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STATE-OF-THE-ART IN EUROPEAN ITS EVALUATION RESEARCH – WHERE EUROPE HAS BLIND SPOTS

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ABSTRACT

This paper focuses on two elements within ITS evaluation studies: user acceptance and feasibility aspects (in terms of legal, technical, institutional and financial feasibility as well as business models). The authors analyzed all ITS evaluation studies on VMS and Public Transport information that are currently available within the database generated under the priority 6.2 of the ITS Action Plan. This exercise was part of a quality enhancement procedure. Not surprisingly results show that these critical elements for the successful deployment of ITS are a rather rare species within the current landscape of ITS evaluation studies. Strategies how

to improve both the presentation format as well as the underlying practice of carrying out European ITS evaluation is discussed. Findings are encouraging when it comes to identifying blind spots and improving the currently fuzzy picture of ITS evaluation in Europe.

INTRODUCTION

The assessment of user acceptance and feasibility aspects plays an important role when it comes to the deployment of ITS applications. Several European case studies and evaluation reports deal with these aspects. The underlying paper shows how these studies deal with user acceptance and feasibility aspects. It has to be considered that the following finding and discussions are only related to European research studies dealing with VMS (Variable message signs) and Public Transport information. Findings can not be transferred to other ITS research areas.

The basis for all the findings and discussion points reported in this paper was the compilation and analysis of European ITS studies focusing on VMS and Public Transport information within the 2DECIDE project. Before presenting results of this compilation and analysis the study context is described.

STUDY CONTEXT

2DECIDE PROJECT

2DECIDE is a project funded under the European Union's 7th Framework Programme for Research and Development. Its objective is to develop an "ITS Toolkit" to assist transport authorities in the deployment of Intelligent Transport Systems, to help them solve traffic and transport problems and address policy objectives.

Aim of the project

The aim is to help authorities to best exploit ITS to address problems such as congestion, accidents or environmental pollution, as well as to improve user services, promote intermodality and access to information, enhance safety and security aspects, etc. This toolkit will suggest different solutions, depending on the problem or situation encountered by the user. Solutions include the deployment of systems integrating telematics with transport engineering in order to plan, design, operate, maintain and manage transport systems, in the road and Public Transport sectors.

The ITS toolkit will be free to users and aims to provide via a web-based user interface:

- Best practice examples of ITS deployments

- Information about costs, benefits and impacts of ITS solutions
- A database of evaluation reports on ITS projects
- Information on technical and legal aspects for ITS solutions
- Targeted information in response to a user query.

The ITS toolkit is aimed to be used by governments and public administrations (EU, national, regional, county, municipal, etc), Public Transport authorities and operators (rail, coach, bus, ferry), road operators (public authorities, toll motorway companies, etc), associations and networks (road directorates, ITS, cities, motorway operators, etc), developers or major event organizers with an interest in transport and access, and operators of major airports, seaports, etc, regarding road and Public Transport issues.

The approach of the ITS toolkit is illustrated in Figure 1. The main contents of the ITS toolkit lie in the evaluation matrix and knowledge base. The function of the evaluation matrix is to control the way the different documents relate to market packages, operating environments, problems and objectives. That function is realized by populating the evaluation matrix with references to case studies, evaluation studies and other documents located in the knowledge base. [1,2]

The knowledge base contains the original documents or links to them and all related metadata which may be related to the contents of the documents, publication details or the type or quality of content available in the document. [2]

