



MEMAN

INTEGRAL MATERIAL AND ENERGY FLOW MANAGEMENT
IN MANUFACTURING METAL MECHANIC SECTOR

D 7.1

Energy and resource saving based Networked Business Model framework

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2. EXECUTIVE SUMMARY

The overarching goal of MEMAN is to implement an approach that optimises resource efficiency across three selected value chains (i.e. casting, machining and surface finishing) by developing and validating innovative tools and business models. To achieve this task, MEMAN aims at analysing resource saving potentials not only at company level but also by focusing on interfaces between companies of the value chain.

In this context, the goal of WP7 is the design of the new business models affordable by the different value chains and clusters of the project under the collaboration criteria established for reducing energy and resource consumption along the entire value chain.

The goal of the present working document is to define a networked business modeling framework (NBMF) based on existing business modeling techniques and methods to address the modeling and assessment of the impact of innovation opportunities identified in the project both, globally along the value chain, and company isolated

To achieve this, in a first step a review of existing technique has been carried out. This has covered the following aspects: business concept modeling techniques, business economic evaluation techniques, business features of collaborative networks, and linking business conceptual modeling and economic evaluation.

Then, based on these techniques, a modeling framework has been defined consisting of:

- **A value network modeling framework:** this is a modeling proposal that permits the representation of a value network in a two level modeling approach.
- **Economic evaluation:** The quantitative part of the model will be based in a different approach depending on the type of improvement alternative to be evaluated and the confidentiality issues of the required information and also results. The quantitative model will reflect the impact of each business model component (activities, resources, supplies, channels, customer segment, transactions...) in the economic statements.
- **Modeling orientations:** modeling guidelines and clues are given as orientations to apply the NBMF in tasks 7.2 and 7.3. The set of orientations refer to:
 - Value network modeling
 - Business innovation opportunities identification
 - Business innovation scenario modeling

3. GLOSSARY

NAME	DEFINITION
NBMF	Networked Business Model Framework
Value network	A value network is composed by stakeholders (companies) that exchange goods, services and information in the form of “transactions”.
Stakeholder	Is a company, business unit or organization that participates in the value network. Each stakeholder performs a series of activities and processes that reflect a specific organisation (business logic) that has its corresponding economic performance as business.
Transaction	Transactions are input/output events between stakeholders, and each one has an impact in the economic statements of both ends’ stakeholder.
P&L	Profit and Losses statement: It summarizes the revenues, costs and expenses incurred during a specific period of time, usually a fiscal quarter or year. These records provide information about a company's ability – or lack thereof – to generate profit by increasing revenue, reducing costs, or both.
NPV	Net Present Value: is the difference between the present value of cash inflows and the present value of cash outflows. NPV is used in capital budgeting to analyze the profitability of a projected investment or project.

Table 1. Glossary and acronyms

4. BACKGROUND AND OBJECTIVES

4.1 Context of MEMAN

MEMAN aims at improving the competitiveness of the European companies of the metal mechanic sector by developing and validating innovative tools and business models across the entire value chain (i.e. including casting, machining, surface finishing and recycling aspects) in order to reduce global impacts in terms of resources use (i.e. material and energy).

In this context, the overarching goal of the MEMAN project is to implement an approach that optimizes resource efficiency across three selected value chains (i.e. casting, machining and surface finishing). To achieve this task, MEMAN aims at analyzing resource saving potentials not only at company level but also on focusing on interfaces between the companies of the value chain.

The overall approach of MEMAN is divided into three main phases:

- The first phase aims at “setting the scene”. This means to define in detail the companies involved in each cluster (WP 1). Once the scope has then been defined, the three clusters will be analysed in order to define and characterize every constitutive unit process (WP 2).
- The second phase consists in developing a decision-making toolbox, specifically designed for value chain analysis (WP 3). This toolbox will be used to carry out the modelling and the simulation of the three selected value chains (WP 4) in order to determine alternative improvement options.
- The third phase builds on the outputs of the previous phases to define new business models aiming at reaching a global optimum in terms of resource efficiency at value chain level (WP 7) and aims at implementing selected alternatives options in field (WP 8).

4.2 Global approach of WP7 and positioning in the project

The objective of WP7 is the design of the new business models affordable by the different value chains and clusters of the project under the collaboration criteria established for reducing energy and resource consumption along the entire value chain. The design of the new business models will take into account aspects of value proposition, interface with customer, infrastructures, and profit equation, taken into account the point of view derived from the energy characterization along the entire value chain, both globally and company isolated.

WP7 will also address the economic evaluation of new defined business models, the sensitivity analysis under different scenarios and a comparison with the current situation. This economic evaluation will consider and visualize both aspects, those related with the entire value chain, such as those corresponding to each of the companies involved.

WP7 is organized in four tasks:

- T 7.1 Networked Business Model framework definition
To define a modeling environment based on Existing Business Modeling Techniques and methods.
- T 7.2 New Industrial Business Models for energy and resource saving
Use the Networked Business Model Framework to represent the old and new business model and compare the different alternatives from a qualitative point of view.
- T 7.3 New Industrial Business Models economic evaluation

An economic evaluation tool defined in the modeling framework will be used to visualize the impact of the applied measures to reduce energy and resources over the value chain figures and over the figures of each partner.

➤ T 7.4 Networked Business Model intervention methodology

The objective is to define a generalized methodology of collaboration and intervention in order to define new business models based on a common strategy to reduce energy and resources consumption along the value chain.

WP7 contains the following deliverables:

- D7.1 Energy and resource saving based Networked Business Model framework
- D7.2 New Industrial Business Models for energy and resource saving
- D7.3 New Industrial Business Models economic evaluation
- D7.4 Networked Business Model intervention methodology

4.3 Objectives of T7.1 and D7.1

The objective of this deliverable is to define a networked business modeling framework (NBMF) based on existing business modeling techniques and methods to address the modeling and assessment of the impact of innovation opportunities identified in the project both, globally along the value chain, and company isolated.

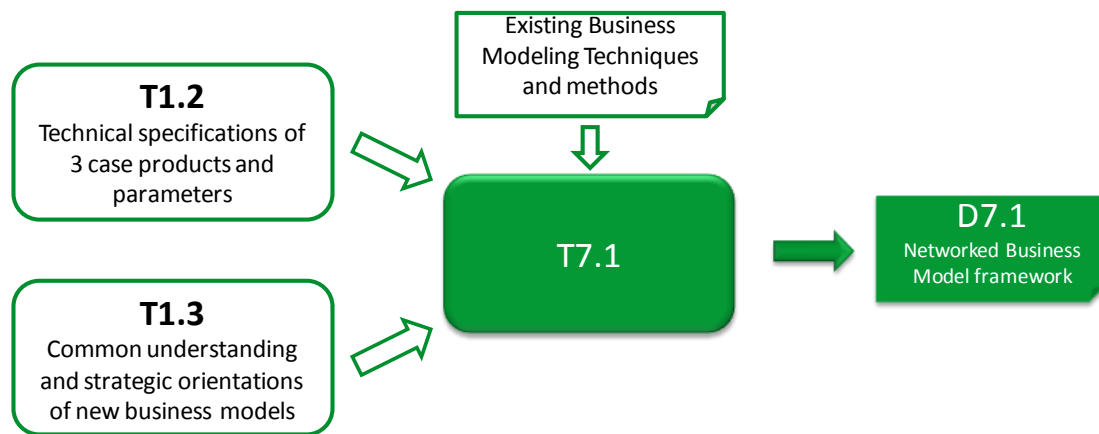


Figure 1: T7.1 positioning in the project and WP7

The NBMF must fulfill the following high level requirements:

1. The NBMF must allow modeling existing and new business models
 - under the collaboration criteria
 - established for reducing energy and resource consumption along the entire value chain.
 - affordable by the different value chains and clusters of the project
2. The NBMF must take into account the following aspects from a firm perspective:
 - Value proposition
 - Interface with customer
 - Infrastructures
 - Profit equation
3. This model requires also being able to model value chain structure, its actors and relationships.
4. Also economic evaluation of new defined business models, the sensitivity analysis under different scenarios and a comparison with the current situation must be addressed. This evaluation will consider and visualize both aspects, those related

with the entire value chain, and those corresponding to each of the companies involved.

