

DEVELOPMENT OF PROJECT EVALUATION METHODOLOGY FOR INTELLIGENT TRANSPORT SYSTEMS

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ABSTRACT

Scientific research of transport may be useful if it supports the development of transport system and deployment in effective and efficient manner. Traditional transport planning and project evaluation methodology have to be adapted to the new requirements and features of Intelligent Transport Systems (ITS). It is possible to identify certain shortcomings of traditional methods which were primarily used for investments in physical infrastructure. It is necessary to adopt them to ITS project requirements. ITS projects (solutions) have to be designed to work in a compatible way and there are strong interactions of different parts of ITS (for example, there is a strong interaction between traveller information system, traffic management and emergency management). Proper evaluation methodology must assess the interaction among ITS projects (services) and measure additional impacts for each completed project. There are also strong interactions between ITS and advanced project such as digital (intelligent) city, national critical infrastructure (national safety), etc. The nature and the scope of ITS leads to significantly different requirements for project evaluation including two basic types of evaluation that can be used for ITS development, i.e. formative and summative evaluation. Formative evaluation relates to process and provide guidance to assess ITS projects during their realisation. Summative evaluation is a retrospective look at the whole development and it is related to an outcome or impact. In this paper, basic concept, requirements and a set of criteria for ITS evaluation process will be elaborated and systematized.

1 INTRODUCTION

The evaluation is systematic determination of merit, worth, and significance of something or someone using criteria against a set of standards. Thus, evaluation process of any ITS system or solution must be in line with its defined and documented objectives (system requirements). It is important that the evaluation process is feasible and that it has no effect on the evaluation results. Also after the completion of evaluation it has to be clear to all stakeholders how the new system is performing, that is, does it meets its predefined objectives.

Proper evaluation methodology must assess the interaction among ITS projects (services) and measure additional impacts for each completed project. The nature and the scope of ITS leads to significantly different requirements for project evaluation including two basic types of evaluation that can be used for ITS development:

1. Summative evaluation
2. Formative evaluation.

To provide a support for decision making activities additional cost/benefit analysis can indicate the wide range impacts of an ITS project as well as business-as-usual or do-nothing scenario.

In order to perform an effective evaluation process certain data collection activities must be preformed. Usually the same set of data is collected before implementation of ITS solutions (before data) and after the implementation (after data). This before and after data must be collected using the same methodology and under the same conditions to be able to conduct the analysis. There is a different set of data needed for summative and formative evaluation activities.

Data can also be collected continuously if there is a necessity (e.g. to keep track on current state of implementation and to detect the need for more resources for certain activity) and longitudinal (annually every 6 months or every year) depending on the project life cycle.

2 BASIC CONCEPT OF EVALUATION PROCESS

The Figure 1 shows a conceptual framework for evaluation of ITS projects that aims to improve transport conditions. It identifies the key inputs to the evaluation process, the potential impacts associated with ITS improvements, and considerations in evaluating overall merit of improvements. Also, it illustrates the interrelationships among the activities constituting the evaluation process; including the iterative nature of evaluation associated with implementation of several interrelated and integrated ITS solutions (services) that often require successive revision and refinement as more critical information is forthcoming about their potential impact and feasibility.

