THE BUSINESS MODEL, A TOOL FOR TRANSITION TO SUSTAINABLE INNOVATION

Bisiaux, Justine (1); Gidel, Thierry (1); Huet, Frédéric (1); Millet, Dominique (2)
1: Sorbonne Universités, Université de Technologie de Compiègne, France; 2: SEATECH/ SUPMECA-UTLN, France

Abstract

To be consistent with sustainable innovation, production and consumption evolution, business model design needs to be reconsidered to jointly redefine the value proposition, the productive organization, the remuneration modalities and the customer relationship. This paper shows how business model design could help to manage the transition from intensive innovation toward sustainable innovation. First, we distinguish two visions of business model: a representative vision, and an interactionist vision in which the business model acts as an intermediary object. Then, we choose to adopt the interactionist vision diverting the representative canevas of business model as an intermediary object. This approach is supposed to support the co-evolution of business models and technologies leading to the design of sustainable innovation. We have tested this methodology with industrial partners in order to move toward PSS offers as sustainable innovation. Our results suggest that business model can become a privileged tool for facilitating this transition. This finding leads us to formalize a method supporting decision in order to help industrials to define their sustainable transition.

Keywords: Business models and considerations, Product-service systems (PSS), Sustainability

Contact:
Justine Bisiaux
Sorbonne universités, Université de technologie de Compiègne
EA 2223 Costech (Connaissance, Organisation et Systèmes Techniques)
France
justine.bisiaux@utc.fr

Please cite this paper as:
Surnames, Initials: *Title of paper*. In: Proceedings of the 20th International Conference on Engineering Design (ICED15), Vol. nn: Title of Volume, Milan, Italy, 27.-30.07.2015

1 FROM INTENSIVE INNOVATION TOWARD SUSTAINABLE INNOVATION

The current economy, driven by intensive innovation, has been criticized by some authors such Moati (2009) on an economical and ecological level. At the same time, this intensive innovation has also been disturbed by the emergence of new models of consumption and production adopted by consumers and some companies. These signals reveal a trend in favor of more sustainable innovation. Intensive innovation is anchored in a logic of hyper production and hyper consumption, creating some tensions with these new models. Thus, new opportunities are emerging. First, economical and societal opportunities, with new productive organization centred on uses and services like functional economy or Product Service Systems (PSS) (Ceschin, 2013; Mont, 2002). And secondly, environmental opportunities with the creation of new environmental standards promoting energy and material sobriety, and increasing recyclability (Bourg, 2008; Mont, 2002).

In response to these signals that may indicate the entry in a new socio-economic system, most companies are still reluctant to or indecisive about changing their offer and business due to the complexity of this change (Boons and Ludeke-Freund, 2013; Ceschin, 2013). Indeed, this change impacts the entire business model: value proposition, material goods, services, productive organization, relationships with clients and the costs and revenues of company. The complete and cohesive modification of the business appears as a challenge (Boons and Ludeke-Freund, 2013; Ceschin, 2013).These new models are uncertain and feedback concerning the implementation of functional economy, PSS or other models compatible with sustainable innovation on an environmental and economic level are too few (Boons and Ludeke-Freund, 2013; Ceschin, 2013; Moati, 2009). Finally, the number of consumers involved in these new consumption models is growing but they are still limited to some niche markets.

A tension between the weakness of these new signals of evolution and the radicality of change may be identified. Moving towards sustainable innovation is necessary. A transition is partially underway in an attempt to respond to these issues and which is in opposition to the tendency towards intensive innovation. To support this change, the companies concerned need a transition. In our research, we suggest using business models as a tool to facilitate this transition. This paper thus aims to provide some elements of response to the following research question: *"How can the business model, as an intermediary object, be a relevant tool for transition toward sustainable innovation?"* To answer this question, we highlight the interest of the business model as a device allowing companies to overcome the reluctance to radical change. This paper explores elements of response by following this structure:

- First, the business model is defined and a discussion concerning the functions of the business model as a tool is proposed. Two points of view will be developed: the business model as a representative tool and the business model as an intermediary object;
- Then, the operational research method is described. It consists in supporting two industrial projects for supporting companies to move from their current business model towards a PSS model consistent with sustainable innovation.
- Finally, the results of this study are presented. It validates that the proposal of the business model as an intermediary object can be used as a device to move from intensive innovation to sustainable innovation through a trajectory of business models for a paradigmatic change.

