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Ecole Nationale Supérieure des Mines
SAINT-ETIENNE

Engineering of Service Oriented Collaborative Networks

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Plan

Work in Progress : 1st year PhD work of N. Elhabib

1. Research context (Product/Service Systems)
2. Approach overview : key steps for the engineering of Service Oriented CN
3. Static model : illustrative case study
4. Evaluation system (structural evaluation)
5. Conclusion

Change of general business models

Standard Products

Scale Economy
- Standardisation of Manufacturing and Design processes
- Mass-Production

Customization

Customized Products

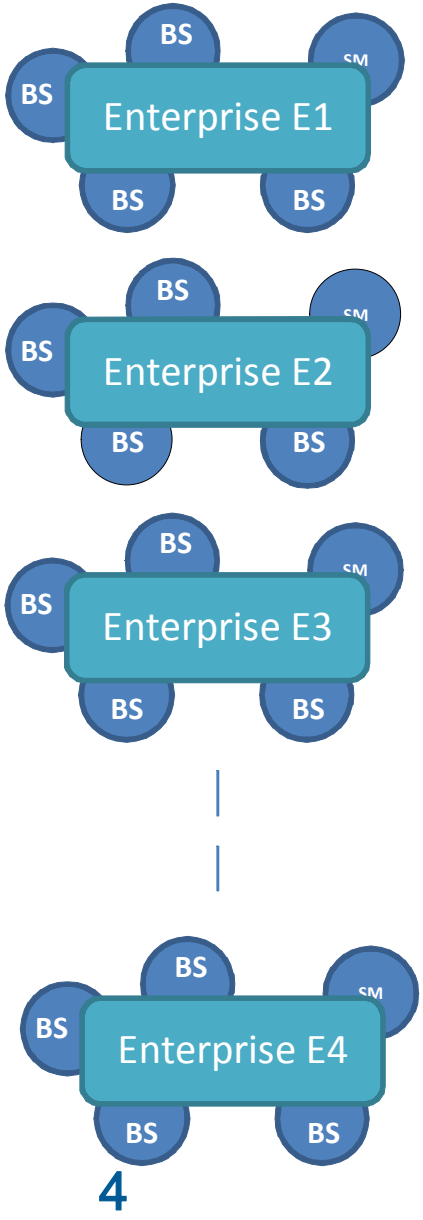
Mass Customisation
- Postponement
- Manufacturing decoupling point
- Implication of the Customer along the Product design process

De-materialization

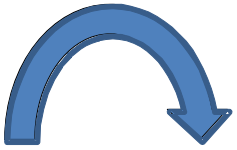
Product Service Systems
Specifically adapted to the needs and use of the client

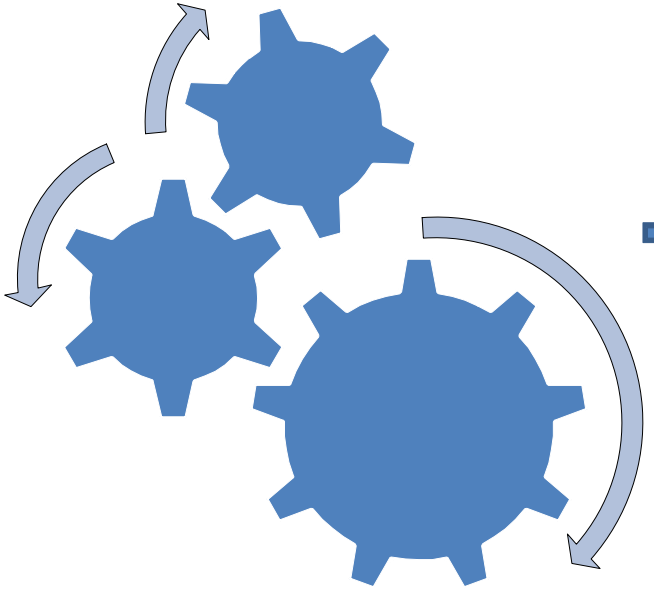
Functional Economy
- Modelling and simulation of Use scenarios
- Focus on product life-cycle management
- Design of Product-Service- Systems (PSS)

