AIRDEV

Airport Development 2012

Benefits of turnaround integration into the airport business trajectory:TITAN

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INSTITUTO SUPERIOR TÉCNICO

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Approach

- TITAN (Turnaround Integration in Trajectory and Network) is a project in the EU's Seventh Framework Programme;
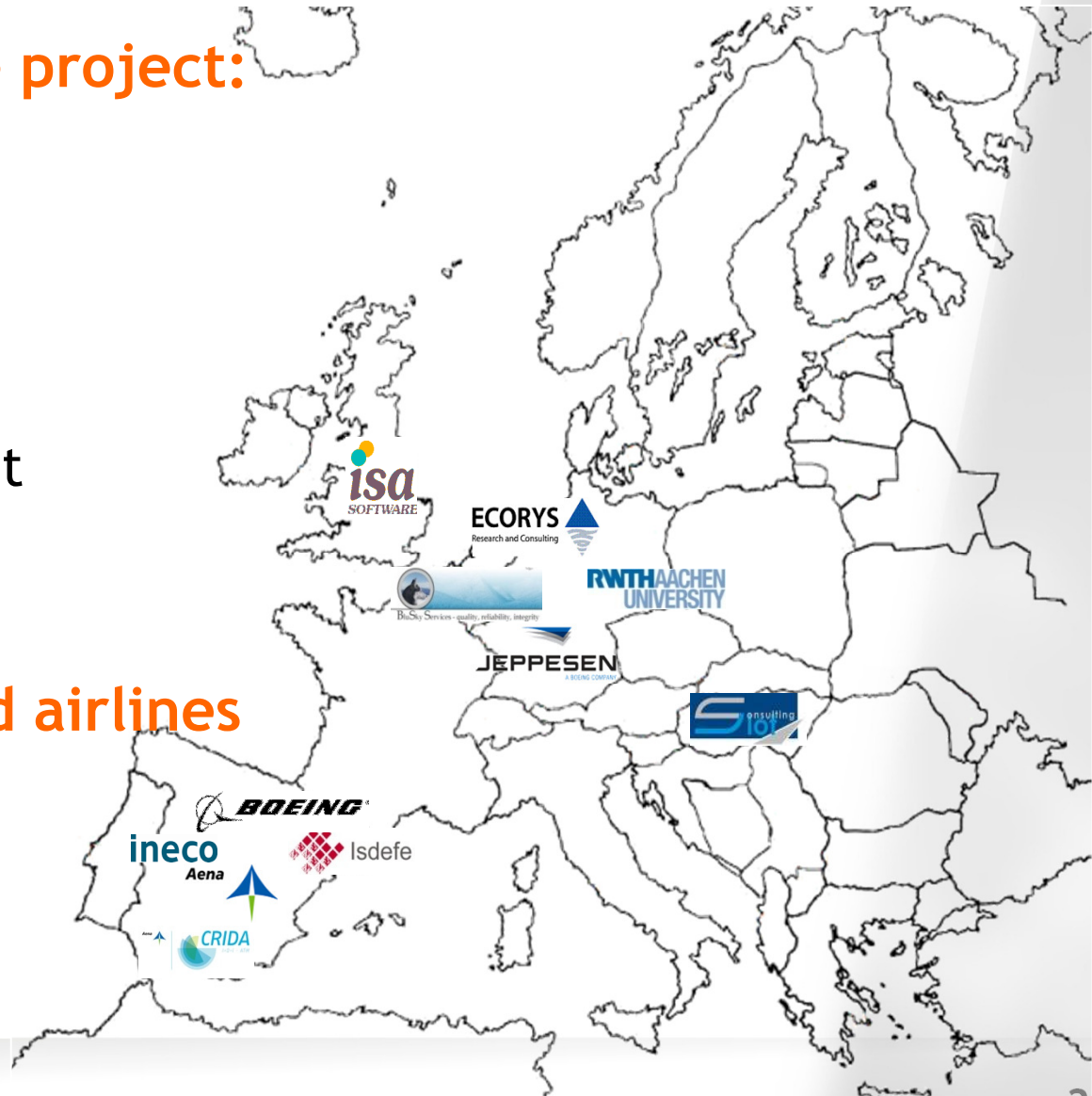- December 2009 – December 2012
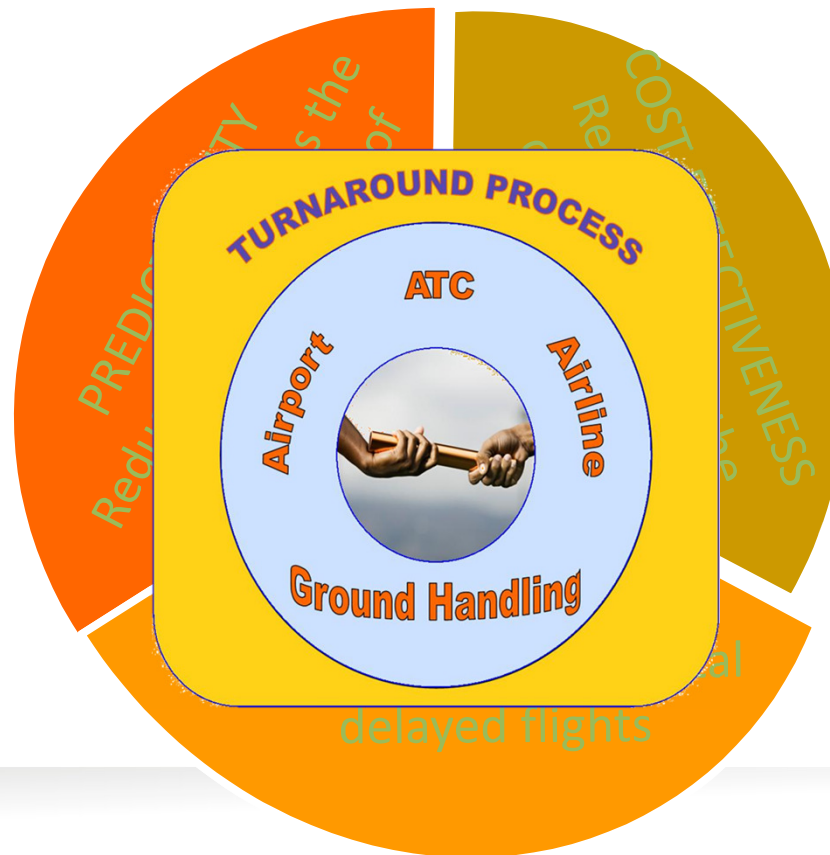
Project consortium

