

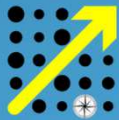
Cost Benefit Analysis for the Assessment of Intelligent Transportation Systems

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Presentation Outline

- Purpose
- ITS Assessment
- ITS Definitions
- ITS Assessment Overview
- Economic Assessment
- Issues to consider in ITS assessment
- Nature of ITS quantifiable benefits/dis-benefits
- Other ITS benefits
- CBA for ITS Assessment
- Examples of ITS capital & maintenance cost
- Examples of benefit figures from ITS impacts
- Special ITS Issues to consider in CBA
- Conclusions

Purpose of Presentation

- Demonstrate the use of CBA method in the evaluation of ITS
- Pinpoint the main differences of CBA application to regular transport infrastructure and to ITS
- Identify the most significant issues to be considered in ITS assessment

ITS Assessment

- ITS assessment closely related to ITS definition and ITS specific objectives
- Many ITS applications, many different objectives, different assessment methods
- Term “ITS assessment” used with different meanings:
 - Impact
 - Economic
 - Technical
 - Technological
 - Commercial
 - Multi criteria
 - Before and After
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ITS Definitions



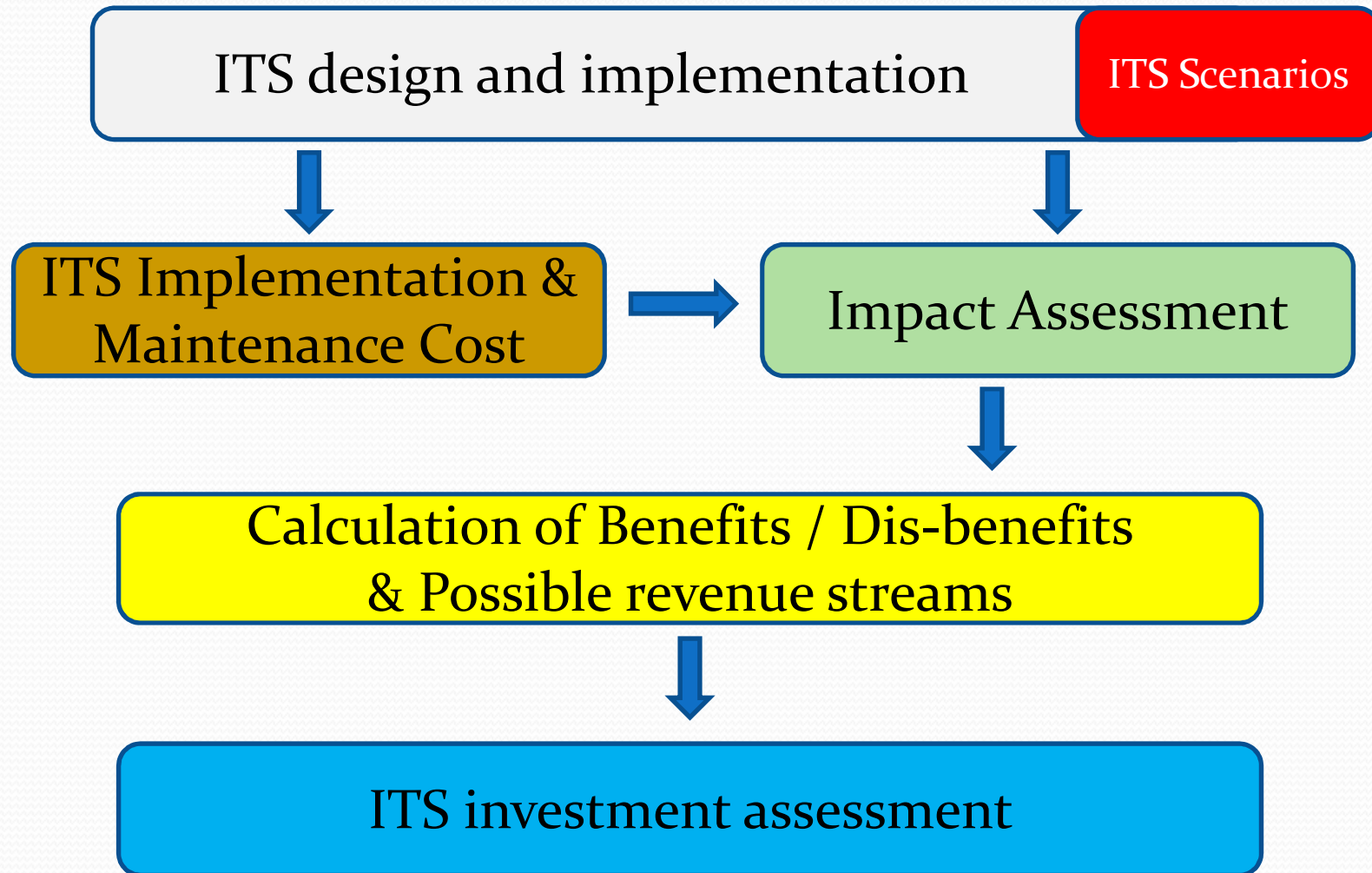
ITS apply well-established technologies in communications, control, electronics, and computer hardware and software to improve surface transportation system performance

