

Techno-economic analysis of reliable ICT networks and services

Sofie Verbrugge

Invited talk DRCN2017
Munich, Germany, March 9th 2017

Techno-economic analysis

supports investment decisions

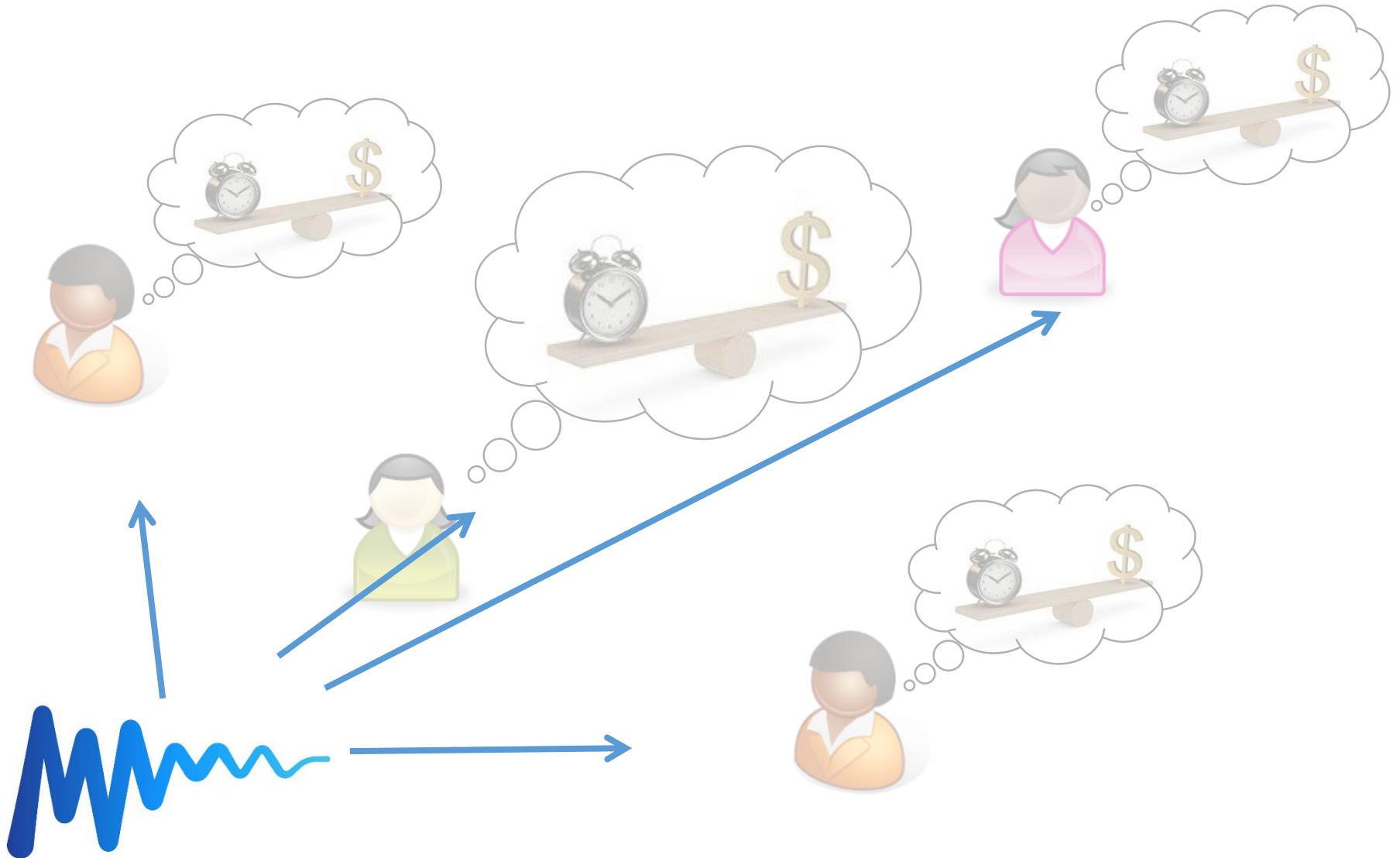


Techno-economic analysis is always done in a multi-actor context



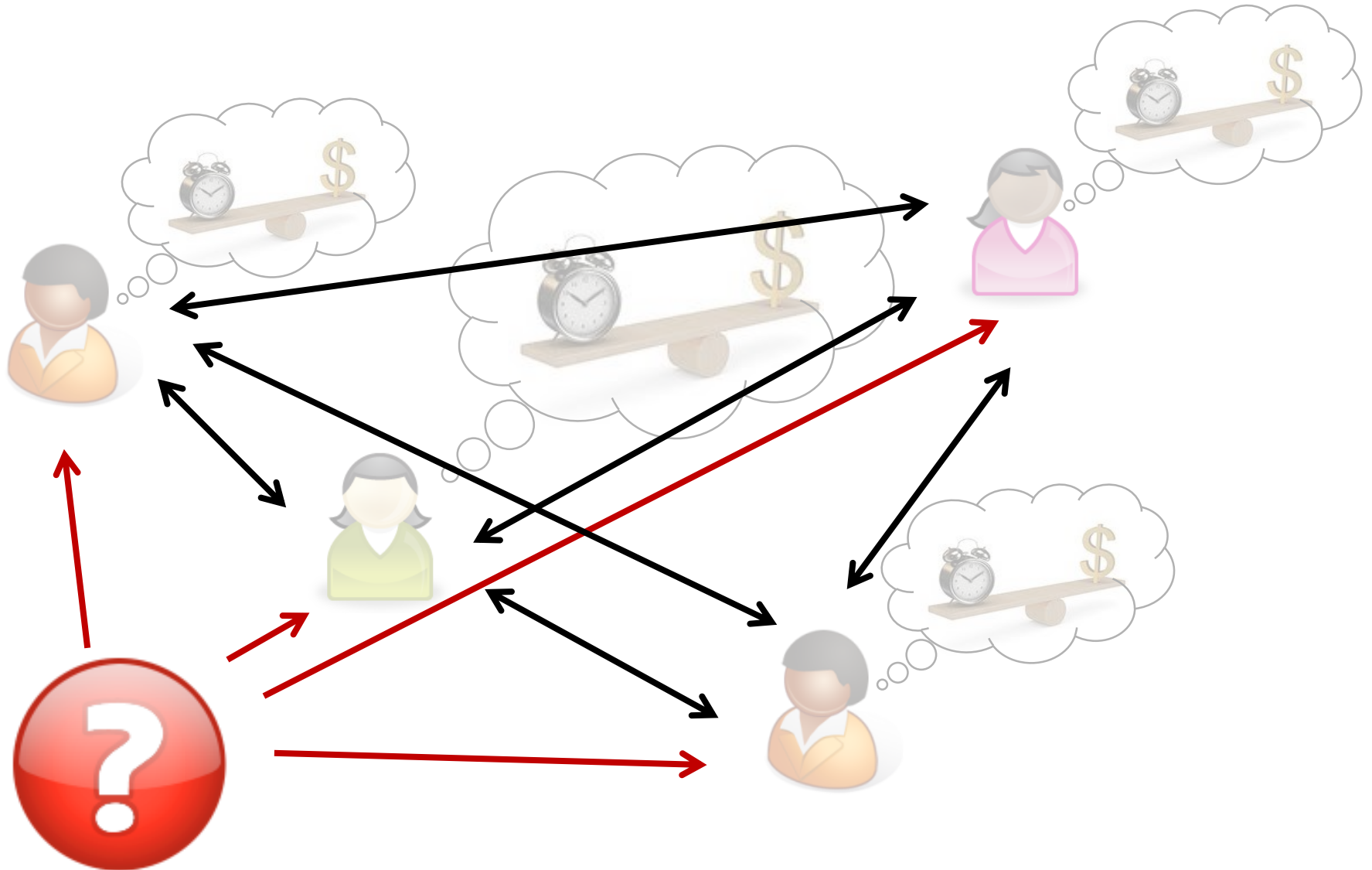
Techno-economics analysis

deals with expected market and customer dynamics



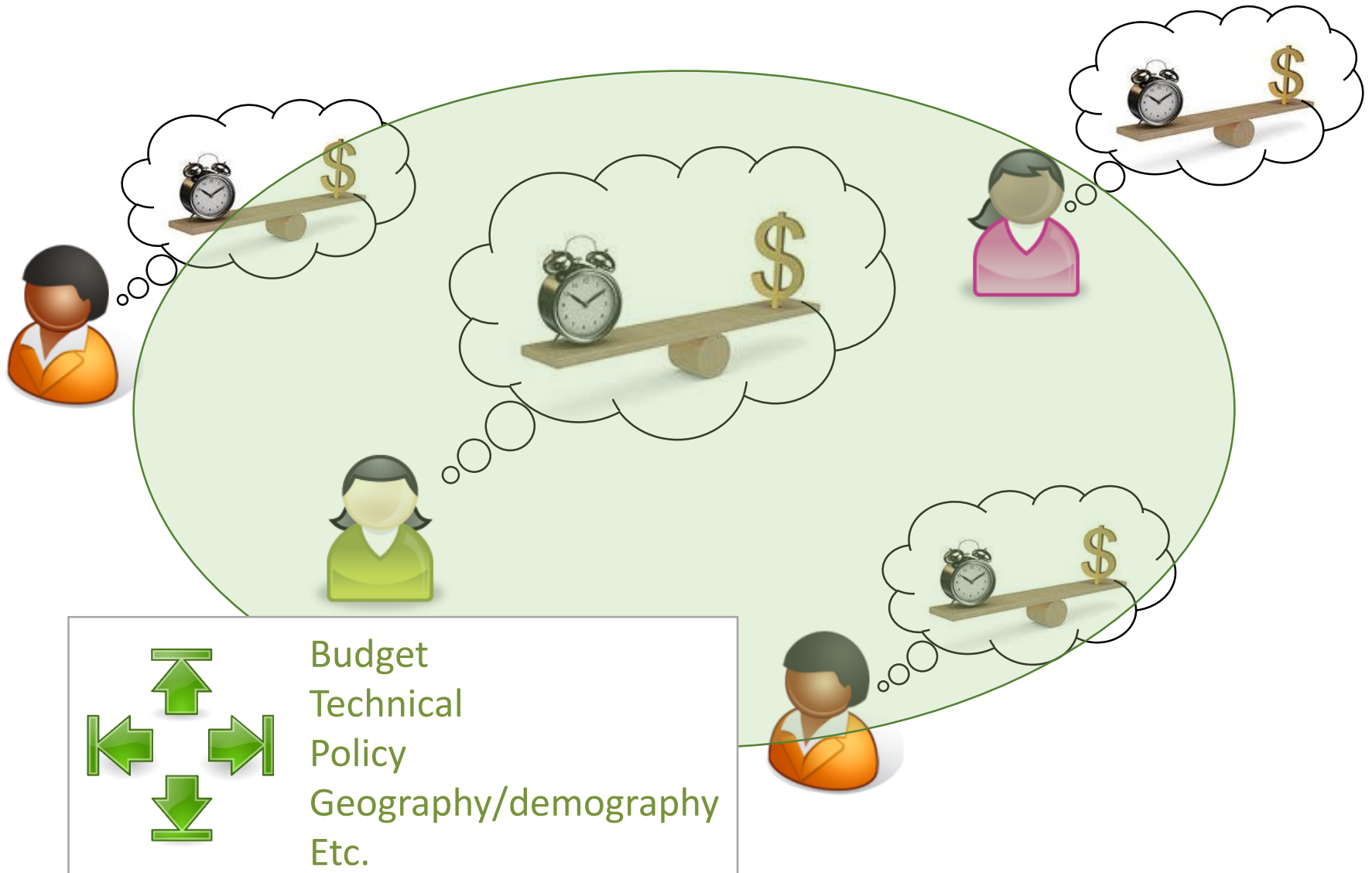
Techno-economics analysis

