

Ecosystem Business Model design

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Abstract:

The business ecosystems, open innovation, platforms and systemic innovation are the concepts that are growing fast; they share the multi-actor context and the alignment on a common comprehension of the business. On the other hand the business model concept has been developing in the recent years mostly having a focal firm perspective so it does not provide lenses or tools adapted to such multi-actor contexts. In this regard, through an action research methodology we developed an ecosystem business model design tool within a public-private innovation project for transportation. The Ecosystem Business Model (EBM) includes mapping, matrix and histogram tools to interpret and simulate cost-revenue structure as one of the aspects of business models. These tools helped to overcome the complexity of collective design for the business model within a multi-actor innovation project and assisted different actors to coordinate and collaborate together to establish a business ecosystem for

innovation. This communication calls to open the business model literature to the business ecosystem context.

Key words: Strategic Management, Ecosystem Business Model, Systemic Innovation, Business Model Design

INTRODUCTION

Many innovations involve several and various actors, who are supposed to align on a common comprehension of what the future business ought to be. Surprisingly, despite the growing importance of the business model concept, the existing literature is quite silent about such ecosystem approach. How to use the business model approach for an innovation project within a business ecosystem?

The business model concept has been dramatically developing in the recent years, business model federates several issues and combines different functions, it consists of a coherent set of business variables (value proposition, partners, resources, revenue structures, customers, etc.) surrounding a given technology.

The literature shows that the concept of business model mostly focuses on designing business models taking a “focal firm” perspective, so it is not able to explicit the business model of the multi-actor activities. For example a systemic innovation requires that different actors coordinate together and it entails interrelated changes in product design, supplier management and etc., (Chesbrough, 2003). In fact many contemporary systemic innovations are too big and complicated to be managed in the firm level even the largest(Maula et al., 2006).

So existing literature on business models which is mostly focused on a focal firm – marginally associating partners – do not provide lenses or tools adapted to such multi-actor contexts. It seems that the application of the business ecosystem notion to the business model concept will fill this gap. Business ecosystem as an economic community is supported by a foundation of interacting organizations and individuals, it gradually moves from a random collection of actors to a more structured community through a formation phase(Moore, 1993). In this phase the business model is forming gradually. This phase concerns about identifying innovations,

technologies or concepts that will create better products and services than those already available, a primary offer targets some customers who agree to be the first users of an innovation, and the actors try to define the value structure and new actors may come on board (Moore, 1993), (Loilier and Malherbe, 2012). However this formation stage is important for establishing a business ecosystem but industrial or public actors are not equipped with appropriate tools to be able to make decisions.

We conducted an action research methodology for a public-private innovation project within Vedecom institute. This institute is an original collaboration between automotive companies (carmakers and suppliers), infrastructure and services operators, public research labs and public local authorities from the Paris region (Ile de France). We had the opportunity to join one of the main Vedecom projects which deals with the development of innovative mobility solutions near Versailles, in the perspective of helping the actors to build a concrete, viable and innovative offer.

We propose an ‘‘Ecosystem Business Model design tool’’ for systemic innovation, in which several actors should collaborate together in order to realize a big and complex project. When an innovation is being designed, the offer and its detailed specifications are not completely determined and all the actors who will take a part in realization of innovation are not onboard yet, in addition there is not enough information about potential users.

To that extend, ‘‘EBM design tool’’ can assist different actors to coordinate and collaborate together to establish a business ecosystem for innovation.