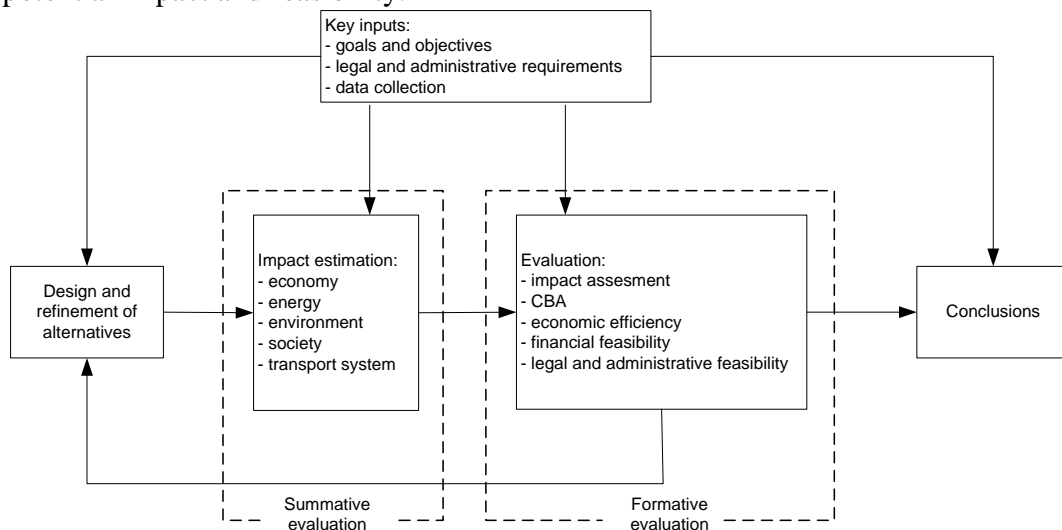


Figure 1: Conceptual framework for evaluation

Before the implementation process a set of clear and consistent objectives must be defined (system requirements) in close cooperation with all stakeholders involved, [1]. Therefore, every objective has to be in line with the certain set of indicators. By selecting and defining indicators it will come clear what will be measured, in relation to which objective and scope, [2].

An indicator is a parameter that gives information about the impact that certain ITS project has in relation to its objective, [5]. The indicators can be categorised in five categories: energy (e.g. fuel consumption), economy (e.g. operating costs/revenues), environment (e.g. emission level), society (e.g. public perception on safety in transport), and transport (e.g. accident rate, vehicle speed etc.). With each indicator a methodology for data collection activity must be defined (e.g. in order to collect data for average vehicle speed a certain measurements can be applied).

3 SUMMATIVE EVALUATION

The summative evaluation relates to process and provides guidance to assess ITS projects during their realisation. The summative evaluation includes the evaluation of a wide range of technical, social, economic and other impacts of ITS solution being implemented and it can be achieved by applying effective evaluation methodology throughout following activities:

- Defining the evaluation approach, indicators and methodologies used in ITS project evaluation;
- Providing necessary feedback and comments on the approach, indicators and measurements by involving stakeholders;
- Providing guidance on using indicators, measurements, scenarios, up-scaling, and analysis etc.
- Collection and interpretation of evaluation results;
- Conclusions.

To evaluate an impact of a specific ITS solution it is necessary to know how the situation was before and after implementation. Both data collection activities should be executed in the same way, using the same methodology and for the same scope (area, target group, zone, etc.). In some cases it can even be necessary to do periodical data collection or even keep day to day records. This depends strongly on the system that is implemented. Sometimes the expected outcome or expected impact of a newly installed ITS system doesn't meet the predefined objectives (e.g. decrease the number of accidents by introducing incident management system). If this is a case a business-as-usual scenario (BAU), as a part of summative evaluation, can be simulated. This is how the situation would be if the ITS solution was not to be implemented (e.g. taking into account increase in the number of vehicles on the road the number of accidents would be higher without incident management system). Figure 2 shows the comparison of the different scenarios.

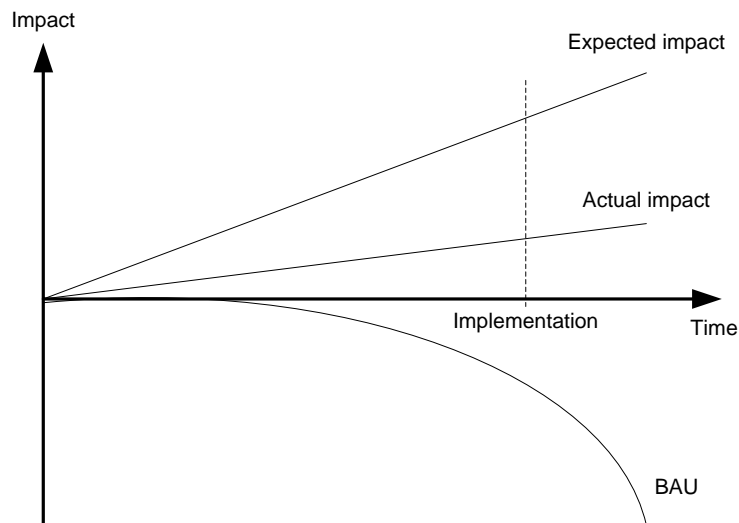


Figure 2: Type of impact analysed in summative evaluation process

4 FORMATIVE EVALUATION

Formative evaluation is a retrospective look at the whole development and it is related to an outcome or impact. The formative evaluation concerns the evaluation of the processes of planning and implementation including the roles of information, communication and participation. This type of evaluation is also called process evaluation and it represents a method for implementation assessment carried out while the project activities are forming or happening. The main objectives of formative evaluation are:

1. Getting insight to the drivers and barriers during preparation, implementation and operation of the ITS solution
2. Getting insight to roles of communication and participation
3. Getting at the stories behind the data.