4.4 Main results

The main results of the deliverable consist of:

- **A value network modeling framework:** this is a modeling proposal that permits the representation of a value network in a two level modeling approach.
 - Network modeling: this model shows all the actors participating in the value network and the relationships among them.
 - Components modeling: this model shows the details of each element of the value network. The characterization of each one depends on the nature of it. There are two classes of elements:
 - Stakeholder modeling: these represent the companies and organizations participating in the value chain, exchanging goods and services between them through bidirectional transactions.
 - Transactions modeling: These elements represent the details of a transactional relationship between two stakeholders of the value network.
 - Scenario modeling: this part of the NBMF allows modeling the events that set up specific conditions that would influence the performance of the value network. Each innovation arising from MEMAN improvement opportunities will be modeled as a set of events that can affect to a stakeholder, to a one or more transaction, or to both types of elements of the model.
- **Economic evaluation:** The quantitative part of the model will be based in a different approach depending on the type of improvement alternative to be evaluated and the confidentiality issues of the required information and also results. Two alternatives are foreseen:
 - Profit and losses statement
 - Investment project statement

The quantitative model will reflect the impact of each business model component (activities, resources, supplies, channels, customer segment, transactions...) in the economic statements.

- **Modeling orientations:** modeling guidelines and clues are given as orientations to apply the NBMF in tasks 7.2 and 7.3. The set of orientations refer to:
 - Value network modeling:
 - Stakeholders: This includes the business logic (value propositions, customer interface, and infrastructure) and the economic model (revenue streams, cost structure and profit equation)
 - Transactions: The definition of a transaction implies the characterization of the transferred value proposition, frequency of occurrence, impacts of an occurrence on incomes of the “supplier” stakeholder and costs to the “customer” stakeholder.
 - Business innovation opportunities identification: this part presents how to proceed when identifying the innovation opportunities. Two types of opportunities are addressed:
 - Individual company’s opportunities
 - Business Models and Value Networks
 - Business innovation scenario modeling: This part provides a modeling framework to represent the impact of business innovation opportunities into the economic performance assessment. A business innovation opportunity will be transformed into a series on “events” that modify the characteristics of

the value network model elements' (stakeholders and transactions) characteristics. The following types of event are foreseen:

- Stakeholder events: Stakeholder related events will impact the cost structure through activities and resources innovations. An event must show the increase or decrease on the consumption of activities and/or resources.
- Transaction events: These events modify the characteristics of existing transactions. These events may modify any characteristic of the transaction, but specially those corresponding to economic evaluation:
- General events: these events will show how variables external to the value network influence the scenario and the performance of the value networks. These events will be used to represent specific risks such energy/raw material price variations, regulation and taxes, etc...

4.5 Participants

Under the coordination of IKERLAN as task leader, the following partners have contributed: EIFFO, VMT, CETIM, TECHNOFI, and EDERTEK.

Partner	T7.1.1 Define draft proposal of NBM framework	T7.1.2 Refine and produce first version of NBM framework	T7.1.3 Review and validation with clusters	T7.1.4 Produce deliverable D7.1
IK4-IKERLAN	• Prepare a draft proposal of the Networked Business Model (NBM) framework.	• To produce a first draft based on EIFFO's feedback and VMT contributions	• Review and give feedback on Networked Business Model framework regarding Casting Cluster specific issues.	• Make contributions to the deliverable • Produce the deliverable
CETIM	• Discussion and feedback for base concepts.		• Review and give feedback on Networked Business Model framework regarding Machining Cluster specific issues.	
EIFFO	• Discussion and feedback for base concepts.	• EIFFO will review the first draft and will provide a feedback to IK4-IKERLAN. • Provide insights on collaborative innovation opportunities modeling requirements	• Review and give feedback on Networked Business Model framework regarding Finishing Cluster specific issues.	• Make contributions to the deliverable
TECHNOFI	• Discussion and feedback for base concepts.		• Review and give feedback on Networked Business Model framework	
VMT	• Discussion and feedback for base concepts.	• Review first draft and provide contributions regarding: <ul style="list-style-type: none"> • Value chains typologies. • Risk and reward between partners. • Waste & recycling modeling 		• Make contributions to the deliverable
EDERTEK	• Discussion and feedback for base concepts.			

Table 2: Partners participation details.

5. BUSINESS MODELING TECHNIQUES

5.1 Business concept modeling techniques

As David Teece¹ points out, the concept of a business model lacks theoretical grounding in economics or in business studies, mainly due to the ubiquity of theoretical constructs that have markets solving the problems that, in the real world, business models are created to solve. But the rise of information industries and the internet itself as an enabler, new and unexpected ways of creating, delivering and capturing value have emerged. This has pushed an increased interest on business model research, and scholars have made several proposals on business modeling.

There are several definitions of the concept of business model. Some of the more relevant are:

Author	Definition
Chesbrough & Rosenbloom ²	The heuristic logic that connects technical potential with the realization of economic value.
Johnson et al. ³	Consist of four interlocking elements that, taken together, create and deliver values. These are: customer value proposition, profit formula, key resources, and key processes.
David J. Teece ¹	A business model articulates the logic and provides data and other evidence that demonstrates how a business creates and delivers value to customers. It also outlines the architecture of revenues, costs, and profits associated with the business enterprise delivering that value
Alexander Osterwalder ⁴	A business model describes the rationale of how an organization creates, delivers and captures value.

Table 3: Business model definitions

Some authors identify the main functions or components of a business model:

Author	Business model components
Henry Chesbrough	<ul style="list-style-type: none"> • Articulates the value proposition (i.e., the value created for users by an offering based on technology); • Identifies a market segment and specify the revenue generation mechanism (i.e., users to whom technology is useful and for what purpose); • Defines the structure of the value chain required to create and distribute the offering and complementary assets needed to support position in the chain; • Details the revenue mechanism(s) by which the firm will be paid for the offering; • Estimates the cost structure and profit potential (given value proposition and value chain structure); • Describes the position of the firm within the value network linking suppliers and customers (incl. identifying potential complementors and competitors); and • Formulates the competitive strategy by which the innovating firm will gain and hold advantage over rivals.

Alexander Osterwalder	<ul style="list-style-type: none"> • Value proposition • Customer segments • Relationships • Channels • Key activities • Key resources • Partners network • Revenue streams
Ash Maurya	<ul style="list-style-type: none"> • Cost structure • Unique value proposition • Customer segments • Unfair advantage • Channels • Solution • Key metrics • Problem • Revenue streams • Cost structure

Table 4: Authors and business model components

As we can see, there is a coincidence between most of the components pointed out by each author. The main difference lay on that Chesbrough considers firm positioning, value chain and competitive strategy as key components of the business model, while Osterwalder doesn't include them in his proposal but proposes a process to focus on business strategy applying blue ocean concepts through its business model canvas components. In addition to model components, Alexander Osterwalder has built a proposal for business model logic communication based in what is known as "business model canvas".