takes the impact of uncertain changes into account



Techno-economics analysis

needs to adapt to boundary conditions

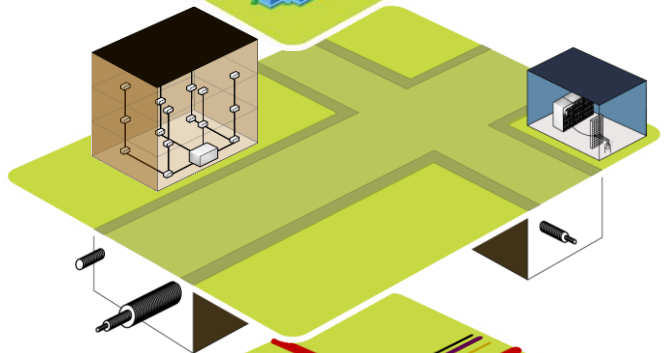


Investment decision based on innovation can be situated on different layers in the network stack

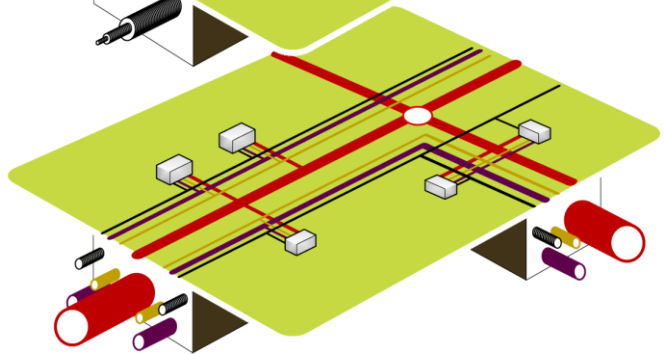
Service deployment
and operations



Network
deployment



Infrastructure
deployment

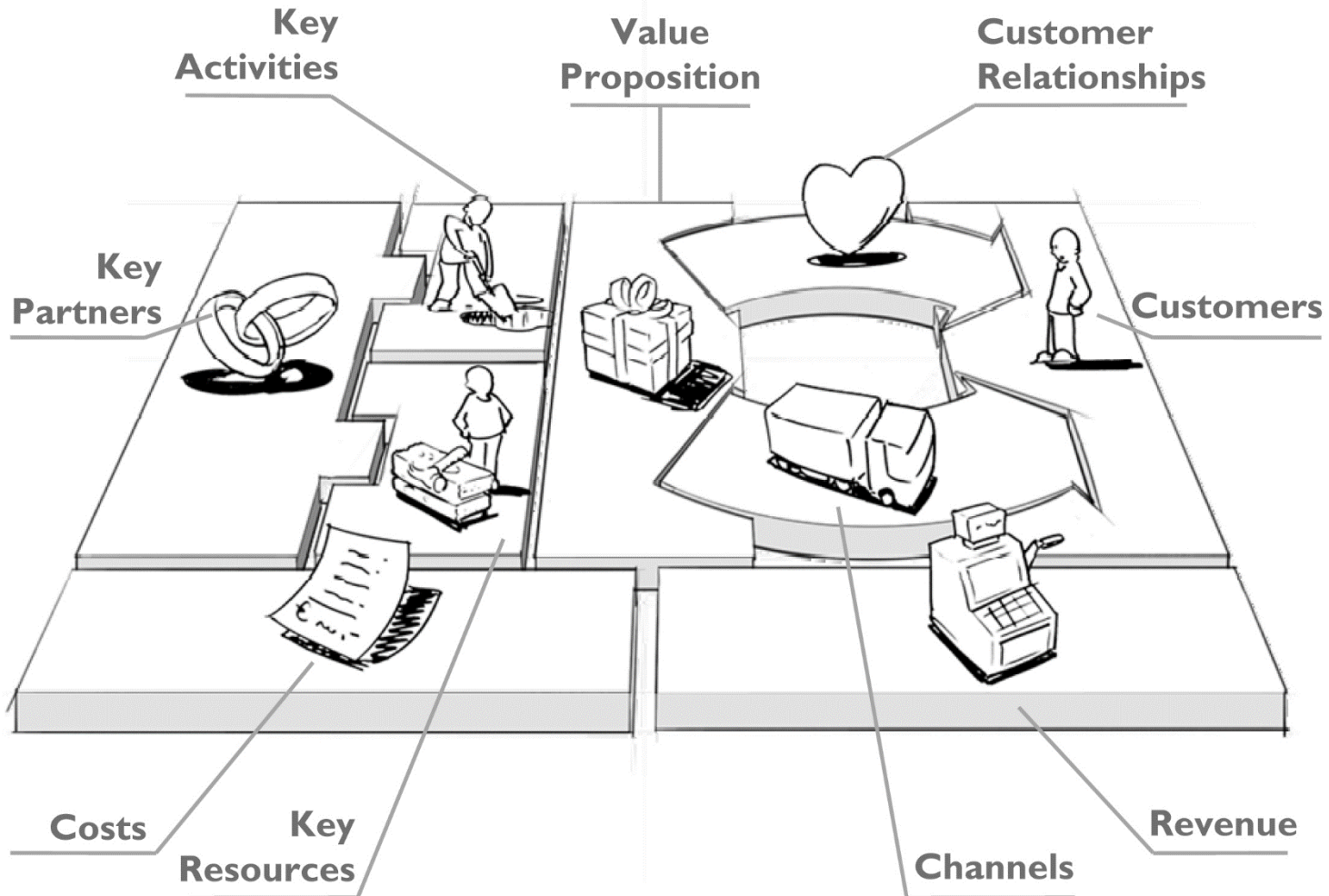


Outline

- What is techno-economic analysis?