In this communication we develop a method for EBM mapping for public private complex projects. Mapping tools are the first insights on the business aspects of the project (Lavoisy et al., 2011) and they can prepare the information for corporate actions, however these tools are useful but they do not predict what the new business model will become (Chesbrough, 2010), so they do not provide information about the viability of business ecosystem and its involved actors. Despite the importance of this issue, there is no model or tool capable to do so. So we focused on creating an ‘‘EBM matrix’’ that reply satisfyingly to these questions. This matrix is based on the reality that each actor may play a contributor and/or beneficiary role in the reaction with other actors in the business ecosystem. In addition business ecosystem is a dynamic and collective action of actors; it generates some costs and negative externalities

which exit the boundaries of ecosystem and provides some exterior funding or subventions as well as positive externalities which enter the business ecosystem. “EBM histogram” provides information about operational situation of business ecosystem and its involved actors. In the case of systemic innovation, a simple use of NPV (Net Present Value) based on the information extracted from “EBM matrix” determines the viability of the business ecosystem for innovation.

1. LITERATURE REVIEW

1.1 BUSINESS ECOSYSTEMS

The most companies today inhabit ecosystems that extend beyond the boundaries of their own industries and they may depend on hundreds, if not thousands, of other businesses (Iansiti and Levien, 2004a). Therefore business ecosystem includes a large number of loosely interconnected actors who rely on each other for their mutual effectiveness and survival and they share their fate (Iansiti and Levien, 2004b).

Business ecosystem represents a pertinent scope for systemic innovation; within an ecosystem, different interrelated and interdependent companies cooperate together in order to jointly deliver a product or service to customers (Clarysse et al., 2014), so value creation is not a linear process, value is created through the cooperation within a network of companies with many interrelations (Moore, 1996), (Iansiti and Levien, 2004b). Business ecosystem permits firms to create value that no individual firm could have created alone (Ander, 2006).

Moore defines four stages for a business ecosystem; formation, expansion, authority and renewal or death of an ecosystem (Moore, 1993). It is clear that business model does not exist from the beginning and it is being constructed gradually, if so, we take a business ecosystem as a relevant scope for business model design in a systemic innovation, the first stage “formation” is highly important in which business model is being established. The early stage focuses on identifying innovations, technologies or concepts that will create better products and services than those already existing. In this stage, a primary and maybe incomplete offer is provided to a selected population of customers, who are also ready to contribute to test the innovation. The actors of the ecosystem try to establish the value structure and define the organizational architecture, and new actors may come on board.

Finally actors evaluate the past proceedings and prepare themselves to go or no go to the next stage “expansion” of ecosystem(Moore, 1993), (Loilier and Malherbe, 2012).

However this formation stage is important but industrial or public actors are not equipped with appropriate tools to be able to make decisions. In the next section we define our methodology for a public-private innovation project within Vedecom institute, and then we present the ‘EBM design tool’ that supports the actors to make such decisions. Because of the confidentiality reasons we just present the tool and other information is provided just as example and it is not the results of project.

1.2 SYSTEMIC INNOVATION

Systemic innovation in contrast to the autonomous innovation which can be managed independently from other innovations and other actors, is too big or too complex to be managed by one actor/firm, even the largest firms lack the resources to do so(Maula et al., 2006). In systemic innovation the benefits can be realized only in conjunction with other actors(Chesbrough and Teece, 1996) who make up a significant resource pool to develop different components of the innovation(Maula et al., 2006). Systemic innovation processes span beyond the boundaries of the firm, it requires significant adjustments in its business ecosystem and coordination among different actors and various activities(Chesbrough and Teece, 1996). The systemic innovation does not stand alone and it requires changes in the business ecosystem and other innovations initiatives from other actors(Adner and Kapoor, 2010).The coordination among the actors goes beyond the suppliers and customers; it requires a dynamic interplay between complementary innovators (incumbents, startups and research institutions)(Maula et al., 2006), industrial partners and public sector through various collaboration mechanisms. The systemic innovation is about a core innovation and the innovations within its suppliers, buyers and complementors, who contribute to resolve their own challenges in order to assist the core innovation to create value(Adner and Kapoor, 2010).