Expertise within the project:

- Management
- Airports + ANSP
- Concept
- Validation
- Economic assessment
- SW development
- Research

Ground handlers and airlines expertise:

- Workshops
- Personal interviews
- LinkedIn group

The turnaround process 1/2

Turnaround: set of services required from the time the flight arrives at its stand (AIBT – Actual In-Block Time) until the time it leaves it (AOBT – Actual Off-Block Time)

Depends on:

- size of aircraft
- itinerary of aircraft
- number of passengers
- volume of cargo to be loaded and unloaded
- company operating strategy

Length: from twenty minutes to three hours

The turnaround process 2/2

Typical turnaround process:

- The aircraft arrives to the stand
- Placing of chocks in front of the aircraft's wheels
- Ground Power Supply
- Unloading of passengers and baggage
- Post-flight administration
- Pre-flight administration
- Aircraft refuelling
- Catering replenishment

- Aircraft cleaning
- Draining of waste water
- Replenishment of potable water
- Security checks
- Loading of passengers and baggage
- De-icing of the aircraft
- Removal of chocks for departure
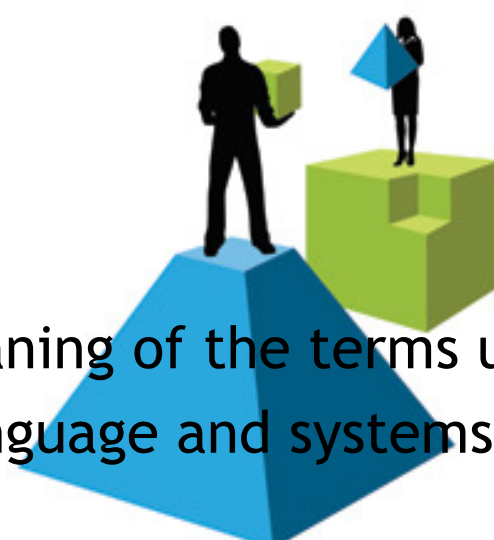- The aircraft leaves the stand
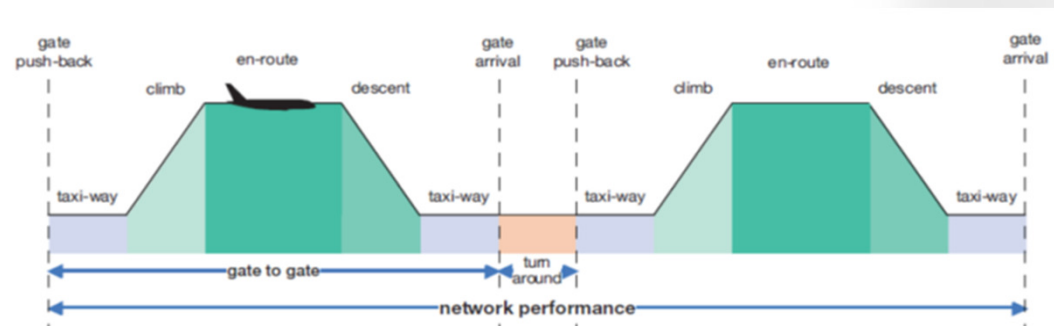
Why to analyse the turnaround?

- Airports are becoming the bottlenecks of the air transport network.

- In the year 2008, airport delays accounted for around 26.6% of total delays, and it is showing an increasing trend.

- The turnaround processes are the main cause of departure delays.

