

# **A NEW TOOL TO DESIGN BUSINESS MODELS – APPLICATION TO THE EHEALTH SECTOR**

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## **1. ABSTRACT**

In today's fiercely competitive business climate, the importance of innovation in making profits cannot be overstated. However, in the eHealth sector, innovative firms often fail to capture economic returns from their invention although lots of local eHealth initiatives have been proven effective in many ways. Designing robust business models has become an issue and businessmen are looking for new tools to help them. This article presents a new business model design tool and puts it into practice. It is based on the financial flow modeling (FFM) method and applies this complex system modelling method to model and compare business model canvas. The methodology is tested on an innovative healthcare service and deal with both the design of its business model and its national deployment. The design of business models based on canvas alongside the FFM method should help both project promoters and investors to understand the limitations and the assumptions underlying the model. Thus, it shall strengthen business models as key elements in the decision making process. Furthermore, the use of both systemic approach and dynamic models may increase possibilities in creating shared value and profits maximization.

## **2. INTRODUCTION**

Over the last fifty years, the globalization of the world economy has redefined the way we are doing business. On the first hand, companies must now face competitors from all over the world. On the second hand, they must fulfill ever higher customer wishes. To survive in this competitive economy, managers must always find new markets to explore and new clients to capture. The mix of innovation and a good business model to support it has been proven effective.

However, in the eHealth business, startups are facing major difficulties. Although many innovative projects are successfully tested, a few of them lead to an economic return. It can be explained by the complexity of the Health sector that forces startups to have a strong business model. As a consequence, designing robust business models has become an issue for entrepreneurs.

To address this problem, this article provides a framework that allows entrepreneurs to design multiple business models and then compare them based on value creation.

This approach differs from existing methods in different ways. First, it intends to tackle the complexity of business models by using complex system modelling methods. Second, it aims to give both

entrepreneurs and investors a comprehensive view of value streams. Third, comparing business models should help investors and project leaders during the go to market process.

The rest of this paper is organized as follows. In section III, a literature review explores business model design and its challenges. In section IV, the methodology that tackles the problematic is presented. In section VI, the case study is presented. In section VII, the main results of the experimentation are discussed. Finally, a conclusion ends this article.

### 3. STATE OF THE ART

The first part of the literature review aims at establishing the importance of business models in today's economy. The second stage focuses on the business model canvas, while the last part presents the business model design and the scientific positioning of this paper.

#### 3.1 Business models

Nowadays, business model is a buzz word but it has long been ignored by the scientific community. It was introduced by Drucker in the fifties [1]. First, economists listed and described business models that were in use [2] like the franchise model or the low cost model. Secondly, they defined its components [3]. There is not a consensus among the scientific community but according to some surveys of the literature [2-3], they can be classified into four categories: value proposition, value network, value finance and value architecture [4]. More recently, the growing importance of business models in the economy has led to numerous papers. They have become essential for any startup that intend to raise funds and are widely use in strategy, specifically in the go to market strategy [5].

Business models and innovation are tied up. The first one is a tool to create value while the second is the explanation of how a company creates, delivers and captures value [6]. As a consequence, innovation may trigger changes in the company's activities, thus changing the business model itself. Just like the business model is essential to implement innovation [7].

#### 3.2 Business models canvas

The scientific community provides many types of business models. However, there are a few business model design methods. Among the frameworks provided, the business model canvas introduced by Osterwalder is probably the first attempt to create a tool that helps specifically entrepreneurs to design business models [6]. Based on creativity methods such as design thinking, business model canvas has proved to be effective especially in the early stage of projects or in the startup environment.

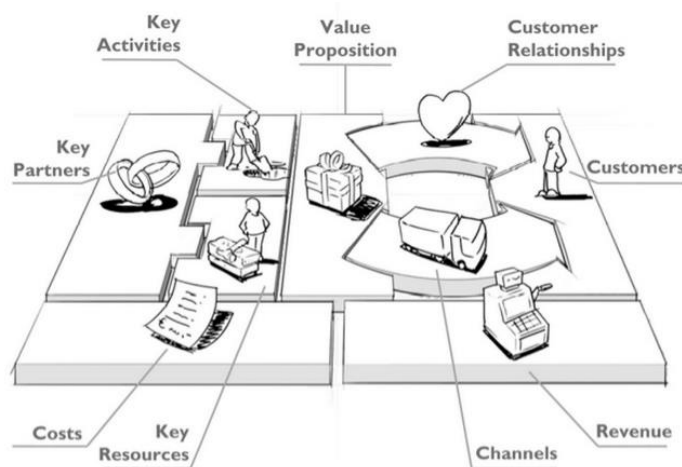


Figure 1 : The business model canvas



In the literature, there is one example of the use of a complex system modelling method known as the financial flow modelling method (FFM) to model the implementation of an innovative telehealth system [10-11].