Business Model Canvas

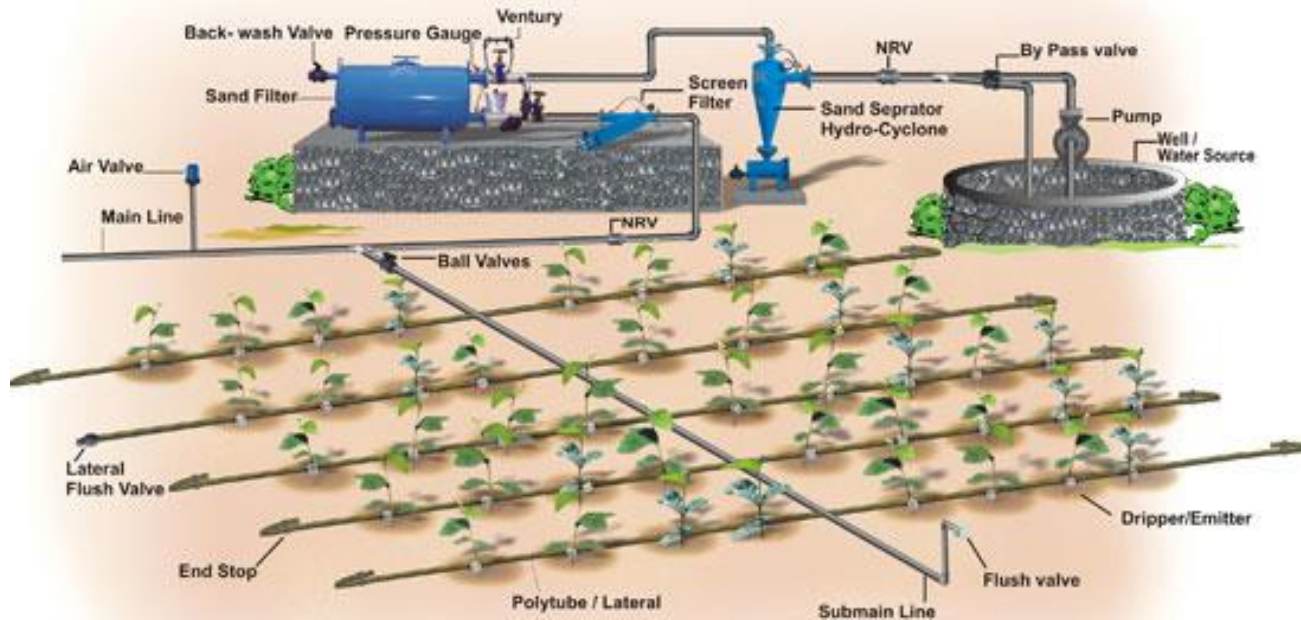
proposed by A. Osterwalder



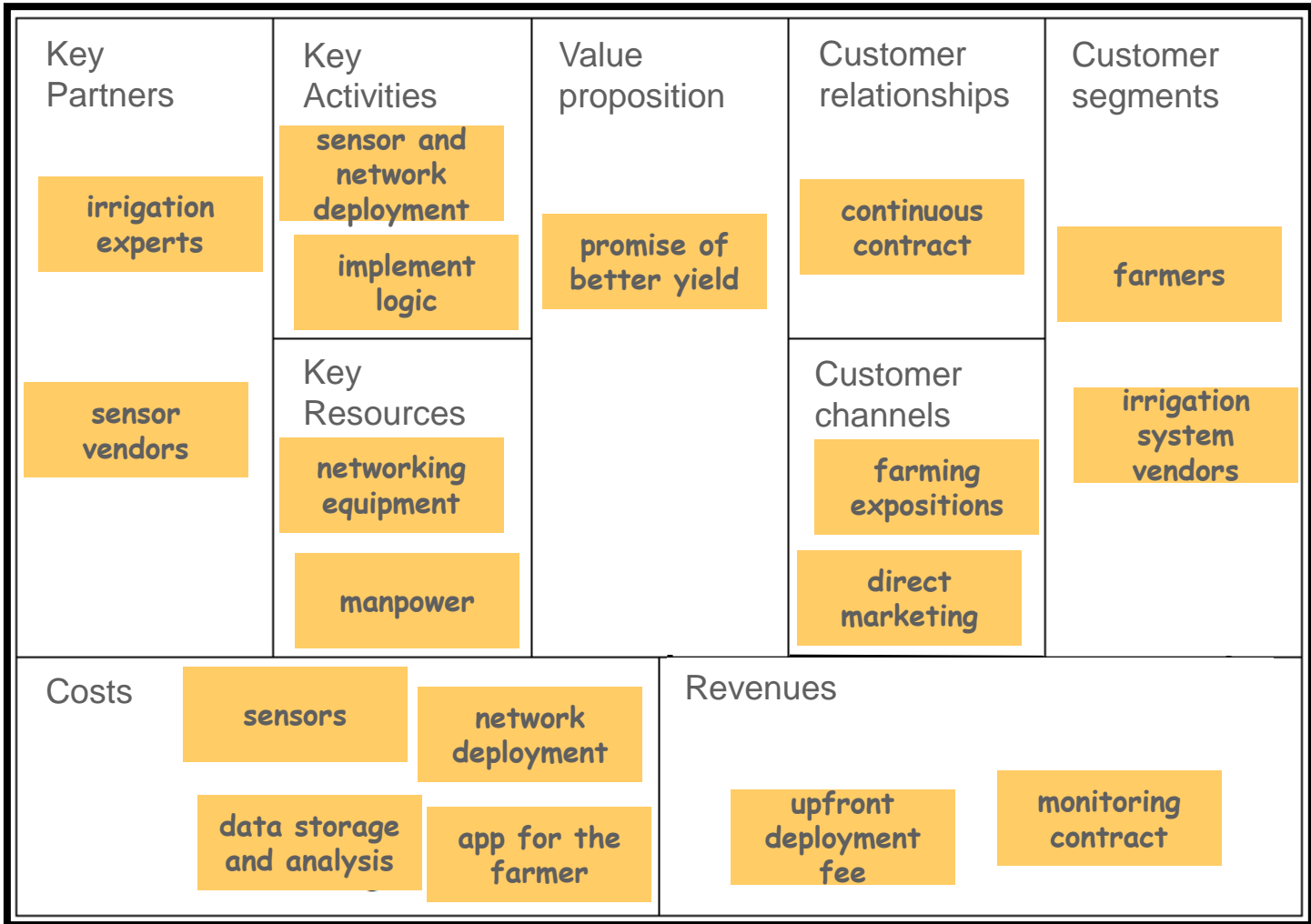
drawings by JAM

Example: Irrigation monitoring system

smart farming solution based on IoT



Example: Irrigation monitoring system business model canvas



Template and explanation available for business model canvas

Designed for:

Designed by:

Date:

Version:

The Business Model Canvas

<p>Key Partners </p> <p>Who are our Key Partners? Who are our key suppliers? Which Key Resources are we acquiring from partners? Which Key Activities do partners perform?</p> <p>KEY PARTNER BENEFITS Reduction in our operating costs Reduction of our risks Reduction of our operational costs</p>	<p>Key Activities </p> <p>What key activities do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue streams?</p> <p>KEY ACTIVITIES Manufacturing Procurement Human resources</p>	<p>Value Propositions </p> <p>What value do we deliver to the customer? Which one of our customer's problems are we helping to solve? What bundles of products and services are we offering to each Customer Segment? Which customer needs are we satisfying?</p> <p>VALUE PROPOSITIONS Performance Reliability Customization Being the first to market Price Risk reduction Convenience Self-Service Risk Reduction Flexibility Accessibility Interoperability</p>	<p>Customer Relationships </p> <p>What type of relationship does each of our Customer Segments expect us to establish and maintain with them? Which ones have we established? How are they integrated with the rest of our business model? How costly are they?</p> <p>CUSTOMER RELATIONSHIPS Self-Service Personalized Automated Personal Assistance Self-Service Automated Services Co-creation Co-branding</p>	<p>Customer Segments </p> <p>For whom are we creating value? Who are our most important customers?</p> <p>KEY SEGMENTS Mass Segment Niche Segment Segment of One New Value Network</p>
<p>Key Resources </p> <p>What Key Resources do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue Streams?</p> <p>KEY RESOURCES Channels Human Resources Manufacturing Infrastructure Intangible Assets Physical Assets</p>		<p>Channels </p> <p>Through which Channels do our Customer Segments want to be reached? How are we reaching them now? How are we targeting them next? How are our Channels integrated? Which ones are best? Which ones are most cost-efficient? How are we integrating them with customer touchpoints?</p> <p>CHANNEL STRATEGIES 1. Awareness 2. Evaluation 3. Purchase 4. Post-purchase 5. Retention 6. Referral</p> <p>1. Awareness 2. Evaluation 3. Purchase 4. Post-purchase 5. Retention 6. Referral</p> <p>1. Awareness 2. Evaluation 3. Purchase 4. Post-purchase 5. Retention 6. Referral</p> <p>1. Awareness 2. Evaluation 3. Purchase 4. Post-purchase 5. Retention 6. Referral</p>		
<p>Cost Structure </p> <p>What are the most important costs inherent in our business model? Which Key Resources are most expensive? Which Key Activities are most expensive?</p> <p>KEY COST STRUCTURES Our Customer Segment? Our activities for price-value proposition, customer acquisition, retention, upselling Our Channels? Channel or value network, production and operations</p> <p>KEY COST STRUCTURES Fixed costs Variable costs Semi-variable costs Economies of scale</p>		<p>Revenue Streams </p> <p>For what value are our customers really willing to pay? For what do they currently pay? How are they currently paying? How should they prefer to pay? How much does each Revenue Stream contribute to overall revenues?</p> <p>REVENUE STREAMS Asset Sale Usage Fee Subscription Fee Licensing Advertising Transaction Fee Rental Fee Performance-based Customer segment Marketplace Usage-based Advertising</p> <p>REVENUE STREAMS Asset Sale Usage Fee Subscription Fee Licensing Advertising Transaction Fee Rental Fee Performance-based Customer segment Marketplace Usage-based Advertising</p> <p>REVENUE STREAMS Asset Sale Usage Fee Subscription Fee Licensing Advertising Transaction Fee Rental Fee Performance-based Customer segment Marketplace Usage-based Advertising</p>		