1.3 BUSINESS MODEL

The business model concept as one of the concepts of strategic management(Demil et al., 2014) rapidly grew in the past 15 years, including a growing list of components which all are

supposed to make sense together in a coherent business perspective. Business models are proactive and caught in a dynamics of trials and contribute to the emergence of a new entity (Doganova and Eyquem-Renault, 2009). Business model has various definitions which partially overlap, and different interpretations exist even if we find persistent components (Zott et al., 2011).

Chesbrough and Rosenbloom define the Business model as a construct which connects technological characteristics and potentials as inputs to economic outputs through customers and markets (Chesbrough and Rosenbloom, 2002). To do so business model includes cost and revenue structure, market segmentation, value network, competitive strategy formulation and value proposition (Chesbrough, 2010). Teece argues that a business model is the articulation of the logic, the data, and other evidence to support a value proposition for the customer, and a viable structure of revenues and costs for the firm itself (Teece, 2010).

The *business model canvas* proposed by Osterwalder involves activities, resources, partners, customers, costs and revenues and value proposition (Osterwalder and Pigneur, 2010). Demil and Lecocq describe the business model with components including resources and competences, internal and external organizational structure, value proposition to the customers as well as cost and revenue structure (Demil and Lecocq, 2010). Chanal suggests that the business model is a description of how a company creates value in interaction with other companies and how the value is distributed between the actors (Chanal, 2011).

Roehrich and Llerena define the business model as the interface between value propositions to customers and the position of the firm in the value network and they categorize the actors in two categories, on the one hand the supply network (innovator, producer and provider) and on the other hand the demand network considering that the applier, user and payer are not the same always (Roehrich and Llerena, 2011).

The concept of business model apart from the significant works of Amit and Zott (Amit and Zott, 2001), (Zott and Amit, 2010) mostly focuses on designing business models taking a “focal firm” perspective, so it is not able to explicit the business model of multi-actor activities. For example a *systemic innovation* (Chesbrough, 2003), (Maula et al., 2006) requires the coordination of different actors and it entails interrelated changes in product design, supplier management and so on (Chesbrough, 2003). So existing literature on business

models which is mostly focused on a focal firm – marginally associating partners – do not provide lenses or tools adapted to such multi-actor contexts. It seems that the application of business model concept to business ecosystem will fill this gap. As business model in the firm level takes the autonomous innovation to the market so the business model of the ecosystem gradually takes the systemic innovation as a collective value proposition to the market.

Business model mapping

To justify corporate actions for emergent opportunities, the deep wealth information is needed, however almost always it is not available, mapping tools as experimental actions are useful to generate new data and information(Chesbrough, 2010). Mapping is a powerful tool to provide the first insights on the business aspects of the project like the business partners to interact with, the overall business network, the revenue generation mechanisms, the revenue flows, and the value propositions(Lavoisy et al., 2011). Mapping can demonstrate the first financial simulations based on revenue generation hypotheses and provide a useful support to collective strategic analysis(Haggege et al., 2011). Mapping tools are able to illustrate a representation of both current and prospective business models so managers can surmise the implications of their decisions for changing the business model more quickly and easily(Chesbrough, 2010).

The business model canvas(Osterwalder and Pigneur, 2010) and business model value network (Chanal, 2011) are examples for such business model mapping approach. The qualitative characteristic of the nine brick business model canvas provides a business model schema but the lack of quantitative characteristic makes it difficult to understand the viability of the business. This zooming-in on a business role of the firm makes the model applicable mainly for small size start-ups and not within business ecosystems. The value network approach emphasizes on the interactions and flows among potentially involved companies(Chanal, 2011) by proposing a methodology to map the various actors which play a role in the final value proposition. This approach zooms-out and gives the overall picture of a complex offer, which is necessary to understand the ecosystem in order to prepare for changes and rivalries (Lavoisy et al., 2011). However, this tool has several limitations in the context of EBM design; First, it is a visualization approach that does not provide an idea about fate of each actor and the viability of ecosystem. Second, it is more integral tool (in contrast with modular) since its form makes it difficult to investigate different scenarios with a new set of actors since the business model design stands as a collective experimentation design process.