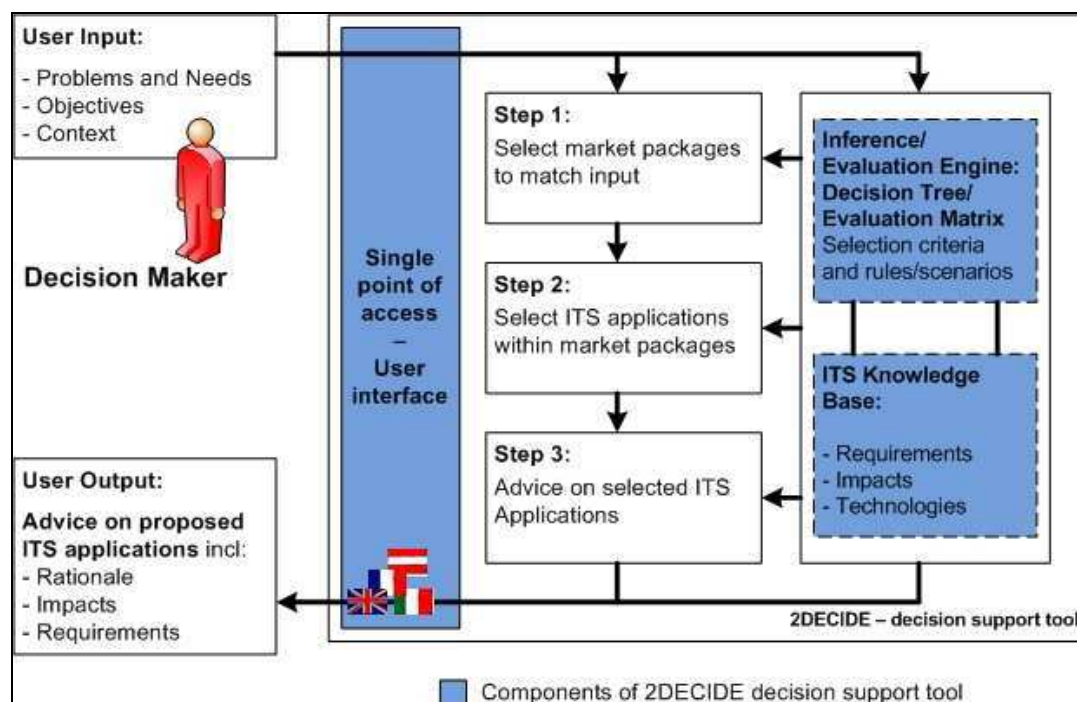


Figure 1: Three step approach for identifying ITS applications and services within the toolkit [3]

Case studies and evaluation reports building up the knowledge base were compiled and assessed with regard to the user acceptance and feasibility information. The set-up of the knowledge base started with describing primary, secondary and general indicators for the different assessment aspects. The following section gives an overview on the assessment methodology and aspect definitions as well as assessment indicators.

ANALYSIS OF USER ACCEPTANCE AND FEASIBILITY ASPECTS

METHODOLOGICAL APPROACH

Data entry and aspect analysis

During the last months of the 2DECIDE project the data entry team filled in available case studies into the 2DECIDE database. The data entering follows beside entering context information a catalogue of assessment topics and related indicators. Every case study is analyzed with regard to these assessment topics and indicators. If the data entry team finds information on user acceptance or feasibility aspect they enter dedicated information into the evaluation matrix. This information is filled in text field (description field). In addition indicators relating to the assessment topics have to be filled in further fields, if they can be found in the original case study. Due to this approach it is traceable if and how case studies deal with the assessment aspects. The following subsection depicts what user acceptance and feasibility aspects in the context of ITS mean.

ASSESSMENT ASPECTS

User acceptance assessment

User acceptance is defined as the degree to which individual users will use a given system when the usage is voluntary or discretionary. The acceptance of a product or service refers to the continued usage of it. [4]

User acceptance related assessment indicators show if users already invested or have the intention to invest in ITS applications, or how users perceive a system or service.

Extract of indicators: intention to buy, including indications to the willingness to pay, perceived usefulness (i.e. users find the system useful), perceived ease of use (i.e. users find the system easy to use, clear and understandable), behavioral intention to use (i.e. users would buy the system, would use the system).

Feasibility aspect assessment

Feasibility aspects comprise various aspects that deal with the feasibility of ITS application. 2DECIDE is covering the following ones:

Institutional feasibility: With institutional feasibility the study team means the ease of deploying the ITS system or operating the service from the institutional or organizational point of view. Usually, the more stakeholders are involved in the value chain or value network of a service, the more complicated the service provision or deployment becomes and the more difficult will the institutional issues be. The issues will be made easier by having a clear champion for the service, i.e. a specific stakeholder taking the main responsibility for driving the service or the deployment of a system or by having set up specific contracts or other agreements between all stakeholders involved.

Extract from Indicators: number of stakeholders needed to deploy and operate the service, service responsible / champion, primary institutional issues encountered, etc..

Technical feasibility: Technical feasibility relates to whether the system is technically ready and mature for deployment and implementation. In detail whether the system is described as a prototype, an early test implementation or pilot, or full scale deployment of an "off-shelf product" widely available in the market place and whether technical standards are available and should be complied to.

Extract from Indicators: level of application development or maturity, requirements for compatibility (with other systems and services or standards/agreements), etc..