DESIGNED BY: Business Model Foundry AG
The makers of Business Model Generation and Strategyzer

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Strategyzer

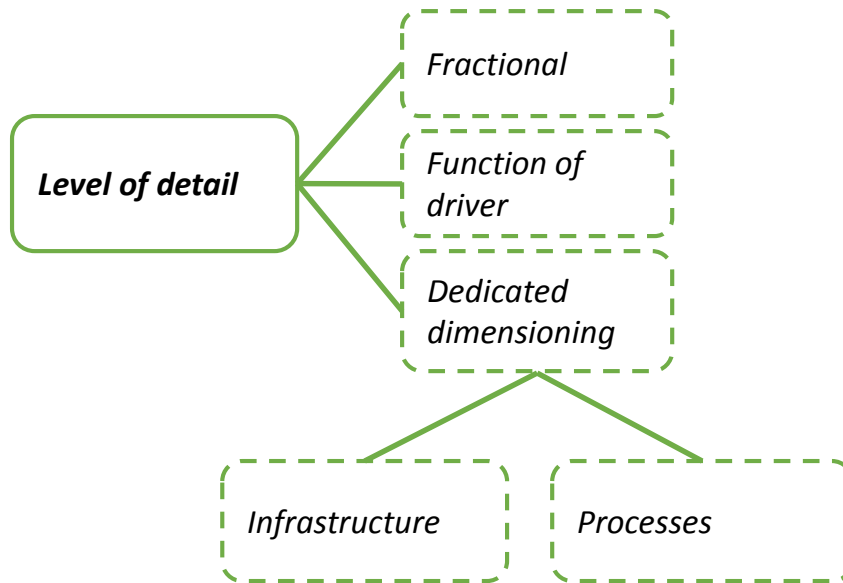
strategyzer.com

Outline

- What is techno-economic analysis?
- How to make a quick assessment?
- What are appropriate cost models in an investment analysis?
- How to integrate more advanced concepts in an easy way?
- Where to find all information?
- Wrap-up and call for action

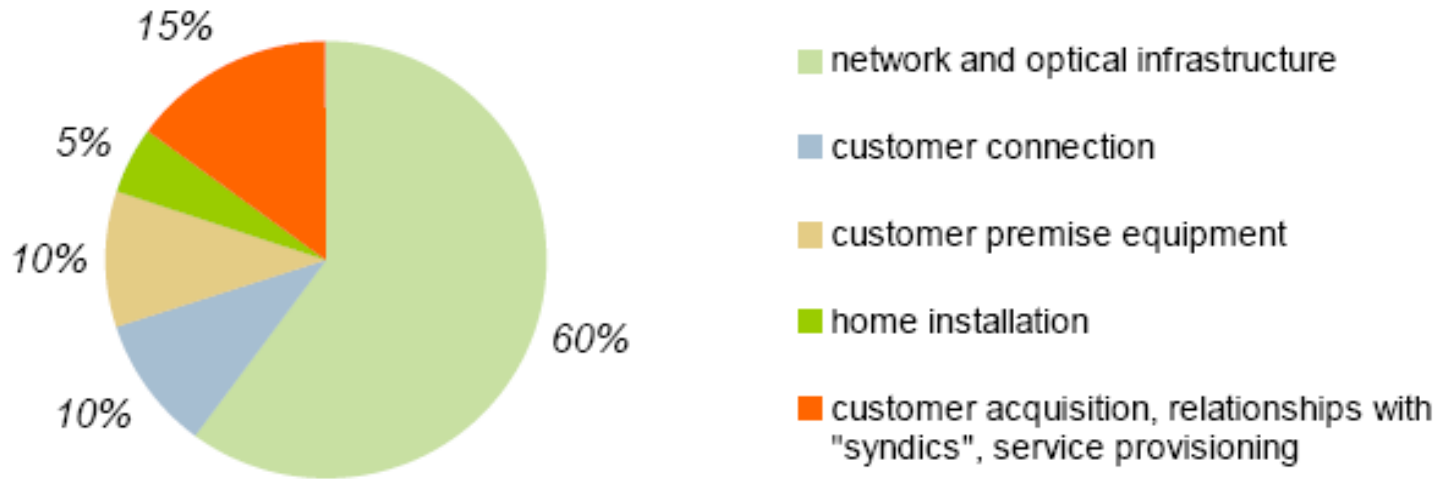
Appropriate level of detail/abstraction

depends on available input data and goal of the model



Fractional cost modeling is on the highest abstraction level

cost structure derived from pilot phase



for a 10% penetration rate (subscribers / home passed)

Source: Orange – from FTTH pilot to pre-rollout in France

Determine fraction of overall costs to allocate to different parts based on previous projects (pilots, other areas, etc)

Function of driver cost modeling

is on the intermediate abstraction level



Examples of drivers:

installation length (50€/m)

customer base (1k €/cust)

...

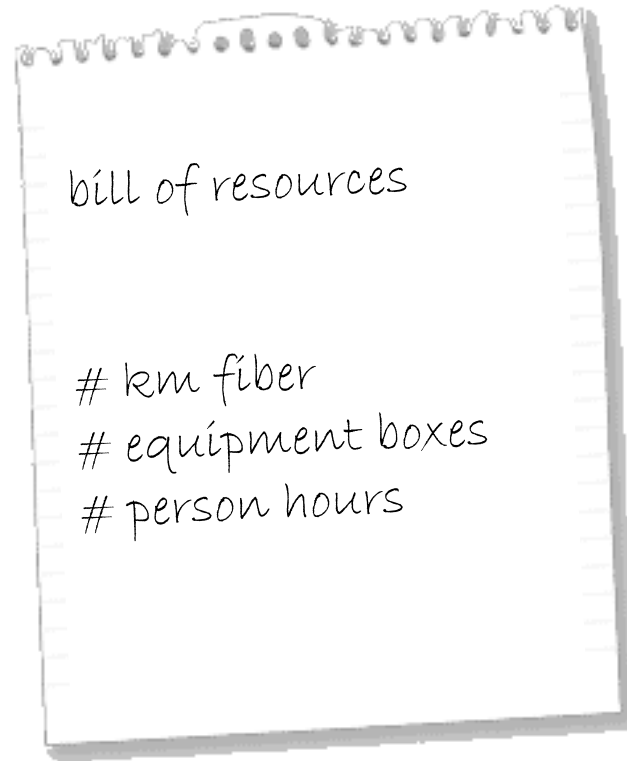
→ combinations possible

Find the parameter that mainly drives the cost

This is the most common cost modeling approach!

Dedicated dimensioning

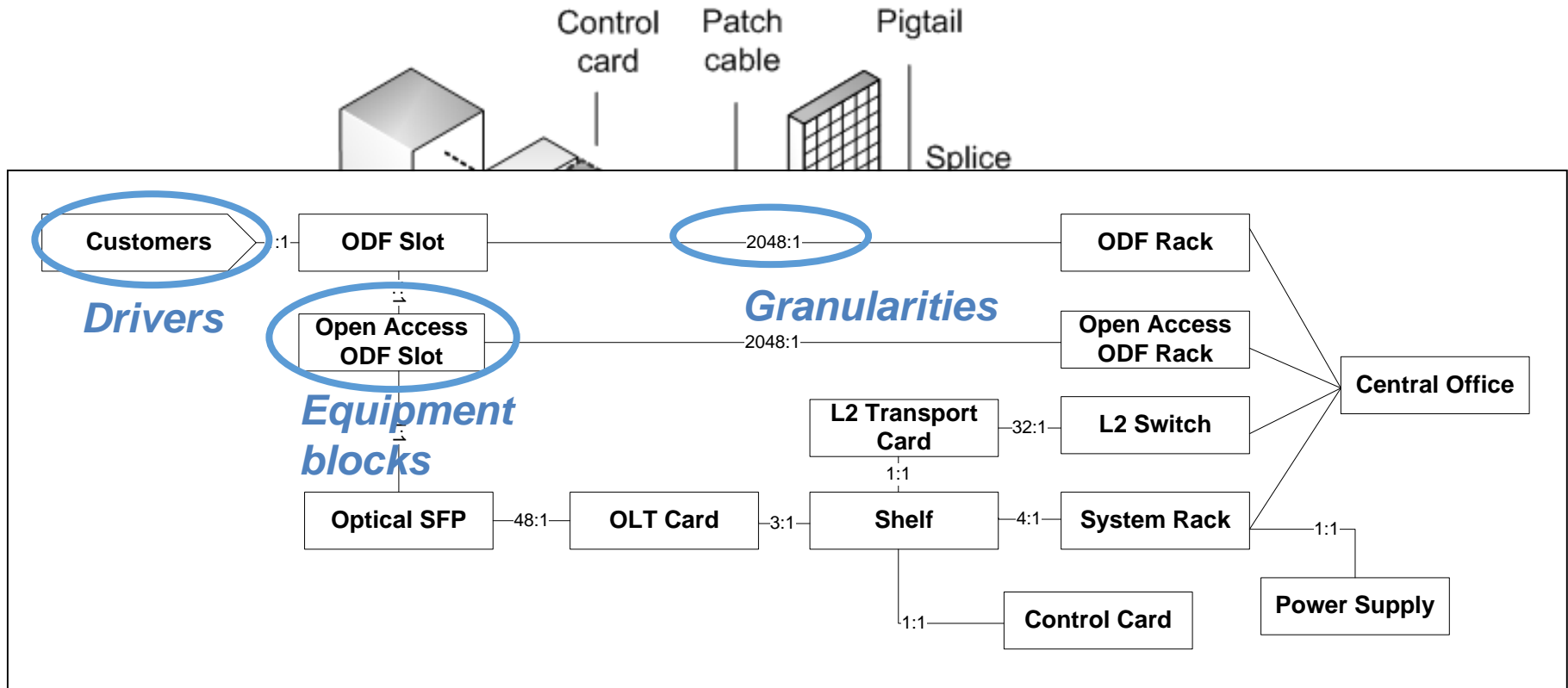
is on the lowest abstraction level, thus gives most detail



