A DECISIONAL MODELLING FOR NETWORK FRANCHISE AND SUPPLY CHAIN MANAGEMENT.

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ABSTRACT
This paper proposes a modelling process which aims to evaluate/optimize logistic and financial flows in franchise networks. Our modelling is a combination of two modelling processes: a first modelling reproduces the running logistic network through simulation and/or optimization (Comelli et al., 2008a); then data given by this model are used by a model which reproduces the consequences on the mixed franchise network thanks to a Mixed Integer Linear Programming (MILP) optimization based on the four Bradach management challenges.

We will apply the proposed modelling process on 3 networks types:
- A bakery networks composed of a supply chain producer and a retail outlet that sells the products made by the operator of the network in his own factories (Paul, La Mie Caline, Saint Preux, La Croissanterie, Brioche Dorée, St Preux…)
- A traditional Restaurant Franchise network composed of a supply chain producer and retail outlets that transform products made by the operator of the network in his own factories (Flunch, Courte Paille, La Boucherie, Buffalo Grill, Dell Arte, la Pataterie, Hippopotamus…)
- A fast food restaurant franchise network composed of a supply chain producer and retail outlets that sell and transform products made by the operator in his own factories (Mac Donalds, KFC, Quick, Domino Pizza, Class’Croute…)

As we will see, our modeling tend first to confirm that a combination of companies owned outlets and franchised outlets is the best way to manage the growth of the networks and second to show that the mix rate can be different between different type of networks.

Keywords: SCM, financial flows evaluation, franchise network, optimization, mix rate.

INTRODUCTION
The reticular commerce has a dominating position within commercial activities, underlined by Cliquet and Pénard (2002). From that point of view, it is important to note that one of the most studied commercial forms within research work is the commercial system of franchising. So far, works undertaken up have been based upon two approaches, which are traditionally opposed: first, analysis based on the resource constraints and second, analysis based on the agency theory. Whether one or the other is considered, choosing franchising, rather than branching, is justified in a contingency manner compared to criteria, such as distance from the operator, ability to settle within a local competitor territory, belonging to consumer attraction (Cliquet, 1997), the “know-how” mobilisation for uniformity, and so on. Unfortunately, numerous empiric works based on such explanations lead to contradictions (Lafontaine F. and Bhattacharyya S, 1995; Combs, Ketchen 2003). We therefore believe that the analysis of franchising and statutory choices (franchising versus branching versus mix) must not be undertaken in a contingency manner, but in a global manner, using a systemic view, which will allow retroacting phenomena. What Bradach’s research (1997, 1998) has essentially brought is: “we should go beyond the problematic of contingency and to expose, not the advantages of the alternative statutory forms, but rather the advantages of mix itself”. The author has studied American fast-food networks, allowing the confirmation of the appearance of synergies linked to statutory plurality, and stressing four main challenges that the networks have to meet. Relying to this, in the case of franchised mixed networks, it is necessary not to carry out a sequential analysis, but rather a holistic one, so as to take into account the basically systemic aspect of this type of organization both in its physical and managing shape. This paper proposes a process dedicated to the approach of the four Bradach’s challenges, allowing a better apprehension of the mixed reticular
forms. Lagrange and Féniès (2010) produce an analogy between franchise networks and supply-chains and realize that the aims of an operator of a supply chain and of an operator of a mixed network are the same as it is all about optimizing a collective performance in a global manner, while bearing in mind local sense of identity. The proposed approach in this paper, based on those latest observations, uses supply-chain modeling process to evaluate/optimize financial flows in a franchise network. This will lead to three evaluated scenarios: a company-owned network, a franchised network and a mix network will be compared. In section I, we will present the theoretical material necessary to understand the problematic of mixed networks and the supply chain modeling process. Next, in section II., we will present the general modeling process and the way it can be instantiated to franchise networks in an evaluation or/and optimization view. Then, in section III comes the application to French networks. Section IV presents the results of the modeling process both in terms of evaluation and optimization. Finally, we conclude on that work.