The FFM method is an approach to identify the added value of an innovative product/system. The main idea is to compare the existing scenario and the one that will take place thanks to the new product/system. The key indicator of the FFM method is the annual margin balance. It is the balance sheet of profits and losses of each stakeholder when a new business system goes to the market. The FFM method consist in five steps. The first one is to identify all the stakeholders involved. The second one is to identify the existing financial flows. The third one is to make hypothesis on new financial flows and collect data to quantify them. The fourth one is to make hypothesis on the implementation scenario. And the last one is to calculate the margin balance.

This method was effective to quantify the added value of an innovative system and the shared value among the stakeholders. But there isn't a direct link with any business model framework. Thus, the research goal of this paper has not been previously studied.

We propose to use FFM alongside business model canvas during the business model design process to strengthen the fourth stage and gives more imputes to the decision makers.

## 4. RESEARCH DESIGN

### 4.1 Business model design process

We propose to model and simulate different business models created during the third phase (design). Therefore, using the FFM method allows entrepreneurs to compare different added value streams among business models. The objective is to get new inputs for the decision-making process and reduce the risks during the next step.

The FFM methodology has to be adapted in order to fit in the business model design process. In fact, the design phase gives us a lot of inputs. Consequently, the third stage of the FFM process depends on the business models created before. The new methodology is described in figure 4.

The main idea is to model the financials streams of each canvas and compare them to the financial streams of the current business model.

Thanks to this new process, business model canvas can be compared based on their financial streams. This should help decision makers and entrepreneurs to choose and select the best business model before the go to market stage.

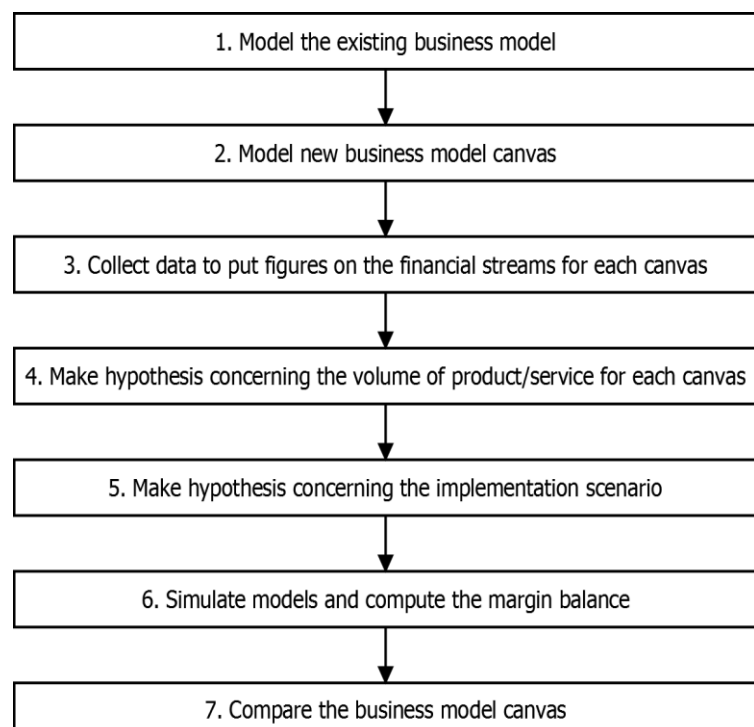


Figure 4 : Applying FFM to canvas

## 5. CASE STUDY

The methodology presented above was tested on EclairAge, an innovative project conducted by Altran. EclairAge was selected and approved by the government as a demonstrator for e-Health on the French territory.

The project goal is to create and test a connected platform that aims to improve elderly care in long-term dependency care centers (EHPAD). This platform allows EHPAD's medical staff to contact directly a geriatrician when one of the patients has a problem. Furthermore, the doctor has access to a database containing all important and useful medical information to provide a remote diagnostic. Thus, there are three possibilities. Either, the patient must be sent to the hospital or a doctor must come on-site or the medical staff can take charge of the situation thanks to the doctor's advices. This workflow is schematized in figure 7.