ITS - integration of information and communications technology with transport infrastructure, vehicles and users. By sharing vital information, ITS allows people to get more from transport networks, in greater safety



- Collect and use information → create products and services → solve surface transportation problems
- Use “smart” technologies to improve mobility and provide useful information for the user

ITS Assessment overview



Economic Assessment

- Term used for both Socio-Economic Analysis and Financial (Viability) Analysis
- Both analyses required to justify the investment of transport infrastructure and/or (technological) systems (EU CBA Guidelines)



CBA not preferred so far for ITS evaluation →
Uncertainty about future impacts / benefits and
new technological advancements



Cost effectiveness
Impact assessment (estimation of impacts)
Multi-criteria analysis

Issues in ITS assessment

- Recipients of expected impacts
 - Users
 - Operators/Managing Agencies
 - Other Involved stakeholders
 - General public (non users)
- Categorization of benefits
 - Economic, social, environmental
 - Quantifiable (Q) and non quantifiable (NQ)
- Discrimination between
 - equipment/subsystem related benefits
 - complete system benefits (resulting from system integration)
- Market penetration of technology & traffic information services
- Maturity of involved authorities/agencies/stakeholders



Nature of ITS Quantifiable Benefits/Dis-benefits

Time savings of users
(private & professionals)



- Less congestion
- Avoidance of accident locations
- Change of departure time and/or route

Accident related
benefits



- Fatality and injury savings
- Savings from PDO accident reduction

Vehicle/Fleet operating
cost reductions



- Private vehicles
- Commercial vehicles
- Fleet Management costs
- Operations Planning

Environmental
benefits/dis-benefits



- Aerial pollution reduction
- Traffic noise reduction
- Visual Intrusion

Other ITS Benefits (Q & NQ)

Employment related benefits



- Job creation during implementation
- Job creation during operations

Quality related benefits



- User satisfaction
- User comfort
- User safety feeling
- Travel time reliability

Other Operator/Manager related benefits



- Increases in Efficiency
- Increases in Effectiveness
- Increases in Productivity



ITS areas and respective benefits

ITS area	Impacts	Benefits
Arterial & Freeway Management	Less congestion, improved safety , reduced pollution, better info provision, better M & O planning	Time savings , reduced operating costs, fewer fatalities & injuries , environmental benefits, user convenience
Freight & Fleet Management	Better Planning of operations, better services, increased demand , better image to clients	Operations cost savings , Increased productivity, efficiency and effectiveness, increased revenues
Incident Management	Avoidance of secondary accidents, less congestion, better public image, coordination among agencies	Time savings, reduced operating costs, fewer fatalities & injuries, environmental benefits , user convenience, increase efficiency and effectiveness of involved agencies
Emergency Management	Better and faster decision making for mitigation measures, better image to public and safety feeling	Operations cost savings, fewer fatalities & injuries , environmental benefits
Traveller Information	Better trip planning , less congestion, improved safety, reduced pollution	Time savings, reduced operating costs, fewer fatalities & injuries, environmental benefits, user convenience
Fare Collection and e-ticketing	Increased demand, fare evasion avoidance, more efficient pricing policy	Time savings, increased revenues , reduced operating costs, operating cost savings, increased productivity

CBA for ITS Assessment [1/4]

Socio-economic analysis

- ITS feasibility by using CBA standard economic indicators (EPV, ERR, BCR & PBP)
- Costs and benefits converted into money terms
- Uses market or shadow values to calculating costs and benefits
- Includes risk and sensitivity analyses