I. STATE OF THE ART: FROM PURE NETWORKS TO MIXED NETWORKS AND FINANCIAL SUPPLY CHAIN MODELING

Taking into account the managerial interest of mixed networks

Contingency studies propose some explanations of the success of the franchise form: the agency theory argues that franchise is a good means to control when the operator’s interest is a problem of relation such as principal and agent (Jensen, Meckling, 1994), and the scarcity resource theory (Oxenfeld, Kelly, 1969) is looking at the problem of financial or managerial resources that an operator could face when he wants to develop a company-owned network. Such choice modalities tend to prove that mixed networks are neither considered as a strategic idea nor as a real managerial choice for its specific properties. However, Lafontaine and Shaw (2001) show that, in spite of some variations depending on sectors, there may be a stable rate of mix. According to Bradach’s results (1998) it also appears that mixed networks are able to raise four management challenges that lead to the success of the network: this deals with the growth of units, the respect of uniformity, of local reactivity, as well as the systemwide adaptation of the network to the competing pressure. As far as Bradach’s challenges are concerned, if we consider the growth management, this kind of stake is particularly important when Emerson (1982) shows that the growth of the network originates almost exclusively from the addition of units, which allows an income progression. In addition, if we follow Ghosh and Craig’s intuition (1991), a thinly spread network gives other organizations the opportunity to occupy a competing space. As far as growth is concerned, it appears that mixed networks have a definite advantage because they allow the operator to call upon several expansion mechanisms simultaneously (Bradach, 1998): the development itself of retail outlets and the attraction of new franchised. In the second case (development through franchising), the attraction of potential franchised will be essentially based on the perspective of income. However, there are only a few ways of bringing this kind of information to future franchised; amongst the different types of income, there are entrance fee levels (Galani and Lutz, 1992) and the public image already developed by the network (Bradach, 1998). We will see here some particulars of management of development, which is the strong link with the public image: the development initiates a public image, which itself allows to strengthen the ability of the network to grow. The second stake spelt out by Bradach is related to uniformity; it is about managing to keep a uniform aspect to the commercial process in all the network outlets, either themselves administered by the operator or franchised. Manolis, Dahlstrom and Nygaar, (1995), from a uniformity point of view, show that, during the development of the network, it would lean towards a company-owned structure for standard violation standards. Also, Michael S.C. (2002) shows that the statutory form of the franchise is less able to correctly manage the elements of mixed marketing than a company-owned chain. This type of reasoning seems to be confirmed as far as Lafontaine and Shaw (2001) are concerned; they pretend that, because of the ability for franchisees to be opportunistic, the operator would be better off by owning a great number of company-owned outlets in order to protect the value of its public image. The weight of this challenge is all the more so great that it is important to consider the necessary dispersion of the network outlets so as to give a global nature to the network, which is well-suited to the public image but has possible variations within the competition as corollary.
Therefore, it is necessary to modulate between uniformity and local reactivity (which is the third challenge we are facing). Effectively, the essence of the network is to be able to offer the same format on the whole territory, which brings us to consider local territories with different characteristics. This local reactivity stake of the retail outlets seems unavoidable in regard to the definition of the commercial format we are dealing with. Beyond that, it appears that this component of reactivity in the management of retail outlets is strongly related to another stake described by Bradach (1998): the stake dealing with the local adaptation of the network to the competing pressure. Effectively, this latest stake can be broken down into sub-elements which represent the generation of new ideas, their selection and the set up of innovations. According to Bradach (1998), the generation of ideas is based in the local reactivity of franchised outlets. Moreover, on the fourth level of global adaptation, the local reactivity will also enable the quick and uniform set up of innovation to gather the activity in a territorial manner, as this set up of innovations decided by the operator will allow dealing better with local specificities. As we have just seen, the interdependency of the local reactivity stake and the global adaptability of the network is real. Besides, this fourth stake affects the realization of the uniformity stake. The systematic opposition in the innovation and uniformity in literature makes this link a central element. Beyond this, there is another interaction that we are able to find between the global adaptation and the network growth. Effectively, one of the foundations of the management of global adaptation is to achieve it within the network, in a uniform manner, which means that an oversized network might be an obstacle to the set up of innovations. This way, the more the manager will focus on the network growth, the harder the fourth stake will be to achieve (Bradach, 1998). We can also notice that, following Bradach (1998), carrying out a global adaptation of the network following innovation, must have some influence on the capacity of retail outlets and the network itself to make some definite profit, as these changes will therefore affect the operator’s concept by modifying some elements. However, the network’s growth by unit addition depends on the ability to generate some important profit for retail outlets. Notably, a good concept appropriateness, through eventual innovations, to the consumers’ preferences is a source of income for the operator, but also for the franchised retail outlets, which will be all the more an incitation to belong to this network for applying franchisee. There is a real reciprocal relation between the development and the global adaptation of the network, and it will be necessary to take into account the growth when we want to achieve global adaptation and to take into account this adaptation, for the purpose of growth management. It will be difficult to deny that this managing stakes, more than simple isolated challenges are in the end closely linked to each other. These latest results would tend to show that mix is not a transitory form but a real equilibrium allowing the better management of the organization. Moreover, taking into account Bradach’s challenges and a whole structure of a supply chain (transaction and logistic chains) it is possible to represent the relation between each other (transaction and logistic chains) it is possible to represent the relation between each other (figure 1).