2 EXPLORATION OF TWO VISIONS OF BUSINESS MODEL: REPRESENTATIONALIST VERSUS INTERACTIONIST

Both as a tool and a concept, the business model has become widespread since the late 90s (Baden-Fuller and Haefliger, 2013; Boons and Ludeke-Freund, 2013; Chesbrough and Rosenbloom, 2002; Doganova and Eyquem Renault, 2009; Osterwalder and Pigneur, 2010; Osterwalder et al., 2005). There are different definitions which concur in their consideration of the business model as a way for companies to make money (Chesbrough and Rosenbloom, 2002; Osterwalder and Pigneur, 2010; Osterwalder et al., 2005).We have nevertheless identified two more integrative or alternative visions of the business model. The first and more classical vision is that the business model operates as a representative tool for business companies (Chesbrough and Rosenbloom, 2002; Osterwalder and Pigneur, 2010; Osterwalder et al., 2005).The second vision suggests that business model is an intermediary object supporting an interactionist process (Doganova and Eyquem Renault, 2009). We

have studied these two conceptualisations in order to provide our own vision of the business model at the end of this section.

2.1 The business model as a representation tool

The most common definition of the business model suggests that it is a way of making money for companies. This vision is presented for example by Afuah and Tucci (2000): *"the business model describes how the firm plans to make money long-term"* or by Michael Rappa (2000): "it *spells out how a company makes money by specifying where it is positioned in the value chain*". This definition of business model is limited to the representation of the value chain. In this same idea of representation, Chesbrough and Rosenbloom (2002) describe the business model in the same way as Osterwalder and Pigneur (2010), providing a definition in which the business model represents the company's strategy and organization: *"a business model describes the rationale of how an organization creates, delivers and captures value*"(Osterwalder and Pigneur, 2010). Osterwalder and Pigneur and Chesbrough and Rosembloom define the business model as a tool to design or improve strategic alternatives. It is possible to consider the business model as a formalization of the key dimensions of a business. Considering this descriptive and representative function of the business model captures the systemic dimension and complexity associated with a value offering when a plurality and heterogeneity of complementary dimensions is associated with it. This allows the articulation of the technological and economical dimensions of the business (Chesbrough,2009). Thus, Osterwalder and Pigneur (2010) aggregate "9 blocks" that constitute a business model (Figure 1):

- Value proposition: the factor of value for the company;
- Customer relationship: types of relations established with the user;
- Customers: targeted customers;
- Channels: means used to spread the offer;
- Revenue streams: how the company makes money;
- Cost structure: the major costs in the offer construction;
- Key activities: the most significant activities in the company management;
- Key partners: the most significant partners in the business model's optimization;
- Key resources: essential resources of the business model.

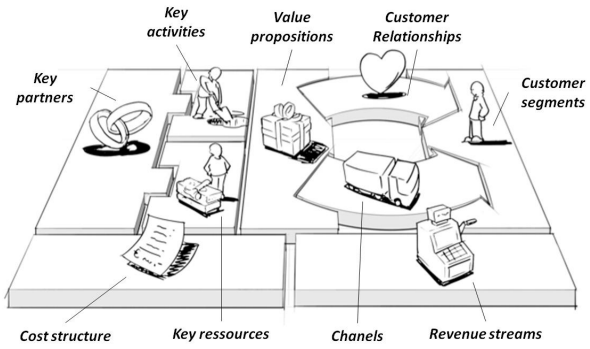

Figure 1. Business Model representation by Osterwalder and Pigneur (2010)

By dividing the business model into different blocks, Osterwalder and Pigneur offer a descriptive and static vision of the business model that aims to design a company's value chain in order to improve it and create new strategies. Other formalizations and business model representations were developed, joining the strategic analysis. But beyond these variations, the contribution of this tool is to capture the activity of a company in all its complexity and provide a representation tool able to assess the consistency and the interdependencies between these heterogeneous categories.