2. METHODOLOGY

We conducted an action-research methodology within a public-private innovation project for mobility. Action-research methodology in management science leads to produce scientific knowledge that can serve the action, it enables the formalization and contextualization of models and tools, it constitutes the rationalization and produces new knowledge capable of making the organization change (David, 2012). We used the business model concept as a methodological tool for a collective innovation project within a business ecosystem.

We developed our work in close interaction with a real-life systemic innovation project within the Vedecom Institute. This Institute is a French public-private partnership dedicated to research on carbon-free and sustainable mobility. It relies on an original collaboration between automotive companies (carmakers and suppliers), infrastructure and services operators, public research labs and public local authorities from the Paris region (Ile de France). These organizations carry out research based on common research roadmaps, and real-life mobility development projects. The role of Vedecom is therefore to provide new knowledge, new ideas, and support this territorial initiative. Vedecom research effort deals with managerial, technical and sociological issues, in order to unlock current obstacles for recent emerging mobility issues (Autonomous vehicles, intelligent parking, car sharing, etc.). This project was a systemic innovation project within an ecosystem including various actors with different strategies and expectation, so creating a business model for an innovation ecosystem as the unit of analysis encouraged us, as a management science lab to join the initiative in order to bring a “business” perspective, providing methods and insights to build viable offers.

We had the opportunity to join one of the main Vedecom projects which deals with the development of innovative mobility solutions near Versailles, in the perspective of helping the actors to build a concrete, viable and innovative offer.

The project benefited from various dynamics which a priori converged towards the offer:

Existing mobility problems like congestion, lack of efficient public transport and immense use of personal cars, as current local mobility constraints would be aggravated with respect to the future urbanism plan of the zone for construction to accommodate new habitants and new

enterprises. However in next fifteen years, this area would benefit from public transport plans including few new subway stations and itineraries, but for such a growing demand for transport that is forming, it is essential to forecast the new types of mobility to cover the area optimally in order to connect it more efficiently in the above-mentioned public transport plans. This area is the French innovative mobility cluster, hosting R&D centers from major French automotive companies (Renault, PSA, Valeo, etc.) and startups, each developing critical parts for future mobility systems (electric and autonomous vehicles, sensors, etc.). Therefore implementing a systemic innovative mobility project in such a zone would be appropriate.

Relying on these dynamics, the various actors engaged in the project whose ambition is to develop a local innovative mobility solution, bridging private companies and public authorities. Our mission within this project was to help the various actors shifting from such a fuzzy “initial brief” to a common representation of what could be a common business model.

The first difficulty to overcome was the extreme heterogeneity of actors. The first step of this work was to identify the actors of the ecosystem. We identified public authorities, private industrial enterprises and the users as the main actors in the ecosystem:

- Public authorities (Département des Yvelines), (Versailles Grand Parc, Communauté d’agglomération de Saint Quentin en Yvelines) and public transport organizations (Autorité organisatrice de transports), each one has a role in the current transportation situation (in terms of funding and regulation), and maybe a role in the future mobility solution.
- Several companies which can play a role in a local mobility service, ranging from the carmakers who can manufacture the vehicles, the suppliers which can provide the sensors and intelligence equipments, the IT companies which can support the digital infrastructure, road equipment manufacturers which can provide the intelligent infrastructure, etc.
- The “customer” was also quite ambiguous, since the value of such innovations spreads among different actors interacting within the business model. We based ourselves on Roehrich and Llerena’s definition of “demand system”, (a combination of actors who needs the innovation, who uses it and who pays for it) and “offer system”, (a combination of actors who innovates, who produces and who offers) (Roehrich and Llerena, 2011, p.141). However

an actor could be the member in the both systems of offer and demand. In this perspective, the customers of innovative mobility service would ranging from the future users of the transportation service, the local employers which will potentially benefit from it, the local public authorities whom their territory will be more attractive thanks to the modern system and the local and global society which will benefit from less air and noise pollution as well as reduced greenhouse gas emissions.