This innovative system should lead to fewer EHPAD's patients transfers to the emergency service or hospitals.

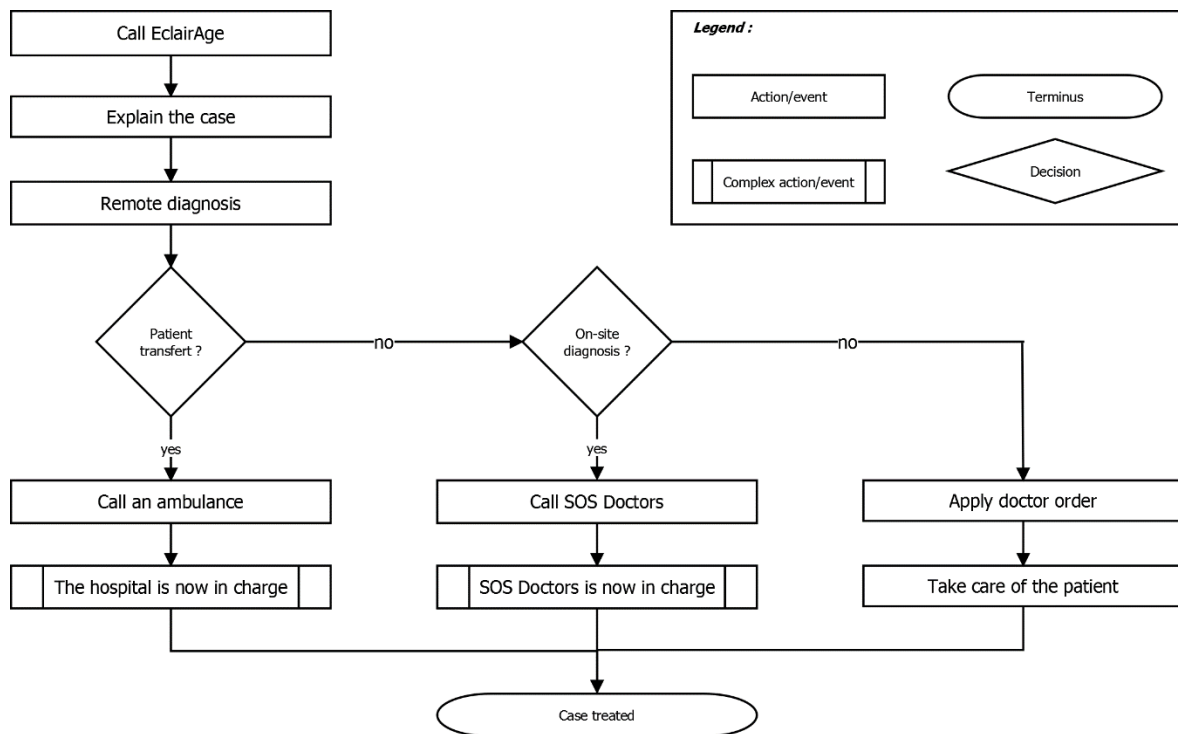


Figure 5 : The EclairAge workflow

A local initiative has been successfully completed in five EHPADs for 18 months. The next step is to provide a go-to-market strategy in order to implement nationally the system.

Thus, the methodology presented before was tested on this study case. Four business models were computed.

## 6. RESULTS

The methodology presented in the fourth part was applied to the case study. We followed the exact 7 steps to verify the validity of our methodology.

## 6.1 Modelling the existing business model

The first stage of the method was to model the existing business model. Before the implementation of EclairAge, no other system in place avoided patient transfers except SOS Doctors a French structure that aims to ensure the continuity of care when doctors are not available. Therefore, in case of an alarming situation, if the EHPAD's doctor was not available, there were only two possibilities. Either, the patient was transferred to the emergency service or a doctor had to come on-site.