Figure 1. Management model of franchise mixed networks with supply chain sourcing
Financial Supply Chain modeling and collaborative planning

Collaborative relationships between firms deal with physical, informational and financial flow in Supply Chain. Many definitions of supply chain can be given (Beamon, 1998). In a logistic way, the value for consumers depends on the demand satisfaction: one of the main goal of Supply Chain is therefore to increase the customer satisfaction. In the case of the Supply Chain of a franchise network, the operator has to be sure that the value is shared between the franchisor and the franchisee. Financial value for shareholders (supply chains are made of firms, these firms have shareholders) depends on shares value. A part of shares value depends on the market level and firms financial policy. Another part of shares value depends on the cash flow level. Cash flow from operations is important because it indicates the ability to pay dividends. To our mind, a Supply Chain exists if partners earn money thanks to collaboration, and if cash flows levels are increased for all the supply chain partners. A supply chain may be defined as a coalition of autonomous actors coordinated thanks to an integrated logistic process. Thanks to collaborative planning, Supply chain actors share created value (cash flow). It is relevant to link physical flow and financial flows in planning because financial flow depends on physical flow operations in this decisional level. Many works such as Dudek and Stadtler (2005) or Holweg et al., (2005) deal with collaboration in supply chain, but in these approaches, financial aspects are neglected. Indeed, value sharing often remains theoretical and deals with costs but not cash. In a recent paper, thanks to a given production planning, Badell et al. (2005) optimize financial flow and cash position at the end of each period. Bertel et al., (2008) show the links between financial flow and physical flow in an operational way, but the domain of research deals with a workshop. The main objective of cash managers is to have enough cash to cover day-to-day operating expenses but also to have the lowest excess cash because it is not a productive asset. Cash management problem were simply formulated by Baumol (1952) as an inventory problem assuming uncertainty (Miller and Orr, 1966). Two types of metrics are generally used to optimize financial flow: cash position which reveals the cash which is available at the end of a period and cash flow which reveals cash generation during a period. In a recent paper, (Badell et al., 2005) optimizes financial flow and cash position at the end of each period. To conclude this paragraph, we may note that Shah (2005) holds that combined financial and production-distribution models should be considered in the area of SCM in strategic level but that very few works propose this type of approach for the moment. Comelli and al., (2008a) propose to evaluate the impact of physical flow planning on financial flow, thanks to ABC and cash flow level. The authors propose a mathematical formalization of cash flow evaluation for a Supply Chain tactical planning: the use of this approach will be extended in order to integrate together financial objectives with distribution network constraints for a franchise network on a strategic level. This approach, combining supply-chain financial aspect and collaborative management problems for franchised networks, is presented in the next section.