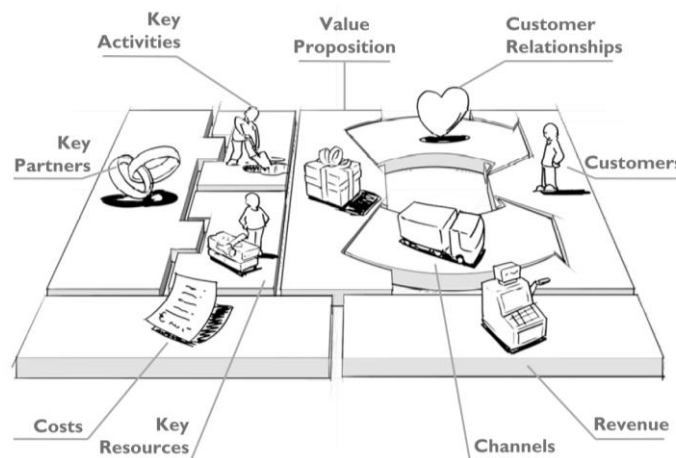


Figure 2: Business model canvas from Osterwalder

Ash Maurya proposes the "lean canvas" an adaptation of Osterwalder's "business model canvas" specifically suited for the start-up walking through the "valley of death" of a start-up. This proposal deep in more detailed aspect related to the value proposition like its uniqueness, competitive advantage, problems to be tackled, solution and key metrics. This proposal also includes a logic visual modeling that eases communication. The drawback of this proposal from MEMAN point of view is the lack of modeling components for activities and resources, which are key elements for our objectives.

In conclusion, we point to a two-level modeling approach to grasp both, the elements of a firm's business model and the systemic/positioning view of the firm in its value network:

- **Firm level:** we have selected the proposals of Alexander Osterwalder as a reference at firm level modeling technique to be used in WP7 for the following reasons:
 - Provides a framework to consider all relevant components of a business model.

- Gives a tool to represent the model.
- Model components critical to MEMAN objectives such as activities and resources can be mapped to economic elements.
- His proposals include strategic business model innovation thinking approaches.
- **Value network level:** Chesbrough proposals to consider value chain positioning are critical for MEMAN due to our objectives of discovering collaborative innovation opportunities. For these purposes, value network modeling including network partners and their relationships, requires to be considered adequately.

5.2 Business economic evaluation techniques

One of the objectives of WP7 is the economic evaluation of new defined business models, the sensitivity analysis under different scenarios and a comparison with the current situation must be addressed.

The economic performance of a business is shown with two main types instruments:

- **Profit and Losses statement:** It summarizes the revenues, costs and expenses incurred during a specific period of time, usually a fiscal quarter or year. These records provide information about a company's ability – or lack thereof – to generate profit by increasing revenue, reducing costs, or both.
- **Balance Sheet:** It presents a company's financial position at the end of a specified date. It allows someone to see what a company owns as well as what it owes to other parties as of the date indicated in the heading.

Considering that MEMAN aims to design new business models under the collaboration criteria and established for reducing energy and resource consumption along the entire value chain, the following reflections arise:

- **“Reducing energy and resource consumption”:** These innovations will have an impact on costs of goods sold and/or on fixed overheads through the investment that could be required to get these improvements.
- **“Along the entire value chain”:** This implies innovations in the transactions between partners of a value chain. This would impact on the incomes of the partner in the “supplier” side of the transaction, and on the costs (direct or indirect) in the “customer” side of the transaction.

So that, we conclude that the profit and losses statement is the first option to perform the required economic evaluation.

Income	50,000
less discounts and allowances	(5,000)
Net income	=45,000
Less direct costs (cost of sales)	(20,000)
Gross profit	=25,000
Less indirect costs (fixed overheads)	(7,000)
Operating profit	=18,000
Plus other income	2,000
Less other expenses	(1,000)
Profit before tax	19,000
Less tax	(8,000)
Net profit (or net loss)	=11,000

Figure 3: Example of profit and losses statement

This suitability of this approach is based on the fact that MEMAN analysis are performed on existing companies and value chains, which give as their present profit and losses statements as the base stones to tackle the required economic evaluation.

But, there might be some innovations under collaboration criteria that would propose the joint creation of new businesses or ventures. In such a case, there wouldn't exist a base profit and losses statement and a different approach to evaluate economic performance should be considered. The selected instrument in such a case is the Net Present Value investment evaluation technique because is oriented to evaluate the cash flows generated by a project and this fits with the type of economic flows that are evaluated with the profit and losses statements in existing companies.

This second approach would also be applicable when required by confidentiality criteria of company's economic data.

Both approaches measure the economic inflows and outflows

Postage Reduction Project									
ITEM	Month-1	Month-2	Month-3	Month-4	Month-5	Month-6	Month-7	Month-8	Month-9
Budget Cost									
Labor	25,000	30,000	25,000						
Supplies	2,000		5,000						
Software	132,000								
Travel	2,000	3,000							
Equipment	16,000								
Total Cost	177,000	33,000	30,000						
Payback									
Reduce overnights				28,000	28,000	28,000	28,000	28,000	28,000
Reduce normal postage				12,000	12,000	12,000	12,000	12,000	12,000
Total Cost Recovery				40,000	40,000	40,000	40,000	40,000	40,000
Accumulated cost to recover	177,000	210,000	240,000	200,000	160,000	120,000	80,000	40,000	0

Figure 4: Example of investment evaluation

5.3 Business features of collaborative networks

Moore⁵ defines business ecosystem as “an economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world.” This applies to MEMAN objectives that aim to achieve collaboration based innovations.

The **e3-value**⁶ methodology developed by Jaap Gordijn, provides modeling concepts for showing which parties exchange things of economic value with whom, and expect what in return.

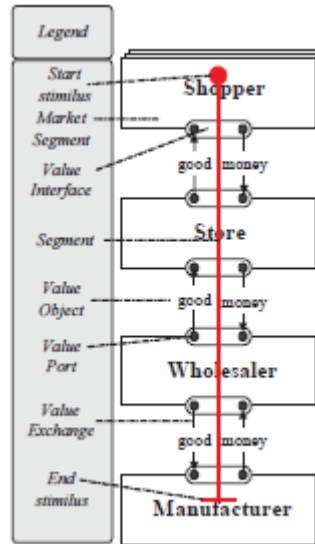


Figure 5: Example of e3-value model (Jaap Gordijn).

This approach allows modeling the relationships between the stakeholders of a value chain, specially showing the economic implications of these relationships.

From these proposals, MEMAN will base its view of value chain innovations as innovations that produce changes in the structure of the value network of collaborative stakeholders. These structural changes can be of different types:

- A change in one or more existing transactions.
- A new transaction between existing stakeholders
- A new stakeholder in the value network (and the corresponding new transactions).

Some tools are also proposed to model and evaluate such e3-value models but, unfortunately, we haven't been able to put them at work. So, a simplified approach to model and evaluate value networks requires to be developed based on the modeling framework that is presented in section 7.

5.4 Linking business conceptual modeling and economic evaluation

The importance of conceptual modeling lies on the necessity of understanding and communicating both, the key components of a business regarding MEMAN objectives, and the implications of innovations on them. But conceptual modeling alone will not enable to evaluate the economic impact of MEMAN innovations. In consequence, an approach to link the conceptual model components to economic evaluation is required.