Reactive engineering of Service Oriented Collaborative Networks



Requirements





Product-Service System

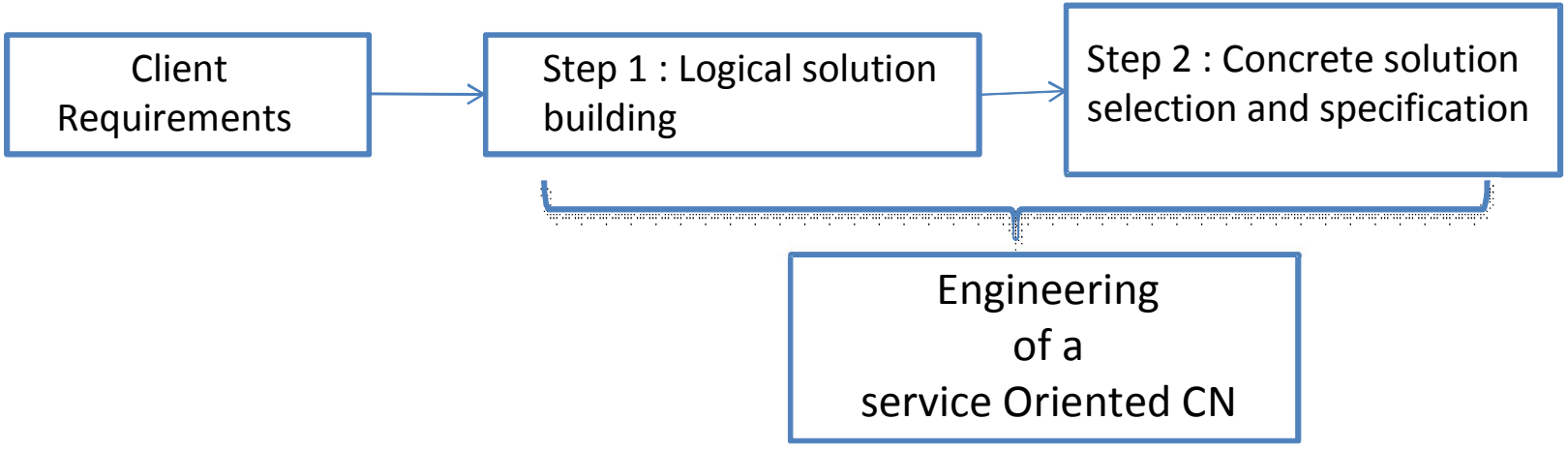
Product-Service System

"Product-Service is a value proposition that consists of a mix of tangible product and intangible service designed and combined so that they jointly are capable of fulfilling final customers' needs." [Tukker et al].

Business Service

« An adaptable, material or immaterial business activity, that an organization (provider) can execute to contribute to a partial or full solution, which offers a contextual answer to a problem raised by a client »

