



**TEMPO PROGRAMME
EURO-REGIONAL
PROJECT EVALUATION**

HANDBOOK ON EVALUATION BEST PRACTICE

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TABLE OF CONTENTS

1.	INTRODUCTION.....	1
2.	EVALUATION OVERVIEW	4
3.	EX-ANTE AND EX-POST EVALUATIONS.....	11
4.	MANAGING THE EVALUATION PROCESS.....	17
5.	EVALUATION CHECKLIST	20
6.	RELEVANT IMPACTS.....	25
7.	RECOMMENDED INDICATORS.....	28
	APPENDIX 1: TEMPO REPORTING/WEBSITE FORMAT.....	34
	APPENDIX 2: HISTORICAL BIBLIOGRAPHY	35
	APPENDIX 3: WEBLINK RESOURCES	36
	APPENDIX 4: GLOSSARY.....	37

EXECUTIVE SUMMARY

Evaluation is required within Euro-regional projects, in order to:

- justify EU and National Government expenditure on sub-projects;
- demonstrate the benefits of individual applications;
- demonstrate the benefits of Euro-regional project activities; and
- demonstrate the benefits of increased information sharing between projects.

The ability to compare results of similar ITS initiatives carried out in different locations increases the value of individual projects.

The Handbook of Best Practice is one of four documents concerning a common approach to the evaluation and reporting of project results. This document provides insight based on the experience of those who have evaluated ITS projects within the TEMPO programme

The other documents, which address the issue of evaluation at a European level, and are referred to in this document are:

- 'Euro-Regional Project Evaluation – Summary';
- 'TEMPO Guidelines for Reporting Evaluation Results'; and
- 'Euro-Regional Project Evaluation Guidelines'.

This Handbook presents perceived best practice in ITS appraisal and evaluation, based on the experience of that involved in the TEMPO programme of ITS deployment throughout Europe. It also provides a base for further development of common performance indicators and measurement techniques, which are being championed by the EC Evaluation Expert Group. The evaluation of projects and reporting of results in the way advocated by the Handbook will provide valuable evidence to inform future scheme development and improve future decision making.

The Handbook provides a working example of the evaluation approach.

1. INTRODUCTION

1.1 PURPOSE OF DOCUMENT

The appraisal of projects, the monitoring and evaluation of impacts and reporting of results recommended in this handbook are designed to meet an organisational need for accountability and transparency, throughout the lifetime of projects and to demonstrate, particularly for schemes receiving financial support from the European Commission, that monies have been wisely spent. It presents perceived best practice in ITS appraisal and evaluation, based on the experience of that involved in the TEMPO programme of ITS deployment throughout Europe.

The evaluation of projects and reporting of results in the way advocated by the Handbook will provide valuable evidence to inform future scheme development and improve future decision making. It will enhance the collective body of knowledge available about the costs and benefits of deploying ITS and enhance the Handbook for the future.

1.2 EUROPEAN CONTEXT

This document is one of a suite of four documents relevant to project evaluation in the Euro-regional context.

The 'Euro-regional Project Evaluation Summary' is a short document that proposes a generic approach to the evaluation of European projects. It presents:

- general principles for evaluation;
- advice on undertaking an appropriate level of evaluation;
- an overview of the stages involved in developing an evaluation plan for a pilot or implementation project; and
- a summary of the TEMPO Guidelines for Reporting Evaluation Results.

The 'Euro-Regional Evaluation Guidelines' provides more in-depth detail on how to apply the generic 'Euro-Regional Project Evaluation Summary' to a particular sub-project.

The 'TEMPO Guidelines for Reporting Evaluation Results' presents a common format to be used for summarising and presenting the results of evaluation. Links to these documents can be found in Appendix 2.

This document provides insight based on the experience of those who have evaluated ITS projects within the TEMPO programme and presents best practice for key stages within the evaluation process.

1.3 TEMPO PROGRAMME

Current evidence on the costs and benefits of ITS deployed within the TEMPO programme is available via the European Evaluation Expert Group (EEG) website (TEMPO.austriatech.co.au). The website also provides access to a suite of documents (shown in Appendix 2) which present guiding principles for undertaking pre and post implementation evaluation and reporting project outcomes. The adoption of a standard set of guiding principles, particularly those related to the reporting of results will give decision makers a clear, systematic and consistent basis for selection between options and will foster best practice.

As well as the direct participants in projects, "Customers" for the results of projects also include a broad audience of potential users of ITS. For them, it is important to know how the various systems and applications perform, how much they cost to buy and to operate, and what impacts they might

produce if implemented locally. The reporting of results for this wider audience will form a basis for assessing the true, longer term merits of the investment made in ITS. Evidence arising can be used to build a continuous data set of up to date information on actual costs and benefits. This will strengthen the body of supporting evidence available to those who wish to deploy ITS in the future.

Knowledge of the true costs and benefits of ITS and circumstances where ITS can be used to its best advantage is not directly available from any one project alone. Without appropriate synthesis of project results, decision makers (those who will manufacture, own, operate or use ITS systems in the future) will be limited in the evidence available to them on the relative advantages of comparable systems and on which investment may be the most appropriate for their particular environment and conditions and for their own policies/purposes.

1.4 EVALUATION APPROACH

It is important, therefore, that evaluation results are:

- transparent;
- easily understandable; and
- can be compared easily with other results.

Performance indicators can be used which reflect criteria for success in achieving specific aims and objectives. It is important that performance indicators reflect the services delivered by the ITS tool rather than simply a reflection of the technology used. Where appropriate, common indicators are advocated, which can be used across projects, for example, lives saved. However, specific data sources and evaluation tools may vary between projects.

Impacts, either anticipated (pre implementation) or measured (post implementation) can be expressed in a range of different ways, again reflecting the diverse nature of options. Whichever approach is adopted for expressing an impact, care should be taken to ensure that undue prominence is not given to any one type of effect, or to those benefits expressed in monetary terms compared with those that cannot be measured in this way.

In this respect Assessment Frameworks are advocated as an ideal aid to decision making. They provide a means of making appraisal processes transparent and giving decision makers a clear, systematic and consistent basis on which to found their decisions.

Recommendations on the appraisal of options and on monitoring and evaluation reflect closely the TEMPO guidance, accessible via the EEG website. The advice in this handbook is predicated on the basis of using such guidance to develop appraisal, monitoring and assessment programmes, reflecting the aims and objectives for deployment and recording and assessing project outcomes through appropriate indicators of success.

The level of detail required for evaluation in each project will vary, dependent on its exact nature, however, the proposed processes should still be relevant, even if, for example, only high-level measures of success are adopted.

The proposed approach advocated by the Handbook is intended to be flexible, whilst, at the same time, ensuring that all aspects of evaluation are considered, even if only a few aspects can be wholly adopted within any individual project. Evaluation requirements should be considered on an individual project basis, dependent, for example, on whether the project is primarily aimed at informing future widespread deployment, or concerned with the deployment itself.

Whichever the case, there are a number of key stages (identifying user needs, setting objectives, appraising options etc) which underpin the overall evaluation process. The Handbook provides insights into putting this process into practice, based on the experience of those who have evaluated ITS projects within the TEMPO programme.

Although primarily aimed at those practitioners charged with the evaluation of ITS projects, the Handbook will also be of interest to high-level decision makers, technologists and system developers. The material within the Handbook is structured to reflect the different needs of this audience.

1.5 STRUCTURE OF THIS DOCUMENT

Section 2 provides an overview of the processes involved in evaluation, pre and post implementation and the timing of evaluation within the project cycle. It is largely aimed at project sponsors, who will be responsible for commissioning work associated with project evaluation.

Best practice dictates that evaluation is not considered at the end of the project but is the first thing considered when a need for a project has been identified.

Section 3 is aimed at the evaluation practitioner, setting out the various stages of work to be undertaken to appraise options, to monitor impacts and report on outcomes. A step by step process is presented, which can be adapted for any individual project.

Section 4 is primarily aimed at the evaluation manager, responsible for providing the necessary evidence sought by decision makers on which ITS tool to invested in, what the costs and benefits have been and how the outturn results from other projects might be transferable to their own individual circumstances.

Section 5 presents a Checklist, appropriate to all readers, to ensure, from their own perspective, that all relevant issues have been addressed through the evaluation lifecycle.

Section 6 presents a list of the most relevant impacts of varying ITS systems / services.

Finally, Section 7 presents recommended indicators by which to assess the impacts, beneficial or otherwise, of the ITS Tool deployed and how values might be ascribed to impacts to facilitate easier comparison between projects. .

2. EVALUATION OVERVIEW

2.1 THE ROLE OF EVALUATION FOR DECISION-MAKERS

Evaluation in the most general sense is actually a term covering a number of feedback mechanisms. An evaluation plan could cover all of them in a single whole co-ordinated framework.

Some different feedback mechanisms are:

- scientific studies;
- audits;
- monitoring;
- performance measurement;
- policy analysis;
- feasibility studies; and
- impact analysis.

The question “Why evaluate” has been answered by The Evaluation Guidelines published by the EEG noting that “Evaluation is required within Euro-regional projects in order to:

- justify EU and national government expenditure on the projects;
- demonstrate the benefits (financial and socio-economic) of individual applications;
- demonstrate the benefits of Euro-regional projects; and
- demonstrate the benefits of increased information sharing between projects.”

It becomes clear that all the different feedback mechanisms can help to find answers for the defined requirements mentioned above. The borders within the feedback mechanism are flowing and it seems to be that there is no concrete, absolute, and general admitted definition of the term evaluation. In the European context of ITS projects, evaluation is defined as a procedure that justifies expenditure on the European and national level and demonstrates the socio-economic and information-led cross-fertilization of benefits.

2.2 THE ROLE OF EVALUATION FOR DECISION-MAKERS

Expenditure of increasingly scarce public funds and the realisation of projects in the public sector for critical users are the responsible tasks of authorities. They have to act in a sensitive way, always taking into account the demands of the financial audit court and the parliamentary technical committees. In that context, evaluation serves as a first step to convincing ITS programme decision makers on the rationale for project investments. . This first pre-investment decision assessment step allows a clear justification of the future expenditure of money based on generally accepted evaluation procedures and criteria. In the second step, evaluation will generate an “after the fact” feedback on the investment’s success with the purpose to confirm or correct how and which investments will be made in further ongoing activities and programs. The decision-making process cannot ignore the results of these evaluations without coming to a conflict with the surrounding public representatives.

Two special types of evaluation, the so-called “ex-ante” and the “ex-post”, meet the demands of the two-step evaluation approach before and after project implementation. Ex-ante evaluation should provide an assessment of whether a proposal is worthwhile, as well as optionally addressing the optimality and feasibility of the proposed solution(s), and clearly communicate conclusions and recommendations. Ex-post evaluation ensures that real impacts are understood and that lessons are widely learned, communicated and applied when ex-ante evaluating new proposals or improving

current status. Providing evaluation results makes processes clear, transparent and especially comprehensible. Project based systems and overall inclusive programmes will become more irrefutable against quick changing political attitudes and non-technical arguments and discussions.