In the following figure, a map describes the main financial flows between the stakeholders that support the current business model:

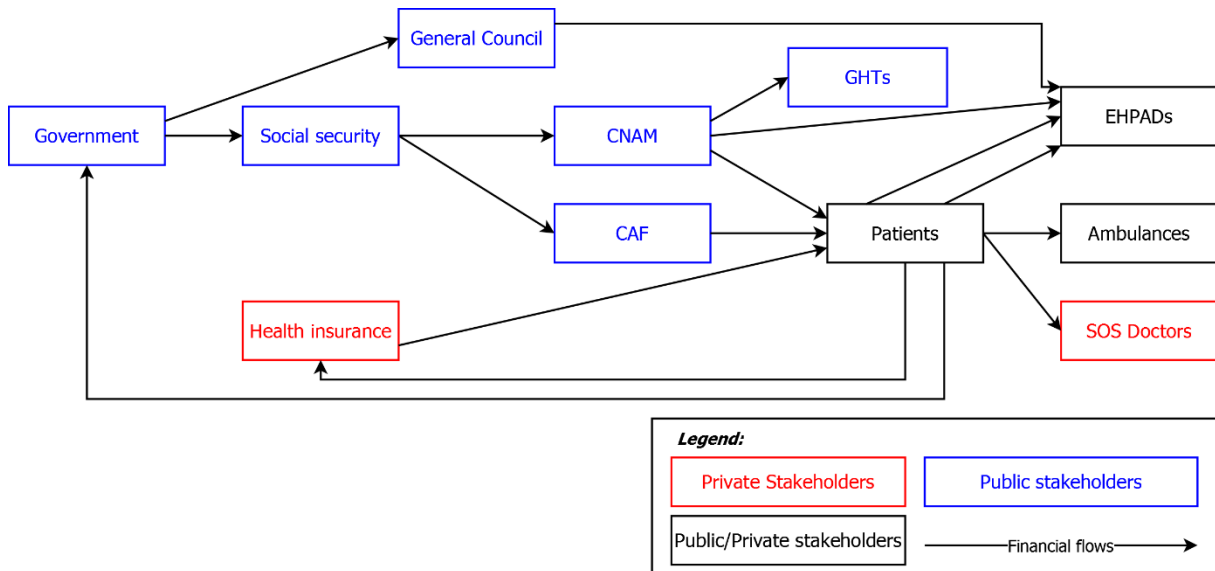


Figure 6 : Existing financial flows

Figure 7 presents our financial model of the baseline business model with the associated parameters presented on table 1 and 2.

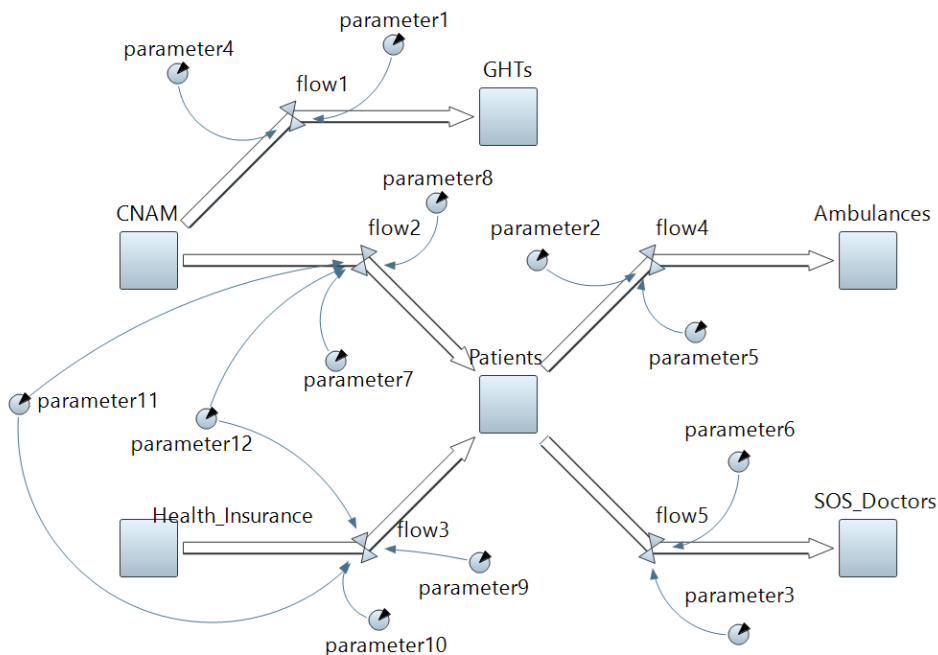


Figure 7 : Baseline business model

As an example, the parameters and equations underlying flows are sum up in the following tables:

Parameter number	Name
Parameter 1	Average Hospitalization Cost
Parameter 2	Average Transportation Cost
Parameter 3	Average Doctor Visit Cost
Parameter 4	Average Number of Hospitalizations Per Month
Parameter 5	Average Number of Transportations Per Month
Parameter 6	Average Number of Doctor Visits Per Month
Parameter 7	Public Insurance Reimbursement Rate for Transportation
Parameter 8	Public Insurance Reimbursement Rate for Doctor Visits
Parameter 9	Private Insurance Reimbursement Rate for Transportation
Parameter 10	Private Insurance Reimbursement Rate for Doctor Visits
Parameter 11	Patients Transportation Fees Per Month
Parameter 12	Patients Doctor Visit Costs Per Month

Table 1 : Baseline business model parameters

Flow	Equation
Flow 1	Parameter 1 * Parameter 4
Flow 2	Parameter 7 * Parameter 11 + Parameter 8 * Parameter 12
Flow 3	Parameter 9 * Parameter 11 + Parameter 10 * Parameter 12
Flow 4	Parameter 2 * Parameter 5
Flow 5	Parameter 3 * Parameter 6

Table 2 : Baseline business model equations

## 6.2 Modelling different business model canvases

We used exactly the same process to model new business models.

After deliberating with the stakeholders and partners of the local initiatives, we were able to select four interesting business models. They were modeled into four scenarios. In the first two scenarios, the geriatricians are employed by the hospital and receive a monthly salary while in the third and fourth scenarios they are paid for each EclairAge call. Furthermore, in the first and the third scenarios, the government pays for the system instead of patients. The scenarios are listed in the following table:

Scenario number	Cost Model	Revenue Model
1	Salary	Government based
2	Salary	Patient-based
3	Fee per call	Government based
4	Fee per call	Patient-based

Table 3 : Scenarios

As an example we present in the following figures, a simplified business model canvas of the first scenario:

Government + ARS + CNAM								
Ambulances + SOS Doctors + GHTs	Managing the database + Answering calls	EclairAge	Local Experiments	Patient Experience	EHPADs	No Intermediaries	Medical Staff	EHPADs' Directors + Medical Staff
	Geriatricians + Developers		Improving Patient Safety					
			ARS + CNAM					
Geriatrician Salaries + Database costs				Government pays EclairAge access for the EHPADs				
Patient Medical Database								

Figure 8 : A Simplified Business model canvas for the first scenario

Then, we simulate each scenario.

### **6.3 Collect data to put figures on the financial streams**

Due to confidentiality obligations, we cannot give the value of every variable. Yet, in order to get these values, we used:

- The results of the local experiment conducted in 5 EHPADs
- Interviews with doctors that were in charge of the local initiative
- The conclusions of the French Court of Audit on the 2015 Annual Health Financing Plan

### **6.4 Make hypothesis on the volume of product/service**

We extrapolate the results obtained during the local experiment to make hypotheses on the volume of calls.

### **6.5 Make hypothesis concerning the implementation**

After deliberating with the stakeholders involved in the local initiative and the decision makers, we chose an implementation scenario. The EclairAge service will be progressively implemented in a French local territory named Essonne. It is a department localized near Paris. EclairAge will be operational in the 5 EHPADs where the experiment was conducted at the beginning of 2017 and it will be progressively deployed throughout the territory up to the end of 2019. Eventually, the health local facilities that consist in Essonne's 100 EHPADs will all have access to EclairAge service.

### **6.6 Simulate the models and compute the margin balance**

Once, all scenarios were modelled, we simulated them thus we can compare the margin balances of each stakeholder. The main objective of the EclairAge system is to reduce patient transfers, thus the National Health Insurance Fund (CNAM) should save money depending on the cost of the new system.

### **6.7 Compare the canvas**

The last stage of the methodology is to compare the business model canvas based on financial value. This comparison can be achieved for each stakeholder.

The main objective of the EclairAge system is to reduce patient transfers, thus the CNAM should save money depending on the cost of the new system. In this case study, we choose to put emphasis on the CNAM, the patients and the doctors to verify if the CNAM saves money and to quantify the impact of this new system on doctors and patients.

The figures 9 shows the sum of the monthly margin balances of the CNAM for 48 months. As expected, margin balances during the implementation stage are variable and finally stabilize.