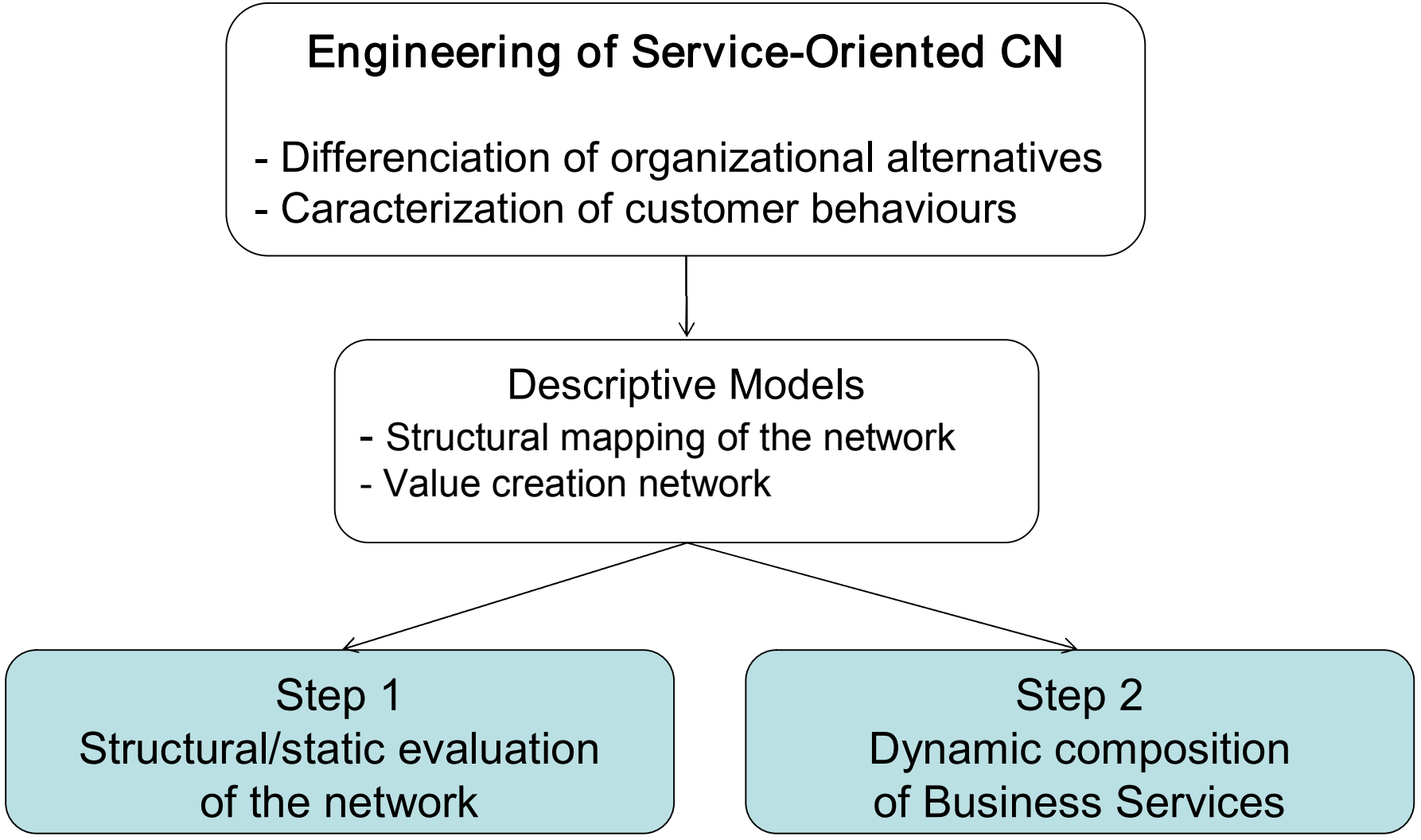
Engineering of Service - Oriented Collaborative Neworks, based on the formalisation of organisational scenarios



Organizational Scenarios

- ✓ Scenario: Formalization of the transition between the needs and the solution
- ✓ Networking a set of business services
- ✓ Variety sources : **client requirements, but also other types of incertitude, notably induced by various organizational alternatives**.
- ✓ => Comparative analysis of the **variety of potential solutions and the variety of customer behaviours**

Engineering Approach



Illustrative example: vehicle repair service (with a single damaged part)

- ***Scenario 1 :*** the damaged part is fully replaced by a similar mechanical part by the garage.
- ***Scenario 2 :*** the damaged piece is repaired by the garage.
- ***Scenario 3 :*** garage facilities are provided to customers, where they will repair their vehicle. Replacement parts can be bought and diverse tools rented.