However it is precisely these human but sometimes less than economically optimal motivations of the socio-political environment that are most dangerous for the existence and acceptance of evaluation, as evaluation can confirm opposing views and expose “failure”.

Institutional anchoring of a standard objective evaluation (e.g. in law, binding norms or guidelines) requiring consideration of evaluation results and independent demonstration of objectivity and quality of evaluation on a case-by-case basis are the key to its consistent application and acceptability. The failure to achieve this can lead to evaluation being distrusted, missed out or ignored when convenient or manipulated to meet the short-term needs of the socio-political environment (a dishonest but far too common process known as reverse-evaluation which uses a loose evaluation process to justify in a biased way a pre-specified conclusion to the order of the evaluation procurer).

2.3 THE TIMING OF EVALUATION WITHIN THE PROJECT CYCLE

An ITS project runs through four main project phases in its life cycle, as always is the case for engineering projects:

- General Planning Phase;
- Investment Decision Phase;
- Implementation Phase; and
- Operations Phase

The four project phases of the project life cycle are shown in Figure 2.1 below. The diagram presents these phases and the relevant evaluation steps that occur within and between the phases.

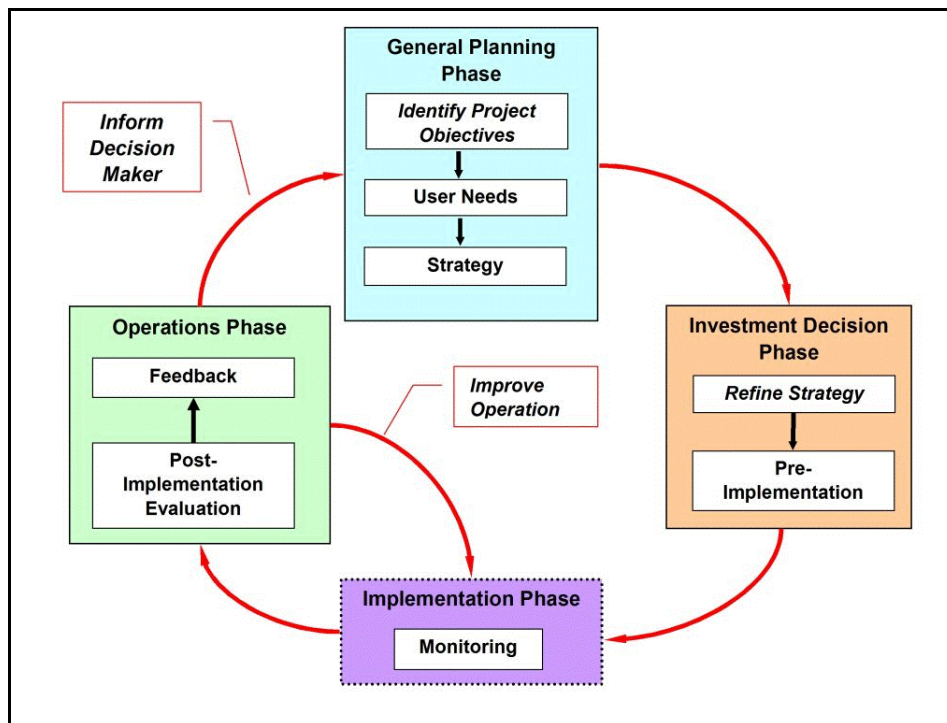


Figure 2.1 Evaluation Lifecycle.

The main project stages consist in dependence on the complexity of several partial stages and the approval procedures of the decision-makers. Note that the following is considered normal best-practice and is not always in place the same way or at all in some countries

2.3.1 General Planning Phase

In the General Planning phase, the aims and relative attractiveness of the project have to be handled in the context of a general investment program. The projects may be part of an overall ITS - program, which has become part of the program by an announcement of the road authorities based on a general consideration of the expected benefit, but not be approved in detail. In the case of a well-known and well-tested ITS-application in a given geographical and economic context (i.e. lane control or re-routing systems) the rationale and aims are mostly clear and do not need to be considered in huge detail. However, in the case of new applications with a high technical and financial risk, addressing the rationale and aims will assume a higher significance even in this phase and may be the subject of general studies, research or pilots.

2.3.2 Investment Decision Phase

The **Investment Decision Phase** allows a concept to be developed in detail with project scope, content and questions of implementation being addressed to best meet the described rationale, and in parallel the ex-ante evaluation involving analysis of the concept feasibility. As the project progresses, now individually as a current priority into this phase, the detailed quantification of objectives and the estimation of related benefits and costs can be analysed. This presents the most important phase in the realisation of a project. The ex-ante evaluation is parallel to but can be interlinked with the development of the detailed project concept (for example ex-ante evaluation can help to understand the real problems, detail objectives, optimise the concept and implementation plan i.e. the project concept can be revised on the basis of ex-ante evaluation)

In order to conduct the ex-ante evaluation on a realistic basis, the overall concept of the system has to be finished and described in a clear and transparent way. The comparability, reliability and transparency of the evaluation results are only given if generally accepted criteria and procedures are used.

At this stage certain “before implementation” data on the problem context may need to be newly collected to feed the do-nothing scenario of the ex-ante evaluation. This can then often be used in the ex-post analysis as the basis for the “before” scenario

The discussion of the ex-ante evaluation should decide upon the future of the project and represents a critical project stage, because a project can be definitely stopped, returned for re-working or cleared for realisation. The less clear-cut the benefits of new ITS-applications in relation to the costs are, the more the financial and transport-political risk increases. At this stage, all stakeholders and decision-makers have to act in a sensitive way. The risk – typically the costs – in relation to the expected benefits has to balance carefully. Only with an appropriate amount of risk can new insights be gained and derived, but risky ideas must suggest the potential of a strong benefit-to-cost ratio in the future (a risky project with a low potential benefit-to-cost ratio is known as a white elephant)

2.3.3 Implementation Phase

With the approval of the project, the **Implementation Phase** of an ITS-system starts based on a detailed realisation plan. The implementation plan is always the most essential part of the contract in order to clarify each implementation step and interface to other running or prepared projects. ITS-tools work in most cases based on monitored data. If there is a chance to set up the monitoring devices of the ITS-systems independent of other technical components, the chance should be used in each case to collect real data for future ex-ante and current ex-post evaluation or to fill data gaps. The new implementation of a project can reduce the usage of the existing infrastructure and after having finished the new infrastructure the users have to become accustomed to the realised project and the characteristics and features before a stable reaction sets in. Because of the non-representative characteristics of the physical implementation and the start-up period of several months, this period should be excluded as much as possible from ex-ante and ex-post evaluations. It means that “do-

nothing”/before data for the ex-ante/ex-post analysis should be collected if at all possible prior to the start of the physical implementation and “after” data collected following completion of the start-up period.

2.3.4 Operations Phase

After the implementation phase, the **Operations Phase** will follow. In this phase, the ITS-system has to be analysed in terms of actual and real achievements. The more a new system changes common and used habits pertaining to infrastructure, the more time it takes for the system to be accepted and the users to adjust to working with it.

It is not sufficient to finish the project work with the implementation phase. Every system has to be calibrated and parameters adjusted to find the best working operation mode and this can only be done after some evaluation. The first experience is very important for the future effectiveness of the system, because users' trust in the system can be destroyed if system improvements are not realised in the case of initial malfunctions. Even if it is evident that the system seems to work well, the realisation and operation stakeholders should take the chance to look for optimisation potential. The ex-post evaluation is the most important tool to find and clarify alterations in the users and system characteristics. While taking the ITS-system into operation, relevant data to describe the alterations have to be monitored. The point of time for carrying out an ex-post evaluation should only be during stable and continuous system conditions.

The last evaluation action of the operations phase is the dissemination of results, especially to the decision-makers and other relevant stakeholders. The results of the accompanying evaluation can confirm or cast doubt on the relative attractiveness and socio-economic sense on the system or the overall program and thereby the pursued policy. However, there may be a chance to make adaptations to optimise the system.

2.4 ENSURING PROPORTIONATE EVALUATION

Evaluation has to satisfy different requirements with regard to contents and most often in a formal manner. Evaluation is always based on criteria, which have been chosen by the evaluation team to meet the project's key aims. It is very important that all stakeholders involved in the project have agreed to the chosen criteria in advance of analysis. In order to minimise the coordination effort, the evaluation team should propose the criteria with a short explanation of why they were chosen. An agreement has to lead on the one side to reduced evaluation cost and on the other side to protection from criticism that the results and their interpretation are biased.

The effort expended on evaluation should be commensurate with the anticipated benefits of the scheme, the scale of the scheme or expected deployments of the application, the degree of work already undertaken and the level of certainty of outcomes.

All chosen criteria of a quantification used in the evaluation process have to fulfil four requirements:

- monitored with clear expenditure;
- significant;
- sensitive; and
- comprehensible.

The essential part of an ex-post evaluation is the before-and-after-study. The results of the study should be tested statistically in order to ensure that the differences are significant and not within the bounds of natural random variation. The basis of a significant statistic is a sufficiently large sample of data. If the effects of a new system are unknown, a pre-test to measure the rough variability of the

data values around the mean (characterised by the standard deviation) can help to determine the necessary sample with respect to the required confidence level.

Systems already implemented more frequently, such as lane control systems, will often be compared among themselves. In these comparisons all the stakeholders have to pay attention that the before-period is comparable. The comparability of the before-periods is a pre-condition for the transferability of the results. External influences can limit the comparability too. A key aim of an evaluation is to avoid, extract or shut out to the greatest extent possible any external influences to ensure that only the system has evoked alterations.

Implementation of new systems with the potential for large-scale deployment should be evaluated on a broad basis. A large-scale deployment is always of interest if the socio-economic benefits or the traffic-political reputation by the satisfaction of road users' need is high.

The cost for the evaluation may range in an appropriate relation to the overall project cost while ensuring a statistically significant result. For large ITS-projects with a high infrastructure cost, the evaluation should be approximately within a range of 1.0 to 1.5% of the total cost. The percentage can increase up to 10% if the system is at a lower cost implementation level but with more estimated impacts (see Figure 2.1).

Project Capital Cost [€]	Approximate Evaluation Cost
> 5,000,000	< 1.5%
1,000,000 - 5,000,000	≈ 2%
100,000 – 1,000,000	≈ 4%
< 100,000	< 10%

Figure 2.1 Evaluation cost compared to project capital cost

It is important to note that capital cost is only one factor and other factors should be considered that may affect the cost of evaluation such as:

- the anticipated benefits of the scheme and importance of the scheme and evaluation objectives;
- the scale and nature of the scheme or expected deployments of the application;
- complexity of the scheme;
- the degree of work already undertaken;
- the level of certainty of outcomes;
- transferability of findings to other schemes; and
- data availability and difficulty of obtaining.