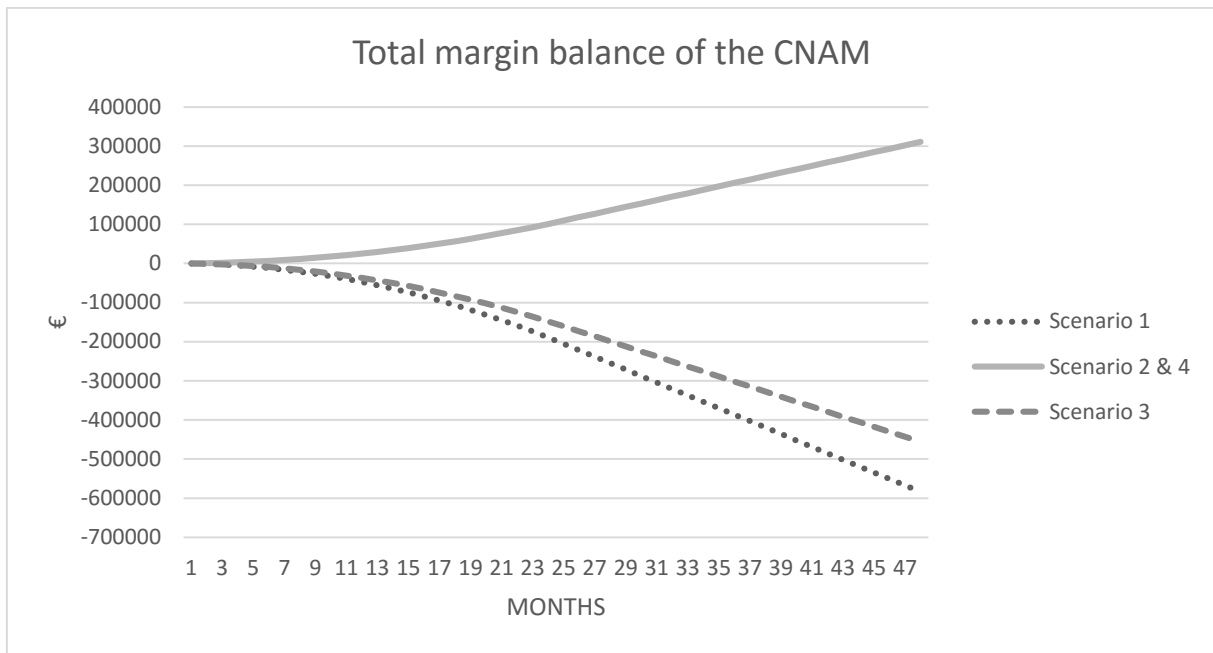


Figure 9 : Total Margin Balance of the CNAM

Furthermore, this first graphic shows that the second scenario and the fourth scenario are the most profitable for the government.