II. AN APPROACH FOR THE OPERATOR SUPPLY CHAIN OF A FRANCHISE NETWORK EVALUATION AND OPTIMIZATION

PREVA Instance for franchisor supply chain management proposes an approach which evaluates and/or optimizes planning for a franchise network and its supply chain. A model (A) reproduces by simulation and/or optimization the supply chain running (Comelli et al., 2008a); then data given by this model are used by a model (B) which reproduces consequences of model (A) on a mixed franchised network where the operator chooses the form of the stores between company-owned outlet and franchised outlet. This second model (B) is constructed within respect of our systemic vision of the franchise and takes into account the management challenges of a mixed network . Therefore, it is possible to use this model (B) as an analytical model, in order to evaluate scenarios for cash flows operators. It is also relevant to use this model as an optimization model. Two decisional variables are proposed: (i) For each period, model (B) shows if each new outlet has to be opened as a franchised one or as a company-owned store; (ii) For each period, model (B) optimizes or evaluates cash flow of a franchise operator. Figure 2 presents the proposed approach, and the model coupling. The model B goal is reproduce the four challenges observed by Bradach’s challenges, and to translate them in Cash flows in order to evaluate/maximize the franchisor cash flows. In order to model those relations, we have to determine variables that can be used to stand for each management challenge. Then, we will briefly describe the behavior of the model. As far as the first challenge, i.e. the growth of the franchise...
network, is concerned, some variables have to be considered in a natural way. It is the case of the size of the network which is an indicator of the effective management of the growth: if the franchisor takes into accounts this growth it obviously conducts to a higher number of outlets. In respect with Castrogiovanni et Justis (2002), it appears that the size of the network is a critical value that indicates the difficulty or the facility a franchisor has to manage his own development. In the understanding of this growth it obviously conducts to a higher number of outlets. In respect with Castrogiovanni et Justis (2002), it appears that the size of the network is a critical value that indicates the size of the network. The size of the network (SIZE) will be our first variable to approach the growth of the network.

We can also consider that the growth is managed as far as new outlets are opened as company-owned or franchised outlets. Naturally, we also consider that the growth rate (GRATE) is the second variable we should take into account. From the point of view of the uniformity, we may consider different variables that can approach this challenge. After Kaufmann and Dant (2001) who have shown that the fees structure depends on the brand image we will take this element (FEE) as an indicator of this second challenge. It is also argued by Galini and Lutz (1992), who have developed a signal theory which tends to show that fees are signaling a good ability to generate profits in the considered network. Also, the authors demonstrate that higher fees are protecting brand in such a manner that it discourages potential free riding from new franchisees. Analyses such as Michael’s (2002) also tend to show that franchisees are less able to manage the elements of the mix marketing such as the trend mark management and the concept enforcement. The network evolution towards company-owned outlets is consequently an indicator of the operator willingness to have a strong brand mark. This is demonstrated by Lafontaine and Shaw (2001) and Scott (1995) who show that the greater the brand mark is, the more it will be interesting for the operator to have a high rate of company-owned outlets. From that point of view the rate of company-owned outlets (CORATE) will be a second variable for the management of the uniformity. An advantage of franchise networks can be seen for the operator since he will enjoy economies of scale in marketing actions. Thus, the same marketing message is valid for all the outlets in the network because all of them are developing the same products. Mathewson and Winter (1985) demonstrate that customers are more receptive to quality if it comes with a global dimension. Foss (1999) believe that a strong brand decrease the risks of free riding. For all those reasons communication and promotion are obviously important keys for a franchisor who wants to protect his brand, as Lafontaine and Shaw (2001) notice it. Thus, fees received from franchisees for national advertising (ADFEE) will be our third indicator for uniformity. It is obvious that without the ability to implement the franchisor’s concept the franchisee won’t be able to control the concept and its procedures. Lafontaine and Shaw (2001) show that the duration of formation is linked to the value of the brand. This is also a way to preserve the intangible assets of the brand as notice it Windsperger (2002). As an effect, we will take (CFORM) the cost of this formation (thanks to the number of annual training days) to represent a measure of the uniformity management. Since Windsperger (2001)’s works about property rights and especially their remuneration in franchised network, it appears that intangible components of property are so high that it is necessary to approximate its measurement. Furthermore, Windsperger (2002) explains that the higher the royalties