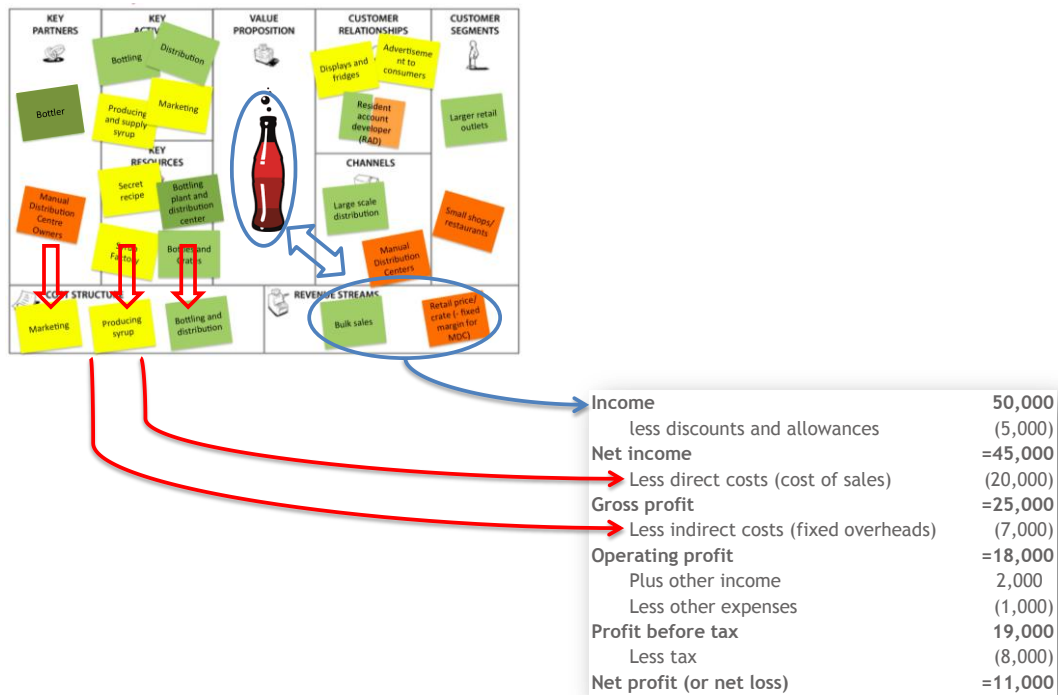


Figure 6: Linking conceptual model and economics (P&L statement)

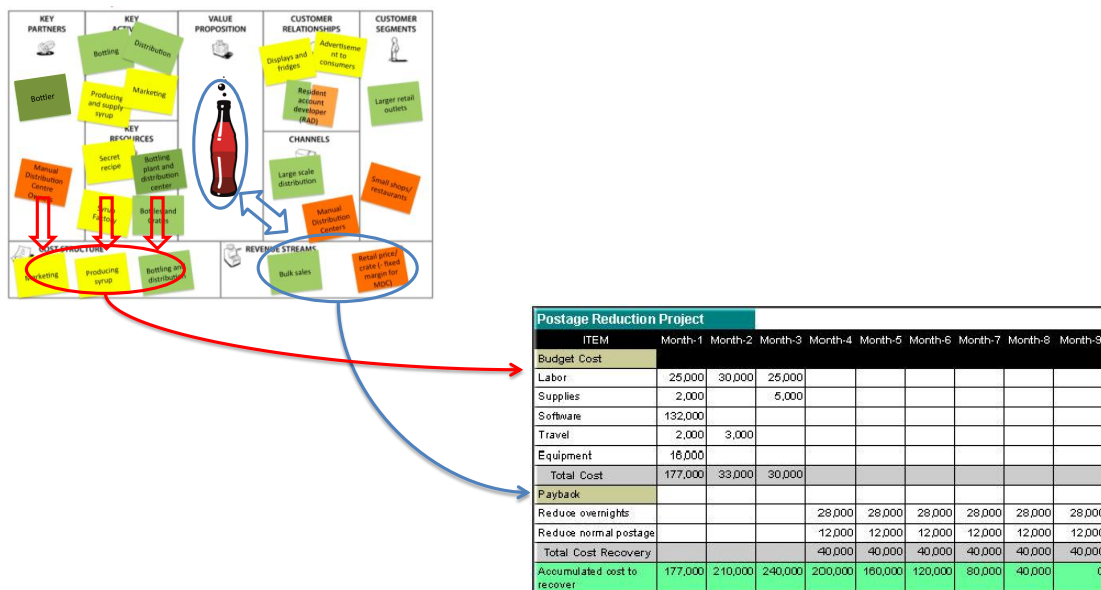


Figure 7: Linking conceptual model and economics (NPV evaluation)

Two types of linkages appear to be the more relevant:

- Stakeholder:** a mapping between stakeholder key business model components and economic evaluation framework (P&L or NPV) is required:
 - Value Proposition to incomes through Revenue Streams.
 - Key Resources to cost structure (direct or overhead)
 - Key Activities to cost structure (direct or overhead)
 - Partner Network to cost structure (usually direct in supply chain workflow)
- Transaction:** A transaction has an effect in both sides of it. In the “customer” side it affects the cost structure while, in the “supplier” side, it has an effect in the incomes

and indirectly in the cost incurred to produce the goods or services exchanged in the transaction.

6. BUSINESS MODEL FRAMEWORK

6.1 Value network

A **value network** is composed by **stakeholders** (companies) that exchange goods, services and information in the form of “**transactions**”:

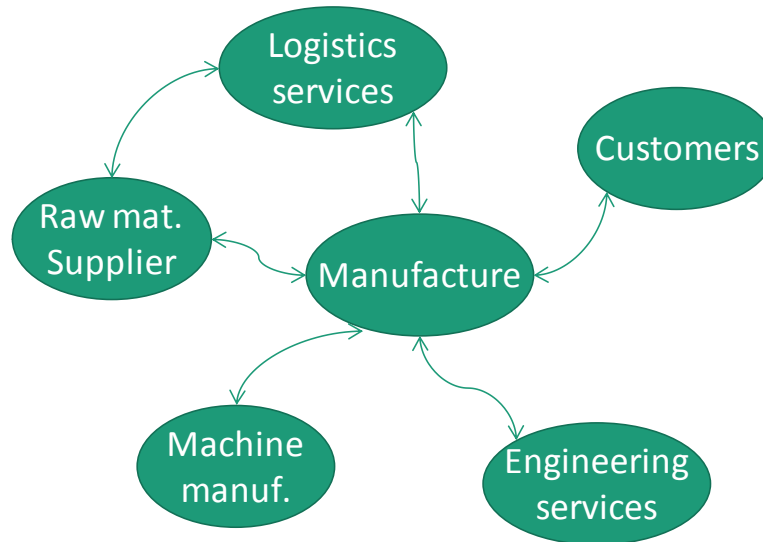


Figure 8: Value network example

- Each stakeholder performs a series of activities and processes that reflect a specific organisation (**business logic**) that has its corresponding **economic performance** as business.
- **Transactions** are input/output events between stakeholders, and each one has an impact in the economic statements of both ends' stakeholder.
- **Any improvement** of current practices regarding energy and raw materials has an **impact on the business model of one or more stakeholders** within the network.
- Moreover, these improvements have an impact in the **aggregated performance of the value network**.
- **Transaction map**: a transaction may prompt other transactions depending on the type of relationships established in the value network. So that, a more detailed set of events based in a transaction-to-transaction map should be produced deploying a scenario.

Transactions' map				
	T1	T2	T3	T4
T1		1		
T2			1	1
T3				1
T4				

T1 switches T2
 T2 switches T3 and T4
 T3 switches T4

Figure 9: Transactions map

The limits of the value network as a system under study are set by the stakeholders pertaining to the value network. Actors that only provide inputs to stakeholders but are not likely to contribute with innovation opportunities shouldn't be considered as stakeholders, i.e. an utility company. The inputs from these actors are supposed that are included in the economic statements of the corresponding stakeholders. So that, transactions between stakeholders and external actors will be considered as part of the system as long as they influence the decision flow of the value network (the transaction map)

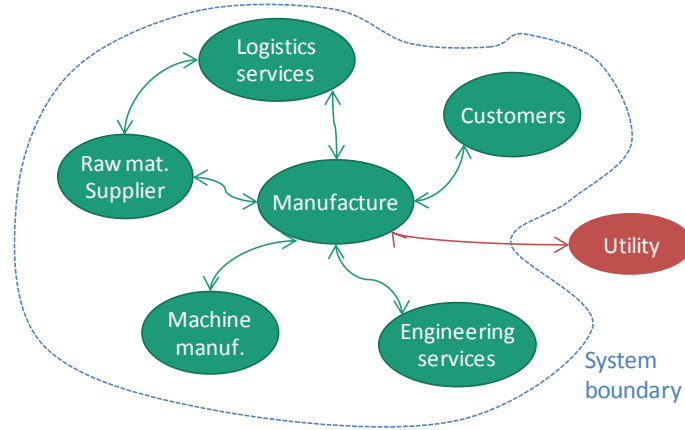


Figure 10: Value network boundary

- It is important to have a **qualitative model** of a business (canvas) that reflects the changes in the **business logic** as a consequence of the improvements.
- And also a **quantitative model** that **measures the impact of changes in the financial health of the business**. The quantitative model will be based in a different approach depending on the type of improvement alternative to be evaluated:
 - Profit and losses statement (impact on an individual company)
 - Investment project statement (collaborative joint opportunities)

6.2 Value Network modeling

A value network is composed by stakeholders (companies) that exchange goods, services and information in the form of “transactions”.