The “investment” in evaluation however will often correspond largely to the novelty of the type or context of an application as ex-post evaluation is most often the largest source of cost. In the case of a first national demonstration project, it may be worth spending considerable resources on ex-post evaluation of various impacts from surveys of user reaction and acceptance to studies of impacts. Such detailed study will allow more precise future ex-ante evaluation and allow a strong decision at the programme level on continuation with an application. “Standard products” in standard contexts require much less detail at the ex-post level with only the really key impact indicators being monitored with operational integrity, since the assumption is that impacts can now be well estimated in advanced.

The issue of the “transferability” of ex-post evaluation results between different countries and regions with very different social and economic profiles should be considered to avoid ex-post evaluation being done twice. This issue must be tackled very carefully at both the programme and project assessment level as the problem, user reaction and benefit valuation contexts can differ widely.

2.5 REPORTING OF OUTCOMES

Making results of evaluation widely available is of great benefit and will foster best practice. The reporting of results for a wider audience will form a basis for assessing the true, longer term merits of the investment made in ITS, helping to build a continuous data set of up to date information on actual costs and benefits.

As well as the direct participants, "Customers" for the results of projects also include a broad audience of potential users of ITS. For them, it is important to know how the various systems and applications perform, how much they cost to buy and to operate, and what impacts they might produce if implemented locally.

This sort of knowledge is not directly available from any one project alone. Without appropriate synthesis of project results, decision makers (those who will manufacture, own, operate or use ITS systems in the future) will be limited in the evidence available to them on the relative advantages of comparable systems and on which investment may be the most appropriate for their particular environment and conditions and for their own policies/purposes.

It is important, therefore, that evaluation results are:

- Transparent;
- Easily understandable; and
- Can be compared easily with other results.

Reporting Format

The following aspect of evaluation should be considered when reporting results. These aspects are the same as those described in the 'Tempo Guidelines for Reporting Evaluation Results' described in Appendix 2.

Key Evaluation Results

- An Executive Summary of key achievements resulting from the project

Description of the Problem

- Site
- Issues addressed

Description of the ITS Project

- Objectives (considering Accessibility, Safety, Efficiency, Integration, Environment)
- Systems and Technologies applied
- Status of Project

Evaluation

- Timing and type of evaluation
- Objectives for the evaluation (considering technical, impact, financial and socio-economic objectives)
- Research questions (those asked by key stakeholders)
- Study area for the evaluation (Describe the site for both the application and also the associated extent of the monitoring and information about any control sites.)
- Impacts measured
- Methods employed

The Impact of the Project

- Technical Performance (present the technical performance results)
- Results (present the results of any impact, socio-economic and financial assessments)
- Research questions answered
- Statistical Analysis
- Overall Assessment.

Transferability of Results

- Local issues which have impacted on what has been achieved

3. EX-ANTE AND EX-POST EVALUATIONS

"If you don't know where you're going, how will you ever know if you get there?"

3.1 INTRODUCTION

Two different evaluation techniques are available, both performed at different stages of the project life cycle. Ex-ante evaluation is performed prior to the implementation stage, as it should be started early on in the process when options are still open. Ex-post evaluation is performed after a certain period has passed since the completion of a target project with emphasis on the effectiveness and sustainability of the project. An ex-post evaluation enables the ex-ante evaluation process to be fine tuned.

This guideline prepared by the Evaluation Expert Group shall provide advice concerning the approach of a successful evaluation from the evaluator point of view.

3.2 EX-ANTE

3.2.1 Introduction

Ex-ante evaluation is a formal requirement before starting with the implementation of Intelligent Transport Systems (ITS). Until now the experience of ex-ante evaluations has been scarce in the European Union and there has also been a lack of established good practice in the Member States or international organisations.

3.2.2 What are the aims of the ex-ante evaluation and why is it done?

During the ex-ante evaluation process, a set of ex-ante evaluation parameters will be assessed. These parameters are defined to have indicators which can be measured after the implementation in order to be able to make a statement about the installed system.

Ex-ante evaluation is supposed to gather information and carry out analyses that help to clarify objectives with the project owner, assess them, turn them into measurable indicators and quantify them.

The primary aims of the ex-ante evaluation are the following:

- **Effectiveness** - does it meet the objectives for a reasonable cost without wider unacceptable side-effects?
- **Efficiency** - could you get a similar result doing it a cheaper way?
- **Efficacy** - will it work and is it feasible?

Ex-ante evaluation provides:

- analytical information based on previous experience or theoretical considerations for GO-NO GO decisions for implementations and pilots (mainly effectiveness and efficacy against a do-minimum scenario);
- analytical information based on experience or theoretical considerations on the relative value of alternative solutions, including solutions for selecting between alternatives;
- analytical information based on experience or theoretical considerations on the implementation process (what organisational, financial, monitoring models work and are most effective as this assesses and helps to form the implementation plan);

- a theoretical measurement base and test-plan for ex-post evaluation; and
- indicator targets for pilots and implementations

3.2.3 The Approach

Problem Analysis and Needs Assessment:

What is the problem that needs to be solved and who are the main actors and factors involved?

To make sure that each member of the project works for the same goal, a document containing the objectives and user needs to be sent out and proven to be practicable.

It is important to do that as soon as possible. In every single meeting the goals and especially the actors involved should be repeated. Besides the official meetings, face-to-face talks help to clarify a single partner's expectations and determine his ambitions.

A common problem is that new partners are often not familiar to the consortium because they work as a subcontractor or in a similar role. It should be ensured that these persons get known as well. This may be more appropriate in a private atmosphere.

What is the target group and what are its needs and/or interests?

The target group has to be defined and their interests determined. The project is successful when the target group is satisfied as simple as it seems. User needs have to be defined and recorded as this helps to keep the process on track.

3.2.4 Objective Setting

What indicators are set for measuring inputs, outputs, results and impacts?

Define the key-indicators of the project and do that together with the project owner and representatives of the target group. This helps to keep the project in line and allows a reliable ex-post evaluation.

Alternative delivery mechanisms and risk assessment

What alternative instruments were considered and why was the one proposed chosen? Such questions will be asked – so you should ask this question first. A good practice is to document every decision making process so that it is comprehensible.

What risks are involved in the implementation of the intervention and what countermeasures have been taken?

Every single implementation is risky. Do not reduce the risk to a minimum if the costs explode but implement certain countermeasures and document and communicate them to the project partners.

Added value of community involvement

Is the proposed intervention complementary to and coherent with other interventions? Does it produce synergies with them?

3.2.5 Lessons from the past

What evaluation, audit or study results/experiences of similar actions are available?

Search for evaluations audits or studies of similar actions available and use them to improve the design of the programme

3.2.6 Planning future monitoring and evaluation

- Are the proposed methods for collecting, storing and processing the follow-up data sound?
- Misunderstandings have to be avoided internally as well as externally.
- Is the monitoring system fully operational already from the outset of the programme implementation?

3.2.7 Helping to achieve cost-effectiveness

- What are the different cost implications of the proposed option?
- Could the same results be achieved by a lower cost or could more or better results be achieved with the same cost by using different instruments?

3.3 EX-POST EVALUATION

Ex-post evaluation is a tool that enables the confirmation of what actually occurred after the implementation of a project. This evaluation process enables a review to be conducted that shows whether the ITS actually performs as it should, and the benefits of such a system.

Confirming what occurred is a primary and crucial stage in the evaluation process. This may begin qualitatively or quantitatively; the scheme should be examined at both a detailed and at a high level.

The high level view should look for unanticipated events and impacts of the scheme as well as the designed impacts. It should try to identify qualitatively changes that have happened and form a view of possible causes.

The more detailed view should take a quantitative look at the changes that have happened since implementation of the scheme, assess their magnitude and provide confidence values for the change. If there are significant changes, especially any that are unanticipated, then an ex-post evaluation should aim to identify mechanisms for these changes and to look at their significance. Simple correlations should be examined and tests for significance should be undertaken.

3.3.1 What are the aims of the ex-post evaluation and why is it done?

The primary aims of the ex-post evaluation are to:

- optimise performance;
- confirm what actually occurred; and
- inform future decision making.

Ex-post evaluation provides information to decision makers about the expected impacts of future schemes. In contrast with ex-ante schemes an ex-post scheme is not predictive but is instead empirical. An ex-post scheme should aim to take advantage of the fact that the factors it aims to assess have happened and may be measurable.

As such, the aims of an ex-post scheme also differ from the aims of an ex-ante evaluation. Whilst an ex-ante evaluation will look at general principles and a body of past experience to try and infer and

assess expected benefits and costs of a specific scheme an ex-post evaluation undertakes the converse. An ex-post evaluation gathers evidence from a specific scheme and aims to use it to update and refine the common body of knowledge and general principles upon which future decisions are made. An ex-post evaluation is carried out to ensure that future projects of a similar ilk have their futures decided on the best possible knowledge base.

3.3.2 The Approach

Problem Analysis and Needs Assessment:

What is the problem that needs to be solved and who are the main actors and factors involved?

To make sure that each member of the project works for the same goal, a document containing the objectives and user needs to be sent out and proven to be practicable.

It is important to do that as soon as possible. In every single meeting the goals and especially the actors involved should be repeated. Besides the official meetings, face-to-face talks help to clarify a single partner's expectations and determine his ambitions.

A common problem is that new partners are often not familiar to the consortium because they work as a subcontractor or in a similar role. It should be ensured that these persons get known as well. This may be more appropriate in a private atmosphere.

What is the target group and what are its needs and/or interests?

The target group will have been determined as part of the initial Ex-ante evaluation. User needs defined during the Ex-ante evaluation need to be evaluated to identify if their needs have been adequately met.

3.3.3 Objective Setting

What indicators are set for measuring inputs, outputs, results and impacts?

To understand the effects of a scheme it is important that performance statistics or performance indicators are agreed and defined. Where common or standard indicators are used then they should be measured where possible in the same manner and using the same definitions as other studies to allow a "like with like" comparison. Where statistics are calculated there should be a clear explanation of which data are used and which tests are undertaken. Where data have been removed from a statistic there should be a record. Where conclusions are drawn from statistics confidence levels should be indicated.

Indicators and metrics that allow comparison with other schemes are desirable. In this way comparisons and evaluations can be made across more schemes and these schemes will collectively be more informative.

What approaches are available for monitoring the impacts of a scheme?

Schemes may be assessed on a number of different criteria. The approach to monitoring the impact of a scheme should be appropriate to its aims. If the scheme has an environmental purpose then metrics such as gas emissions, particulate levels and noise should be used. If a scheme is to tackle congestion then metrics such as journey time and road occupancy should be employed.

What data must be gathered before the implementation?

Crucial to a successful ex-post evaluation is the collection of “before data”. This is data gathered from before the start of the scheme to compare the post implementation results to. The collection of before data must be carried out with as much rigour as any other part of the evaluation. This part of the process requires sound judgement and experience.