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**Fig. 2. PREVA Instance for franchisor Supply Chain Management.**

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Model A
- Customer Demand is evaluated thanks to prevision
- Discrete Event Simulation + Heuristics (Cornell et al., 2005)

Model B
- Prices of goods and services, Royalties...
- Optimization model (Cornell et al., 2003, b)

Model B chooses, for each period, if each new outlet has to be opened as a franchise or a chain store by optimizing franchisor cash flows. Model B evaluates cash flow level for each Business Unit of the supply Chain (Franchisee, suppliers).

Model B evaluates, for each scenario, cash flow level for the operator and for each Business Unit of the Supply Chain (for each franchisee and for each supplier).

Model B evaluates, Supply Chain physical flow activities and costs
- Evaluation, Stock, Chain physical flows Running
- Optimization model

Data for model B
- Analytic model (Evaluates a scenario)
- Optimization model
- Evaluation, Supply Chain physical flows for franchisee
- Optimization model
- Evaluation, Supply Chain physical flows for franchisee

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Analytic model
- Evaluates Supply Chain financial flows for franchisee
- Evaluates Supply Chain financial flows for franchisee
- Optimizes Supply Chain financial flows for franchisee

ERP
- Analytic model
- Evaluates Supply Chain financial flows for franchisee
- Evaluates Supply Chain financial flows for franchisee
- Optimizes Supply Chain financial flows for franchisee

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Analytic model
- Evaluates Supply Chain financial flows for franchisee
- Evaluates Supply Chain financial flows for franchisee
- Optimizes Supply Chain financial flows for franchisee

Optimization model
- Evaluates Supply Chain physical flows for franchisee
- Evaluates Supply Chain physical flows for franchisee
- Optimizes Supply Chain physical flows for franchisee

Optimization model
- Evaluates Supply Chain physical flows for franchisee
- Evaluates Supply Chain physical flows for franchisee
- Optimizes Supply Chain physical flows for franchisee

Optimization model
- Evaluates Supply Chain physical flows for franchisee
- Evaluates Supply Chain physical flows for franchisee
- Optimizes Supply Chain physical flows for franchisee

Model A
- Customer Demand is evaluated thanks to prevision
- Discrete Event Simulation + Heuristics (Cornell et al., 2005)
are, the higher the franchisor’s know-how is, and conversely, the bigger the local know-how of the franchisees is, the lower the royalties are. Consequently, it seems obvious to use set royalties (ROY) as our first measure of local responsiveness. As we described it previously, it seems that there are some contradictions between local responsiveness and uniformity. As we decide to use the number of owned outlets to approach uniformity, it is logical to use the number of franchisees to measure the responsiveness propensity of the network (from that point of view Cliquet and Al. (1998) notice that reaction capabilities are more effective in a franchise system than in a company-owned structure).