It is important to have both, a qualitative model of a business (canvas) and a model of quantitative figures that measure the financial health of the business.

The quantitative model will be based in a different approach depending on the type of improvement alternative to be evaluated:

- Profit and losses statement (impact on an individual company)
- Investment project statement (collaborative “joint-venture type” opportunities)

6.2.1 Stakeholder modeling

Each stakeholder will be modeled in two ways:

- **Qualitative** model: using the business model canvas proposed by Alexander Osterwalder.
- **Quantitative** model: will be based on the profit and losses statement or the net present value.

A map showing the impact of the main elements of the qualitative model into the quantitative model will be also produced. This map should only be provided for those elements of the

qualitative model that would potentially be affected by the innovations proposed from WP4 and WP8.

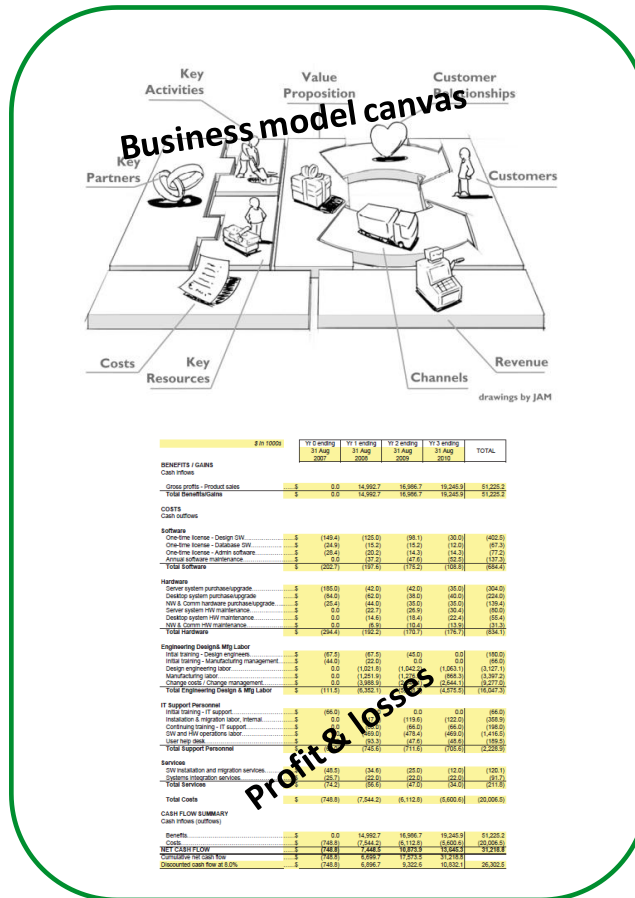


Figure 11: Stakeholder modeling

The economic impact will be modeled mainly by means of **Profit and Loss statements or the Net Present Value**. This is a financial statement that **summarizes the revenues, costs and expenses incurred during a specific period of time** - usually a fiscal quarter or year. These records provide information that **shows the ability of a company to generate profit by increasing revenue and reducing costs**.

But we need also to consider that financial statements use to be confidential, so we need to **keep confidentiality of data and, at the same time, show the economic impact of MEMAN achievements**.

6.2.2 Transaction modeling

Transaction economic effects: a transaction has an economic effect in both ends of it. From the “supplier” side, it represents a variation in the incomes, while in the “customer’s” side it has an impact in the cost structure. Each transaction will be modeled in such a way that it allows:

- Establish the links to its both sides’ stakeholders.
- Quantify its occurrence in a period of time.
- Map the quantitative impact of an occurrence on both sides stakeholders’ quantitative model.

Transaction effects

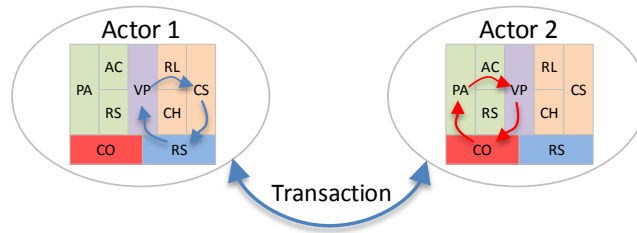


Figure 12: Transaction economic effects

6.3 Modeling business innovations

Any improvement of current practices regarding energy and raw materials has an impact on the business model of one or more companies within the network.

There may be different types of innovations that will be identified in the three value chains of MEMAN:

6.3.1 Individual company improvements

The logic of an individual company innovation would follow the following logic:

1. MEMAN key findings will be oriented mainly towards resources consumption optimization (energy, raw materials).
2. The resources consumption optimisation in the three clusters focuses on manufacturing activities.
3. So, they are mainly direct costs. These costs are classified as “costs of goods sold” in the Profit and Losses statement or budget cost in NPV.

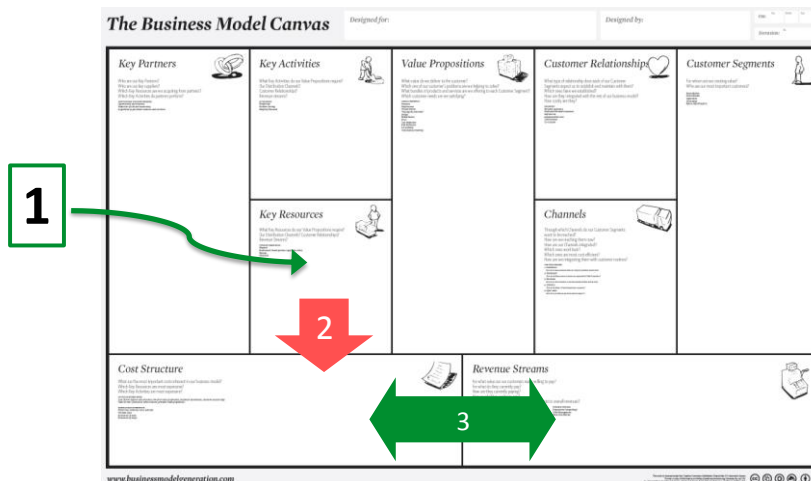


Figure 13: Individual innovations impacts

6.3.2 Collaborative opportunities:

It implies that at least two organisations participate in an improvement. This collaboration can have two main types of consequences in the value chain.

➤ A change in an existing transaction.

1. MEMAN key findings will be based on a **value proposition innovation as the object exchanged between stakeholders**

2. The new value proposition will update the **revenue streams** in the “seller” side of the transaction
3. The new value proposition will influence the cost structure of the “customer”
4. The value proposition will produce a change in the infrastructure of resources and activities
5. This change will influence the cost structure of the “seller”.
6. The changes on **the incomes** from revenue streams **and the costs** of building the innovation update the **profit equation**.
7. The changes on **the costs** structure will update the **profit equation**.