Nevertheless, this single representative and static function of the business model impoverishes and reduces the opportunities associated with its mobilization. The transition to a more interactionist view of the business model allows for the renewal of the consideration that we can have of this tool, including its integration into the innovative process. Besides, in this interactionist approach, the business model should be apprehended in a more dynamic vision in which we do not consider the value chain, which is linear and static, anymore but we consider the value network. From our point of

view, the value network better represents the heterogeneity of the elements involved in an interactionist approach.

2.2 Business model as an intermediary object

The second vision we would like to explore is the vision given by Doganova and Eyquem-Renault. They present the business model as extending beyond just a representative tool helping to find new ways to make money. They suggest that *"the business model can be analyzed as a "market device" one among the many intermediaries that circulate in the techno-economic networks of innovation"* (Doganova and Eyquem Renault, 2009). This definition implies that the design of the business model should be understood in a network of actors, in a more interactionist way. Thus, it operates a shift from the value chain consideration to the value network consideration. There are two elements to consider in the inetractionist approach. First, a collective negotiation process occurs. This change in the business model status, adopting an interactionist perspective, implies giving up the idea that the business model would serve to clarify, represent and synthesize a clearly determined future state. The business model design should not be regarded as a roadmap to meet in order to deal with the complexity of the innovation process. It will be an essential feature of the construction and negotiation of the future reality in its different dimensions and between the various stakeholders. Interactionist approaches consider innovation as a gradual building process. Moreover the initial uncertainties presented by the indetermination of innovation will be lifted by the different interactions, negotiations and decisions taken subsequently. Innovation is mostly a largely distributed process between a plurality of contributors that will nourish and guide the diffusion of the trajectory and the innovation development. It is in this collective negotiation that innovation is initiated (Callon, 1998, 1991).
Secondly, it is in this collective action that innovation emerges. Innovation is the product of the various interactions during a given process, whith no clear pre-existence, hence the uncertainties involved in its programming. In this interactionist approach, the success of an innovation cannot be determined by the intrinsic characteristics of a product but by the process that progressively links them together in a cohesive way. This primacy of the relationship is inseparable from the radical uncertainty and initial indetermination of innovation. The analysis moves from technical analysis to a socio-technical analysis in which the social and technical dimensions are co-composed (Callon, 1998, 1991). In other words, far from being a stable representation, it will temporarily crystallize around compromise. Thus its evolution will reflect a process ideally leading to a stabilization of innovation despite the radical change. This vision of the business model reveals it as an intermediary object in the design of a new offer. The device market mobilized by Doganova and Eyquem-Renault (2009) refers to this idea of an intermediary object. The intermediary object according to Vinck (Vinck, 2009) is "*a mediator interacting with actors, facilitating the emergence of solutions and convergence between aspects otherwise separated"*. Besides, intermediary objects facilitate cooperation in design as exposed by Boujut and Blanco (2003). In a temporal dynamic, these intermediary objects correspond to breaks or transitions or phase changes markers. The business model becomes a mediator between the heterogeneity of the elements that make up the business model and interact with each other.