Financial feasibility: Financial feasibility refers especially to the costs related to a system or service. These costs include investment costs and maintenance costs of the ITS application. Indicators for financial feasibility refer as well to the market potential of ITS.

Extract from Indicators: investment costs, maintenance costs, lifecycle duration, sales numbers, etc..

Legal feasibility:

The way an ITS application is planned or implemented may depend on the legal frame of the context. Legal feasibility comprises special legal issues including legal aspects or consequences for the adoption of specific ITS applications as well as regulations by local, regional, national and European laws.

Extract from Indicators: appeals/recourses related to the ITS application, amendments to law

due to the ITS application, privacy problems related to the ITS application, etc..

Business model: A business model describes the specific way a business expects to recover costs of implementing ITS applications (...), in order to continue (and even expand) services over a longer time period.“

Indicators for business model are different types of business models: (1) subscription model (paid service through periodic fees), (2) usage model (paid service – pay per use), (3) free model (free service – offered by authorities / socio-economic benefits generated), (4) advertising model (free service – revenue generated via for instance advertisement), (5) enticement model (free service – revenue generated via additional services).

RESULT OF THE ANALYSIS

SAMPLE OF THE STUDY

The 2DECIDE database includes by now 65 European case studies dealing with VMS and Public Transport information. The 2DECIDE database will finally reflect the complete picture of ITS applications, but in the first testing phase the focus lied on studies dealing with VMS and Public Transport information. Thus results are only reflecting the evaluation picture of available VMS and PT studies. 25 studies of the assessed studies deal with variable message signs and 40 studies are dealing with Public Transport information.

MAIN RESULTS AND FINDINGS

The assessment of case studies and evaluation reports regarding the above mentioned aspects showed the following picture.

Study reports dealing with VMS:

Most of the VMS studies contain information on user acceptance. From 25 studies dealing with VMS 19 contain information on user acceptance. With regard to feasibility aspects the picture is a different one. Only a very little number of VMS studies contain information on feasibility aspects and business models. In detail:

- 2 studies with business model information,
- 1 institutional feasibility information,
- 1 technical feasibility information,
- 1 financial feasibility information,
- 0 legal feasibility information

The assessment of these studies also showed that even if information on these aspects is

available, different as defined or no indicators related to these aspects are included in the assessed study reports.

Example 1: Applied user acceptance indicators

VMS studies designs illustrate that user acceptance is defined differently: Study teams consider user acceptance as:

- a degree to which users/drivers recall a VMS
- a degree to which users change their driving behavior according to the displayed message
- a degree to which users understand the messages
- a degree to which users find a system useful
- a general attitude towards the system

Study reports dealing with Public Transport information:

About the half of studies dealing with this kind of ITS area include information on user acceptance. In detail: 22 studies deal with user acceptance. With regard to feasibility aspects the picture is again a differentiated. A lot of studies deal with institutional feasibility. Information on business models, financial, technical and legal feasibility is rare.

- 2 studies with business model information,
- 15 study institutional feasibility information,
- 3 technical feasibility information,
- 2 financial feasibility information,
- 1 legal feasibility information

The assessment of these studies also showed that even if information on user acceptance and feasibility aspects is available, different as defined or no indicators related to these aspects are included in the assessed study reports.

Example 2: Applied user acceptance indicators

Public Transport studies designs illustrate that user acceptance is defined differently: Study teams consider user acceptance as:

- awareness towards a Public Transport system
- a level of customer satisfaction
- the perceived usefulness
- the perceived ease of use
- the behavioral intention to use
- willingness to pay

Summarizing what has been mentioned in the previous subsections:

The 2DECIDE study team and in a wider context the European research community and ITS decision makers are confronted with:

- 1) a little number of VMS and PT studies dealing with deployment relevant aspects, like feasibility aspects;
- 2) studies dealing with user acceptance and feasibility aspects use heterogeneous methodological approaches and provide heterogeneous results that are difficult to compare and transfer. This complicates (1) to generate an overall assessment of ITS areas based on different studies, as well as (2) a comparison of different ITS applications.

Limitations:

On the issue of validity of the data used for this analysis we find 2 supporting points in our favor.

- 1) We picked 2 areas (VMS and Public Transport) where the number of documented ITS evaluation studies is significantly higher than for any other field of study.
- 2) The overall procedure for gathering ITS evaluation studies has been heavily biased towards the high quality end. In more direct terms, if the evidence we have found suggests a blind spot in the cream of the crop this blind spot is representative for all evaluation studies.