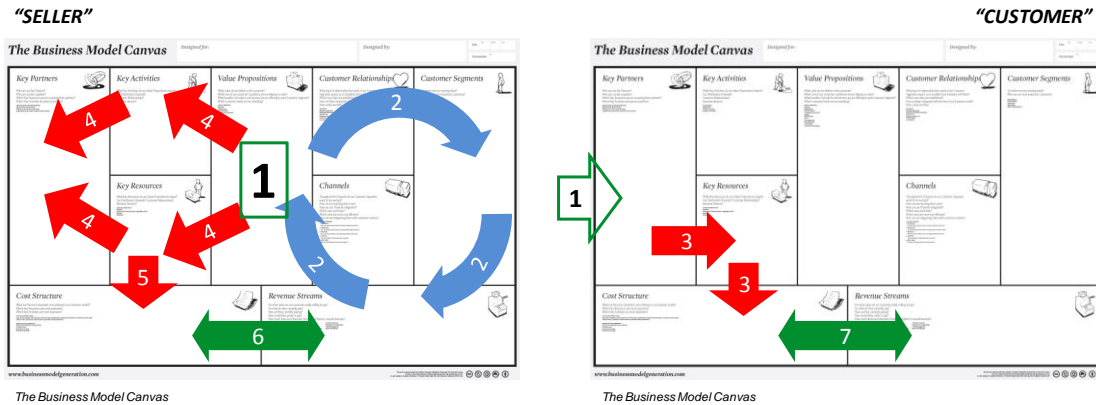


Figure 14: Collaborative innovation impacts

➤ Structural change in the value network:

Any structural change implies creating a new model, which introduces new variables and an additional difficulty for comparative studies between old and new models.

New transactions affecting existing stakeholders should be modeled in the same way and their impact in the economic statements should be mapped.

In case of new stakeholders, especially if they are new joint-ventures, economic impact evaluation should be addressed in a different manner, due to the lack of available data.

Structural change in the value network may happen in two ways:

- ✓ Creating a new transaction: New exchange activities between actors from the value chain that imply new transactions:
 - Physical products/byproducts
 - Services as: engineering consulting, training, knowledge transfer
- ✓ Creating new stakeholders and related transactions.

6.4 Scenario evaluation modeling

A scenario is a time series of transactions' switch-on events that occur in a given value network structure. A scenario is composed by two parts:

- The value network model.
- The innovation events model.

Each innovation arising from MEMAN improvement opportunities will be modeled as a set of events that can affect to a stakeholder, to a one or more transaction, or to both types of elements of the model. So that, each event should have its corresponding impact model configuration.

The impact of an innovation event requires specifying the influence or change that the corresponding innovation produces in the model parameters of any model component affected by the event.

These influences must map to both, the qualitative and the quantitative part of the model.

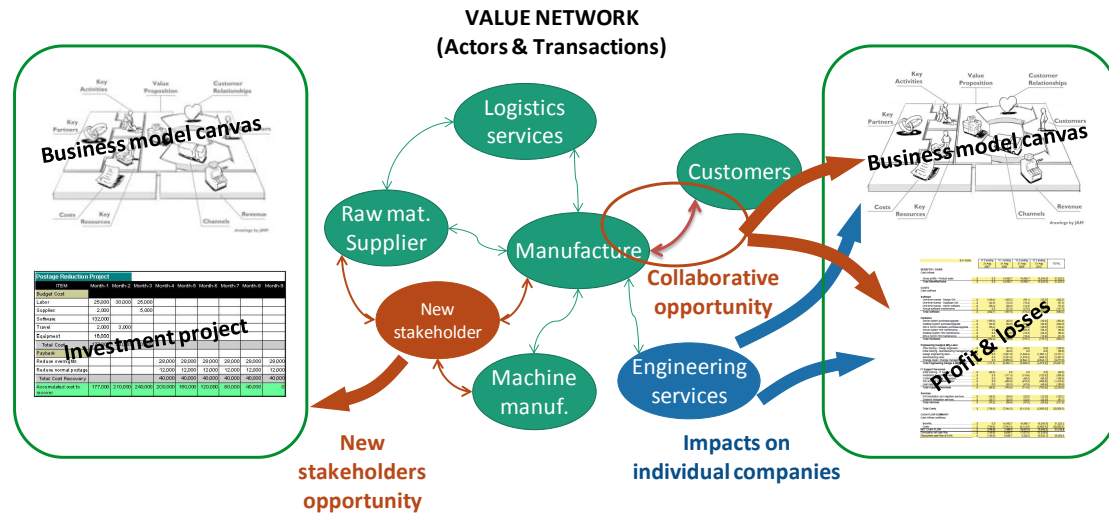


Figure 15: Networked business model framework

7. METHODOLOGICAL ORIENTATIONS

7.1 Value network modeling

Office type common visual tools (powerpoint or others) and specific templates will be used for value network modeling and its components specification. These templates must cover all the modeling concepts described in the Networked Business Modeling Framework.

The templates will be defined in detail in task 7.2 of the project. A first version will be developed for qualitative modeling purposes and feedback from this modeling will allow the required refinement to gather data for economic evaluation purposes.

Methodologically, value network modeling will consider two types of components: stakeholders and transactions.

7.1.1 Stakeholders

7.1.1.1 Stakeholders identification

Each stakeholder that participates in the flow of goods and services in the value network must be identified and characterized as model component. This characterization includes only stakeholder identification because the specific modeling of its components from a business model perspective will be done in the “Stakeholder modeling” phase.

These identification characteristics will be based on the information available in D2.1 and D2.2. Each company is a stakeholder, unless it has several business units that perform with their respective business logic. In this later case, the business unit should be identified as a stakeholder.

7.1.1.2 Stakeholder modeling

- Business logic modeling

There are three relevant types of elements that require to be modeled from a business logic perspective:

- Value propositions: these are the goods or services exchanged between value network stakeholders. The characteristics of the product behind the value proposition require also to consider some specific issues in the modeling:
 - The requirements of the customers have to be implemented in the decision process. Typically, the customer defines the required characteristics of the products and if they are fulfilled. From this view it has to be answered what should be achieved by the company and his customer. One can also think about the location of production. In certain cases the product could be needed directly at the customer's site. Then, the company has to decide what kind of production process is needed, e.g. 3D Printing vs. conventional manufacturing.
 - These requirements will be modeled through the involved activities and resources sections of the business logic, and the corresponding impact on the cost structure.
- Customer interface:
 - Customers segments: types of different customers that participate in transactions with the stakeholder being modeled.
- Infrastructure:
 - Main activities performed by the stakeholder regarding the process being modeled, including management activities.
 - Main resources that participate in the process: the reference information required to identify this resources comes from functional units modeled in WP2.

- Partnership: types of different suppliers or collaborations that participate in transactions with the stakeholder being modeled.
- Economic modeling
 - Revenue streams: income flows produced as a consequence of transactions. These flows will consider specially the incomes resulting from those transactions between partners of the value network that are modified by the innovation opportunities identified in the project.
 - Cost structure: Costs structure derived from the infrastructure elements gathered before, and the incoming transactions from value network partners that are modified by the innovation opportunities identified in the project.
 - Profit equation: Relation between incomes and costs that allows economic evaluation of each stakeholder performance. In each case, the approach (Profit statement or Investment evaluation) for the profit equation will be selected by each partner of the value network. Profit equation modeling must preserve the confidentiality of this sensitive information. Also costs/profits increase or reduction percentages evaluation approaches will be analysed and implemented if necessary and feasible.

7.1.2 Transactions

7.1.2.1 Transactions identification

The interfaces between stakeholders are the reference points to identify transactions between stakeholders.