As it is in most cases difficult to collect additional “before data” after a program has commenced it is important that the data that are collected beforehand fulfil all requirements:

- There must be enough data to give statistical significance to any inferences made. This can be challenging as without knowing the magnitude of the impact of the system it is difficult to know how much data are required to give significance to the findings. As a minimum data should be collected to give a 90% confidence level if the post implementation data shows benefits equal to those made in the business case that justified implementation. To assess the coefficient of variance for this calculation may be assumed to be that of a small preliminary sample of pre implementation data,
- There must be broad enough data to support the generality of any conclusions; for example data gathered on a decline in accident rates in summer months of the year may not be applicable to winter months
- There must be an awareness of the limitations of the data gathered. If data are gathered according to a criterion dependant on an effect being measured then there may be a regression to mean effect which should be considered.
- Limitations of equipment used in measuring should be considered. If Automatic Number Plate Recognition Systems are used to assess traffic flow and the project aims to speed up the vehicles, the detection equipment should be checked to ensure they function as expected at higher speeds.
- Accuracy of measurements should be considered. If the scheme aims to improve journey times and the majority of benefits are due to small decreases in journey time for a large number of people, then the equipment used to measure the change in journey time needs to be sensitive enough to detect the change.
- Whilst not gathered as part of an evaluation, outside trends should also be considered. If a scheme is aimed at reducing congestion any success should be assessed not against the pre implementation figures but the pre implementation figures combined with any outside trend for increasing/decreasing congestion where no measures were taken.

In addition to these basic concerns there is also the slightly more subtle issue of data versatility. The reason Ex-post evaluations are conducted is that the effects of a scheme are not absolutely predictable. If the scheme shows some unexpected changes then the “before data” should be comprehensive and versatile enough to compare to post implementation data. These data may not have been anticipated to be part of the assessment before the scheme was implemented.

Alternative delivery mechanisms and risk assessment

What alternative instruments were considered and why was the one proposed chosen? Such questions will be asked. Are the results significant? Are the results likely to change in the future? What parameters are the results sensitive to?

What risks are involved in the implementation of the intervention and what countermeasures have been taken?

All risks in the ex-post evaluation should be documented. Where a risk has been identified a response should be made. If a “do nothing” response is chosen then it should be shown that the risk is negligibly small or there is little impact. Where a positive response is made to an identified risk there should be some evidence that the chosen response is appropriate.

Added value of community involvement

Is the intervention complementary to and coherent with other interventions? Does it produce synergies with them?

3.3.4 Lessons from the past***What evaluation, audit or study results/experiences of similar actions are available?***

Search for evaluations audits or studies of similar actions available and use them to improve the design of the ex-post evaluation. Where possible speak to others with experience in evaluating similar schemes. Review other schemes and note similarities and differences between them and the scheme in question. Compare evaluations of these schemes and note which schemes produce similar outturn benefits.

3.3.5 Planning monitoring and evaluation

- Misunderstandings have to be avoided internally as well as externally.
- Is the monitoring system fully operational already from the outset of the programme implementation?

Key to an ex-post evaluation is clarity and consistency. By laying out all assumptions and having an explicit methodology for measuring the effectiveness of the implemented measures misunderstandings can be minimised. Constraints such as a changing operational capacity partway through the test or expanding the scheme through the evaluation should be considered. The ex-post evaluation results should be compared to any ex-ante results to highlight any inconsistencies with the ex-ante assessment methodology.

3.3.6 Helping to achieve cost-effectiveness

- What are the different cost implications of the proposed option?
- Could the same results be achieved by a lower cost or could more or better results be achieved with the same cost by using different instruments?

Where possible the scheme should be broken down into different components and each of these should be assessed to identify the most successful elements. Where possible there should be a study to identify the mechanism that delivers the benefits and alternative means of replicating that mechanism should be examined for cost effectiveness.

4. MANAGING THE EVALUATION PROCESS

As for any other project, the process of evaluation needs to be managed effectively if it is to achieve its overall goal. Evaluation Management includes the planning; monitoring and control of all work undertaken and will focus, inter alia on technical quality, finance and delivery.

4.1 EVALUATION TEAM

The management process starts with the formation of the evaluation team and the development of the test plan. It then continues through to the analysis of data and the reporting of results.

An evaluation champion, playing the role of Project Director, in support of an evaluation Project Manager, may well be required, helping to ensure appropriate resources (including finance, third party data etc) are made available to the evaluation team.

The formation of the evaluation team is a key initial step in the evaluation process.

Although the involvement of those implementing the ITS project will be important (certainly a high degree of co-operation is required), there is also a requirement for the evaluation team to act independently (as far as possible).

Managing the evaluation process itself begins with a clear statement of intent; summarising what exactly the problem is that will be addressed, what the ITS project objectives are, what the evaluation objectives are and what the general approach will be to evaluating the ITS project – be it orientated towards an evaluation of the technical performance of a system, its impact, user acceptance, socio-economic or financial performance.

4.2 STAKEHOLDERS

Buy in to this Vision Statement by the stakeholders is vitally important if the outputs are to be accepted and used accordingly. Time taken at the start, to gain agreement from stakeholders on the evaluation work to follow, is time well spent. Understanding stakeholders needs and ensuring these are met by the evaluation process, as far as possible given available resources, is likely to minimise the time and 'heartache' involved in achieving this buy in.

Stakeholders in the evaluation process extend beyond the evaluation team to the users of the system or service delivered by the ITS project – traffic managers, operators, passengers, commercial drivers, fleet operators, emergency services etc – and, very importantly, decision makers, those responsible for the production, implementation and operation of ITS – government agencies, road infrastructure owners, system operators etc. Other stakeholders, third parties will include those directly affected by the project, for example, residents alongside the scheme and those who are funding the project (and the evaluation process).

Mechanisms must be put in place to capture their collective needs and ensure appropriate consultation is maintained throughout the process of evaluation. The reporting of outcomes must also be sympathetic to their particular needs and desires. The Evaluation Management Plan which should be developed in consultation with appropriate stakeholders should, therefore, include a preliminary description of final reports and an outreach plan.

4.3 OTHER KEY ELEMENTS

Other key elements of the Evaluation Management Plan, as illustrated in the generic example shown summarised in Figure 4.1, include: preparation of a Work Breakdown Structure and, alongside this a Resource Allocation.

Integration with other evaluations, including, for example, those undertaken by other authorities within the TEMPO programme, will avoid unnecessary duplication of effort and could lead to the sharing of costs and resources to mutual advantage. Collaboration could lead to multi-site deployments of the same or similar ITS applications, improving the robustness of results and any conclusions drawn on the transferability of results to other situations.

Other key issues to be considered at this initial stage, with an associated strategy / plan being developed include how to coordinate between project staff and with other stakeholders and how data are to be managed (stored, processed, made accessible etc).

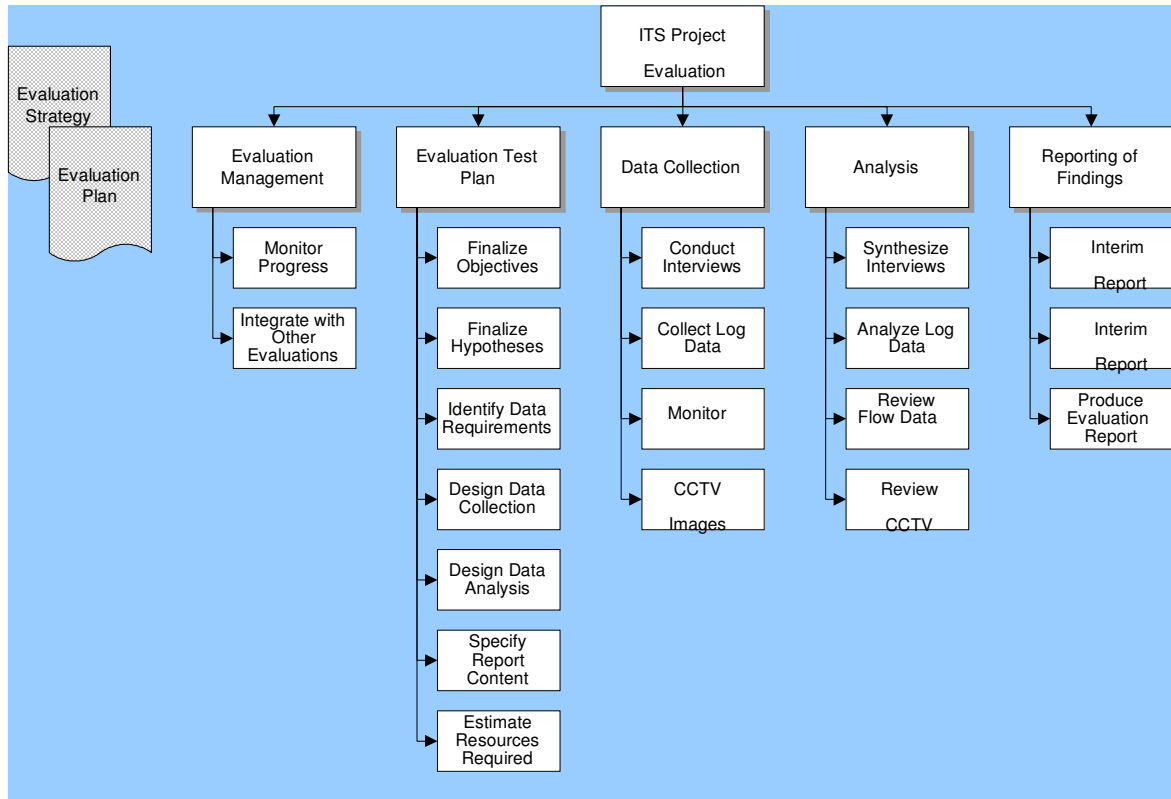


Figure 4.1 Steps in the Evaluation Process

4.4 MONITORING

Interim monitoring reports should keep stakeholders abreast of how the evaluation process is developing and at appropriate stages provide pointers to the anticipated and, thereafter, out turn costs and benefits of the ITS project. The TEMPO reporting format is designed specifically for this purpose.

Progress meetings will likely be held with relevant stakeholders, at key stages in the evaluation process. Sound financial / resource management should ensure that adequate resources are available throughout the evaluation process. Effective pre-implementation appraisal is of limited value if the post-implementation monitoring is curtailed through lack of time and / or resources to undertake the surveys.

4.5 EVALUATION MANAGEMENT PLAN

The Evaluation Management plan should be reviewed, updated and amended as the evaluation process continues. Any changes should be agreed with the appropriate stakeholders before the plan is changed. Any implications for the final deliverables as a result of changing the Plan should be clearly brought to the attention of stakeholders.

The Plan is a cornerstone of the evaluation management process and basically, provides the evaluation team with a guidance manual for 'quality control'. It provides the key mechanism for: task

programming; resource planning; control of project 'interfaces'; definition of technical methods; review of evaluation outputs; control of project deliverables; risk management; project review; and change management.

4.6 RISK FACTORS

There are a number of interrelated procedures that are brought to bear, to support the delivery of quality outputs from the evaluation process. Figure 4.2 presents a generic example of some of the risk factors that may be associated with the completion of the evaluation process and implications for the management of performance. A similar risk / dependencies matrix should be developed for each evaluation project.