Differences among scenarios:

- Distinct organizational systems: actors, infrastructures…
- Implication degree of the customer (during the delivery process)
- Attractivity for customers, depending on subjective factors
- Service delivery processes

Descriptive model of scenario : Structural map of the network

- Identification of all the Business Services required
- Identification of the contribution of each Business Service to the life cycle and organizational structure proposed

Network Functions			
Infrastructure (Technical operator Function)	**Production System (PSS Providing Function)**	**Client/User Relationship System (User management Function)**	
⬡ Diagnostic platform	1 Diagnostic procedure		**Stage 1: Customer's needs**
		6 Proposed solution and cost estimate	**Stage 2: Customised Solution Building**
⬡ Maintenance platform ⬡ Car rent platform	5 Replacement part command 3 Replacement of the damaged piece 4 Elimination and destruction of the damaged part 2 Manufacturing and storage of replacement part	7 Delivery of the repaired car to the customer 8 Vehicle loan	**Stage 3: delivery of the Product Service System PSS**
			Stage 4 : PSS life long maintenance
			Stage 5: PSS end of life

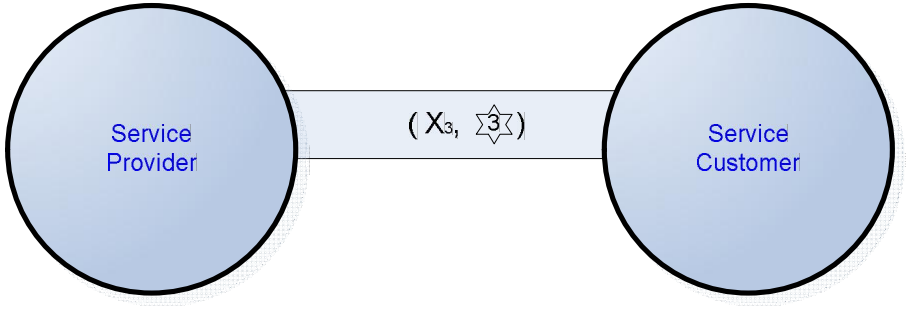
Life Cycle stages

⬡ Infrastructure Component SM Production Service △ Relation Service

Model of Value Creation Network

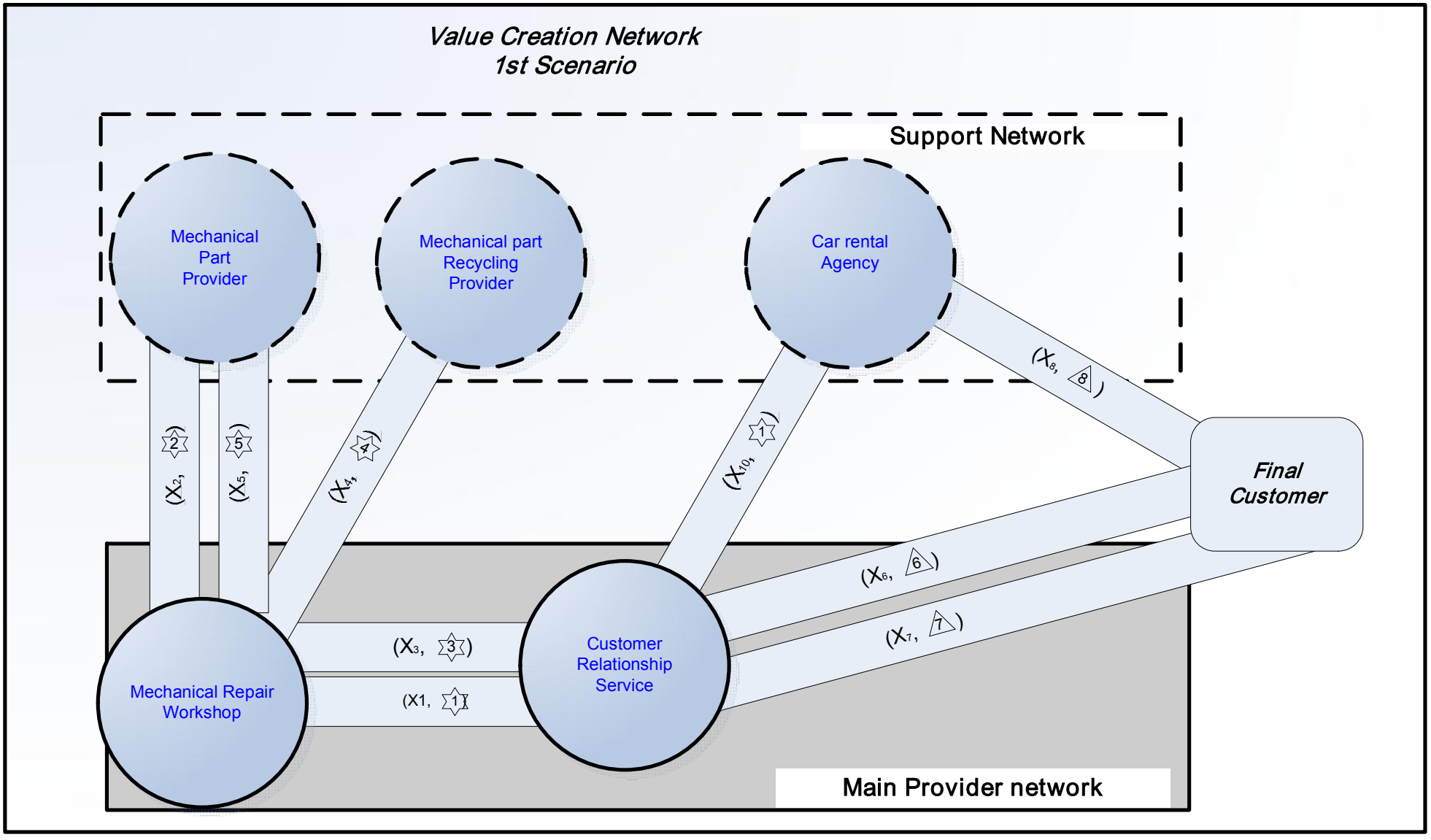
- **Goal:**
  - ✓ Identify every actor involved
  - ✓ Provide all organizational information required for the postrequisite evaluation