Since nobody had a clear and global knowledge about all the potential players which could / should be associated with the project, we conducted a set of semi-directive interviews with all these players, in order to identify each actor and its interactions with others and to frame the perimeter of the business ecosystem. These steps led to building a first understanding of the “who would pay and what would be the gain?”

Relying on this emerging knowledge, we faced two critical issues when trying to put together a first hypothesis of business model. First, the different actors had very different approaches about costs and values. Second, nobody had a global evaluation of the current situation, i.e.

Nobody really knew who currently pays what and who earns what in the current transportation system. This issue is critical as reference scenario is important in order to be able to evaluate the profitability for each actor in the whole business ecosystem in the systemic innovation scenario. Ensuring the profitability of the innovation legitimizes business model of the ecosystem.

In line with the project partners and with the literature, we decided to build a first common picture of the business model of ecosystem for reference scenario. We considered the ecosystem as a combination of actors (public, private and users) involved in a specific activity (collective value proposition); in our case study the activity was defined as urban passenger transportation.

we identified the actors and their roles as contributor and/or beneficiary, then in order to calculate existing monetary flows between the actors, different sources and methods were mobilized (life cycle assessments, externalities calculation, public transport costs, fuel consumption costs, economics of transport, fuel consumption taxes, ...), the gathered information during the interviews, academic and public sources as well as collected data via mobility survey were processed by pertinent methods according to the character of each flow.

The results of the mobility survey revealed important information about the lived situation. The statistical information about the distribution of place of residence, place of work, worked days per week, flexibility of work day schedule, work displacement during the day, utilized mode of transport, travel time, distance from home to work and weekly delays due to transport provided us some information. We processed these statistics and articulated them other sources of information with appropriate methods in order to make the inputs for our “EBM matrix”.

3. ECOSYSTEM BUSINESS MODEL DESIGN TOOL

We developed three visual tools for business model of ecosystem:

- Ecosystem business model mapping, this mapping shows the identity of the actors and their interlinking monetary flows as well as non inter-actor monetary flows.
- Ecosystem business model matrix is based on the fact that each player can be contributor and/or beneficiary. Some monetary flows are among the actors and some flows exit or enter the boundaries of ecosystem.
- Ecosystem business model histogram shows simply the operational situation of business ecosystem and the sum of contributions and gains for each actor.

3.1 ECOSYSTEM BUSINESS MODEL MAPPING

Here we explain our approach for mapping the business model especially for big businesses in which the activities are complicated and the actors are various. To create the EBM mapping, first, the actors who play a role in the business model are identified; this can be done by realizing the interviews, meetings, surveys, websites and other sources of information. Second, the actors of ecosystem are placed in logical positions toward each other. To do this we created a cross-functional mapping that shows both identity and situation of each actor. Identity means that each actor is whether public, private or end-user. Situation signifies the role of each actor in offer and demand systems (Roehrich and Llerena, 2011). This manner of mapping contributes to a much clearer representation of the business model and it illustrates visibly the position of each actor sometimes multiple.