Shortcomings identified during TITAN 1/3

- Restricted information sharing
- Fragmented information flow;
- Inaccessibility of information;
- Lack of agreement regarding the meaning of the terms used;
- Lack of common and standardised language and systems

- Late detection of the deviations from the original planning;
- Poor visibility of the handling process of the aircraft to all the actors involved;
- Lack of continuous monitoring and updating of the process;

Shortcomings identified during TITAN 2/3

- Deficiencies in passenger and baggage handling process (check-in, security, border control, boarding).
- Weak integration of the turnaround in the overall planning process;
- Lack of unified data coding;
- Increasing of hidden costs due to operational inefficiencies;
- Lack of a European standard turnaround process due to different national regulations which makes difficult to unify different practises

Shortcomings identified during TITAN 3/3

- Slow boarding procedure;

- Inadequate departure planning because of the lack of an advanced and integrated CDM process;

- Infrastructural and resource optimization problems due to increasingly demanding security process;

- Inadequate information to stakeholders about the actual position and purpose of their vehicles involved in the service of an aircraft

TITAN vision

TITAN ConOps:

- An advanced operational concept for the turnaround as an integral part of the aircraft trajectory, taking into account also the relevant landside processes and based on the principle of Collaborative Decision Making (CDM) and System Wide Information Management(SWIM)

Leading principles:

- Integration with ATM Trajectory Based Operations;
- Integration with airport and network CDM;
- Service Oriented Approach;
- Net-centric Approach;
- Integration with different levels of information management;
- Automation and decision making support;
- Communications support.

The TITAN Tool: definition

- The Titan tool is a non-commercial demonstrator software package to prove feasibility and benefits of the TITAN concept
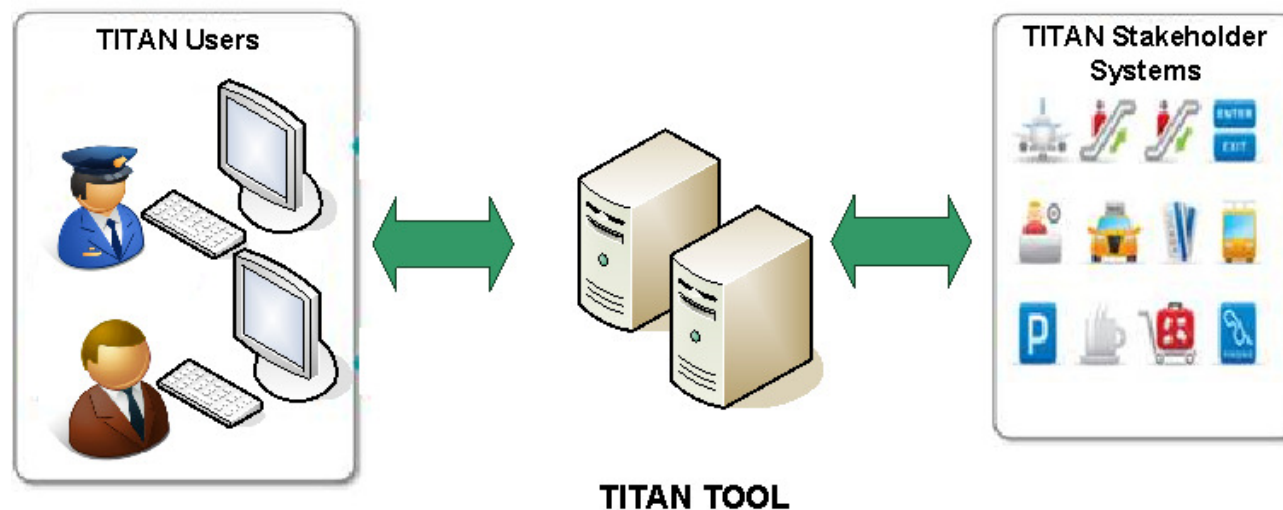
The TITAN Tool: objectives

- Provide extra predictability for the turnaround process;

- Extend the forecast horizon of the stakeholders responsible for different aspects of the turnaround;

- Contribute to the human-machine communication efficiency in order to prevent channel overload;

- Publish reliable information to the interested parties in a secure, controlled manner, through a protocol that promotes information reusability;

Provide extra
predictability

Extend the forecast
horizon

Contribute to the human-
machine communication
efficiency

Publish real-time, reliable information
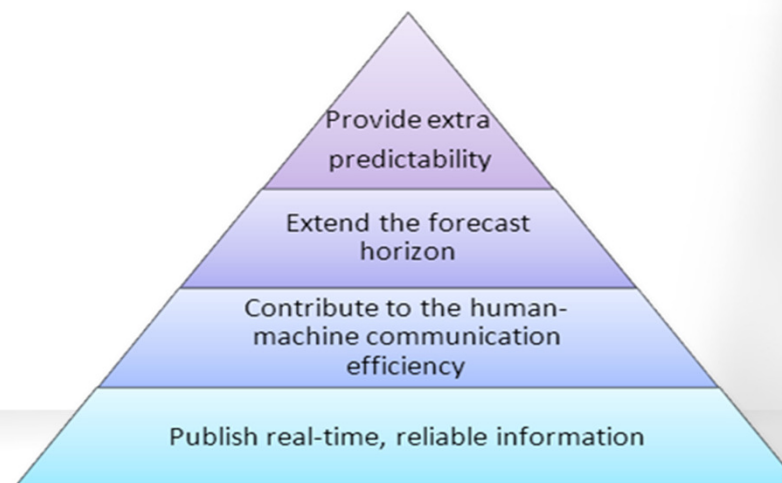
The TITAN Tool: Information flow