Risk Area	Management Response
Delivery of programme to programme	Provide a high degree of predictability in delivery, by clearly identifying and recognising the constraints that may arise as a result available resources, financial and otherwise and the time available to complete the work that is required
Reliability of programming, resource estimating and forecasting	Carefully define the scope of tasks and resourcing / programming requirements at the outset. Regularly monitor and update Evaluation Plan, programmes and resource plans and initiate effective change management procedures to ensure that both the Stakeholders and evaluation team members have a full and up-to-date understanding of progress and the impacts of changes are mitigated.
Reporting and Control	Ensure that each deliverable is fully reviewed for consistency with Evaluation Plan requirements..
Risk Management	Identify risk and develop / apply a risk minimisation strategy to ensure that the impacts of risk are kept to a minimum.
Management of Relationships	Day to day management of the evaluation process / individual tasks to ensure that the stakeholders are provided with timely updates on progress with the specific aim of rapidly resolving issues as quickly as possible after they arise.
Management of 3 rd Party Relationships	Recognise at the outset the needs of potential 3 rd parties and develop / apply procedures to engage pro-actively at the appropriate time and using the appropriate techniques.
Avoiding re-working	Rigorously apply task monitoring and control procedures to ensure that outputs are 'right first time' and that reworking is minimised.

Figure 4.2 Generic risk factors

5. EVALUATION CHECKLIST

The following section contains checklists for use by those undertaking evaluation to ensure that all key aspects of evaluation are considered. Checklists are provided for both ex-ante and ex-post evaluation, as well as the relevant impacts of different types of ITS systems and services.

EX-ANTE EVALUATION – CHECKLIST OF QUESTIONS TO BE ANSWERED

ASPECTS OF EX-ANTE EVALUATION	TICK, WHEN ANSWERED
STANDARD QUESTIONS TO BE ANSWERED	
UNDERSTANDING THE RATIONALE OF THE PROJECT/SYSTEM/SERVICE	
WHAT IS THE USER NEED BEHIND THE SERVICE AND THE PROBLEM TO BE SOLVED WITH THE SERVICE?	
WHAT IS THE DEVELOPMENT TREND AND SEVERITY OF THE BACKGROUND PROBLEM (E.G. THE CURRENT AND FUTURE NUMBER OF ACCIDENTS, INCIDENTS OR DELAYS, AND THEIR EFFECT ON THE SOCIETY)?	
WHAT ARE THE OBJECTIVES OF THE PROJECT/SYSTEM/SERVICE?	
EVALUATION PROCESS	
WILL THE PROJECT/SYSTEM/SERVICE INVOLVE THE EVALUATION OF “MAINSTREAM” PRODUCTS AND SERVICES OR A PILOT STUDY OF NEW TECHNOLOGY?	
UNDERSTANDING HOW THE PROJECT/SYSTEM/SERVICE WILL WORK	
WHAT KIND OF INFORMATION OR CONTROL DOES THE SERVICE PRODUCE?	
HOW OR VIA WHICH CHANNELS CAN USERS ACCESS THE SERVICE?	
CAN OR WILL THE SERVICE BE TAILORED TO FIT USER’S NEEDS?	
HOW WILL THE SERVICE CONTENT AND DISSEMINATION CHANNELS CHANGE WHEN NEW TECHNOLOGY SOLUTIONS ARE DEVELOPED AND TAKEN INTO USE?	
HOW IS SERVICE PROVISION ORGANISED?	
WHICH ARE THE RESPONSIBILITIES OF THE ORGANISATIONS INVOLVED?	
HOW ARE THE SERVICE OWNERSHIP AND HOST ISSUES SOLVED?	
HOW ARE THE MAINTENANCE AND LIABILITY ISSUES SOLVED?	
WHICH DATABASES AND TECHNOLOGY SOLUTIONS ARE THE SERVICE PROVISION AND USER ACCESS BUILT UPON?	
ASSESSING COSTS AND RESOURCES NEEDED BY THE PROJECT/SYSTEM/SERVICE	
WHAT INVESTMENTS, ANNUAL MAINTENANCE AND OPERATIONAL COSTS AS WELL AS FEES DOES THE SERVICE REQUIRE IN TOTAL AND FROM THE PUBLIC SECTOR AS A PURCHASER/SUPPORTER?	
WHAT ORGANISATIONS FINANCE THE SERVICE AND IN WHICH MANNER AND PROPORTIONS?	
HOW IS THE SERVICE TO BE MARKETED OR PROMOTED, AND HAVE THE MARKETING COSTS BEEN CONSIDERED IN THE CALCULATIONS?	
WHICH PERSONNEL RESOURCE NEEDS ARE REQUIRED FROM THE PURCHASER OR PUBLIC SECTOR?	
ASSESSING THE MARKETS OF THE SYSTEM/SERVICE	
WHAT IS THE POTENTIAL FOR COMMERCIAL EXPLOITATION OF THE SERVICE?	
WHICH AND HOW LARGE ARE THE POTENTIAL PRIMARY CUSTOMERS OF THE SERVICE (E.G. NUMBER OF USERS OF THE TRANSPORT SYSTEM PART TARGETED BY THE SERVICE)?	
WHICH IS THE ESTIMATED NUMBER OF PERSONS, COMPANIES OR TRANSPORTATIONS USING THE SERVICE (E.G. ESTIMATED NUMBER OF SERVICE SUBSCRIBERS) AND HOW IS THE ESTIMATE CALCULATED?	

COLLECTING DATA ON AND ESTIMATING THE RELEVANT IMPACTS OF THE SYSTEM/SERVICE	
HAVE THE RELEVANT IMPACTS OF THE SYSTEM/SERVICE BEEN IDENTIFIED? SEE SEPARATE CHECKLIST	
HAVE THE EARLIER STUDIES ON IMPACTS BEEN IDENTIFIED VIA LITERATURE AND INTERNET SEARCHES, EVALUATION DATABASES OR LIBRARIES (HTTP://TEMPO.AUSTRIATECH.ORG ; WWW.ITS.DOT.GOV/BENEFITS ; WWW.ESAFETY-EFFECTS-DATABASE.ORG ETC., SEE APPENDIX 3)?	
HOW DOES THE SERVICE AFFECT THE NUMBER, TIME AND MODAL CHOICE OF JOURNEYS AND THEIR COSTS?	
HOW DOES THE SERVICE AFFECT ROUTE CHOICES, JOURNEY TIMES, CONGESTION AND TRAFFIC FLOW?	
HOW DOES THE SERVICE AFFECT INCIDENT OCCURRENCE, INCIDENT IMPACTS AND POSSIBILITIES FOR INCIDENT MANAGEMENT?	
HOW DOES THE SERVICE AFFECT THE TRAVEL AND OTHER POSSIBILITIES OF SPECIFIC USER GROUPS, SUCH AS THE ELDERLY AND DISABLED?	
HOW DOES THE SERVICE AFFECT THE BUSINESS POSSIBILITIES AND WELFARE OF DIFFERENT TYPES OF ENTERPRISES?	
HOW DOES THE SERVICE AFFECT TRAFFIC SAFETY, SECURITY, ENVIRONMENT, LANDSCAPE, CITYSCAPE AND COMMUNITY STRUCTURE?	
HOW DOES THE SERVICE AFFECT E.G. THE NEEDS TO BUILD AND IMPROVE TRANSPORT INFRASTRUCTURE?	
HOW DOES THE SERVICE AFFECT TRANSPORT INFRASTRUCTURE MAINTENANCE AND OPERATIONAL COSTS?	
HOW DOES THE SERVICE AFFECT PUBLIC TRANSPORT OPERATIONAL COSTS?	
HAS THE QUANTITY AND QUALITY OF OTHER RELEVANT IMPACTS BEEN ESTIMATED?	
ESTIMATING THE ECONOMIC FEASIBILITY OF THE SYSTEM OR SERVICE	
HAVE THE CALCULATION PRINCIPLES (DISCOUNT RATE, TREATMENT OF TAXES, LIFE CYCLE/CALCULATION PERIOD, UNIT COSTS, ACCEPTED UNCERTAINTY, ETC.) BEEN ACCEPTED BY ALL RELEVANT STAKEHOLDERS?	
HAVE THE COSTS OF THE SYSTEM BEEN ESTIMATED FOR THE WHOLE LIFE-CYCLE OF THE SYSTEM/SERVICE?	
HAVE ALL SYSTEM BENEFITS WITH AGREED UNIT COST VALUES BEEN ESTIMATED IN MONETARY TERMS?	
HAVE ALL SYSTEM BENEFITS WITHOUT AGREED UNIT COSTS BUT WHICH COULD BE EXPRESSED IN MONEY BEEN ESTIMATED IN MONETARY TERMS?	
HAVE ALL THE COSTS ABOVE BEEN ESTIMATED FOR THE ALTERNATIVES IN THE ECONOMY COMPARISON?	
HAVE THE BENEFITS AND COSTS BEEN ALLOCATED TO DIFFERENT STAKEHOLDERS? (IF EXPECTED)	
HAVE SENSITIVITY ANALYSES ON THE ESTIMATES BEEN UNDERTAKEN?	
LEGAL AND INSTITUTIONAL RISKS	
IS SERVICE FINANCING SETTLED?	
IS SERVICE CONTINUITY (MAINTENANCE, DEVELOPMENT) SETTLED?	
HAVE THE KEY ORGANISATIONS IN THE SERVICE VALUE NETWORK BEEN IDENTIFIED AND INVOLVED?	
HAVE LEGAL ISSUES (PRIVACY, DATA SECURITY, ETC.) BEEN SOLVED? ARE NEW OR MODIFIED REGULATIONS REQUIRED?	
HAVE THE POSSIBLE TENDERING ISSUES BEEN ADDRESSED?	
MARKET AND USER RELATED RISKS	
DO SIMILAR SERVICES EXIST? HOW MANY USERS EXIST FOR COMPETING SERVICES?	
CAN THE SERVICE BE EXTENDED WITH REGARD TO CONTENT OR USER GROUPS (SERVICE INTEGRATION, E.G. WITH TOURISM, ENTERTAINMENT)?	
CAN THE SERVICE BE EXPANDED AND EXPORTED (MARKETS, COMPETITION, BUSINESS OPPORTUNITIES)?	