2.3 Towards the mobilization of the business model as sustainable innovation support tool

Regarding these two visions of business models, it seems coherent to use the business model as an intermediary object in the transition towards sustainable innovation. We define the business model as centred on the value proposition. This value proposition is the center of negotiations in the interactionist approach, leading to discussions about productive organization, customer relationships, material goods and cost and revenues. A business model is characterized by one value proposition supported by different modes of revenues for example. Indeed, as sustainable innovation implies a systemic rupture in a company's business model, this approach offers an opportunity to face this complexity. The challenge in driving innovation is to clarify the potential role of this business model in facing the radical change involved in the development of a sustainable innovation. Involvement in a significant change of business model will be subjected to different resistances or sources of inertia, which may be strategic or cognitive in nature (Chesbrough, 2009) and at an organizational level or inter-organizational level (Boons and Ludeke-Freund, 2013). Business models in which the activity of a company is rooted reflect a stabilization of power relations and a shared perception of the environment. This stability leads to forms of obstruction and confusion during experimental attempts,

or it can also lead to a questioning of the permanent existing and proven. These difficulties are even more intense when the business model is embedded in a system of interdependencies beyond the organization, which can lead to locking shapes or the irreversibility of the existing model. Faced with this tension between inertia and rupture, how can the business model be mobilized? The response is not so much a tool to reduce the uncertainty as a support tool for action in undetermined situations. We must therefore integrate the business model as a collective tool, accompanying firms on initially unpredictable change trajectories. We should bear in mind 2 important factors for the mobilization of the business model: its ability to provoke reactions from the various actors and its ability to facilitate compromise. Thus the challenge is to develop a socio-technical network, which implies that the business model acts as an attractor for the establishment of a network around innovation. This is a profit-sharing or enrollment tool (Callon, 1998, 1991) that will allow companies to build and expand this network. Specifically, the business model aims to interpellate and react. That is why we suggest diverting the representation of Osterwalder and Pigneur (2010) to make an intermediary object around which to design a progressive trajectory of business models to achieve sustainable innovation. Indeed, we can consider a projective purpose beyond the descriptive and synthetic properties of the tool. Indeed, the business model is not so much an "inventory" of value production as a representation of a value creation project when mobilized for a company (Coste, 2012). Then, in the construction of the change trajectories, we can consider different situations. Depending on the companies, the trajectory can be composed of a plurality of coexisting business models, which means, different value proposition coexisting for a company at the same time in the trajectory. The result is a collective construction, a negotiation process, between the heterogeneity of points of view inside and outside the company. From these interactions, logical enrollment and progressive determination of innovation emerge. Thus, we consider the business model as an intermediary object that could allow us to move towards more sustainable innovation. As our approach has been defined, the next part focuses on the application of this approach by testing it with companies that are looking for the implementation of PSS.

3 IMPLEMENTATION OF PSS BUSINESS MODELS CONSISTENT WITH SUSTAINABLE INNOVATION

In this paper, we consider that the PSS as defined by Oksana Mont (2002) is a business model consistent with sustainable innovation: *"PSS is a marketable set of products and services capable of jointly fulfilling a user's need. A paramount goal of product–service systems should be to minimise the environmental impact of consumption"*. This definition is also supported by Tukker (2013). PSS seems to take into account the environmental, economical and societal aspects described in the introduction of this paper that characterize sustainable innovation from our point of view. It is defined by Oksana Mont as a Business Model based on the association of services and goods to provide global solutions to customer needs, and which allows improvements of environmental performances to be implemented (Mont, 2002). Thus, we have conducted the IDCyclUM study in order to test the relevance of the business model as an intermediary object in the transition towards sustainable innovation.

3.1 The IDCyclUM project to test the business model as an intermediary object

The IDCyclUM project (Innovation Durables à Cycles d'Upgrades Multiples: Multiple Upgrades Cycles for Sustainable Innovations) aims to apply sustainable innovation in companies by working on the diffusion of evolutionary systems based on modularity (Andreasen et al., 2004; Van Beek et al., 2010). These evolutionary systems are material goods with multiple cycles of upgrades. An upgrade is defined as a performance improvement that can be technological through added modules, software or service-based. The principles of IDCyclUM are presented on the Figure 2.