Model in detail all resources that you need based on detailed view of actual implementation

Detailed equipment modeling using ECMN

example: FTTH network



Open ECMN specification available

part of FI-ware open specification

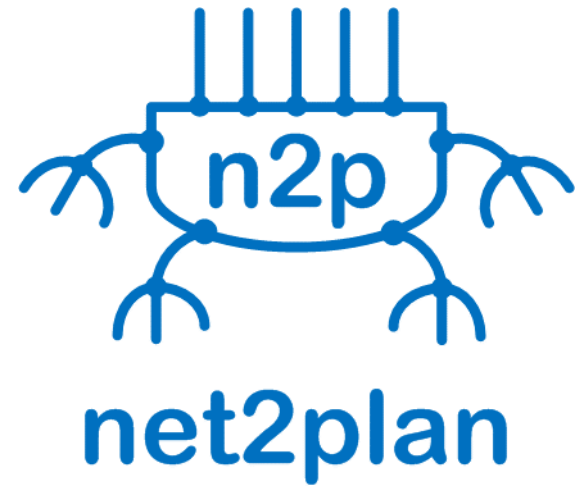
Open Specification for
Equipment Coupling Modeling Notation
(ECMN)

developed by iMinds

Net2Plan tool available

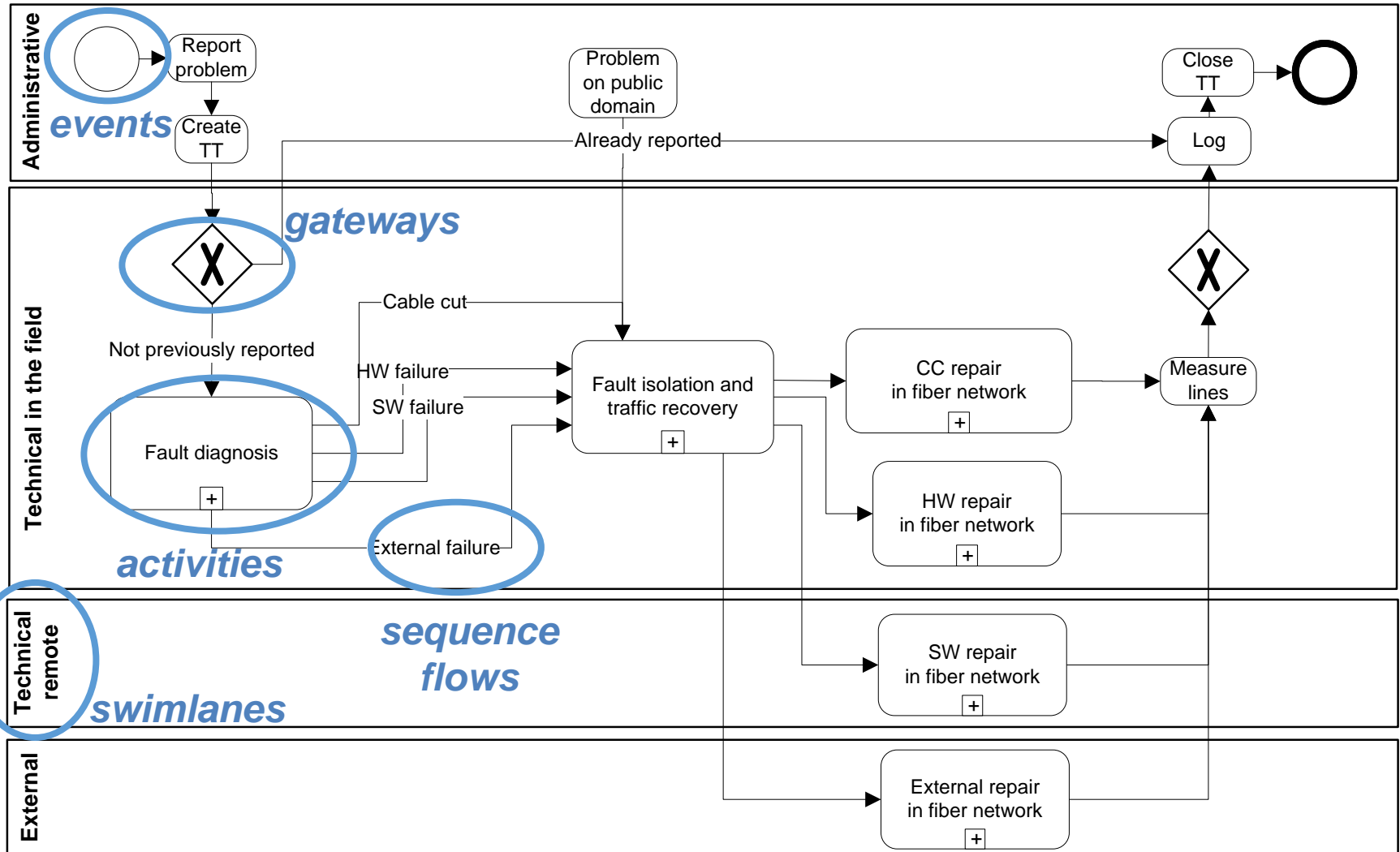
allows to model equipment per year

- Planning and evaluation of a multilayer IP-over-WDM network
- Goal
 - Plan and allocate the resources at the IP and optical layers for a given year
 - while minimizing the capital expenditures (CAPEX) cost of the network
- Open source Java tool
- Developed at Universidad Politécnica de Cartagena