Furthermore, Castrogiovanni G.J., Combs J.G. and Justis R.T. (2006), based on a 439-network study argue that the rate of franchisee tends to grow when those networks spread abroad. However thanks to Hayek (1945) followed by Jensen and Meckling (1995) it is known that centralized skills and decentralized skills cannot be possessed by a unique agent. Furthermore a company-owned network is managed in a centralized way whereas franchise is concerned by decentralization. The rate of franchisee (FRARATE) in the network marks the operator’s will to favor local responsiveness. “The best marketing a restaurant manager can do is to operate the restaurant effectively. The marketing department’s job is to bring in customer; it is the restaurant manager’s job to deliver on the promise. We don’t want to burden the restaurant manager with outside projects” are the words of one coordinator asked by Bradach (1998). Thus local advertising and local marketing operation seem not to be the salaried managers‘ matter in company-owned outlets, whereas franchisees can do it considering local competing conditions. In that sense we use “local advertising fees” (LOADV) to describe our third measure of local responsiveness.

The last challenge evoked by Bradach (1998) is the systemwide adaptation which is a sequence of several operations whose first is the generating ideas, the second is their testing and their evaluation, the third is about the decision making and the fourth concerns the implementation of the innovation. As far as the generation of new ideas is concerned, Lewin-Solomons (1999) notices that the franchisee’s autonomy encourages him to innovate and he notices the ability of franchisees to innovate. Bradach (1998) also rely to this when he argues that systemwide adaptation is narrowly connected with local responsiveness. Indeed, the Schumpeterian characteristics of the franchisees lead them to innovate and to try anything that could enhance their profitability in local markets, which produces a local response. Such behaviors on the part of franchisees tend to generate ideas that can be recovered by the operator if it means a better adequacy with the whole consumers. We take into account this in a variable called “innovation rate from franchisees” (INRATE) which is connected to another one which is “local responsiveness rate” (LORATE) which depends of franchisees. The latter is in fact reflected by the ability of the franchisees to have a part of local outsourcing and not to be delivered by the operator’s supply chain. Then, the author of “franchise organizations” argues that only the operator can engage research and development expenditures because of the amount of it. The franchisor is motivated to make that sort of expenditure because it allows higher revenues in all the outlets and consequently for him too. It is obvious that the higher this expenditure will be, the higher the franchisor’s interest for the systemwide adaptation challenge will be. A second variable (RDEXP) symbolizes it.

**Fig. 3.** Modeling of the management challenges
This work on those variables is issued from PhD studies (Lagrange, 2009) and is based on a structural equations modeling. A point that is important to stress on is that an operator has to balance between two groups of goals: first are growth and uniformity and second are local responsiveness and systemwide adaptation. Those aims are in fact issued from respectively company owned structure and franchised outlets. As Bradach demonstrate it, it cannot be possible to emphasis only on one of this group of goals or structure and the operator has to manage simultaneous all of those variables. This is relied to two major costs inside the structure of the network as we demonstrate it: transaction costs and uniformity costs relied to franchised organization and coordination costs due to company owned structure. The first two costs are a symptom of a loss in the control and in uniformity and the second is a consequence of agency theory and a lack of motivation in companies owned.

The next sections present applications of the proposed approach on a supply chain of a franchise network: section 3 will present the different type of networks and describe them whereas section 4 will present results and discussion on those results.

III. APPLICATION ON FRENCH NETWORKS: CASES STUDY PRESENTATION

We will apply the proposed modeling process on 3 networks types:
- Bakeries networks composed of a supply chain producer and a retail outlet that sells the products made by the operator of the network in his own factories
- Traditional Restaurants network composed of a supply chain producer and retail outlets that transform products made by the operator of the network in his own factories
- Fast food restaurants network composed of a supply chain producer and retail outlets that sells products made by the operator in his own factories

Such a choice of different type of networks is coming from our need to evaluate if our predictions of a growth at a mix rate are robust face to different kind of activities. In such a case, it will be interesting to compare variations between those networks. First of all, the first and the third set of networks are networks in which the operator’s supply-chain is very important: the operator furnishes almost all of the products. Final products are then assembled in the outlets in accordance with the operator’s concept. For example the final Big Mac with French fries is composed by bread, tomatoes, cheese, salad, and potatoes that come from the operators supply-chain but that are mixed in the restaurant in the same way that bread dough is delivered by the operators and its supply-chain. Those networks are therefore different from restaurant chains that are present in case study number 2: in this latest case, base products such as meat or vegetables because of their fresh nature come from the area of the restaurant. In this case the operator’s supply-chain should be less requested.