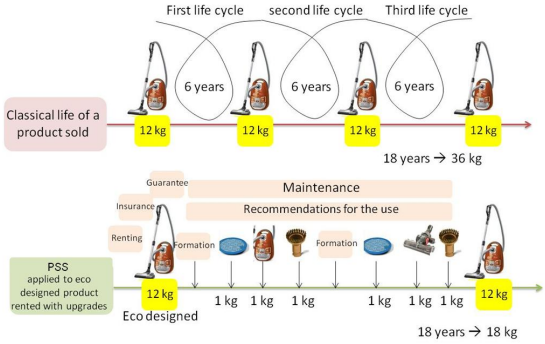

Figure 2. IDCyclUM project

The top part of the figure shows three classical cycles of a vacuum cleaner after its sale. The vacuum cleaner has a short life time and need to be replaced every three years. On the down part of the figure, the PSS system combined with the upgrade system is showed. The aim is to develop a system with product improvements on a regular basis (upgrades), thus providing more value to the offer without totally changing it. This project aims to design and integrate multiple upgrade cycles of products on the market within the framework of sustainable innovation. Sustainable innovation is made possible by the diffusion of an association of technology (material good) and economy (business models).
In this case, the upgradable systems can be an answer to sustainable innovation. On the one hand we have a new offer in which the product life cycle is increased and the product is made more modular (Van Beek et al., 2010) to facilitate the maintenance, thus reducing the environmental impacts. And on the other hand it necessitates the design of new business models to sell this offer with adapted services and move from a product centred offer (consistent with intensive innovation) to a value-in-use centred offer (consistent with sustainable innovation). Indeed, these upgradable systems require us to go beyond the technological dimension of the design to enter into a sustainable networking process. This type of design requires the rethinking of the business model associated with the product to develop business models that meet the needs of both companies and consumers. In our approach we suggest linking the PSS as business models consistent with sustainable innovation to upgradable systems. The hypothesis defended here is that the business model is an interactive tool around which all the stakeholders can cooperate in the design of a sustainable offer.

3.2 Methodology

Two industrial partners were involved in this project. The first is a brand of small electrical appliances (partner A), and the second a supplier of franking solutions (partner B). For each industrial partner of the project, three workshops were conducted respecting the following methodology:

- A workshop to analyse the current business model and discuss a future one;
- A workshop to develop potential business models not destined to a direct application but as intermediary objects around which to discuss and argue. The aim is to identify opportunities and resistance to changes in the business model;
- A last workshop to identify evolutionary, compatible and negotiated trajectories.

During the different workshops the representation of the business model given by Osterwalder and Pigneur (2010) was used as a tool, an intermediary object, around which to discuss and create new business models. The workshops were conducted under a participatory posture adopting a constructivist logic in the IDCyclUM project. The actors involved were responsible for the supply chain, the business model management and the corporate strategy for each industrial partner.

The first workshop was a semi-structured exploratory one. The idea was to introduce the theme, make the inventory of current business models and to identify the main points of the approach concerning the need for a gradual change of the business models. Around 5 to 10 actors from heterogeneous functions: manager of the supply chain, the business model management, the corporate strategy or marketing team, were gathered around a table and invited to work in two stages.
First, the objective was to define their current business models using posters with 9 empty blocks (Osterwalder and Pigneur, 2010), in order to be completed to better understand the current situation.

Secondly the aim was to think about future business models relying on a new poster with the 9 empty blocks and using an interview guide composed of questions related to the different blocks of a business model.

The second workshop aimed to design potential business models that were used as intermediary objects (Boujut and Blanco, 2003; Vinck et al., 1996) by identifying the levers and barriers to the development in the business models. This step was a semi-directive workshop, in which the same actors present at the first session were invited to think about the different possibilities of migration to new business models. The goal here was to refine the different ideas that emerged during the first session on the gradual change of business model in order to find new scenarios of the current economic model in the short term, medium term and long term. The media used for this session were posters of the business model canvas (Osterwalder and Pigneur, 2010) to complete for three or four business models or intermediary objects (Figure 3). In this process the different participants negotiated around different elements of the business model. For example, in the value proposition, it appeared difficult to find a consensus, as moving from a product sell to an access sell needs a radical change of product design and business model design. The question of the partners was also subject to discussion. When designing new servicial business models, an integrated approach in which the value network is entirely controlled by the company seems interesting. Nevertheless breaking the ties with existing partners such as distributors carries significant risks. At the end of this session, the different intermediary objects were validated and a first proposition of trajectory emerged.