TITAN Information Sharing (TIS)

- one of the basic TITAN applications

Using existing infrastructure at airports, but to be improved by:

- Combining data from different sources
- Adaptations of existing information systems

Necessary to know

- Inputs or trigger from external actors (ground handling, ATC, land-side, etc) in order to recalculate the EOBTs according to different possible scenarios

The TITAN Tool: benefits 1/2

The TITAN Tool is targeted at airlines whose are the main beneficiaries expected to operate the tool.

- Multiple airlines at a single airport (operation center) can operate the system.

- It is assumed that each airline would operate their own instance of the system, tailored to the particular airline operation in order to improve their decision making .

- Airlines are not the only beneficiaries; other stakeholders may benefit by the tool implementation: increased predictability in providing their services, as well as a potential better resource allocation should result in more cost-efficient operations.

- Easy to use: a minimal training is needed

- Impose minimal additional hardware/software requirements on users; i.e. aim to operate on their existing equipment;

- Highlight priority issues, i.e. inform the user if a group of passenger is missing

- Allow the user to see more details information specific to an issue; i.e. how many bags the missing passenger have checked in, where those bags are packed on the aircraft, etc..

- Potentially suggests solutions to some of the resourcing issues that may results from changing the planned turnaround schedule.

The CBA process: objective

- To investigate benefits for different stakeholders and costs needed to implement and operate the TITAN tool

- To define and agree on a business model for the marketable product through a constant dialogue with tool developers;

- To consider multiple stakeholders to demonstrate how the TITAN tool serves the interests of all the actors participating in the turnaround process;

- To present a CBA for each stakeholders, which implies a proper allocation of costs and benefits.

The CBA process: relevant issues

- One of the most relevant issues in assessing the CBA concerns how the cost of the tool development and implementation will be absorbed.

- As not all the stakeholders will use the same level of information, the future benefits and costs borne will be different for each of them. The cost will depend on the quantity and the level of information and data every stakeholder wants to obtain with the use of the TITAN tool
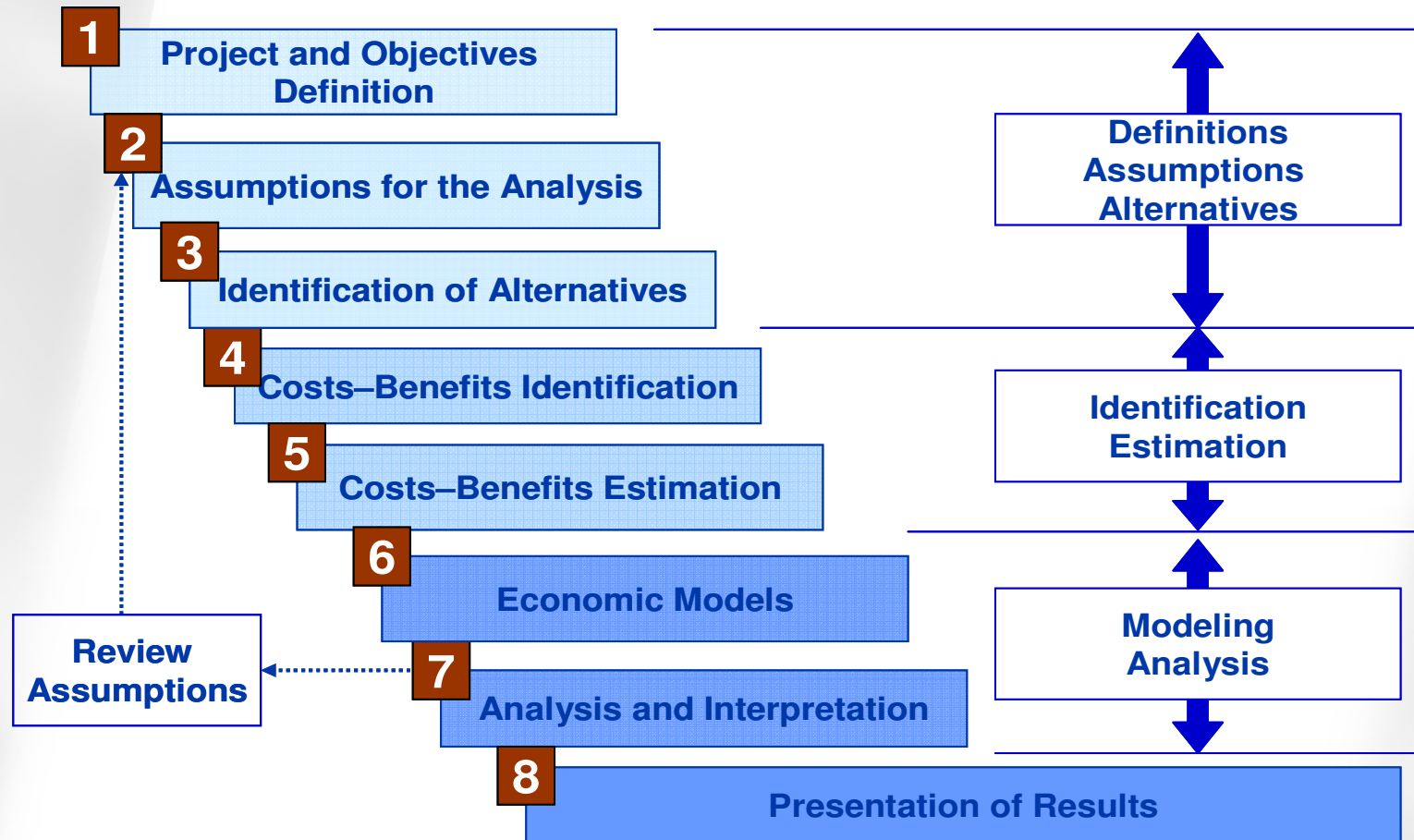
Different solutions have been proposed:

- A full purchase of the tool by the airline (including maintenance and support)

The CBA process: relevant issues

- A service based consultancy operation of the tool (only pay for the services used, where the service is outsourced)

- A "pay as you go" (fee based) model where only successful transactions are charged

- A government (or governing body) provider (ANSP?) is responsible for purchasing the cost of the tool, while airlines are responsible for operation of the tool (due to the expected safety and efficiency benefits)

The CBA Process 1/2

1 Project and Objectives Definition

2 Assumptions for the Analysis

3 Identification of Alternatives

4 Costs–Benefits Identification

5 Costs–Benefits Estimation

6 Economic Models

7 Analysis and Interpretation

8 Presentation of Results

Review Assumptions

Definitions
Assumptions
Alternatives

Identification
Estimation

Modeling
Analysis

The CBA Process 2/2

- To create economic models for each of the stakeholders,

- To determine benefits and costs for each of them

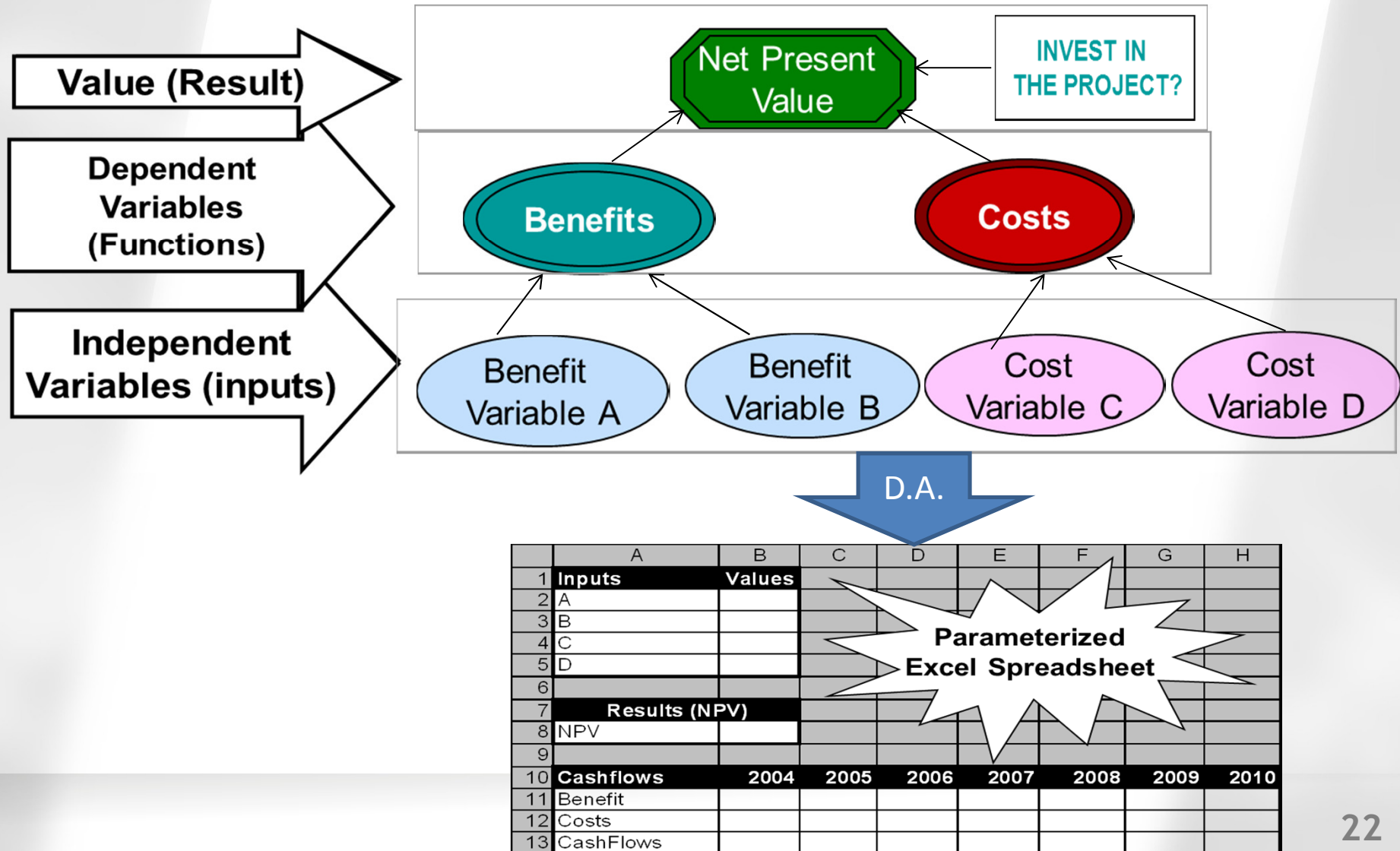- Embrace uncertainty for data: multipoint estimations and associated probabilities,
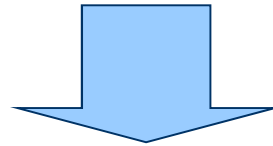
- Sensitivity Analysis: Tornado Charts