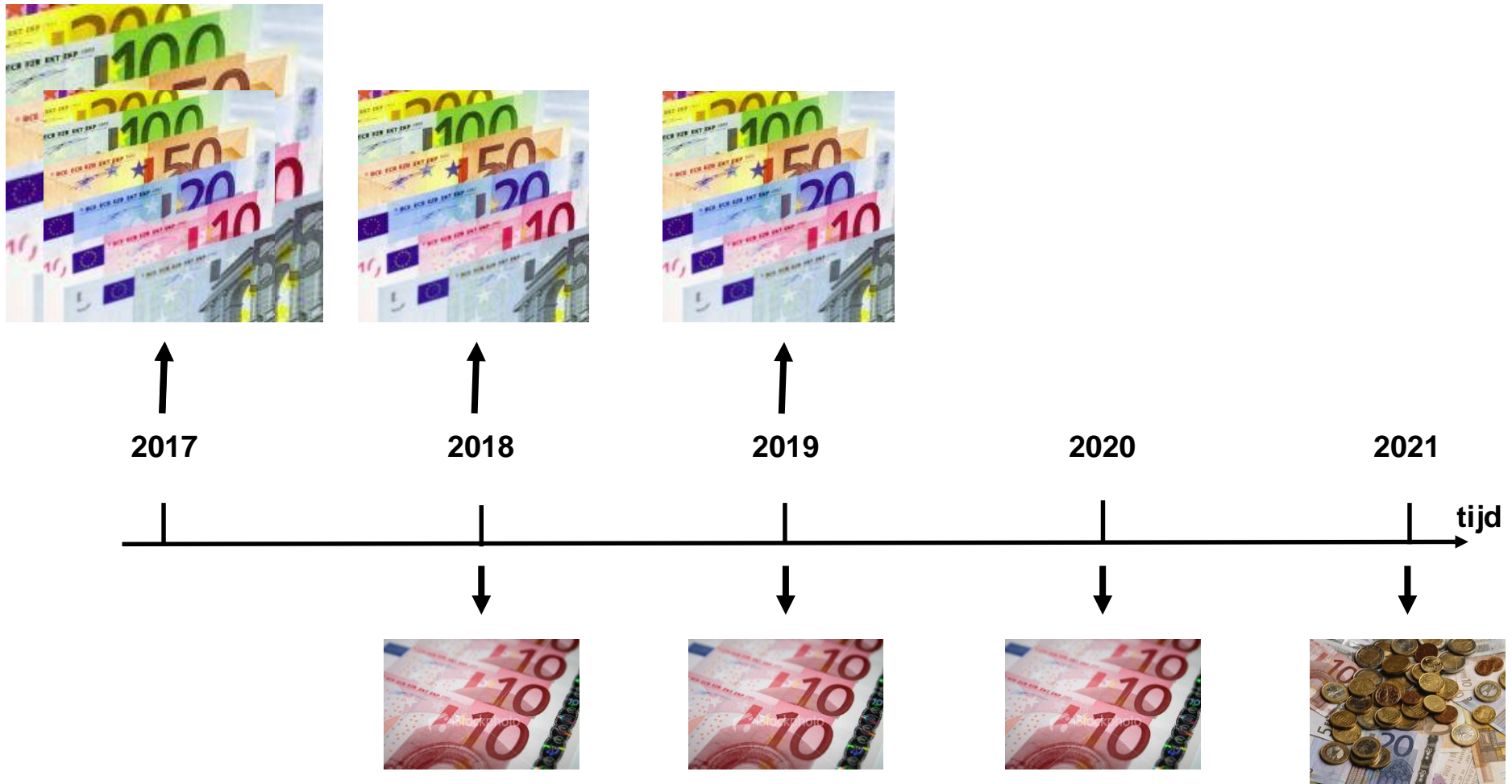
Detailed process modeling using BPMN

example: network repair process



Investment decision

is about comparing incoming and outgoing cash-flows over time

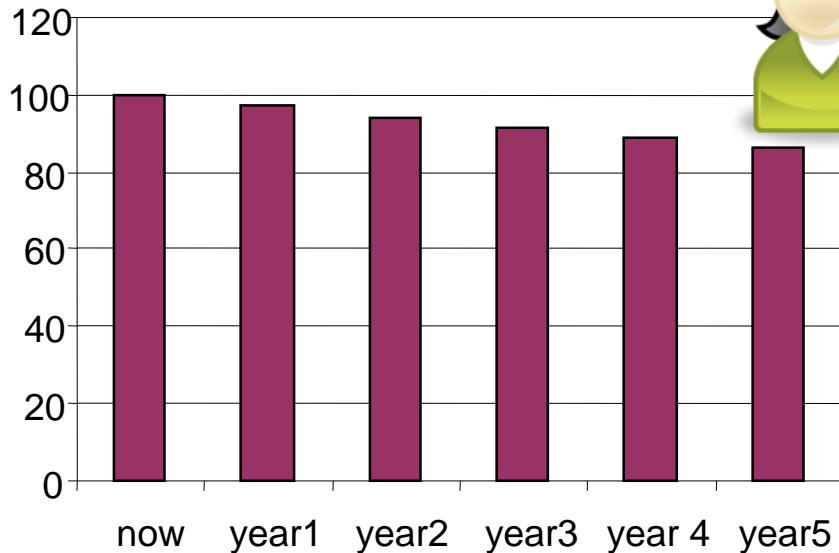


Net present value

is widely spread investment decision technique



current value of 100€ spent in the future

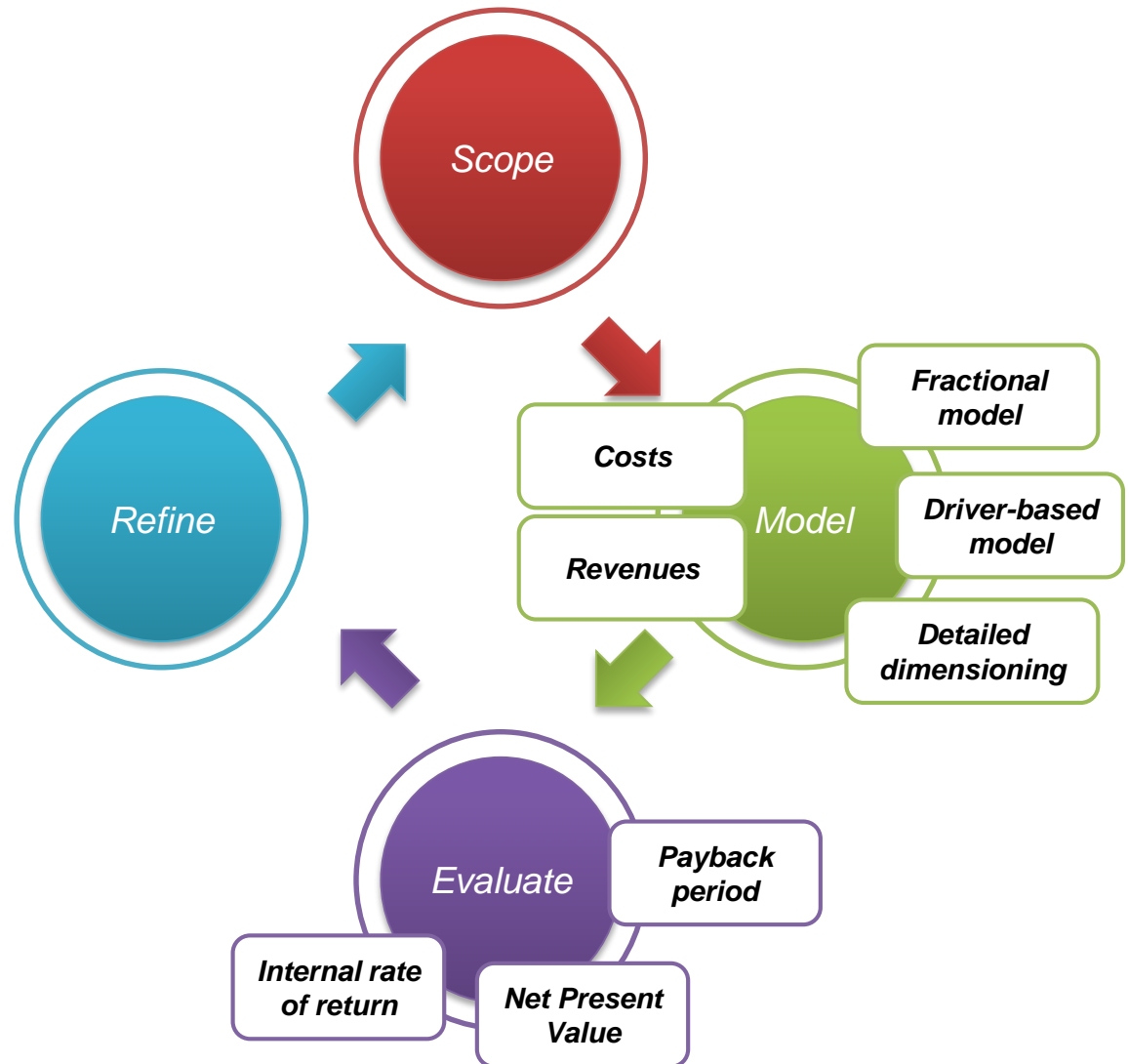


(r = 3%)

$$C = \frac{F}{(1+i)^n}$$

C = current value
F = future value
i = discount rate
n = time period (years)

White paper and tutorial available for techno-economic analysis cycle

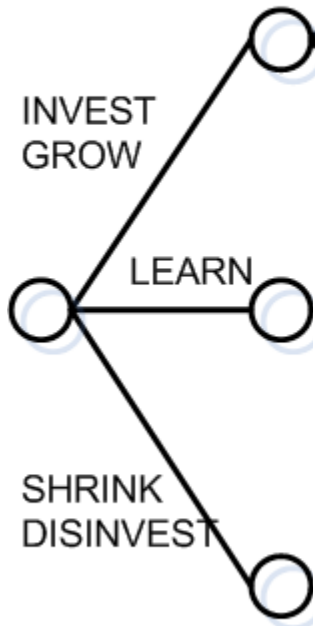


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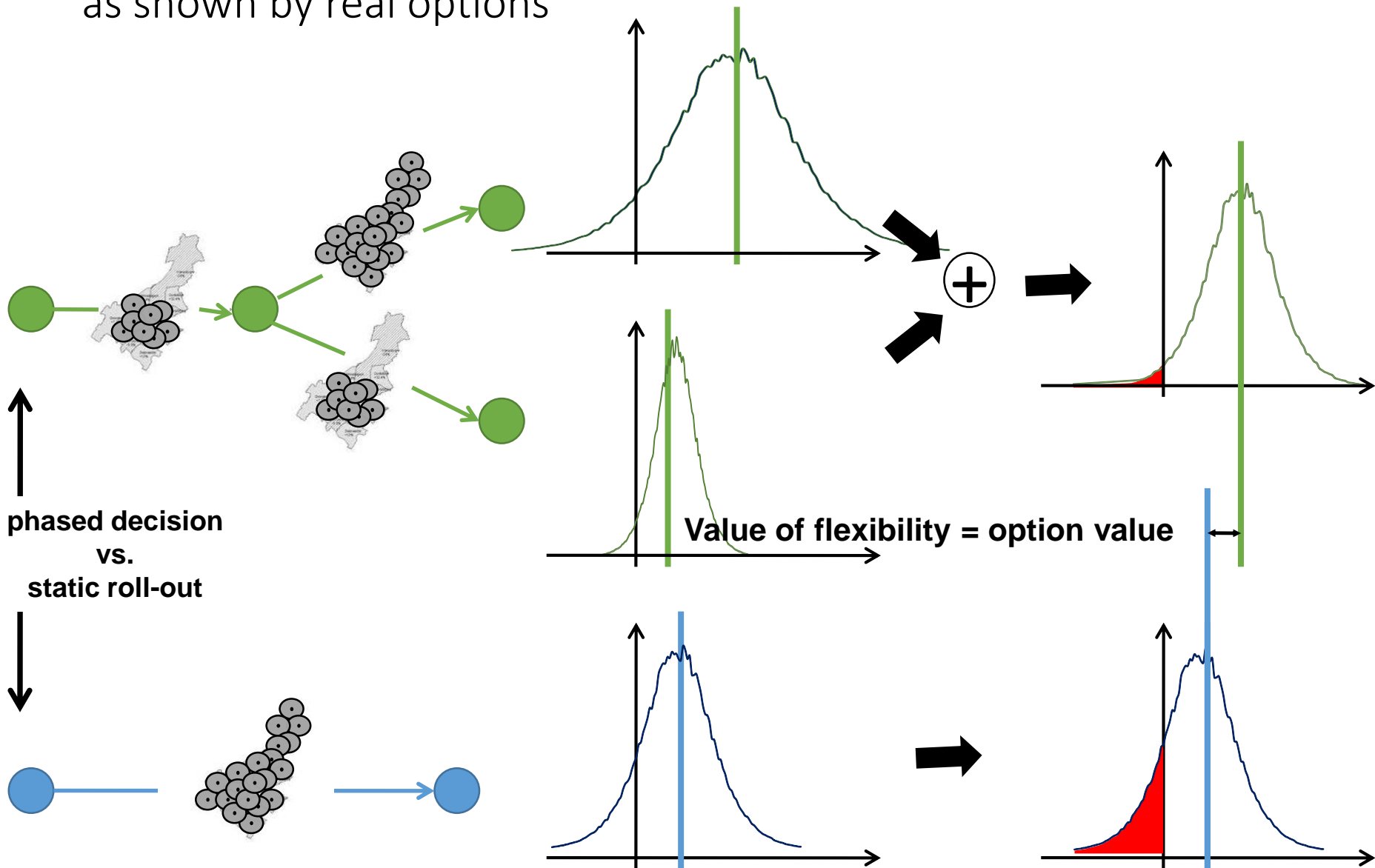
Real option theory