The last workshop was a semi-directive one and aimed to define and characterize an evolutionary trajectory more precisely. It was conducted in three main steps. The first aimed to finalize and validate the different business models to implement. Then a second part aimed to define one evolutionary trajectory using the previous defined business models and to characterize its implementation in terms of time (short term, middle term and long term), in terms of elements of transition: which services or technologies (upgrades) could help to move from short term to middle term and from middle term to long term. A final meeting was implemented as a semi-directive control session. The objective was to present and validate the results of the workshops.

Figure 3. A workshop illustration

4 RESULTS

The two industrial partners offered two different answers on the issue of the business model as a tool to move toward sustainable innovation. Following these workshops, a company is positioned on a transition involving a trajectory of multiple business models coexisting and based on an initial change of paradigm, and the other is positioned on a trajectory involving the mutation of a single business model in a niche.

4.1 Trajectory of business models

The company A struggled to vary its business model over the long term. The future business modelwas drawn very close to the current one and still centered on the material good with associated services but still dependent on the material good. The company is historically rooted in a culture of

good. That can explain their difficulties in designing business models consistent with sustainable innovation. They were unable to project into this radical innovation, lacking in strategic vision for the long term and tools to help them to plan it. Company A expressed the difficulty of engaging in such radicalism in the short term. This is a general and very complex change from an industrial point of view. It is very risky as it can lead to the cannibalization of old products, a lack of understanding of the new strategy by the shareholders...

The reluctance of partner A faced with this radical innovation implying an significant organizational change allowed the emergence of two proposals:

- Evolving towards a new trajectory in the current paradigm. This means progressively adapting the business model in the current industrial logic by adding new elements consistent with sustainable innovation such as added services. Nevertheless in this case, the innovation cannot reveal a significant sustainable potential.
- Creating a protected niche to introduce a paradigm shift with no direct link to the brand. This scenario would result in the creation of new partnerships and potentially integrate new skills such as distribution, maintenance and services in the reorganization of the value network, the material goods re-design, the re-designing of the business model more centred on sustainable issues.

The first proposal is presented on the top part of the Figure 4. It involves the deployment of a new trajectory whose offer would be derived from the existing (sale of tangible property). It would be an offe still focused on the material good. This first scenario would allow a gradual transition of technological innovation, however putting aside the innovation of business models. The second proposition, presented on the down part of the Figure 4, allows a better evolution moving from intensive innovation toward sustainable innovation by progressively implementing new business models however separated from the existing business models. Thus the result for this partner consists in suggesting a single trajectory of the uses-centred business model in a niche in parallel to the existing business model.

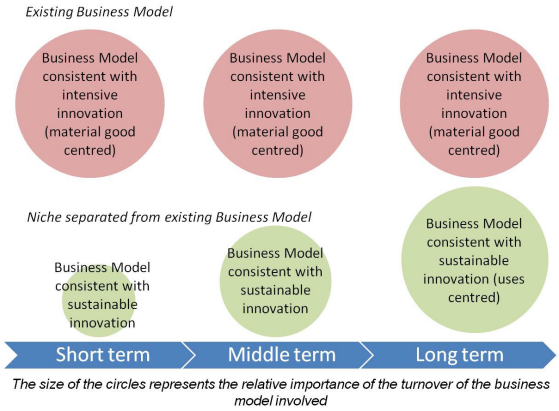

Figure 4. Trajectory adopted by Partner A using the Business Model as a tool to move toward sustainable innovation