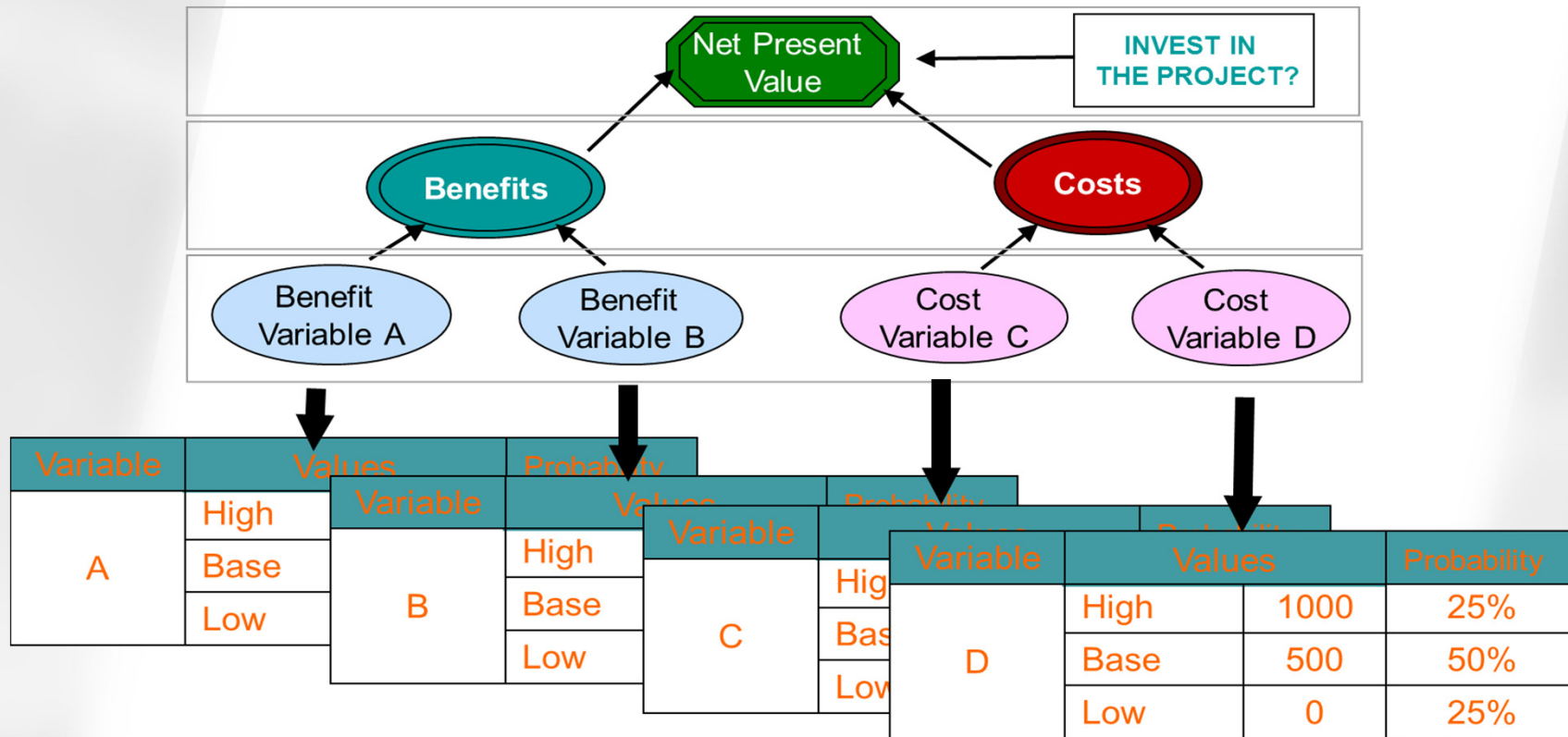- Probabilistic (risk) analysis: Probability Distribution Curves