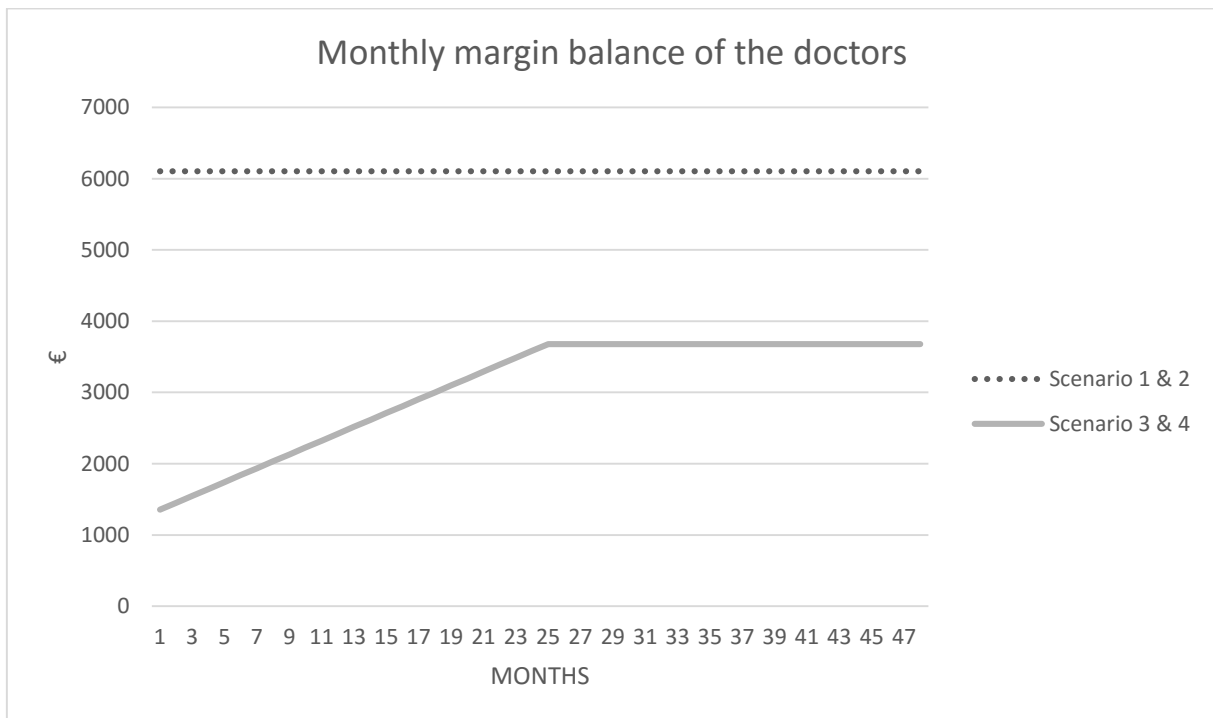


Figure 10 : Monthly Margin Balance of the doctors

Doctors make more money with the new system. It can be interpreted as a job creation too if the doctors are already at full charge. From the point of view of the doctors, the first two scenarios are more profitable.

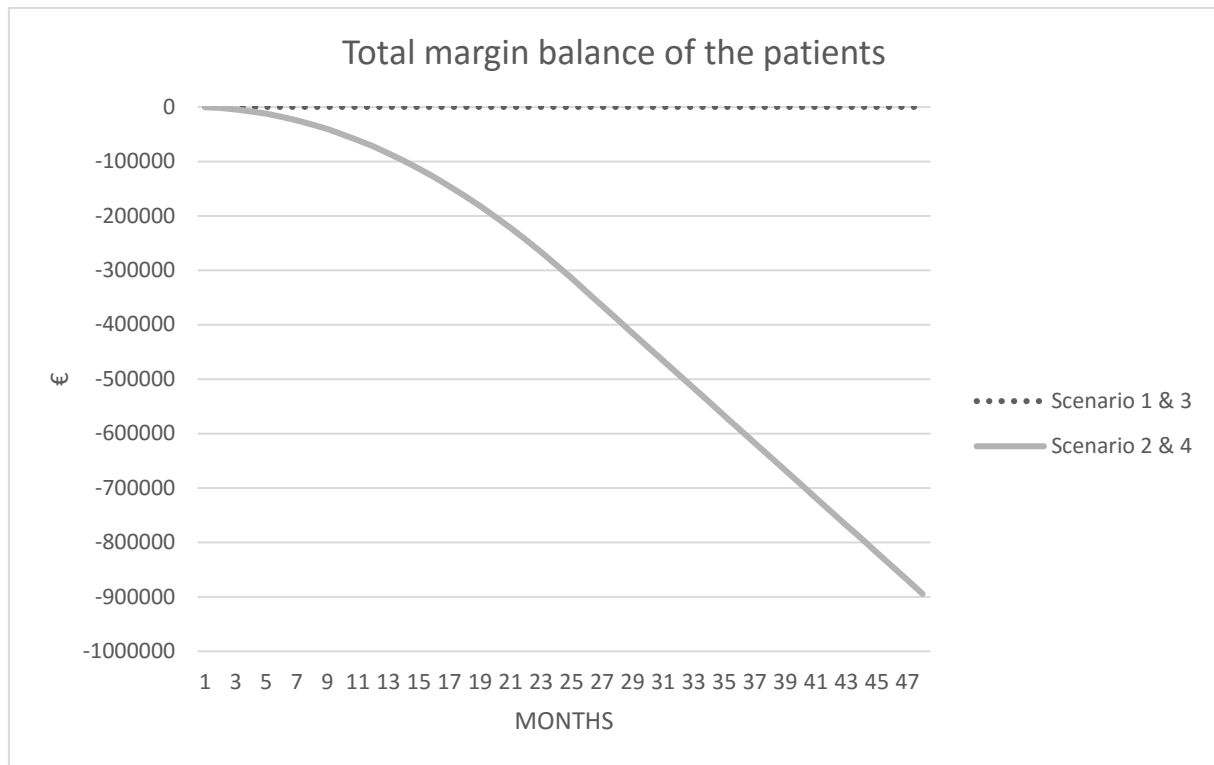


Figure 11 : Total Margin Balance of the Patients

This last graphic shows that the second scenario is worse than the fourth scenario from the point of view of the patients. The first and the third scenario don't change anything for patients, they benefit from the system without paying anything.