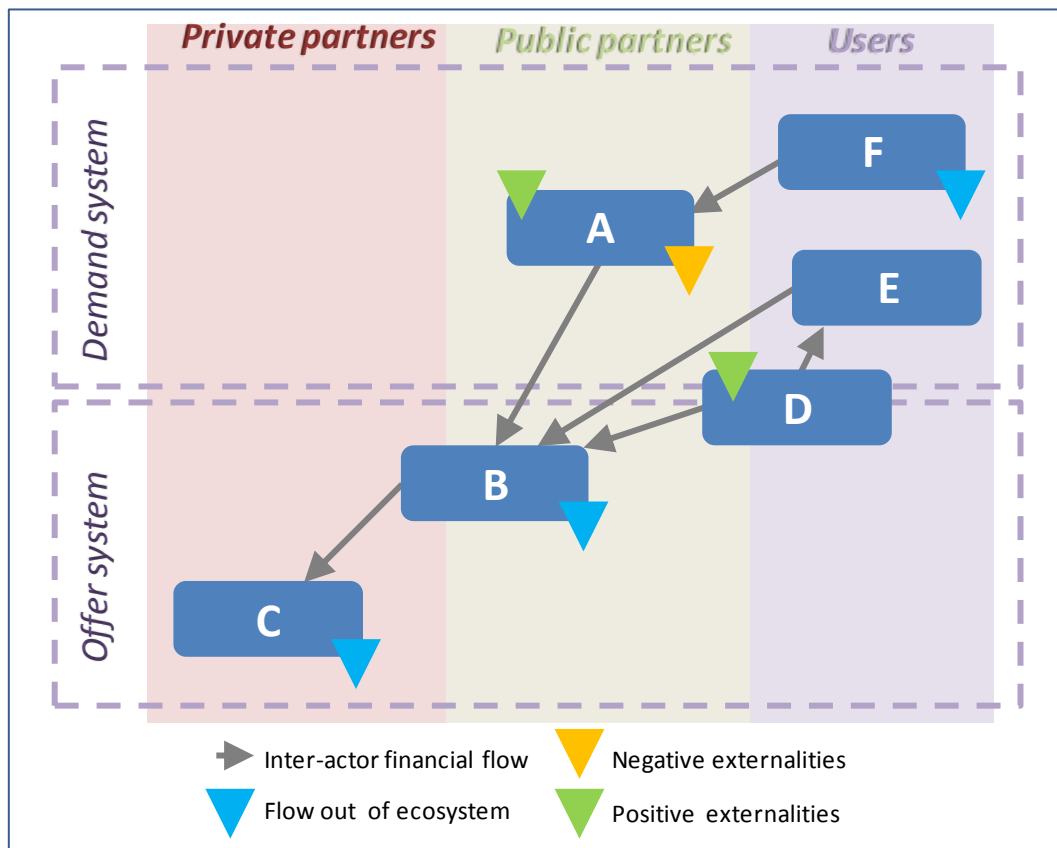


Figure 1: An example of an EBM mapping

Mapping tools are useful just as a representation for business models but they do not predict what the new business model will become (Chesbrough, 2010). In addition, a business ecosystem and all its actors have a shared destiny so the business ecosystem will be healthy if each actor is healthy (Iansiti and Levien, 2004b). It is clear that a tool which can contribute to construction of business model and interpretation of its viability is strongly needed, but surprisingly there is not a model to do so. In the next section we explain our approach to overcome this gap.

3.2 ECOSYSTEM BUSINESS MODEL MATRIX

We created an EBM matrix to be able to know more clearly and easily what is in the “black box” of the business. We consider the ecosystem as a combination of actors (public, private and users) involved in a specific activity; like our case study, in which the activity is defined as urban passenger mobility. i.e. however there is value exchanges among the actors a part

from the collective value proposition, their existence depends on the success of delivering the collective value proposition. Due to the fact that the actors sometimes play a contributor role and sometimes a beneficiary role, this “bifacial character” makes the business model more complicated. On the other hand monetary flows within the ecosystem vary enormously in terms of character and calculation methods. To elaborate an ecosystem business model, it is necessary to overcome this heterogeneity and diversity by having a modular visualization of ecosystem.

Based on the fact that actors play a contributor and/or beneficiary role, so the origin of every monetary flow is a contributor and the destination is a beneficiary. In addition to the monetary flows between the actors, we also take in consideration other flows which exit the boundaries of ecosystem like negative externalities and operational costs, and the flows which enter the boundaries of ecosystem like earnings and positive externalities. It is also feasible in the case of systemic innovation to take in to account the capital expenditures and funding. This ecosystem business model provides us the view from the gains and contributions of each actor and business ecosystem. These information are important, they provide the information about each actor, about ecosystem and about improvement paths and occasions.