Financial analysis

- ITS financial viability under alternative funding schemes by using standard financial indicators (FPV/C, FRR/C, FPV/K & FRR/K)
- Includes all investment and O & M costs and all possible revenue streams
- Uses nominal prices and determines the cash-flow and system financing needs in short and long term
- Includes risk and sensitivity analyses

CBA for ITS Assessment [2/4]

Socio-economic analysis

- Economic analysis period is selected according to ITS components expected life
- Cost and benefits calculated on a differentiated basis against the Do-Minimum Scenario

Financial analysis

- Funding Gap Ratio method for the calculation of maximum EU financing
- Cost and benefits calculated on a differentiated basis against the Do-Minimum Scenario

ITS investment is co-financed by EU funds only if it is feasible ($EPV > 0$) and at the same time is non viable without EU grant ($FPV < 0$)

CBA for ITS Assessment [3/4]

Socio-economic Analysis

- Conversion of all cost and benefit items into monetary figures – Need for estimation / calculation of benefits
- Use of unit cost factors (actual or shadow)
- Analysis may include both tangible & intangible costs and benefits
 - time savings from alleviating congestion
 - environmental benefits
- Use of ITS benefit data from other sources - but with caution
- Need to employ several different valuation methods for non tangible benefits (contingent valuation, WTP/WTA, etc.)
- Use of SP surveys and/or other techniques for this purpose including behavioural models

CBA for ITS Assessment [4/4]

Financial Analysis (per scenario examined)

- Calculation of the initial investment cost and the financing needs for all examined funding schemes
- Calculation of M & O cost for all years of ITS operations
- Calculation of expected revenue streams per year (if applicable) based on demand figures for the services to be provided by ITS
- Use of nominal figures including taxes and subsidies, but no VAT
- Calculation of cumulated cash flow figures for the financial analysis period, including VAT
- Calculation of financial indicators for the total investment as well as for the equity provided by the responsible authority/ agency

Examples of ITS Capital & Maintenance Cost

Equipment	Average Lifecycle (years)	Capital Cost (€)	Maintenance Cost per device per year (€)
Inductive loops	5	3,000-8,000	500
MIDAS loops	5	12,000	640
Camera (CCTV)	10	54,000	640
Road Weather Station	15	35,000	600
Radar sensors	5-7	8,250-12,000	165
Reception of PSAP data	n/a	100.000	n/a

Reproduced from Commission SWD on CBA, 2013

Examples of Benefit Figures from ITS Impacts

- Unit values for benefits from Safety Improvements
 - Value of fatality saved: € 1,361,262
 - Value of serious injury: € 214,074
 - Value of less severe injury: € 16,428
- Savings from reduction in delays
 - Fatal accident: € 37,500
 - Injury accident: € 10,350

Reproduced from Commission SWD on CBA, 2013

Special ITS Issues to Consider in CBA

- Integration Issues
 - Data (Exchange)
 - Technological
 - Institutional
 - Stakeholder Involvement
- Agency Maturity Issues
- Diminishing benefits with time
- Multi-criteria Analysis required



- Impacts and hence benefits heavily rely on Integration and scalability
- Agency maturity and familiarity with ITS secure success and continuity
- Technological advancements are quite rapid
- Agency & Technological Maturity, Institutional and legal environment, User Acceptance

Impediments to ITS Evaluation

- Lack of clear ITS policy goals and objectives
- Lack of ITS architecture
- Inadequate knowledge of ITS impacts and benefits
- Lack of skilled personnel
- Strong inertia and reluctance of practitioners to change
- Political pressure
- Limited budgets

Conclusions

- CBA is appropriate for ITS evaluation → much better decision rule for ITS implementation than other approaches
- CBA for ITS not similar to CBA for evaluating transport infrastructure:
 - Many non quantifiable factors (Agency & Technological maturity, User acceptance, Institutional & Legal environment, etc.)
 - National and Regional Architecture should be taken into account as an evaluation criterion
 - Impacts and resulting benefits should be measured at different ITS consideration levels
- Multi-criteria Analysis (MCA) is a necessary supplement to CBA for a comprehensive evaluation of any ITS
- Involvement of Agencies in CBA and MCA is necessary
- Need for a new CBA framework



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Thank you for your attention

Questions?