Economic Models, Influence Diagrams
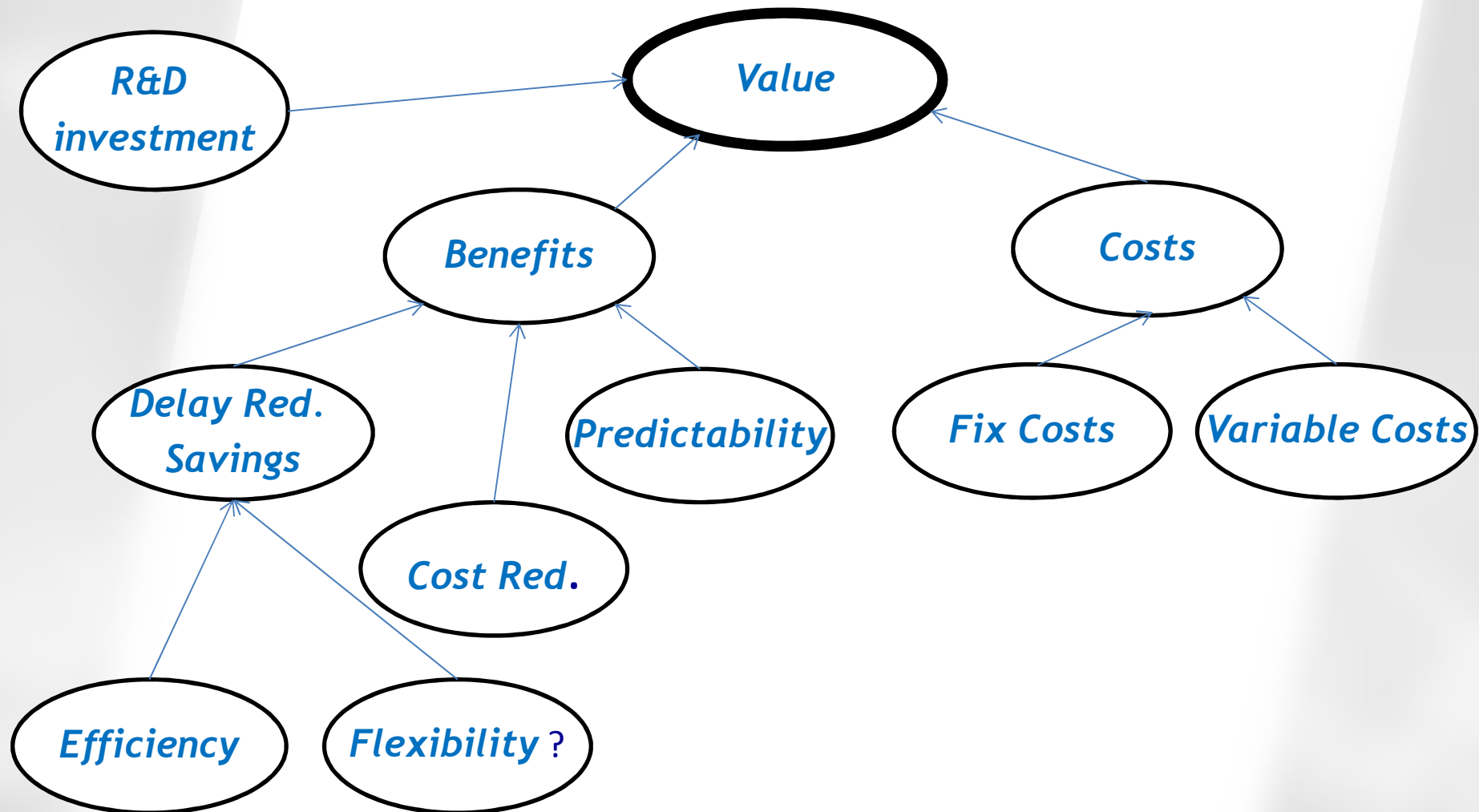
Economic Models, Spreadsheets
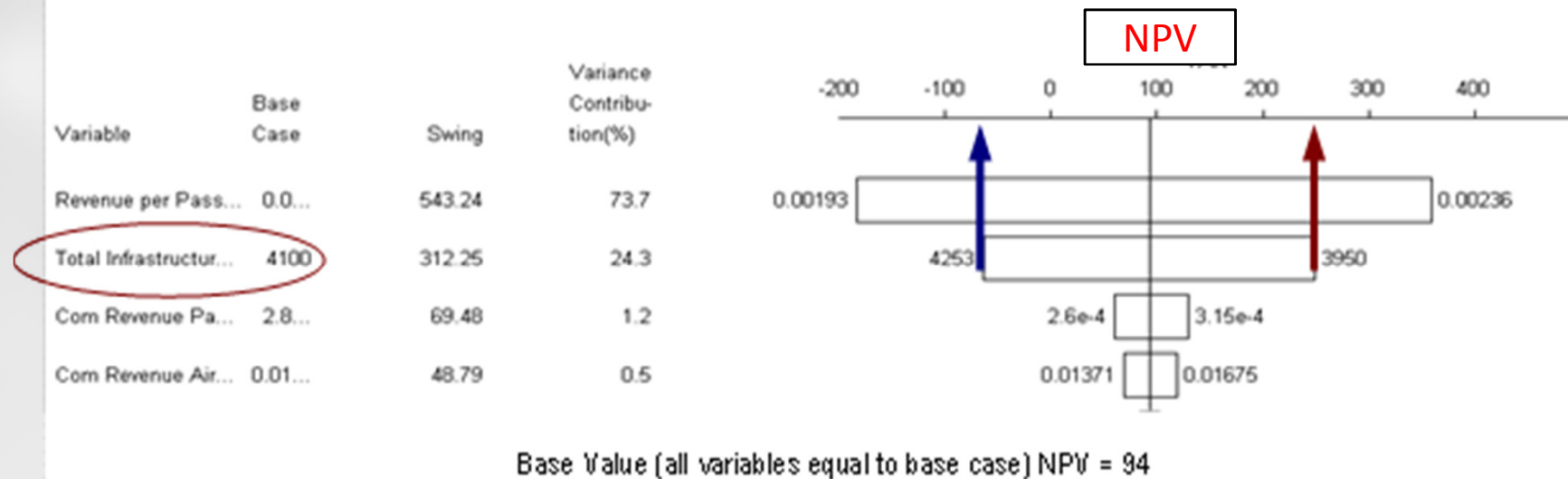
Costs and Benefits: Uncertainties