The project “drivers” can be defined as activity or resources which will push the project forward in terms of implementation and deployment. The drivers can be: clear definition of system requirements, sufficient funding, good planning etc. Thus, “barriers” are: bad planning, insufficient support of political authority, limited understanding of user requirements etc. This concept of drivers and barriers can be used to determine the “obstacles” in the implementation process. Therefore, some additional resources can be redirected to certain activity in order to achieve a shift from barriers to drivers; e.g. additional effort can be allocated for the planning process so it becomes a driver. Overview of categories for barriers and drivers of implementation is shown in the Table 1. [3]

Table 1: Overview of categories for barriers and drivers of implementation

Category	Subcategory	Interpretation as Barrier	Interpretation as Driver
Politics and Strategy	Opposition/ Commitment	Opposition of key actors based on political and/or strategic motives; Lack of sustainable development agenda or vision	Commitment of key actors based on political and/or strategic motives; sustainable development agenda /vision
	Conflict/ Coalition	Conflict between key actors due to diverging material interests and expectation	Coalition between key actors due to shared/complementary material interests

		of redistributive losses	and expectation of redistributive benefits
Planning	Technical	Insufficient technical planning and analysis to determine requirements of measure implementation	Accurate or visionary technical planning and analysis to determine requirements of measure implementation
	Economic	Insufficient economic planning and market analysis to determine requirements for measure implementation	Accurate economic planning and market analysis to determine requirements for measure implementation
	Policy Conflict/ Synergy	Conflicting policies or policy frameworks hampering measure implementation	Synergetic policies or policy frameworks fostering measure implementation
	User assessment	Lack of user needs analysis; Limited understanding of user requirements	Thorough user needs analysis; Good understanding of user requirements
Institutions	Administrative Structures and Practices	Hampering administrative structures, procedures and routines	Facilitating administrative structures, procedures and routines
	Legislation and Regulation	Hampering laws, rules, regulations and their application	Facilitating laws, rules, regulations and their application
Cooperation	Partnership and Involvement	Failed or insufficient partnership arrangements and limited involvement of key actors	Constructive partnership arrangements and open involvement of key actors and/or other stakeholders
	Key Individuals	Lack of leadership, individual motivation or know-how of key persons	“Local champions” motivating actors and catalysing the process
Citizen Participation		Insufficient or poorly performed consultations with and involvement of citizens	Broad consultations with and involvement of citizens
Information and Public Relations		Insufficient information of key stakeholders; lack of awareness raising activities	Information of key stakeholders; Awareness raising activities
Technology		Technology failure; additional technological requirements	New potentials offered by technology
Public Funds and Subsidy		Dependency on public funds and subsidies	Availability of public funds and subsidies
Problem Pressure		not applicable	Severity of problems to be solved (e.g. air pollution)

One of the effective method for detecting drivers and barriers in the implementation process is to keep track of a work being done by conducting stakeholder interview, workshops etc. Producing annual or quarter progress reports by each partner involved is proven to be effective as well, [3], [5]. In this reports each partner describes its own view on the status of implementation process. They are treated confidentially and provide basic information around the implementation status of the project and can be used by the project evaluation management to detect possible barriers and drivers. Each of these methods needs involvement of all stakeholders and their support in the overall project life cycle.

As mentioned before, financial and cost/benefit analysis (CBA) can also be used as “tools” when performing formative (process) evaluation. This includes estimation of costs, impacts and performance levels. Costs are defined in terms of all resources needed for the design, construction, operation and maintenance. Possible impact of newly installed ITS system on the economy (e.g. operating revenues) and improvement of performances (e.g. shorter travel times) can also be elaborated throughout CBA, [4].

5 CONCLUSION

ITS projects have to be designed to work in a compatible and integrative manner and there are strong interactions of several ITS services (e.g. there is a strong interaction between traveller information system, traffic management and emergency management).

Proper evaluation methodology must assess the interaction among ITS projects and measure additional impacts for each completed project. The nature and the scope of ITS leads to significantly different requirements for project evaluation including two basic types of evaluation that can be used for ITS development, i.e. formative and summative evaluation.

For each type of evaluation a data collection activities must be undertaken. Therefore, to evaluate an impact of a specific ITS solution it is necessary to know how the situation was before and after implementation. For that reason a set of indicators must be defined, and they have to be in line with project objectives. Both data collection activities (before and after) should be executed in the same way, using the same methodology and for the same scope (area, target group, zone, etc.).

Sometimes the actual outcome of a newly installed and deployed ITS system doesn't meet the expected outcome, defined at the beginning of the project lifecycle. Therefore, there are several methods for supporting evaluation conclusions such as business-as-usual (BAU) or do-nothing scenario, financial effectiveness and cost/benefit analysis.

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