- **Basic relation within the network:**
  - ✓ Actors: client/fournisseur
  - ✓ Infrastructure element



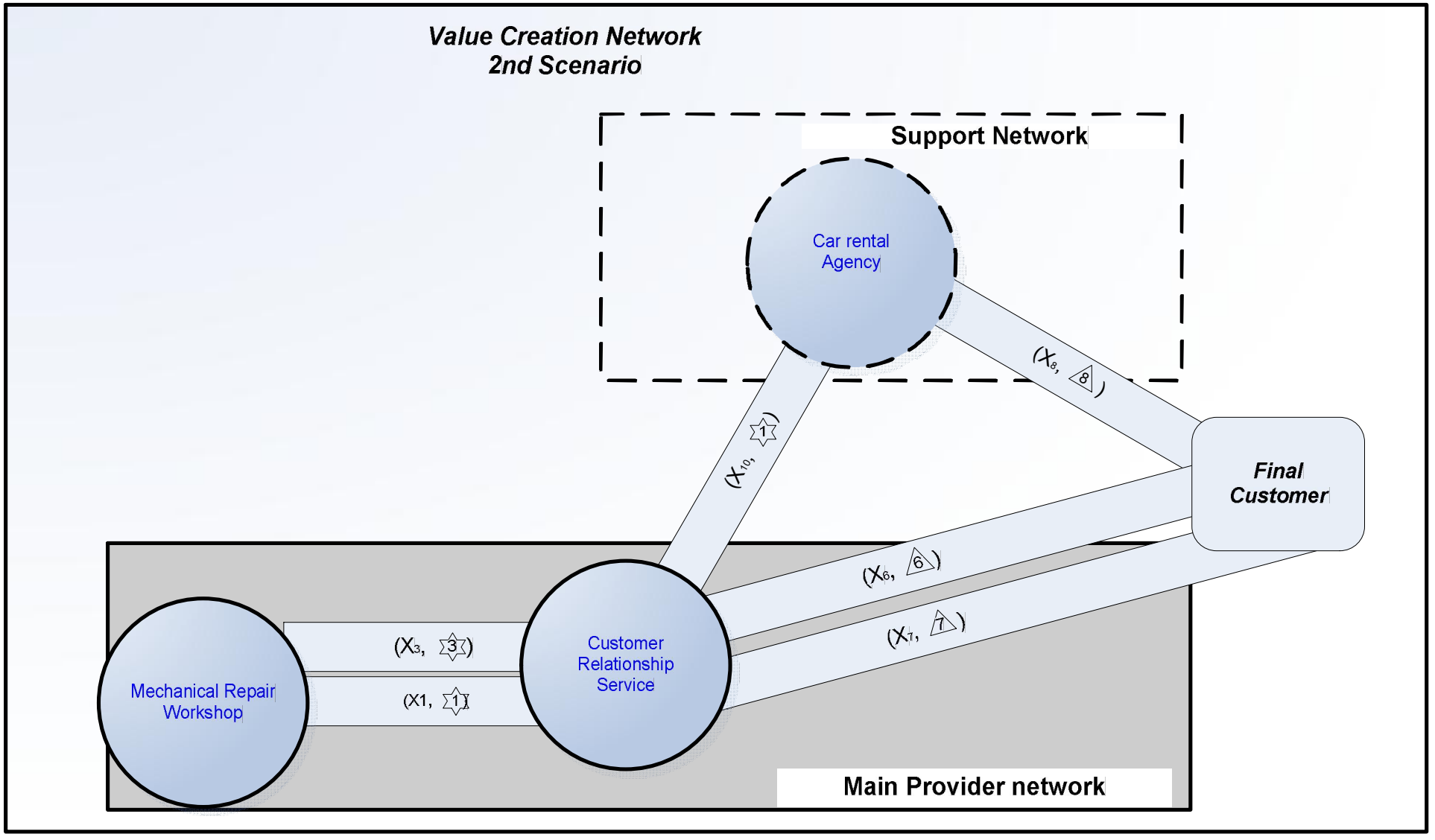
  - ✓ Xi : set of parameters, to modelize client requirements
  - ✓ BSi : Business Services, each of which is described by pieces of information characterizing the quality of service in response to some requirements.