WHAT THREATS EXIST WITH REGARD TO SERVICE COMPREHENSIBILITY, ADAPTABILITY AND USABILITY?	
WHICH SKILLS, INVESTMENTS OR ACTIONS DOES THE USE OF THE SERVICE (E.G. GETTING ACCESS TO INFORMATION) REQUIRE FROM THE USER?	
HAVE THE NEEDS OF SPECIAL GROUPS BEEN CONSIDERED?	
HAS THE USERS' WILLINGNESS TO PAY BEEN INVESTIGATED?	
HAVE USER INSTRUCTIONS AND SUPPORT SERVICES BEEN SEEN TO?	
TECHNICAL RISKS	
WHICH IS THE REQUIRED HARDWARE (E.G. TERMINALS), HOW MANY EXIST IN THE COUNTRY/AREA/POPULATION TODAY, WHAT IS THEIR PRICE, FUTURE TRENDS? POSSIBILITY OF NEW COMPETING TECHNOLOGIES?	
IS THE SERVICE COMPATIBLE TO EXISTING SYSTEM ARCHITECTURES (STANDARD SOLUTIONS, OPEN INTERFACES, GENERIC PLATFORMS, ETC.)	
IS THE COMMUNICATION SOLUTION RESTRICTING USE (E.G. NUMBER OF USERS AT SAME TIME, MANY DIFFERENT TERMINALS AT SAME TIME)?	
IS THE AVAILABILITY OF ALL INFORMATION INFRASTRUCTURES (COMMUNICATION, INTERFACES, DATA, ETC.) ENSURED?	
PRESENTATION OF RESULTS	
ARE THE RESULTS PRESENTED IN TERMS AND LANGUAGE UNDERSTOOD BY THE USERS OF THE RESULTS?	
HAVE KEY RESULTS BEEN CLEARLY HIGHLIGHTED?	
HAS PRESENTATION MATERIAL REQUIRED BEEN PREPARED?	

EX-POST EVALUATION – CHECKLIST OF QUESTIONS TO BE ANSWERED (NOTE: THE CHECKLIST ASSUMES THAT NO EX-ANTE ASSESSMENT HAS BEEN MADE; IF SUCH AN ASSESSMENT HAS BEEN MADE, A NUMBER OF QUESTIONS DO NOT NEED ANSWER)

ASPECTS OF EX-POST EVALUATION	TICK, WHEN ANSWERED
STANDARD QUESTIONS TO BE ANSWERED	
UNDERSTANDING THE RATIONALE OF THE PROJECT/SYSTEM/SERVICE	
WHAT IS THE USER NEED BEHIND THE SERVICE AND THE PROBLEM TO BE SOLVED WITH THE SERVICE?	
WHAT IS THE DEVELOPMENT TREND AND SEVERITY OF THE BACKGROUND PROBLEM (E.G. THE CURRENT AND FUTURE NUMBER OF ACCIDENTS, INCIDENTS OR DELAYS, AND THEIR EFFECT ON THE SOCIETY)?	
WHAT ARE THE OBJECTIVES OF THE PROJECT/SYSTEM/SERVICE?	
EVALUATION PROCESS	
WILL THE PROJECT/SYSTEM/SERVICE INVOLVE THE EVALUATION OF "MAINSTREAM" PRODUCTS AND SERVICES OR A PILOT STUDY OF NEW TECHNOLOGY?	
UNDERSTANDING HOW THE PROJECT/SYSTEM/SERVICE WORKS	
WHAT KIND OF INFORMATION OR CONTROL DOES THE SERVICE PRODUCE?	
HOW OR VIA WHICH CHANNELS DO THE USERS ACCESS THE SERVICE?	
HAS THE SERVICE BEEN TAILORED TO FIT USER'S NEEDS?	
HOW WILL THE SERVICE CONTENT AND DISSEMINATION CHANNELS CHANGE WHEN NEW TECHNOLOGY SOLUTIONS ARE DEVELOPED AND TAKEN INTO USE?	
HOW IS SERVICE PROVISION ORGANISED?	
WHICH ARE THE RESPONSIBILITIES OF THE ORGANISATIONS INVOLVED?	
WHICH DATABASES AND TECHNOLOGY SOLUTIONS ARE THE SERVICE PROVISION AND USER ACCESS BUILT UPON?	
ASSESSING COSTS AND RESOURCES NEEDED BY THE PROJECT/SYSTEM/SERVICE	
WHAT INVESTMENTS, ANNUAL MAINTENANCE AND OPERATIONAL COSTS AS WELL AS FEES HAS THE SERVICE REQUIRED IN TOTAL AND FROM THE PUBLIC SECTOR AS A	

PURCHASER/SUPPORTER?	
WHAT ORGANISATIONS FINANCE THE SERVICE AND IN WHICH MANNER AND PROPORTIONS?	
HAVE THE MARKETING AND OTHER RELEVANT COSTS (INCLUDING PERSONNEL RESOURCES) OF DIFFERENT STAKEHOLDERS BEEN CONSIDERED IN THE CALCULATIONS?	
ASSESSING THE USERS AND REVENUES OF THE SYSTEM/SERVICE	
WHICH IS THE ESTIMATED NUMBER OF PERSONS, COMPANIES OR TRANSPORTATIONS USING THE SERVICE (E.G. ESTIMATED NUMBER OF SERVICE SUBSCRIBERS) AND HOW IS THE ESTIMATE CALCULATED?	
WHAT IS THE POTENTIAL FOR COMMERCIAL EXPANSION OF THE SERVICE?	
HOW MUCH DOES IT COST TO USE THE SERVICE (SUBSCRIPTION, PAYMENT/TRANSACTION, ETC)?	
WHAT IS THE ESTIMATED REVENUE FROM SUBSCRIBERS AND USERS OF THE SERVICE?	
PLANNING IMPACT ASSESSMENT	
HAVE THE RELEVANT IMPACTS OF THE SYSTEM/SERVICE BEEN IDENTIFIED? SEE SEPARATE CHECKLIST	
HAVE THE EARLIER STUDIES ON IMPACTS BEEN IDENTIFIED VIA LITERATURE AND INTERNET SEARCHES, EVALUATION DATABASES OR LIBRARIES (HTTP://TEMPO.AUSTRIATECH.ORG ; WWW.ITS.DOT.GOV/BENEFITS ; WWW.ESAFETY-EFFECTS-DATABASE.ORG ETC., SEE APPENDIX 3)?	
HAS THE EXPERIMENTAL DESIGN BEEN PLANNED SO THAT THE BIAS CAUSED BY OTHER FACTORS CAN BE ELIMINATED FROM THE IMPACTS OF THE SYSTEM/SERVICE? (E.G. BEFORE AND AFTER DESIGN WITH CONTROLS)	
HAVE THE INDICATORS TO BE USED BEEN CHOSEN SO THAT THEY ARE OPTIMAL FOR THE IMPACTS STUDIED AND THE DATA COLLECTION MEANS AVAILABLE?	
DOES THE DATA COLLECTION PERIOD EXTEND SUFFICIENTLY TO ENABLE THE STUDY OF PERMANENT, LONG LASTING EFFECTS OF THE SERVICE/SYSTEM AND NOT JUST NOVELTY EFFECTS?	
HAS THE DATA COLLECTION, PROCESSING AND MANAGEMENT ROUTINES BEEN PROPERLY TESTED BEFORE STARTING DATA COLLECTION?	
HAS DATA STORAGE BEEN ORGANISED WITH BACKUPS?	
HAS THE POLICE, INFRASTRUCTURE MANAGERS, EMERGENCY OFFICIALS ETC. BEEN NOTIFIED OF DATA COLLECTION IN ORDER TO AVOID ANY DISTURBANCES BY THEM ON DATA COLLECTION OR VICE VERSA?	
HAVE THE PROPER ANALYSIS METHODS BEEN SELECTED AND THE CORRESPONDING ANALYSIS SOFTWARE AS WELL AS EXPERTISE BEEN ACQUIRED?	
ASSESSING THE TECHNICAL PERFORMANCE OF THE SYSTEM/SERVICE	
HAVE THE KEY ASPECTS OF TECHNICAL PERFORMANCE WITH REGARD TO THE QUALITY OF THE SERVICE FROM THE USER POINT OF VIEW BEEN DEFINED	
HAVE INDICATORS FOR THESE KEY TECHNICAL PERFORMANCE ASPECTS BEEN SPECIFIED?	
HAS THE DATA COLLECTION REGIME BEEN SPECIFIED?	
HAS THE DATA COLLECTION, PROCESSING AND ANALYSIS BEEN CARRIED OUT?	
HOW RELIABLY DOES THE SERVICE FUNCTIONS (AS ESTIMATED OR MEASURED)?	
WHAT IS THE CORRECTNESS, TIMELINESS AND COVERAGE OF THE INFORMATION PROVIDED BY THE SERVICE?	
WHAT IS THE OVERALL QUALITY OF THE SERVICE?	
COLLECTING DATA ON THE RELEVANT IMPACTS OF THE SYSTEM/SERVICE	
HAS DATA BEEN COLLECTED AND VERIFIED?	
HAS DATA BEEN PROCESSED FOR ANALYSES IN THE MANNER DESIGNED?	
ESTIMATING THE RELEVANT IMPACTS OF THE SYSTEM/SERVICE	
HOW DOES THE SERVICE AFFECT THE NUMBER, TIME AND MODAL CHOICE OF JOURNEYS AND THEIR COSTS?	
HOW DOES THE SERVICE AFFECT ROUTE CHOICES, JOURNEY TIMES, CONGESTION AND TRAFFIC FLOW?	
HOW DOES THE SERVICE AFFECT INCIDENT OCCURRENCE, INCIDENT IMPACTS AND	

POSSIBILITIES FOR INCIDENT MANAGEMENT?	
HOW DOES THE SERVICE AFFECT THE TRAVEL AND OTHER POSSIBILITIES OF SPECIFIC USER GROUPS, SUCH AS THE ELDERLY AND DISABLED?	
HOW DOES THE SERVICE AFFECT THE BUSINESS POSSIBILITIES AND WELFARE OF DIFFERENT TYPES OF ENTERPRISES?	
HOW DOES THE SERVICE AFFECT TRAFFIC SAFETY, SECURITY, ENVIRONMENT, LANDSCAPE, CITYSCAPE AND COMMUNITY STRUCTURE?	
HOW DOES THE SERVICE AFFECT E.G. THE NEEDS TO BUILD AND IMPROVE TRANSPORT INFRASTRUCTURE?	
HOW DOES THE SERVICE AFFECT TRANSPORT INFRASTRUCTURE MAINTENANCE AND OPERATIONAL COSTS?	
HOW DOES THE SERVICE AFFECT PUBLIC TRANSPORT OPERATIONAL COSTS?	
HAS THE QUANTITY AND QUALITY OF OTHER RELEVANT IMPACTS BEEN ESTIMATED?	
ESTIMATING THE ECONOMIC FEASIBILITY OF THE SYSTEM OR SERVICE	
HAVE THE CALCULATION PRINCIPLES (DISCOUNT RATE, TREATMENT OF TAXES, LIFE CYCLE/CALCULATION PERIOD, UNIT COSTS, ACCEPTED UNCERTAINTY, ETC.) BEEN ACCEPTED BY ALL RELEVANT STAKEHOLDER?	
HAVE THE COSTS OF THE SYSTEM BEEN ESTIMATED FOR THE WHOLE LIFE-CYCLE OF THE SYSTEM/SERVICE?	
HAVE ALL SYSTEM BENEFITS WITH AGREED UNIT COST VALUES BEEN ESTIMATED IN MONETARY TERMS?	
HAVE ALL SYSTEM BENEFITS WITHOUT AGREED UNIT COSTS BUT WHICH COULD BE EXPRESSED IN MONEY BEEN ESTIMATED IN MONETARY TERMS?	
HAVE ALL THE COSTS ABOVE BEEN ESTIMATED FOR THE ALTERNATIVES IN THE ECONOMY COMPARISON?	
HAVE THE BENEFITS AND COSTS BEEN ALLOCATED TO DIFFERENT STAKEHOLDERS? (IF EXPECTED)	
HAVE SENSITIVITY ANALYSES ON THE ESTIMATES BEEN UNDERTAKEN?	
PRESENTATION OF RESULTS	
ARE THE RESULTS PRESENTED IN TERMS AND LANGUAGE UNDERSTOOD BY THE USERS OF THE RESULTS?	
HAVE KEY RESULTS BEEN CLEARLY HIGHLIGHTED?	
HAS PRESENTATION MATERIAL REQUIRED BEEN PREPARED?	
HAS ALL DATA USED IN THE ANALYSES BEEN STORED FOR POSSIBLE RE-ANALYSES FOR THE PURPOSE OF E.G. STUDYING THE DATA WITH REGARD TO TRANSFERABILITY TO OTHER CONDITIONS?	
FURTHER DEVELOPMENT OF THE SYSTEM/SERVICE	
HOW SHOULD THE TECHNICAL PERFORMANCE AND QUALITY BE IMPROVED?	
HOW SHOULD THE ORGANISATION OF THE SYSTEM/SERVICE BE IMPROVED?	
HOW SHOULD THE BUSINESS MODEL OF THE SYSTEM/SERVICE BE IMPROVED?	
ARE NEW OR MODIFIED LEGAL REGULATIONS REQUIRED?	
HOW IS USER FEEDBACK UTILISED IN THE FURTHER DEVELOPMENT OF THE SERVICE?	