4.2 Paradigmatic change following by a trajectory of multiple coexisting business models

Company B showed a predisposition to change towards more sustainable innovations in the workshops. It was possible to start designing new future business models with the participants. The result for company B consists in an evolution of the engaged trajectory, as a shift toward a new paradigm has already been conducted with the development of new activities and new business models. For partner B this consists in developping new partnerships and integrating new skills adapted to its new alternative business models without transfer of ownership in line with sustainable innovation. It also consists in designing an adapted trajectory of these business models, that meet their company's strategy and that would be attractive for the consumers. In this way, they also adopt a proactive approach to meet future environmental laws. Thus, the proposed scenario is to develop a trajectory of business models from the classical one: material-good centred, towards new more radical business models which correspond to sustainable innovation (Figure 5). All these business models

coexist and their relative importance in terms of turnover evolve though time, operating a gradual transition from material-good centred business models to uses-based business models while limiting the risks by making the different business models co-exist. These would be the upgrades that would serve as support in the passage of a set of business model to another (Figure 5).

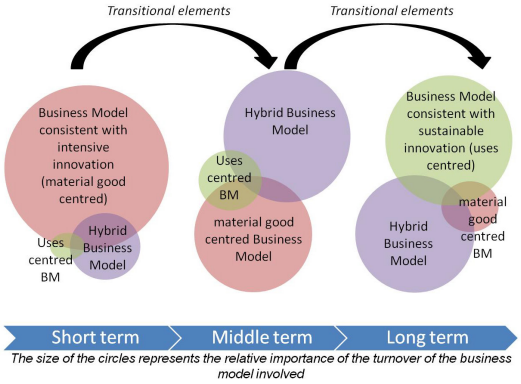

Figure 5. Trajectory adopted by Partner B using Business Model as a tool to move toward sustainable innovation

4.3 General discussion on the use of the business model as a transition tool towards sustainable innovation

The highlights of the first workshop were the prior preparation of interviewers that already had partial knowledge of the companies' business models, which promoted exchanges and achieved an effective and representative representation of the company's current business model, but also enabled the establishment of some characteristics of the future business model. The participants were in phase with the representation of the business model used (posters of the 9 blocks) and they were better able to build around this intermediary object. The post-it system applied directly on the posters allows for collective involvement, everyone can move and contribute. However it should be noted that relatively few participants got to their feet and preferred to give their ideas verbally that were then transcribed by the facilitator on the poster.

Concerning the second workshop, the supports allowed for a good participation by all the partners. The results showed a progression in business model construction. Compromises were found between the divergent views, and led to the definition of several business models. This step was also conducted to enable the identification of opportunities and resistance to changes in the business model in order to understand the various elements that emerged during the workshops. However, it appears sometimes very difficult for participants to make projections in the long term and to define the elements that still seem to them very far in time for implementation. A way forward is therefore to rework this point in order to overcome these barriers.

During the last workshop, the different business models defined previously were used to draw a progressive trajectory of business models to satisfy all the participants. The definition of a business model in the long term with the agreement of all stakeholders was still difficult, but the reliance on a progressive trajectory of business models facilitated the achievement of this goal. This final workshop allowed the partners to better understand the evolution in time of their business models and to anticipate possible barriers to transition, defining elements to facilitate this, in order to overcome any barriers. Thus working around the business model as a tool to reach sustainable innovation seems relevant in light of these workshops as scenarios of transition emerged. The main objective of this project was achieved. The aim was to show that it is possible to do business differently than with material goods.

5 CONSLUSION

We have seen in this paper that the business model can be a relevant tool in the transition from intensive innovation toward sustainable innovation. More precisely, we have suggested that using

business model as an intermediary object can help the creation of new business models and facilitate the transition. Thus we have shown that the business model is more than just a representative tool but also an adapted tool for cooperation in designing an offer.
Business model proves to be a good tool for transition as it details the heterogeneity of the elements included in a company, and thus facilitates the creation of new business models and their trajectory of business models.
The conducted study has also shown that the business model is a tool mastered by companies. The different participants in the project adopted this tool very quickly and easily. They showed capacities to work with it and to draw trajectories of business models evolving progressively to reach sustainable innovation.
Following this study, further work remains to be done on the definition of sustainable innovation in order to be more precise about what to expect of a sustainable offer. This refinement of the definition should lead to the emergence of more precise indicators in the construction of a sustainable offer.
Thus, a method of decision support should be formalized in order to help companies to define more sustainable offers and to allow them to move from their current offers to sustainable offers.