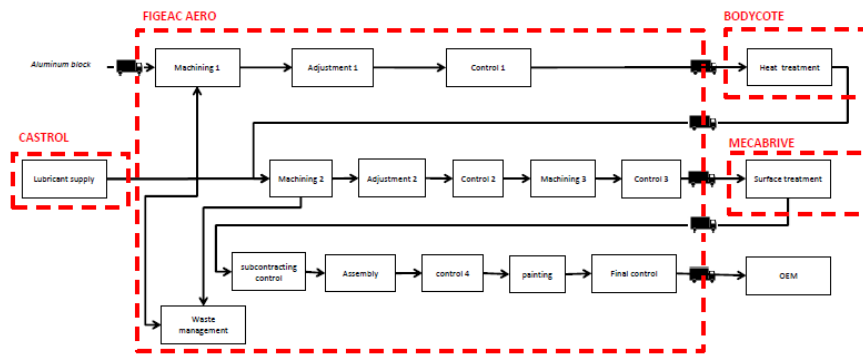


Figure 16: 12H BEAM case product (D2.2)

As it can be seen in this figure, five transactions are identified. Three of them are transactions between network companies and there are two transactions between the central stakeholder and external actors (OEM, Raw material provider).

7.1.2.2 Transactions modeling

The definition of a transaction implies the characterization of the following elements:

- Transferred value proposition (the good or service exchanged from “provider” to “customer”).
- Frequency of occurrence.
- “Supplier” stakeholder
- Impact of an occurrence on incomes of the “Supplier” stakeholder.
- “Customer” stakeholder
- Impact of an occurrence on costs to the “Customer” stakeholder.

7.2 Business innovation opportunities identification

7.2.1 Individual company's opportunities

The nature of MEMAN project has a high potential for business innovation opportunities from an internal perspective of a company. Two main aspects need to be adequately modeled from business model perspective:

- Manufacturing processes
These include the activities and related equipment that is monitored and analysed in each cluster use case. Specific elements representing these items must be implemented in the business model in the activities and resources of the modeling framework.
- Economic model
These economic aspects will reflect first the impact of each manufacturing process components in the cost structure. Secondly, cost and income elements will be mapped to the type of profit equation selected by the company.

Once this modeling is ready, a specific modeling of innovation opportunities will be addressed. Each innovation opportunity will be modeled as an event. The modeling of an event must include at least the following items:

- Innovation event identification
- Frequency of occurrence: how many times does the innovation represented by the event impact in the profit equation?
- Business model elements involved in the innovation
- Impact of an occurrence on incomes
- Impact of an occurrence on costs

7.2.2 Business Models and Value Networks

According to Chesbrough as mentioned in chapter 6, one of the components of a business model is the definition of the structure of the value network, required to create and distribute the offered products to the customers. Which partners and their resources are needed to manufacture and deliver the intended product or service. The time that many OEMs developed, manufactured and sold all products by themselves is already for a long period left behind us. Due to increased outsourcing, specialization and increased technological complexity, especially in the high tech sector, it is closer to reality to speak about value networks competing with each other than competition among individual OEMs. Partners in the value network increasingly possess specific knowledge that contributes to the competitive advantages of a certain product. These specialisms contribute to superior product capabilities, shortening of the time to market and/or lowering the production cost. The specialist competences give the different partners in the value network a more independent and powerful position. The OEM and the value network partners have become mutually dependent. This will find its reflection in the business model and the division of the generated revenues.

The above mentioned developments have led to a variety of value networks. All value networks may have a lead firm but the distribution of power between the partners and the degree of explicit coordination will be different in each value network.

The following typology of value networks helps to come to grips with these differences and the consequences of them for the strategic position of the individual value network partners and the division of costs and revenues in the value network.

7.2.2.1 Typology of value networks

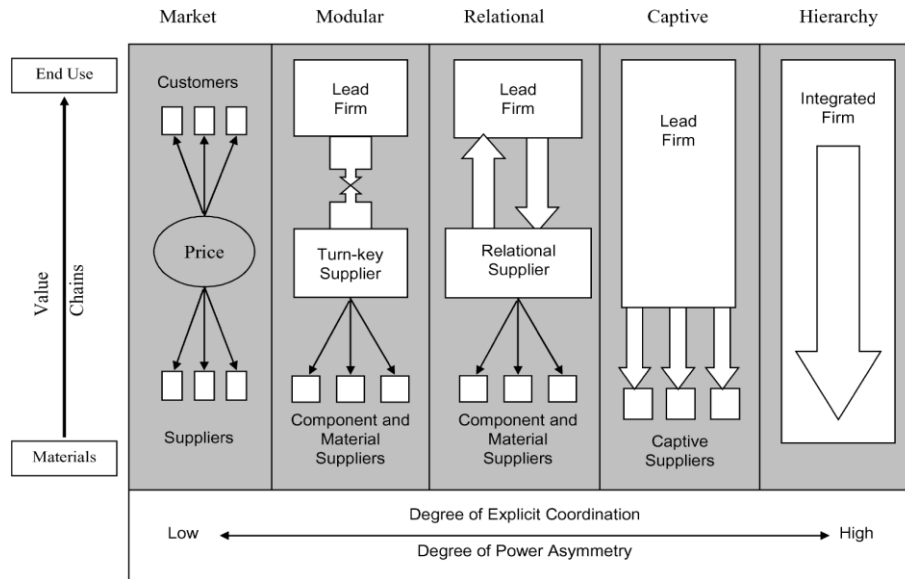


Figure 17: Value network typologies

The typology discerns 5 types of value networks. These value networks differ in the way how partners act together. This ranges from the one side where the partners act as an open market to the other side where partners act as a totally integrated firm. The most important dimensions in which the value networks differ are the power asymmetry between the buyer/OEM and the suppliers and the degree of explicit coordination between buyer and supplier. These two dimensions may differ between partners in the different parts of the value networks. So will there in almost all value networks be transactions where some buyers and suppliers act as market partners. This will be the case where standard products or parts are bought from the shelf. The following scheme represents the typology.

Below a short description is given of the 5 types of the value networks:

1. **Markets.** Suppliers are predominantly selected based on price competition. The essential point is that the costs of switching to new partners are low for both parties.
2. **Modular value networks.** In this situation suppliers, also called “turn key” suppliers, deliver a complete module and take responsibility for its development and for the outsourcing of activities that require external competencies.
3. **Relational value networks.** Relations between suppliers and buyers are complex. Mutual dependency and high levels of asset specificity between buyer and supplier companies are every day's business. Trust and reputation are key.
4. **Captive value networks** are characterised by a large power asymmetry between buyer and supplier. Suppliers depend heavily on a small number of large customers, have high switching costs because of asset specificity, and are frequently monitored and controlled by buyer firms.
5. **Hierarchy.** This governance form is characterized by vertical integration. The dominant form of governance is managerial control, flowing from managers to subordinates, or from headquarters to subsidiaries and affiliates.

Three factors that are dominant in determining the type of value network are discerned. These are:

1. **Complexity of the transactions.** Complex transactions require specialist knowledge and are not easily carried out with a new supplier. The higher the complexity, the more the buyer and supplier are entwined.

2. Codifiability of the transactions. When transactions can be well codified into concrete specifications or instructions, the outsourcing of them can be done in a controlled way. In case of low codifiable transactions the relationship between buyer and supplier must be closer. The specific know how of the partners is complementary. Often tacit or sticky knowledge of one or both partners is involved. Therefore, the lower the codifiability of transactions, the more the buyer and supplier are entwined.
3. Capabilities of the suppliers. The capability of suppliers to internalise knowledge, develop products and access markets, strengthens their position in the value network.

7.2.2.2 Business model types in value networks

There are broadly three main types of business models in value networks. These are 1) Cost based business models, 2) Performance based business models and 3) Revenue based models. Important aspects of value network business models are the sharing of risks and rewards.