As a consequence, the second scenario is the best for the doctors and for the CNAM but it is also the worst for the patients. The FFM method shows that the perfect business model does not exist and entrepreneurs must choose the most adequate.

Such graphics can be made for each stakeholder, thus decisions makers and entrepreneurs can decide which business models they must use to favor a specific stakeholder. They can also choose to change the business model depending on the maturity of the product. Entrepreneurs can also adapt some variables to adjust prospective revenues.

## CONCLUSIONS AND PERSPECTIVES

The research goal – to propose a new tool for business model design – could be achieved straightforwardly. Furthermore, the methodology proposed in this paper was successfully tested.

Based on the case study conducted, five assumptions on the use of FFM alongside business model canvas can be made. First, it is effective to strengthen the coherency of business models. In fact, thanks to the simulation, the cost and revenue structures have to be detailed in coherency with the resources and activities. As a consequence, the links between the activities and the costs are more intelligible. Second, systemic approach is useful to design business models for early stage projects. In fact, the FFM method allows entrepreneurs to test a huge variety of revenue models and choose the best in accordance with both the implementation scenario and the market response. Third, business model canvas and their FFM models can be widely used for a number of key business activities including analysis,

explanation, resources allocation, both short-term and long-term planning, decision-making support, business strategy and profits optimization. Fourth, the business model developed in this case study is both flexible and detailed. In fact, there isn't only one business model for EclairAge but a long range of different scenarios, each of them leads to a different financial structure. Thus, it is still applicable in early stage companies where entrepreneurs must react quickly. Fifth, the research shows that robust business models are more pertinent for investors. The detailed financial structure helps investors quantify both long and short term benefits they might have.

The use of FFM helps entrepreneurs compare and select the best business model canvas based on financial value. One perspective of this work is to implement a second tool to compare them on social values. In fact, according to Porter's works, generating social value is an advantage for companies. Furthermore, the use of a second tool would allow a multi-perspective approach that enhances both the quality and validity period of the business model[12].

## 7. LIST OF ABBREVIATIONS

ARS	Regional Health Agency
FFM	Financial flow modelling method
CAF	Family Benefits Agency
CNAM	National Health Insurance Fund
GHT	District and local hospitals
EHPAD	Long-term dependency care center

## 8. REFERENCES

- [1] P. Drucker, *The Practice of Management*. Harper, 1954.
- [2] C. Zott, R. Amit, and L. Massa, "The Business Model: Recent Developments and Future Research," *J. Manage.*, vol. 37, no. 4, pp. 1019–1042, 2011.
- [3] J. Krumeich, T. Burkhart, D. Werth, and P. Loos, "Towards a Component-based Description of Business Models- A State-of-the-Art Analysis," *AMCIS 2012 Proc.*, p. 19, 2012.
- [4] M. M. Al-debei, R. El-Haddadeh, and D. Avison, "Defining the Business Model in the New World of Digital Business," in *Proceedings of the Americas Conference on Information Systems (AMCIS)*, 2008, pp. 1–11.
- [5] V. Chanal, *Business Models dans l'innovation : pratiques et méthodes*. Presses Universitaires de Grenoble, 2011.
- [6] A. Osterwalder and Y. Pigneur, *Business Model Generation*. John Wiley & Sons, 2010.
- [7] H. Chesbrough and R. S. Rosenbloom, "The role of the business model in capturing value from innovation : evidence from Xerox Corporation ' s technology spin-off companies," *Ind. Corp. Chang.*, vol. 11, no. 3, pp. 529–555, 2002.
- [8] K. Riley, "Our model," 2016. [Online]. Available: <http://imaginego.com/modelh/>.
- [9] M. E. Porter and M. R. Kramer, "Creating shared value - How to reinvent capitalism and unleash a wave of innovation and growth," *Harv. Bus. Rev.*, vol. 39, no. February, pp. 62–77, 2011.
- [10] C. Jean, "Comment réussir l'intégration de système technologiques innovants au sein de systèmes complexes organisationnels? : Application à la télémédecine en France," Ecole Centrale

Paris, 2014.

- [11] C. Jean, T. A. Duong, J. S.-L. Cardinal, M. Jankovic, J. C. Bocquet, and P. Espinoza, "Sharing economic value between the stakeholders of a telehealth project: methodological issues?," *Eur. Res. Telemed.*, vol. 5, pp. 37–44, 2016.
- [12] C. J. Fendt, "Meaning, legitimacy and impact of business models in fast moving environments," University of East London, 2002.