Data. Multi point estimations: Values and associated probabilities

Sensitivity analysis: Tornado diagrams

NPV

Variable	Base Case	Swing	Variance Contribution(%)
Revenue per Pass...	0.0...	543.24	73.7
Total Infrastructur...	4100	312.25	24.3
Com Revenue Pa...	2.8...	69.48	1.2
Com Revenue Air...	0.01...	48.79	0.5

Base Value (all variables equal to base case) NPV = 94

- Tornado Diagrams show the change in the value (NPV) when a variable changes from the high to the low value while keeping the rest variables to the base value
- In this example, when the variable "Total Infrastructur." equals to 3950 the NPV is 250 (Blue Arrow). However, if the variable is 4253, the NPV is -75 (Red Arrow).
- *Tornado diagram allows "What If Analysis..." (i.e. What happens to the NPV of this projects if the value of the variable equals to ...)*

What *happens to the NPV of this projects* if *the value of the variable...*

Risk Analysis
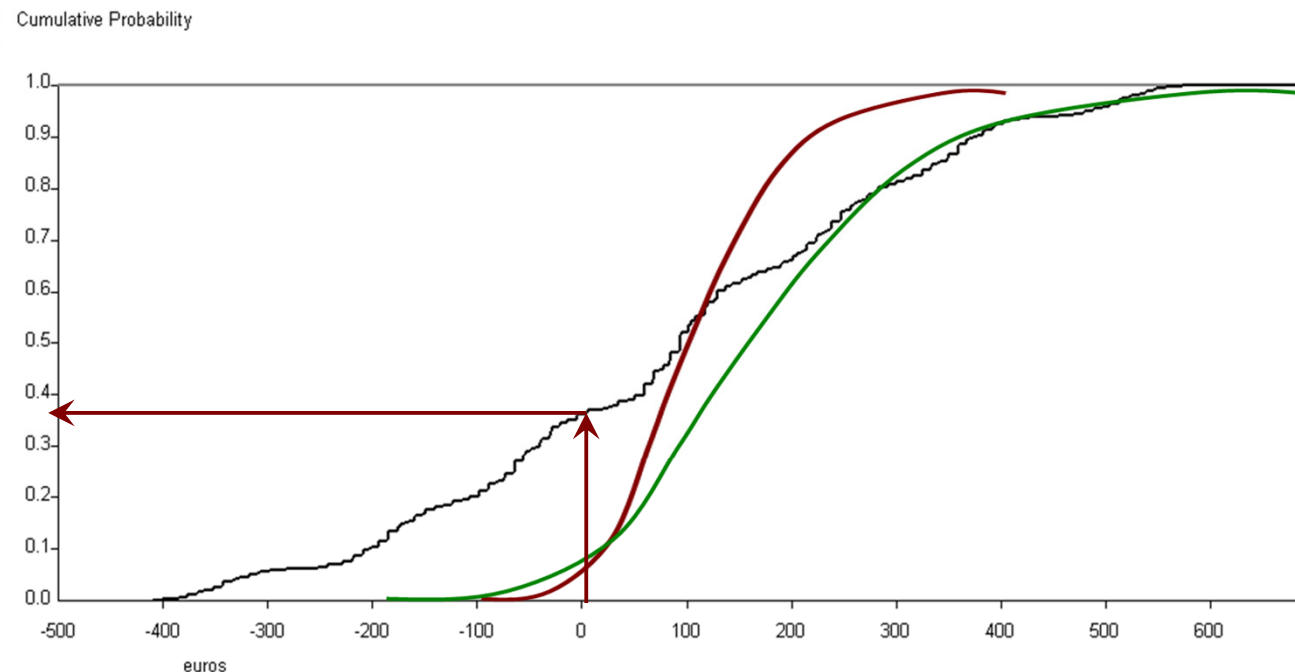
Cumulative Probability Curves show the probability that a variable (NPV) is less than or equal to a given value.

Allows to compare alternatives from a risk and reward standpoint.