makes a distinction between 7 typical types of options (7S)



Flexible roll-out gives value

as shown by real options



Tutorial paper and presentation available concerning practical use of real options in ICT projects

1

Real Options in Telecom Infrastructure Projects - A Tutorial

Mathieu Tahon, Sofie Verbrugge, Peter J. Willis, Paul Botham, Didier Colle, Mario Pickavet,
Piet Demeester, *IEEE Fellow*

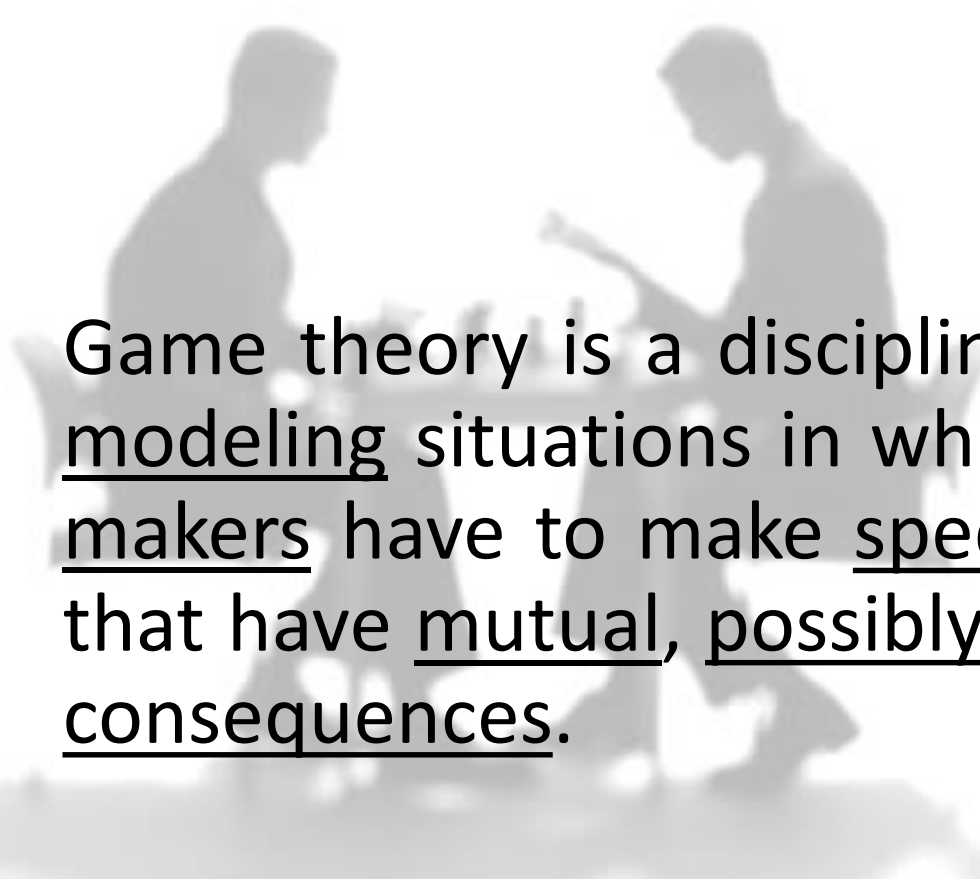
Abstract—The rapid technological change and uncertain future evolutions have a large impact on investment projects in the telecommunication sector. When new infrastructure networks are rolled out, the initial assumptions can prove to be untrue in the future, severely impacting the payoff. It is therefore extremely important that projects offer flexibility to allow the management to react to unforeseen changes. Management must, for example, be able to decide to speed up the project, slow it down, or even completely abandon it. However, the standard method used to evaluate investment projects, the Net Present Value analysis, is unable to capture the value of these different flexibility options. The Real Option concept, derived from financial literature, was proposed as a solution and implements this flexibility in the standard calculations. However, the Real Option Theory is only slowly getting accepted within the telecommunication sector. In this paper, we introduce the basics of real options theory and

license is a straightforward example as it offers the flexibility to decide when and where to roll out the mobile network. The 4G mobile operator can start with a study period, testing the new technology in small areas. When the uptake of 4G services proves to be exceeding initial expectations, extra investments can be made to speed up the rollout of the nationwide network. On the other hand, when a telecom project proves to be unprofitable, the management can decide to abandon it completely. For example, only one year after its launch, British Telecom decided to stop its mobile broadcast TV service in 2007.

All investment problems are economically assessed before they are started. In general, this analysis consists of predicting the future costs and revenues of the investment project.