		Beneficiaries								Negative externalities	Costs	OPEX	CAPEX	Contributions	
		A	B	C	D	E	F	G	H					m€/an	m€
Contributors	A		0,165						0,100	2,000			6,000	- 2,265	- 6,000
	B			0,650					1,000		0,525	0,525		- 2,700	
	C	1,000				0,200	0,150	0,300			0,200	0,540		- 2,390	
	D		0,400			0,200		0,200						- 0,800	
	E		0,750											- 0,750	
	F	0,500									0,450	0,150		- 1,100	
	G	0,100										1,500	5,000	- 1,600	- 5,000
	H											1,500	3,000	- 1,500	- 3,000
Positive externalities								0,200	0,015						
Earnings		1,500		3,000	0,750		0,200	2,000	1,000						
Funding								10,000							
Results per actor	Gains														
	m€/an	3,100	1,315	3,650	0,750	0,400	0,350	2,700	2,115						
	m€							10,000							
	m€/an	0,835	- 1,385	1,260	- 0,050	- 0,350	- 0,750	1,100	0,615						
	m€	- 6,000						5,000	- 3,000						

Figure 2: An example of an EBM matrix

As described in previous section, the first step to elaborate the ecosystem business model is identification the actors using different sources of information, interviews and surveys. After doing this, in order to calculate monetary flows between actors, different sources (interviews, academic articles, public reports, surveys, etc.) and methods (life cycle assessments, externalities calculation, public transport costs, fuel consumption costs, economics of transport, fuel consumption taxes, ...), can be used.

3.3 ECOSYSTEM BUSINESS MODEL HISTOGRAM

Business model histogram summarizes the financial contributions and gains of each actor into a simple scheme. However the positive value for operational situation of whole business ecosystem is necessary but is not sufficient to decide the viability of ecosystem, thanks to the information that the matrix provide us, we can use the methods like NPV(Net Present Value) to analyze the profitability of innovation and viability of business ecosystem.