6. RELEVANT IMPACTS

The following table presents a list for most relevant impacts of varying ITS systems / services

Those shown in dark grey are usually very relevant; those in light grey are likely to be relevant; and those in white are of lower relevance

No.	ITS function	TARGET OF IMPACTS						MAIN INDICATORS						
		Transport demand	Travel timing	Mode choice	Route choice	Vehicle, traffic behaviour	Transport system man/dev	Network and its costs	Fleet and its costs	Accessibility	Time and its predictability	Traffic safety	Noise, emissions, energy	Valuations, comfort
1.	INFORMATION SERVICES (INF)													
INF1	Information on alternative transport modes													
INF2	Information on traffic fluency, incidents and road works													
INF3	Information on weather and road surface condition													
INF4	Information on routes and (travel) services													
INF5	Information on presently available parking places													
INF6	Information services for public transport users													
2.	DEMAND MANAGEMENT (DEM)													
DEM1	Park-and-ride system operation													
DEM2	Demand responsive public transport													
DEM3	Combining trips													
DEM4	Car pooling													
DEM5	Introducing general road tolls													
DEM6	Introducing congestion pricing or area tolls													
DEM7	Access control													
DEM8	Public transport payment system													
DEM9	Integrated payment system (several services)													

7. RECOMMENDED INDICATORS

Within the ITS evaluation processes one of the most delicate and important aspects is the choice of the indicators or parameters. This is needed in order to quantify the project's impact for the different objectives.

The assessment of a large number of indicators would allow a very detailed evaluation and a high probability to be able to compare the results with other similar ITS Projects around the world (transferability of the results). But the assessment of a large number of indicators would excessively increase the costs of data collection. It is therefore clear that the choice of indicators should be strictly linked to the availability and quality of data. This is even more evident for ex-post evaluations that cannot use data and indicators assessed before implementation. The large availability of data that is usually available after the implementation of the system is often useless. This is due to the lack of similar data collected before the installation or implementation. This emphasises the importance of planning a data collection campaign (or ex-ante evaluation) during the starting phases of the Project.

The choice of the indicators is very strictly linked to the Project's objectives and characteristics and many of the indicators listed in the "Euro-Regional Project Evaluation Guidelines" – Appendix 1 may not be defined.

Table 7.1 shows the list of indicators originally developed in the "Euro-Regional Project Evaluation Guidelines". This list of indicators has been compared against the indicators that have been used in reporting and found otherwise useful by EEG members. The shaded indicators are ones that have been used in completed Tempo reports whilst those shown in blue text are indicators that the EEG members have noted as being useful.

Indicator key

Used in Tempo Reports
Found useful by EEG members
Other indicators from Evaluation Guidelines

Overall Objective	Indicators	Unit of indicator	Data source
Network and Costs	Network utilization change in vehicle KM travelled	Veh-km or ton-km	Traffic counts and studies
	Change in the time during which traffic demand exceeds capacity	Hour	Automatic Traffic Monitoring
	Change in average speed during peak hours	Km/h	Automatic Traffic Monitoring
	Number of incident situations caused by insufficient network capacity	Incident situations	Field studies and monitoring of incidents
	Time loss caused by insufficiency of network capacity	Hour	Traffic monitoring, monitoring of incidents, field studies
	Changes in network investment or maintenance costs	Monetary	Cost monitoring
	Changes in the content and timing of network maintenance measures		Monitoring of maintenance measures, surveys
	Necessity for and urgency of constructing additional network capacity		Surveys

Overall Objective	Indicators	Unit of indicator	Data source
Fleet and its Costs	Fleet size	Number	Business monitoring
	Fleet utilisation rate	-	Business monitoring
	Cost of fleet utilisation (personnel and vehicle operating costs)	Monetary	Business monitoring
	Changes in planning of fleet utilisation		Business monitoring
	Need for additional equipment	Number	Surveys
	Changes in fleet maintenance		Work monitoring
	Changes in timing of fleet use		Monitoring of business operations
	Number of complaints due to fleet use	Number	Monitoring of complaints
Accessibility	Number of visitors or users (e.g. in the terminal)	Number	Field studies, Automatic Traffic Monitoring
	Range of impact zone		Trip diaries, interviews, surveys
	Ratio of traffic weighed trip lengths to distance as the crow flies	-	Trip diaries, field studies
	Average length of transport services	Number	Statistics, field studies
	Average length of trip	Number	Field studies, trip diaries
	Public transport's share of all trips or person km travelled	Number	Field studies, interviews, surveys
	Range of public transport service zone (number of inhabitants within 500m of the stop)	Number	Field studies, data from location data system
	Supply of Public Transport Services (buses/inhabitant)	Buses/inhabitant	Timetables, statistics
	Use of low-floor buses	Percentage	Field studies, trip diaries
	Number of trips taken by the disabled	Number	Field studies, trip diaries
	Disabled people's share of all passengers	Percentage	Field studies
	Total travel time in comparison with trip taken by private car	Hour	Field studies
	Ease of travel		Interviews, surveys
	Availability of services at different times		Surveys

Overall Objective	Indicators	Unit of indicator	Data source
Time and Predictability	Travel time (average and standard deviation)	Hour	ANPR, instrumented cars, logs and trip diaries, tachographs
	Additional travel time caused by incidents	Hour	Tachographs, drivers logs, trip diaries, interviews, surveys
	Spot speed (average and standard deviation)	Km/h	Automatic Monitoring
	Vehicle km travelled in congestion	Veh-km or ton-km	Drivers log, tachographs, trip diaries, Automatic Traffic Monitoring
	Stability of traffic flow (number of changes in speed)	Number	Car following, tachographs, driving instrumented cars
	Perceived fluency of traffic flow	-	Interviews, surveys
	Success of Information services	-	Interviews, surveys
	Total door-to-door travel time	Hour	Trip diaries
	Waiting time (terminal, stop)	Hour	Field studies, trip diaries
	Public Transport deviation from timetables		Field studies, trip diaries, interviews, surveys
	Incident proneness of traffic flow (share of short headways or time to collision values)		Automatic Traffic Monitoring
	Capacity of link or junction	Veh/h	Field studies, Automatic Traffic Monitoring during periods including times of flow breakdown and saturation of the link in question
	Need for overtaking		Field studies, Automatic Traffic Monitoring
	Number of delays	Number	Interviews, surveys, Automatic Traffic Monitoring
	Transfer possibilities and information about them		Field studies, interviews
	Maximum transfer time	Hour	Field studies, trip diaries
	Availability of Public Transport timetables		Field studies, interviews
	Public Transport Service frequency	Veh/h	Field studies, interviews
	Barrier effect of traffic (severance)		Interviews, surveys
	Average traffic flow	Veh/h	Automatic Traffic Monitoring
	Average traffic speeds	Km/h	Automatic Traffic Monitoring

Overall Objective	Indicators	Unit of indicator	Data source
	Average delay per vehicle kilometre (congestion)	Hour	ANPR, modelling
	Length of queues	Metres	Automatic Traffic Monitoring
	Traffic Control Indicators (green times, intergreen times, cycle times)	Seconds	System monitoring
Traffic Safety	Number of Traffic Accident (per traffic unit)	Number of accidents (per veh-km)	Before and after accident statistics
	Number of Traffic Accident Injuries (per traffic unit)	Number of injuries (per veh-km)	Police, hospital records
	Number of Traffic Accident Fatalities (per traffic unit)	Number of fatalities (per veh-km)	Police, hospital records
	Vehicle KM driven	Veh-km	Transport studies, drivers logs, origin-destination studies
	Number of traffic violations	Number	Police statistics and accounts
	Feeling of safety		Interviews, surveys
	Number of conflicts	Number	Traffic conflict studies
	Amount of Traffic	Number of vehicles	Traffic counts
	Person km travelled (number of person hours/ or passenger km)	Number of person hours or passenger km	Transport studies, drivers logs, origin-destination studies
	Goods tonnes transported	Tonne/km	Drivers logs, tachographs, surveys
	Average and standard deviation of travelling speeds	Km/h	
	Number of drunk-driver offences	Number	Police statistics and accounts
	Alertness	-	Measure reaction times in instrumented car or lab, interviews
	Attentiveness	-	Measure reaction times in instrumented car or lab, interviews
	Share of short accepted time gaps (gaps acceptance)		Field studies, simulator
Short (under 0.5 seconds) headways as		Automatic Traffic	

Overall Objective	Indicators	Unit of indicator	Data source
	a share of all platooning headways		monitoring, simulator
	Share of short (under 1 second) Time to Collision (TTC) vales		Automatic Traffic Monitoring
	Number of crimes committed in vehicles and terminals	Number	Police, security company statistics, interviews, surveys
Noise Emissions and Energy	Number of Inhabitants affected by traffic noise	Inhabitants	Noise studies, location data analysis, modelling
	Number of people exposed to exhaust emissions	Inhabitants	Exhaust emission measurements, models, location data
	Goods tonnes transported	Tonnes transported	Drivers logs, tachographs, origin-destination studies
	Hazardous goods tonnes transported	Tonnes transported	Corporate interviews and surveys, location data analysis
	Impact of transport infrastructure on the landscape	-	Interviews, surveys
	Air quality indices of urban districts		Air quality measurements
	CO ₂ emissions		Traffic counts and emissions models
	Use of salt	Tonnes	Maintenance statistics
	Transport energy consumption		Traffic counts, Automatic Monitoring, fuel consumption models
	Range of area affected by traffic noise		Noise studies, modelling
	Amount of nature affected by traffic noise		Noise studies, traffic counts, noise models, nature survey
	Number of people affected by traffic noise	Number	Interviews, surveys
	Amount of traffic	Number of vehicles	Traffic counts, models
	Vehicle km driven	Km	Transport studies, drivers logs, origin destination studies
	Person km travelled (number of person hours or passengers km)	Number of person hours or passengers km	Transport studies, drivers logs, origin destination studies
	Average and standard deviation of spot speeds	Km/h	Drivers logs, tachographs, origin destination studies
	Amount of traffic exhaust emissions		Traffic counts and studies, emissions modelling