Value Creation Network
1st Scenario



Xi Requirments
SM Production Service
Relation Service
Actor
Infrastructure Component

Value Creation Network 2nd Scenario



Xi Requirments | SM Production Service | Relation Service | Actor | Infrastructure Component

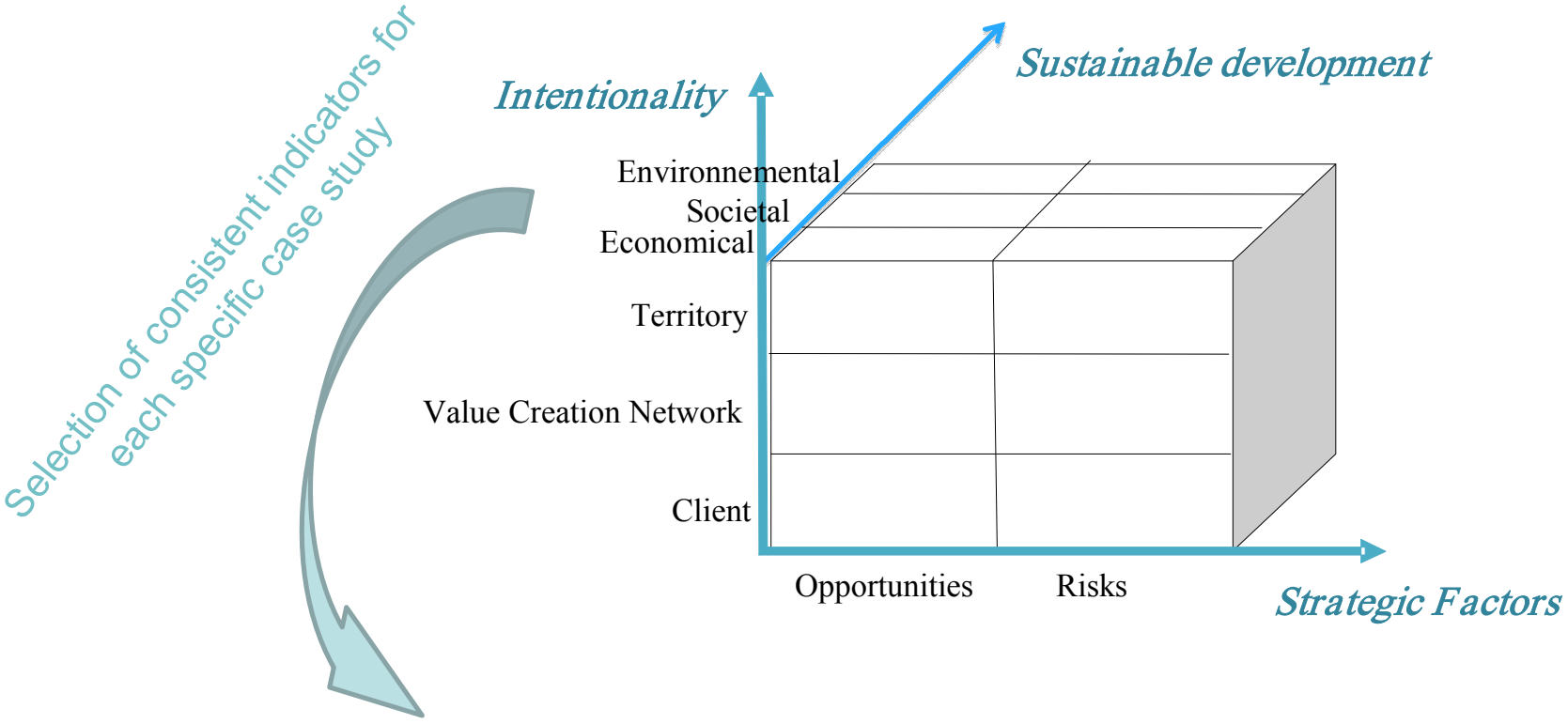
First step of evaluation proposed

- Before any « dynamic evaluation » of the processes and quality of service delivered, we propose a comparative analysis of the alternative organizational solutions (scenarios) of value creation
- Evaluation of the contribution to value creation