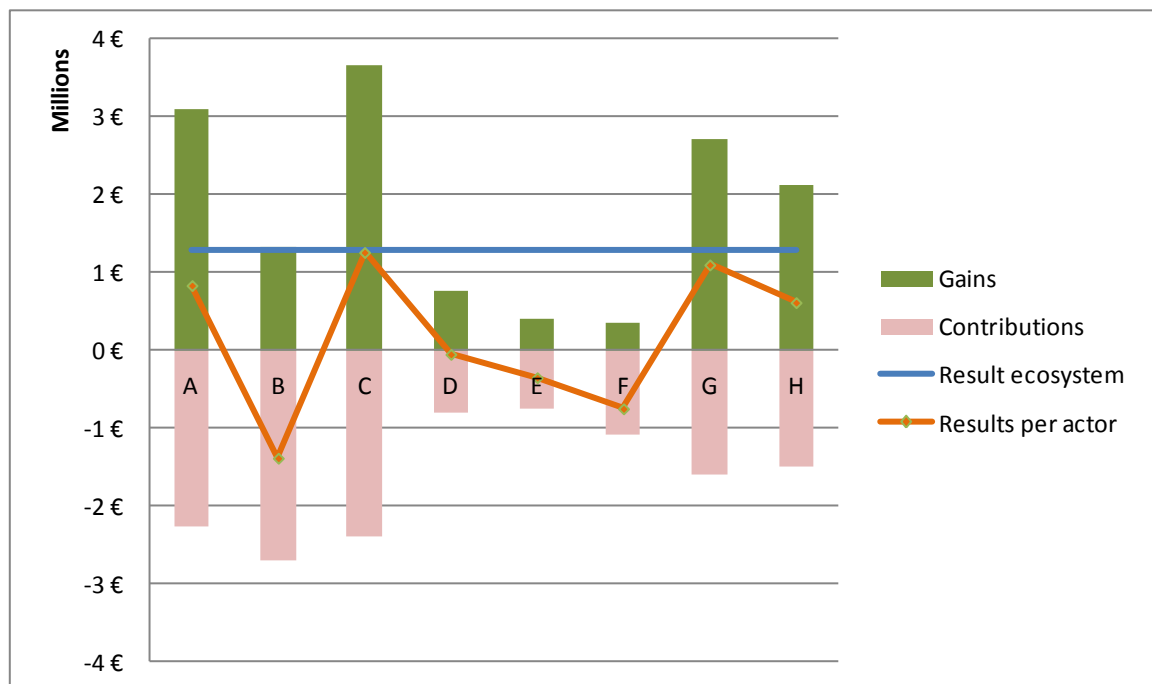


Figure 3: An example of an EBM histogram

4. DISCUSSION AND CONCLUSION

The project within Vedecom is dealing with a systemic innovation, particularly a new mobility system which requires several innovations in different aspects like its vehicles, civil infrastructure, telecommunication, etc. On the one hand, various public and private actors had a strong interest to take a part in the Versailles mobility project. Local public actors (e.g. municipality) wanted to promote modern and eco-friendly urban mobility solutions, increase the image of the city and contribute to economic development. Private actors (e.g. carmakers, IT providers) wanted to promote their technology and package them into a brand-new mobility innovation. Public research centres also joined the initiative to conduct their research projects in a real-life context.

On the other hand, in contrast with these apparently converging motivations, the project was somehow stuck because of the heterogeneity of these actors. They had very different business models, and the possible common project was very different from any of them. This made the early stage very difficult, because nobody knew how to frame the potential common value proposition (semi-public autonomous shuttles, etc), underlying technologies (electric vehicles, sensors, etc) or key partners (whom to include among the consortium's members?).

The revenue structure was even more problematic; the cost and revenue structure had to integrate all of these elements within a consistent common view. This was not only a question of finding a profitable model, but also a question of maintaining the potential actors onboard. Every actor had to see concretely the potential value of the project for himself, and justify in-house why to step in or keep participating.

The project clearly lied into an ecosystem business modelling problem. The actors had to define at the same time nearly all of the components of a common business model. The action research methodology identified very early this issue, and tried to develop tools to help the potential partners to overcome this chasm.

The first tool (EBM mapping) helped the actors to have a general vision that they potentially belong to a common offer and demand system. However, this approach was not sufficient to really overcome the initial challenge. The value proposition was unstable, and the relevant value network players changed according to the revisions of this value proposition. The EBM

matrix helped to meet this challenge. The matrix is modular, it allows easily including or deleting a potential partner, depending on the value proposition scenario. This appears as a practical flexibility when the value proposition is still unstable. Each partner can be considered as contributor and beneficiary from different financial flows. This helps for example considering that one actor gets public subsidiaries from various public actors and customers, and contributes financially to various private investors. This also helps integrating the heterogeneous value flows in a common view (social spillovers, profits loss and, investments, etc.). Business model histogram summarized the financial contributions and gains of each actor into a simple scheme.

These three tools (ecosystem business model mapping, matrix and histogram) appeared as useful representations, simulation and coordination artefacts in the context of project to test the hypotheses at inbound phase and as a result building a common business model.

Our piece of research encourages shifting away from the traditional focal firm perspective when dealing with systemic innovations. This confirms how it is critical in the multi-actor context to adopt a value network perspective (Chanal, 2011). In the early stages where the value proposition is ambiguous and unstable, the quick evaluation feedback helps to keep the actors onboard, especially in a heterogeneous multi-actor context. An increasing number of new businesses rely on the combination of various actors. We studied here an extreme configuration of public and private actors which try to build an ecosystem business model. This encourages developing new methodologies as we did in this communication.

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