Overall Objective	Indicators	Unit of indicator	Data source
	Damage done to valuable nature sites		Interviews and expert statements
	Safety of hazardous goods transport		Hazardous goods tonnes transported and accident models, location data analysis
Valuations and Comfort	Willingness to pay (mobility)	-	Surveys
	Willingness to pay (services)	-	Surveys
	Number of users of a service	Users	Statistics
	User attitudes toward the transport system	-	Interviews, surveys
	User attitudes toward different transport modes	-	Interviews, surveys
	User attitudes on services	-	Interviews, surveys
	Travel comfort experienced by users	-	Interviews, surveys
	Feeling of personal security	-	Interviews, surveys

Table 7.1 – Indicators for ITS Evaluation studies

Indicator key

Used in Tempo Reports
Found useful by EEG members
Other indicators from Evaluation Guidelines

APPENDIX 1: TEMPO REPORTING/WEBSITE FORMAT

When new documents are uploaded to the Tempo report library, a list of standardised website search words, are displayed, these are shown in the table below. If the document to be uploaded is relevant to the displayed topic, it should be selected. On the Tempo report library interface a search facility is used to find all reports that match the topic selected, these are pre-defined. Users logging on to the website do not have the option of entering individual topics into the search facility, a topic can only be selected from the pre-defined list.

Standardised Website Search Words	
Automatic Incident Detection	Ramp Metering
CCTV	RDS-TMC
COMPANION	Red Light Driving
Congestion Management	Re-routing
Controlled Motorway	Road Accidents
Cross Border Management	Road Monitoring Infrastructure
Driver Information and Control System	Road Pricing
Electronic Fee Collection	Road Safety
Emergency Call System	SMS
Field Test	Telematic Services
Floating Car Data	Traffic Broadcast
Freight and Fleet Management	Traffic Counters
Incident and Emergency Handling	Traffic Flow
Incident Management	Traffic Information Kiosks
Information for Commuters	Traffic Management
Information for Road Users	Transport Information
Information, Journey Time	Traveller Information Services
Information, Real Time	Urban Traffic Control
Intelligent Road Studs	Urban Traffic Management
Intelligent Transport Systems	Variable Message Signs
Journey Time Planner	Variable Speed Limits
Overview	Vehicle Positioning System
Probe IT	Video Information Highway

Table A1...Pre-defined standardised website search words

APPENDIX 2: HISTORICAL BIBLIOGRAPHY

This appendix provides a description of and links to the suite of other documents relevant to project evaluation in the Euro-regional context. All of these documents can be found on the European Evaluation Expert Group (EEG) website ([TEMPO.austriatech.co.au](http://tempo.austriatech.co.au)).

The 'TEMPO Guidelines for Reporting Evaluation Results' presents a common format to be used for summarising and presenting the results of evaluation.

1. Euro-Regional Project Evaluation Summary:

(http://tempo.austriatech.org/fileadmin/templates/guidelines/Euro-Regional_Summary.pdf)

The 'Euro-regional Project Evaluation Summary' is a short document that proposes a generic approach to the evaluation of European projects. It presents:

- general principles for evaluation;
- advice on undertaking an appropriate level of evaluation;
- an overview of the stages involved in developing an evaluation plan for a pilot or implementation project; and
- a summary of the TEMPO Guidelines for Reporting Evaluation Results.

2. Euro-Regional Evaluation Guidelines:

(http://tempo.austriatech.org/fileadmin/templates/guidelines/Euro-Regional_Guidelines.pdf)

The 'Euro-Regional Evaluation Guidelines' provides more in-depth detail on how to apply the generic 'Euro-Regional Project Evaluation Summary' to a particular sub-project.

3. Tempo Action Plan:

(http://tempo.austriatech.org/fileadmin/templates/guidelines/2_TEMPO_EEG_Action_Plan_v4.doc)

This Action Plan provides a brief summary of the scope of the library of evaluation reports that have been or will be developed during the TEMPO programme.

4. Tempo Guidelines for Reporting Evaluation Results:

(http://tempo.austriatech.org/fileadmin/templates/guidelines/TEMPO_Guidelines_for_reporting_results_Issue_5_14June2006.doc)

The 'TEMPO Guidelines for Reporting Evaluation Results' presents a common format to be used for summarising and presenting the results of evaluation.

5. Tempo Evaluation Reports

(<http://tempo.austriatech.org/index.php?id=151>)

The EEG website contains the Euro-Regional project reports that have been completed.

APPENDIX 3: WEBLINK RESOURCES

This appendix contains links to some other resources for use in evaluation of ITS projects.

- European Evaluation Expert Group (EEG)
TEMPO.austriatech.co.au

- International Benefits Evaluation and Cost Working Group (IBEC): a cooperative working group set up to coordinate and expand international efforts, to exchange information and techniques, and evaluate benefits and costs of ITS
<http://www.ibec-its.org/index.htm>

- U.K. Department for Transport (DfT) ITS toolkit
<http://www.itstoolkit.co.uk/index2.htm>

- U.S. Department of Transportation ITS Applications Overview
<http://www.its.dot.gov/evaluation/index.htm>

APPENDIX 4: GLOSSARY

The STREETWISE project has developed a common glossary, based on previous work in the CONVERGE project. The Evaluation Expert Group has agreed that this glossary should be used by projects to assist comparisons between them by ensuring that common terminology is used when summarising projects and presenting evaluation results.

Telematics (or ITS) Application

A telematics tool designed to solve a specific problem or problems.

Appraise

To appraise is to determine the performance of a telematics system X by assessing individual telematics applications at regular intervals;

Assessment

The process of determining the performance and/or impacts of a candidate telematics application, usually in comparison to a reference Case. This would include assessment of individual aspects of an application's performance, for example its environmental performance or technical performance.

Assessment Objectives

A precise statement of the objectives, which a telematics application aims to achieve. The performance on a telematics application can be reviewed against these objectives, which will be associated with performance indicator(s) and definitions of success.

Assessment Categories

Assessment Objectives are classified under different Assessment Categories. These categories relate to general National or International goals on which transportation projects can be assessed, for example the impact on the environment or on safety and danger to people. 'CONVERGE' suggests 6 different Assessment Categories, while the UK Government judges performance of transport initiatives against 5 broad Assessment Categories.

Assessment Summary Table (AST)

The Assessment Summary Table records the degree to which the five UK Central Government Assessment Objectives for transport are achieved and provides a summary of the impacts of the scheme or initiative in question. A separate AST must be prepared for each specific transportation scheme option or initiative considered, including options later rejected.

Business Case

A Business Case is a structured approach to obtaining financial approval for a project. It defines the project, it presents the current situation and the anticipated situation after project implementation. It looks to justify the investment, based on experience elsewhere with similar telematics applications and modelling. The business case usually constitutes the financial assessment for a telematics application.

Depending on the level of knowledge available about a telematics application, the BC will be more or less detailed. For a new telematics application or strategy not yet employed the BC is likely to be detailed, whereas for further deployment of a proven application the BC will be much less detailed referring to previous work. Similarly the level of detail will depend on the scale of the project with justification of a £1M scheme requiring a smaller business case than the justification for a £200M scheme.

Cost-Benefit Analysis

This is a mechanism widely used within business cases for financial assessment of the net benefit of implementing a telematics application. It determines the ratio (or difference) between the costs and benefits of an application that can be expressed in monetary units.

Evaluation

The process of determining the value of a telematics system or individual telematics application in comparison with alternatives and/or with reference to a "base case".

Pre-Implementation Evaluation (often known as ex-ante evaluation) concerns the evaluation of a telematics application prior to its implementation. In this instance, expected benefits are anticipated, based on modelling techniques and possibly previous experience of similar applications in similar locations.

Post-Implementation Evaluation (often known as ex-post evaluation) is carried out after a telematics system or application has been implemented, to compare observed results following implementation with expected results of the pre-implementation evaluation.

Feasibility Study

This is a study usually carried out at an early stage of any project to determine the practicability of a telematics application or system.

They tend to be small-scale studies to determine whether or not to proceed to a pilot study or to put together a full business case. The outcomes of the study are assessed against reference figures and a recommendation on the best way to proceed is made.

Evaluation Framework

This is an outline plan applicable to all projects that can form the basis for the appraisal of a telematics system or the assessment of individual applications. It will contain assessment objectives.

Evaluation Guidelines

Set of advice highlighting how to use an evaluation framework in order to appraise a telematics system or assess a telematics application. They may relate to pre and/or post evaluation.

Impacts

Changes or effects brought about by the installation and/or use of a telematics application in an experimental or real situation.

Implementation

The installation and commissioning of a telematics application in a real life environment.

Indicators

Parameters, directly measured or derived from measurements or modelling, indicating the performance and/or impacts of a candidate system.

Monitoring

This refers to the process of collecting data aimed at assessing the performance of a particular aspect or aspects of a telematics application. Monitoring is often referred to as "pre implementation" or "post implementation" monitoring. Pre-implementation monitoring is carried out prior to implementation of a telematics application, to establish the existing situation. Post implementation monitoring is used to assess the impacts of the telematics application in question.

Multi-Criteria Analysis

Different criteria are combined to determine a single deciding value. The weighting factor applied to each item of analysis is a matter of decision and agreement and is particular to the specific case and circumstances in question and results are not readily transferable.

Off Road Trial

These are trials where a telematics application or system is installed in a situation off the national road network to assess the technical performance of the application/system. Off road trials are also used to assess various different strategies and assess the driver response to them. These trials are often used where there is a possible danger to motorists on the main road network with an untried and tested application.

Pilot Study

This is an on-road trial of a new application which may or may not have been initially tested in an off-road trial. Pilot studies are often used to test the technical feasibility of a telematics application, and/or to carry out a preliminary assessment of the impacts of a new telematics application. The focus of a pilot study is on the assessment of the technical performance and impacts of the application.

Roll Out

This term refers to the further implementation of a telematics application, which has been studied, researched, and is already implemented on some other sites.

Testing

Before a telematics application or system is fully implemented, testing to prove the efficacy of the system is required. Testing will be required to ensure the system operates according to the design specification.

Validation

This is the process of verifying that an application performs as expected. Validation can occur throughout the evaluation process with, for example, post-implementation evaluation results used to validate expected benefits generated at the pre-implementation stage, or, at the pre-implementation evaluation stage where a model used to predict likely benefits would need to be validated to ensure that the results produced were realistic.