ACKNOWLEDGEMENTS

The authors thank the Agence Nationale de Recherche (ANR) that have financed this study, the different partners in the project and the companies that have participated in the study.

REFERENCES

Afuah, A., Tucci, C., 2000. Internet Business Models and Strategies: Text and Cases, ISE Editions. ed. McGraw-Hill Education.
Andreasen, M., M., Mortensen, N.H., Harlou, U., 2004. Multi Product Devlopment: New Models and Concepts. Presented at the 15 Symposium Design for X, Neukirchen, p. 12.
Baden-Fuller, C., Haefliger, S., 2013. Business Model and Technological Innovation. Long Range Plann. 1–8.
Boons, F., Ludeke-Freund, F., 2013. Business models for sustainable innovation: state of the art and steps toward a research agenda. J. Clean. Prod. 9–19.
Boujut, J.F., Blanco, E., 2003. Intermediary Objects as a Means to Foster Co-operation in Engineering Design. Comput. Support. Coop. Work 12, 205–219.
Bourg, D., 2008. Economie de fonctionnalité, une solution pour combattre la dégradation environnementale de la planete, in: Séminaire Roland Vaxelaire. Presented at the Séminaire Roland Vaxelaire.
Callon, M., 1991. Techno-economics network and irreversibility, in: A Sociology of Monsters: Essays on Power, Technology and Domination. London, pp. 132–165.
Callon, M., 1998. The Laws of the Markets, Wiley-Blackwell. ed.
Ceschin, F., 2013. Critical factors for implementing and diffusing sustainable product-Service-systems: insights from innovation studies and comanies' experiences. J. Clean. Prod. 74–88.
Chesbrough, H., 2009. Business Model Innovation: Opportunities and Barriers. Long Range Plann.
Chesbrough, H., Rosenbloom, R.S., 2002. The role of business model in capturing value from innovation: evidence from Xerox Corporation's Technology Spin-off Companies. Ind. Corp. Change 529–555.
Coste, J.-H., 2012. le business model : texte-projet et dispositif de recherche action. Entrep. Innover 1, 103–110.
Doganova, L., Eyquem Renault, M., 2009. What do business model do? Innovation devices in technology entrepreneurship. Res. Policy 38, 1559–1570.
Moati, P., 2009. Cette crise est aussi une crise du modèle de consommation. Temps Mod. 1–25.
Mont, O., 2002. Clarifying the concept of PSS, Mont.pdf. J. Clean. Prod. 10, 237–245.
Osterwalder, A., Pigneur, Y., 2010. Business Model Generation, John Wiley and sons, Inc. ed.
Osterwalder, A., Pigneur, Y., Tucci, C., 2005. Clarifying Business Models: Origins, Present, and Future of the Concept. Presented at the Communications of the Association for Information Systems.
Rappa, M., 2000. Business Models on the web. North Carolina State University at Raleigh.
Tukker, A., 2013. Product services for a resource-efficient and circular economy e a review. J. Clean. Prod. 1–16.
Van Beek, T., J., Erden, M., S., Tomiyama, T., 2010. Modular design of mechatronic systems with function modeling. Mechatronics 20, 850–863.
Vinck, D., 2009. De l'Objet intermédiaire à l'objet-frontière. Vers la prise en compte du travail d'équipement. Anthropol. Connaiss. 3, 51–72.
Vinck, D., Jeantet, A., Laureillard, P., 1996. Objects and Other Intermediaries in the Sociotechnical Process of Product Design: an exploratary approach, in: The Role of Design in the Shaping of Technology. Perrin.J et Vinck.D, pp. 297–320.