In connection to all these findings one important question comes up: What is a blind spot in ITS evaluation? Is the blind spot the study and authoring team identified a real blind spot in European ITS evaluation or is it a “blind spot” that hides something more?

BLIND SPOTS IN THE EUROPEAN EVALUATION

LANDSCAPE

The study and authoring team identified a lack and an inconsistency of user acceptance and feasibility aspect information in European ITS evaluation reports and assumes that this is the consequence of the little number of user acceptance and feasibility assessments in the European ITS Evaluation reality that follow above all different methodological approaches.

But this lack and inconsistency of information may arise from various reasons and do not necessarily indicate a blind spot. Reasons that there is no blind spot in the Evaluation landscape may be:

- 1) The lack of user acceptance and feasibility aspects may well not be blind spot because this kind of information is well known or of little importance. If this is representing reality, the 2Decide Team does not know default values.
- 2) European ITS studies focus on bottlenecks and user acceptance information is not a bottleneck.
- 3) Funding scheme: European Commission wants to foster the assessment of user acceptance, feasibility aspect and their transferability. Local funding agencies pursue another strategy and co-finance the development of a prototype, but not its evaluation.
- 4) Developers' culture: Informally some communities share the strong believe that users and all the paper work has never contributed to any real progress. In the end it is more important that it works reliable. This limits the scope of evaluation studies to technical and functional reliability tests.
- 5) The lack of user acceptance and financial feasibility may be the very polite way stating the unpleasant truth that is less than slender evidence on users accepting these systems.
- 6) One reviewer pointed to the possible excuse that user acceptance is rarely documented because it can be a "complicated" issue. Standardization on the methodological approach for user acceptance and financial feasibility has not reached sufficient levels.
- 7) One reviewer argued that this lack of information is not a blind spot. It is rather focusing on what is more relevant. The study team feels we have no framework for discussing what aspects within ITS evaluation studies are more relevant or what can be skipped.
- 8) The 2DECIDE team could have missed excellent studies with user acceptance and feasibility aspect information.

CONCLUSION AND DISCUSSION ON POSSIBLE MEASURES

This paper presents first results of an analysis of studies dealing with user acceptance and feasibility aspects that is not finished at this point.

We have built the development of the ITS toolkit largely on the basis of available reports from case and evaluation studies from Europe. Our experiences clearly indicate that user acceptance and the feasibility aspects are not covered in an appropriate manner.

First, most studies simply neglect to report on any problems related to the legal, institutional, financial, business model and technical issues or even the technical performance related to the ITS system or service referred to in the report. Sometimes parts of this information exist only implicitly in the reports, requiring the ability of the educated reader to read between the lines. The reasons behind this may be related to a number of factors such as the comfort of a researcher of the impacts and socio-economy of an ITS application to stick to his/her area of

expertise, the understandable wish of the commissioner of the study not to highlight any embarrassing facts related to the deployment, the confidentiality of some contractual and business model details, and a number of other possible reasons.

Second, even if these issues and their solutions are explicitly reported, they are reported using vastly differing methods and indicators. This prevents us from building up a synthesis from the multitude of existing experiences with a particular type of ITS service or specific deployment solutions, and thereby drawing conclusions based on facts.

Third, much experience has been compiled in the private sector, especially related to the business model and technical issues. Reports of such are hard to come by as naturally such knowledge provides a competitive edge to the private sector stakeholder in question. At the same time, some of this experience has been accumulated during the course of European actions and projects supported by the European Union, and thereby the Member States.

From all this there is sufficient evidence to conclude that what we label blind spot is in itself a key obstacle for easily deploying ITS solutions. If the lack of information on user acceptance and feasibility aspects is in itself a key obstacle the question arises on how to tackle these obstacles. Two measures could have positively influence:

- 1) Promote standardized evaluation study designs with European ITS research funding bodies. The DOT ITS evaluation studies are commissioned from one federal agency. This agency defines the scope of the studies (research questions) and the study team imperatively needs to come from other states. Further currently the emerging discussion focuses on how ITS evaluation reports can proactively target entirely new stakeholder groups. Not the ITS evaluation experts, but those candidates who might be the next in deploying ITS.
- 2) Educate young researchers by means of the toolkit. The 2Decide database gives access on what is currently available. This allows younger researchers find templates and options from good practice without the necessity of reinventing the wheel.
- 3) Guide users expectations on this phenomenon and compile information from other sources. Compile generic estimates of user acceptance and feasibility aspect information on the basis of expert knowledge.

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