1. Cost based business models

Cost based models are based on the actual costs that the value network needs to make in order to realise the product. If suppliers and buyers in a value network work together, suppliers are compensated for their energy, (auxiliary) material, and labour costs. Usually, the risk is carried by the buyer firm. There are also models possible in which the supplier and buyer share the risk, for example, when payment is carried out afterwards.

2. Performance based business models

In performance based business models the supplier will realise the components for the buyer and get paid a predetermined amount of money. The supplier will have an incentive to realise it as cost effective as possible, since all savings will be directly for the supplier. A possibility is to take into account the learning effect of the supplier, by decreasing the amount over time, anticipating on declining costs for the supplier.

3. Revenue based business models

In revenue based business models the reward of the supplier is related to the commercial success of the resulting product. For example the number of products sold. This is a far-reaching form of cost- and risk sharing between the buyer and the supplier. Several variations can be developed on this basic principle.

7.2.2.3 Value network innovation opportunities.

Based on the value network typology and the three categories of business models for value networks the following framework can be drawn.

Business model Value network type	Cost based business model	Performance based business model	Revenue based business model
Market value network			
Modular value network			
Relational value network			
Captive value network			
Hierarchical value network			

Figure 18: Framework for business models in value networks

This framework will be used to get insight in what business model is best suitable for which value network. Which one should be applied under what circumstances. The outcome of this exercise should support companies in selecting business models and discuss them with suppliers. In this way a healthy cooperation within value networks can be supported. Also the repercussions of changes and innovations in existing value networks can be explored and assessed. This includes changes resulting in increased material and energy efficiency in the value networks. In this way the accompanying costs and risks related to increased resource efficiency and the fact that most probably the cost and the revenues of these measures will be distributed unequally over the entire value network can be addressed in an equitable way.

In the coming months this framework and its implication will be further elaborated upon. Different issues will be researched and evaluated. Among these are the following topics:

- Further explication of the business models for value networks and their implications
- Alignment of the various interests and strategic moves of value network partners in light of increased resource efficiency
- When is what business model appropriate? What are the advantages and disadvantages?
- What are the barriers to adoption of resource efficiency measures and how can a suitable business model support that?
- How can investments burdens in the value network be distributed?
- What are fruitful approaches to risk sharing? Amongst these could be development risks, market risks, financial risks, information risks and partnership risks
- The importance of trust and other soft factor in value network innovation
- Intellectual property in the value network
- Strategic options for value network development and innovation

7.2.2.4 Value network innovation opportunities modeling.

The opportunities identified from a value network perspective affect to the network structure in the sense that it involves at least on transaction and two stakeholders.

These opportunities modelling will have as reference the actual value network model and will show how the opportunity transforms stakeholders' business models and the transactions between them.

- Stakeholders' transformations:
These transformations must reflect the changes in the business model components, and its consequences in the cost structure and revenues' streams.
- Transactions' transformations:
These transformations must reflect the changes in the characteristics of existing transactions (see section 8.1).

In case the opportunity induces a change in the structure itself by adding or eliminating stakeholders or transactions. We need to proceed to model the new value network using the BMF.

The procedure to follow when identifying and modelling value network innovation opportunities will be the following:

1. Model the existing value network using the BMF.
2. Identify value network innovation opportunities based on the approach presented in 8.2.2.
3. Model the new value network:
 - Structure
 - Stakeholders
 - Transactions

7.2.2.5 Communication and cooperation between supplier and customer

Due to the increasing number of different requirements, it is necessary to enhance the tools to exchange information about the product characteristics. This could be related to the selection of the raw material used, the way of processing the material or the combination of materials.

Furthermore, the possibilities of recycling depend on the material and the manufacturing. The chance to save resources increases by matching the materials and the required characteristics of the end-product.

The innovation opportunities regarding communication and cooperation will also be considered and modeled to assess their influence in the value chain performance. This implies to identify and model the impact of the new communication and cooperation strategies and tools in the elements of the value chain: stakeholders and transactions.

7.3 Business innovation scenario modeling

The aim of scenario modeling is to provide a modeling framework to represent the impact of business innovation opportunities into the economic performance assessment. This is an intermediate step between qualitative business opportunities appraisal and modeling and their economic evaluation.

A business innovation opportunity will be transformed into a series on "events" that modify the characteristics of the value network model elements' (stakeholders and transactions) characteristics.

In case an innovation opportunity implies changing the value network structure, the new value network must be modeled in advance. Afterwards, the events corresponding to the innovation opportunity will be defined.

7.3.1 Stakeholder events

Stakeholder related events will impact the cost structure through activities and resources innovations. An event must show the increase or decrease on the consumption of activities and/or resources. Depending on the nature of the qualitative innovation and the economic evaluation statement chosen (P&L or NPV), the impact can be spread in one or more periods of time.

Example: Imagine an innovation opportunity that involves retrofitting an existing equipment to obtain a 20% reduction on energy consumption of this equipment (the equipment consumes the 50% of the total energy). The retrofitting costs have been accounted as an investment of € 20.000, to be amortised over 5 years. This innovation would trigger two events:

- Event 1: $(20\% * 50\%)$ reduction on the energy costs in the cost of goods sold line of the P&L statement.
- Event 2: An increase of €4.000 in the fixed overhead costs in the P&L statement.

In task T7.2 a list of preliminary event types and associated modeling guideline and attached forms will be produced, considering all type of innovations arising from each cluster case.

7.3.2 Transaction events

Transaction related events modify the characteristics of existing transactions. These events may modify any characteristic of the transaction, but specially those corresponding to economic evaluation:

- Frequency of occurrence.
- Impact of an occurrence on incomes of the “Supplier” stakeholder.
- Impact of an occurrence on costs to the “Customer” stakeholder.

7.3.3 General events

Events will be modeled to show how variables external to the value network influence the scenario and the performance of the value networks. These events will be used to represent specific risks such energy/raw material price variations, regulation and taxes, etc...

7.4 Economic evaluation

Economic impact evaluation is a key aspect for the framework and must consider the confidentiality issues of the required information and also results.

Independently of the chosen economic statement (P&L or NPV), the figures will be treated and presented in a way that preserves company's confidentiality.

The approach to keep confidentiality of figures will be developed and agreed between cluster leaders as a first step y task T7.3.

In addition to that, each cluster network will choose the type of statement more suitable for economic evaluation purposes in their use case.

8. CONCLUSIONS

Deliverable 7.1 define a modeling framework based on existing business modeling techniques and methods devoted to model and assess the consequences innovation opportunities identified in the project.

The deliverable is a modeling proposal that will be used as a main input to subsequent tasks of WP7. The critical issue has been to build a modeling proposal integrating different existing techniques due to the absence of proposals that provide adequate tools to tackle all the aspects we need to address.

The negative consequence of this “blended” approach is the inexistence of available tools that reflect all the modeling issues required in MEMAN regarding networked business modeling. This implies that an especial effort requires to be made in subsequent task to provide procedures, forms and tools to get the objectives.

On the positive there is a match between the three main element of the NBMF and the following tasks of WP7:

- The **value network modeling framework** will be used then in task T7.2 to model each cluster’s value network in a qualitative way. Actual value network and the new network as a result of innovations opportunities will be modeled.
- The **economic evaluation** represents the quantitative part of the model. Specific tools based on the value network modeling and economic evaluation proposals will be developed in task T7.3 to assess the economic consequences of innovation opportunities.
- Finally, the **modeling orientations** will guide the execution of tasks T7.2 and T7.3, and will also provide specific inputs for task T7.4.

In conclusion, the results of task T7.1 presented in this deliverable provide the modeling framework to be used in subsequent tasks in order to fulfill the objectives of WP7: the design and assessment of new business models under the collaboration criteria established for reducing energy and resource consumption along the entire value chain.

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