Game theory

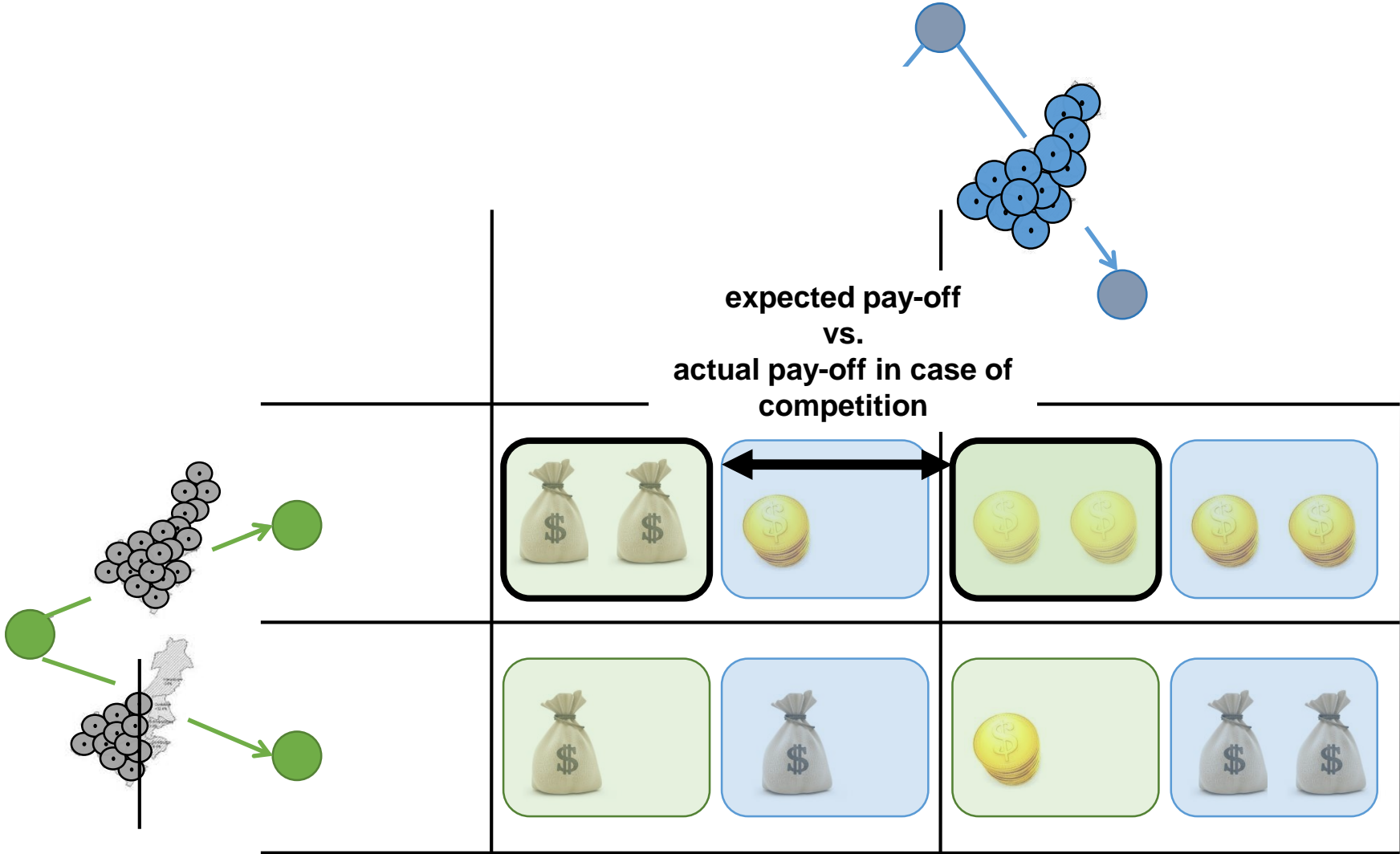
models the impact of interaction



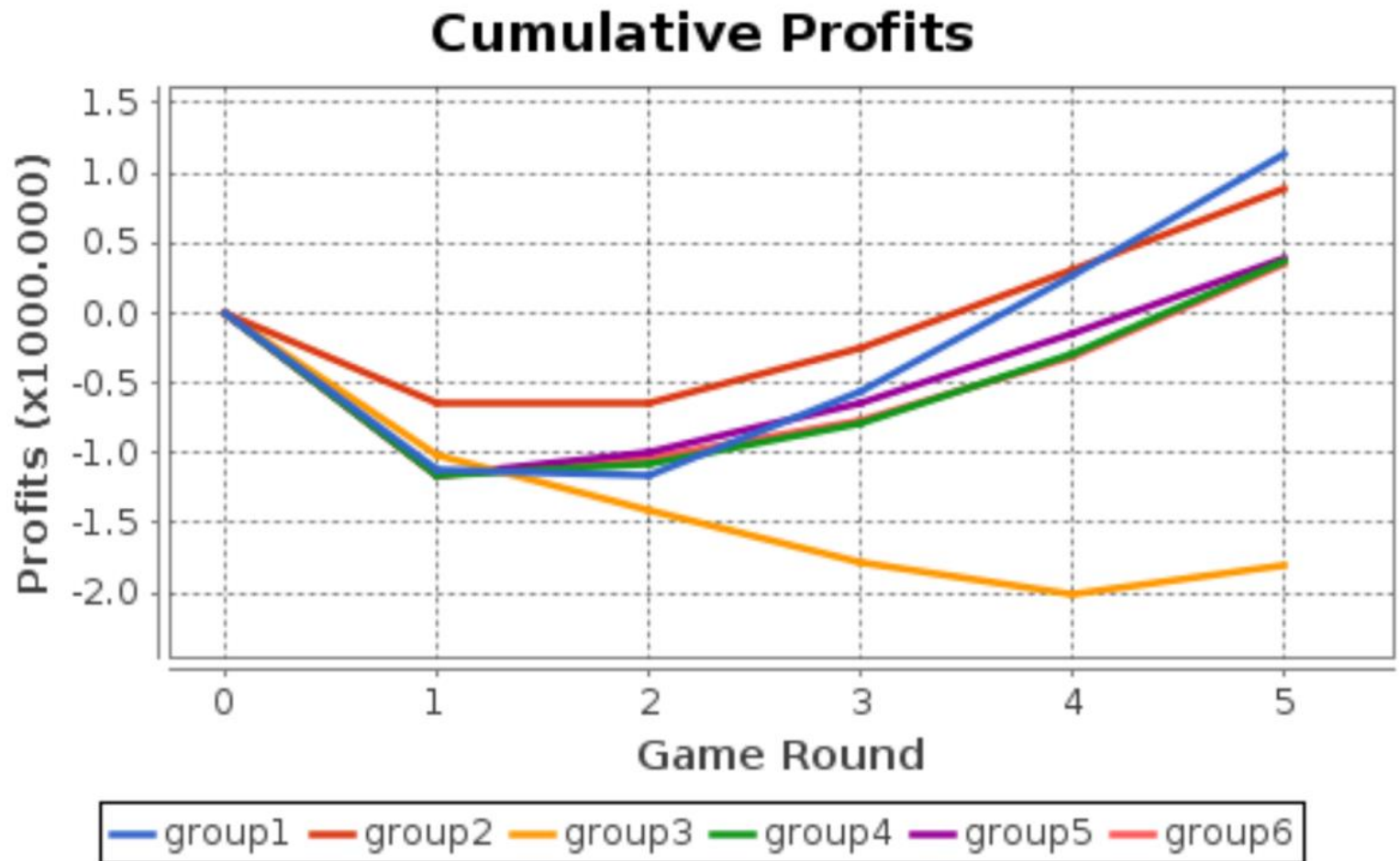
Game theory is a discipline aimed at modeling situations in which decision makers have to make specific actions that have mutual, possibly conflicting, consequences.

Competition has big impact

as shown by game theory

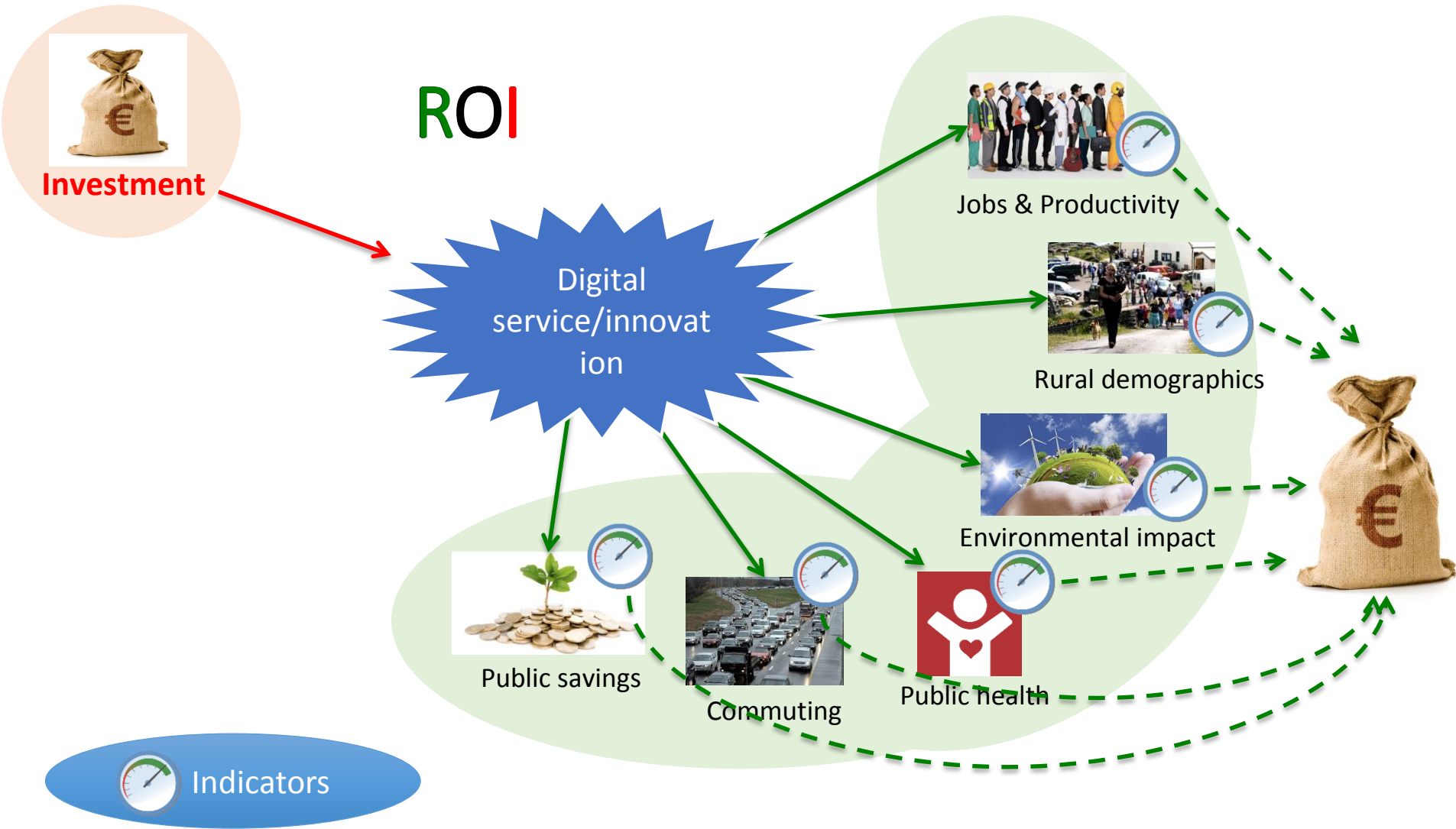


Online business game available for integration in Master course



Indirect effects can be modeled

by socio-economic return on investment indicators (SEROI)



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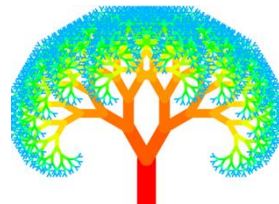


**TEMPLATES &
DATA**



EVENTS

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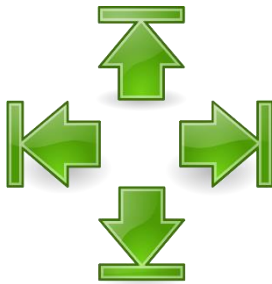
Standard approaches can help in order to tackle difficulties in techno-economic research



Multi-actor



Uncertainty



Case-specific constraints



Dynamics

Common templates and tools

needed in order to take techno-economics research to next level

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Do you want to join?
Do you have any questions?

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