
<thead>
<tr>
<th>Aspect of implementation</th>
<th>Issue encountered</th>
<th>Learning opportunity identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project definition</td>
<td>Projects are poorly defined at inception</td>
<td>Projects should be well defined at the planning stage</td>
</tr>
<tr>
<td>Financial performance</td>
<td>Project budgets exceeded</td>
<td>As above</td>
</tr>
<tr>
<td>Design and technical specifications</td>
<td>Difficulties working with service authorities</td>
<td>Closer relationships between service authorities, designers and DIER are required, and these relationships should be embodied under a memorandum of agreement executed at the planning stages of each project</td>
</tr>
<tr>
<td>Management of landowner issues</td>
<td>No clear process for consultation with landowners</td>
<td>Define the roles and responsibilities of various team members in relation to consultation with landowners within each phase of a project</td>
</tr>
<tr>
<td>Procurement</td>
<td>Late award of contract date</td>
<td>Review processes to bring works forward and take advantage of the full construction season</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Poor handover of project from construction to maintenance phases</td>
<td>DIER standard design brief to include maintenance requirements/ objectives during the design phase. DIER maintenance personnel to be a part of the project team and attend project inception meetings.</td>
</tr>
</tbody>
</table>

These post-completion reviews have been utilised to provide learning opportunities that can guide improvements in the conduct of other projects, an important application of post-completion evaluations. DIER has, for example, used the learning opportunities provided by these post-completion reviews to improve the programming and delivery processes of all subsequent projects.

B.3 Department for Transport Trunk-road Schemes

The United Kingdom Department for Transport (DfT) uses a benefit cost analysis computer program (COBA) to establish the net present value of proposed trunk road schemes compared with a traffic scenario without the road scheme. The COBA program measures the benefits of road schemes as savings in journey time, vehicle operating costs, and the value of reduced accidents. These benefits are assigned a monetary value which is then compared with the capital and operation costs of the scheme (Swift, 2001).
Knight et al. (1996) describe the post-completion evaluation of 11 trunk road schemes during which the actual Net Present Value (NPV) was compared with the NPV predicted using the COBA program, prior to the opening of the schemes. Unlike the two examples presented above, this post-completion evaluation was aimed more at assessing the project evaluation technique (that is, the COBA program) than the outcomes of the project or the project implementation process.

The difference between predicted and actual NPV was calculated by updating original COBA parameters (such as the value of time and of accidents) and substituting predicted traffic data, including traffic volumes, accident numbers and journey times, with measured data. The table below shows the stages involved in comparing actual NPV with the NPV of the projects as predicted by COBA prior to their implementation.

**Summary of stages in calculation of actual benefits of trunk road schemes**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COBA replication</td>
<td>Replicate the original COBA results, as obtained prior to trunk road project implementation.</td>
</tr>
<tr>
<td>COBA rebasing</td>
<td>Change the discount rate and manually rebase predicted benefits to the latest Present Value Year (1988).</td>
</tr>
<tr>
<td>COBA updating</td>
<td>Update COBA economic values relating to time and vehicle operating costs, accidents, annual compound growth rates and maintenance costs.</td>
</tr>
<tr>
<td>Updating traffic parameters</td>
<td>Update accident rates, occupancy rates and vehicle category proportions.</td>
</tr>
<tr>
<td>Application of actual traffic data</td>
<td>Input observed traffic flow, observed vehicle category proportions, observed accident rates and adjust for factors such as road type.</td>
</tr>
<tr>
<td></td>
<td>Adjust COBA speed-flow curves and junction configurations to reflect observed journey time savings.</td>
</tr>
</tbody>
</table>

Source: Knight et al. (1996)

This post-completion evaluation is an example of a comparison between real and predicted situations. Through the steps outlined above it was possible to determine how some of the actual outcomes of trunk road projects, such as reductions in journey times, traffic congestion and accident rates, compared with the outcomes modelled by COBA. The following figure shows the predicted and actual NPV of each of the trunk road projects selected for post-completion evaluation as arrived at through the post-completion evaluation process. For example, NPV for Project A achieved more than three times the predicted value. The NPV predictions when considered in total were within 6 per cent of the NPV line of best fit. While results were found to be variable across different projects, it was found that the main source of inaccuracy came from difficulties in estimating project costs.
B.4 The effectiveness of black spot treatment

In 2001, the BTRE conducted an evaluation of the Federal Road Safety Black Spot Program that commenced on 1 July 1996 (BTRE, 2001). This program provided $36 million per year in 1996-97 dollars from 1996-97 until 1999-2000. The Program was extended in the 1999-2000 Budget, which provided $40.8 million in 2000-01 and $41.7 million in 2001-02.

The Program’s objective is to reduce the social and economic costs of road trauma by improving the physical condition and management of black spots. This is done by implementing traffic management techniques and other road safety measures that have proven road safety value.

The purpose of the evaluation was to provide information to the Federal Government about the merits of continuing to fund black spot treatment.

The evaluation adopted a before and after treatment approach, because of the nature of the data available for analysis. The evaluation compared the number and severity of crashes after the black spots were treated with the number and severity of crashes that would have been expected with no treatment. A Poisson distribution (regression model) was used to determine whether black spot treatments had a statistically significant effect. The benefits of black spot treatments were estimated in terms of crash costs avoided.

The evaluation found strong evidence that the Program achieved its aim of improving safety at black spot locations. It was estimated that from 1996-97 to 1998-99, the Black Spot Program generated a net present value of $1.3 billion and a benefit-cost ratio of 14. It was also estimated that the Program prevented around 32 fatal crashes and 1,539 serious crashes between 1996–97 and 1998–99. Further benefits will continue to accrue over the life of the black spot treatments that were applied.
The evaluation also found that the Program was not uniformly effective in reducing the number of casualty crashes, in that not all road engineering treatments had a statistically significant effect. For example, in the capital cities it was found that sealing road shoulders had no statistically significant effect on road safety. This was interesting as this was the fifth most popular treatment in expenditure terms, and accounted for nearly seven per cent of expenditure on urban black spot treatment. On the other hand, there were many areas in which the Program had a dramatic effect in reducing the number of casualty crashes, and some engineering treatments were consistently very successful.

The evaluation supported continuing the Program on the basis that it was highly effective in reducing the number of casualty crashes. From the findings on the effectiveness of various treatments, the evaluation also suggested modifications to the Program to increase its effectiveness.
BIBLIOGRAPHY