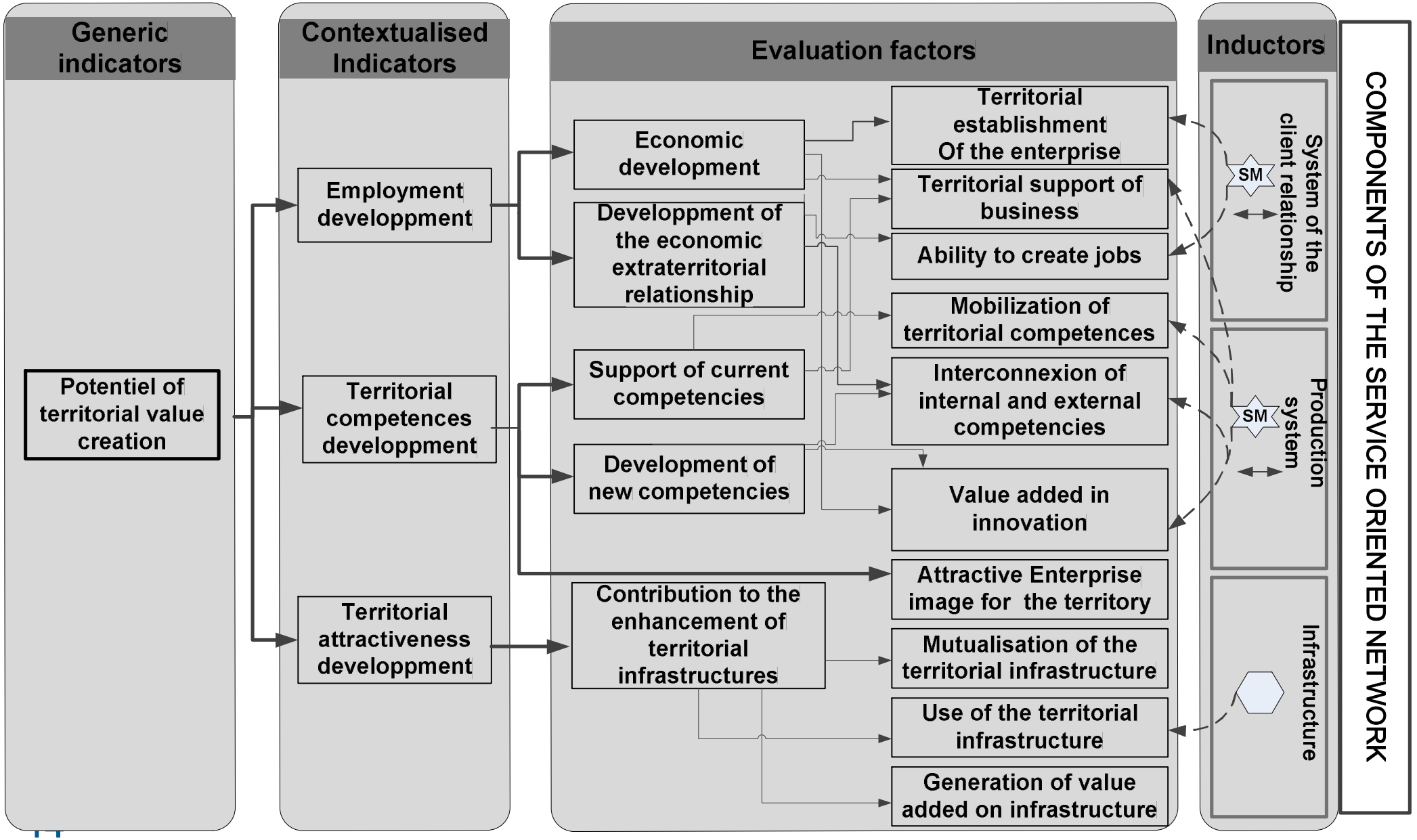
4 stages to build an evaluation system

- To identify the evaluation dimensions and points of view
- To analyse assessment factors, via a causality analysis
- *To build quantitative metrics*
- *To utilise these metrics for a decision aid purpose (comparative analysis of value creation scenarios)*

Generic evaluation frame : axis + points of views



	« Territorial» Actor	Actor « network »	Actor « client »
Opportunities	Territorial value creation	Value creation for the network	Value creation for the client
Risks	Territorial risks	Organisational risks for the network	Risks of inadapted answer


Generic indicators
Contextualised Indicators
Evaluation factors
Inductors
COMPONENTS OF THE SERVICE ORIENTED NETWORK
Potentiel of territorial value creation
Employment developpment
Territorial competences developpment
Territorial attractiveness developpment
Economic development
Developpment of the economic extraterritorial relationship
Support of current competencies
Development of new competencies
Contribution to the enhancement of territorial infrastructures
Territorial establishment Of the enterprise
Territorial support of business
Ability to create jobs
Mobilization of territorial competences
Interconnexion of internal and external competencies
Value added in innovation
Attractive Enterprise image for the territory
Mutualisation of the territorial infrastructure
Use of the territorial infrastructure
Generation of value added on infrastructure
System of the client relationship
SM
Production system
SM
Infrastructure
Is evaluated by
Is influenced by
Contribute to

Next research step : to build and test quantitative metrics

Requirements for quantitative metrics :

1- **The behavior of the customer has to be considered for the evaluation**

→ The evaluation system could be weighted depending on client profile

→ Different levels of potential implication of the client in the service deloibery process have to be assessed.

→ The impact of the client bahaviour variety has to be considered

2- **Decision criteria to for the static evaluation**

→ Agregation of mutiple criteria with different natures

→Both qualitative and quantitative criteria

→Scenario comparison using relative metrics and not necessarily absolute metrics.

Engineering of Service-Oriented CN
Differenciation of organizational alternatives
- Caracterization of customer behaviours

Descriptive Models
- Structural mapping of the network
- Value creation network

Step 1
Structural/static evaluation of the network

Step 2
Dynamic composition of Business Services

- Fuzzy Logic Metrics
- Multicriteria Aggregation

Dynamic simulation with a representation of customer behaviours.

Thank you for your attention