The first kind of network which we study is bakery networks and are comprised of a network of franchisees, a network of company-owned outlets, industrial factories, where bread, cakes, and others products are elaborated. Twelve quarters of demand are known. This case study is elaborated by data issued from the French Federation of the Franchised networks between years 2002 and 2008. Those networks are “Paul”, “La Mie Caline”, “Saint Preux”, “La Croissanterie”, “Brioche Dorée” and “St Preux”. Those trademarks are French because of the French tradition of bakeries. As we have already noticed the sold products are made by the operator in his own factories whereas they are assembled and cooked in the outlets. We also notice that those networks are not so big (at the beginning of the simulation the number of outlets is comprised around a mean of 12 outlets).

The second type of network is “traditional” restaurants and is composed as noticed by a supply-chain and by outlets that are transforming products made by the operator and made by local producers because of the need of fresh food. This case study is elaborated with data that are coming form the French federation of Franchised networks and other sources between years 2008 and 2012. The
networks are: “Flunch”, “Courte-Paille”, “La Boucherie”, “Buffalo Grill”, “Dell Arte”, “la Pataterie, Hippopotamus”. The mean size of those chains is around 70. Least, fast-food chains represent the third kind of networks. This kind of activity is nearly the same of the first kind of networks: a big part of the final products is made by the operators and their supply-chain but are composed and assembled within the outlets to be served to the final customers. Data come from the French Federation of Franchised networks and from the operator’s websites between years 2008 and 2012. The networks are: “Mac Donalds”, “KFC”, “Quick”, “Domino Pizza”, “Class’Croute”. As we can observe it, those networks are international ones and are bigger than the others: the mean size is around 400 outlets and therefore the computational time for our modeling process is around one day.

<table>
<thead>
<tr>
<th>Type</th>
<th>Mean size at the first period</th>
<th>Mean size at the last period</th>
<th>Networks</th>
<th>Period</th>
<th>Computational Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bakery</td>
<td>12</td>
<td>24</td>
<td>“Paul”, “La Mie Caline”, “Saint Preux”, “La Croissanterie”, “Brioche Dorée” and “St Preux”</td>
<td>2002-2008</td>
<td>1 min</td>
</tr>
<tr>
<td>Fast-food Restaurants</td>
<td>400</td>
<td>527</td>
<td>“Mac Donalds”, “KFC”, “Quick”, “Domino Pizza”, “Class’Croute”</td>
<td>2008-2012</td>
<td>1 day</td>
</tr>
</tbody>
</table>

Table 1. The studied franchise networks

For all kind of networks that are studied, the horizon level is 12 quarters, and the planning horizon level is the month. This organization runs under either push or pull system. Therefore, 2 types of strategies for supply chain management are evaluated by Model A: a push and a pull strategy. We only use results from the push strategy that gives a better customer satisfaction for distribution networks. A discrete event simulation model running in SIMAN IV allows building input data for Model B. More precisely, a discrete event simulation was preferred to mathematical model for many reasons such as modeling constraints and computation time. Specific modeling was done to take into account particular constraints caused by horizon level and planning horizon of supply chain networks. Two kinds of scenario are evaluated thanks to Model B (scenario 1: all the new outlets are company-owned; scenario 2: all the new outlets are franchised). Model B is also used as a Mixed Linear Program and gives, by selecting for each new outlet its nature (franchisee, or company-owned), optimal cash flows for the operator. Modeling process is presented in figure 4.

Fig. 4. Model A results and Model B used
IV. RESULTS OF THE MODELLING PROCESS AND COMMENTS

Fig. 5 presents results for bakeries networks; fig. 6 presents results traditional restaurants networks and fig. 7 presents the results for fast-food networks. Each figure is drawn for three cases: in the case of a whole franchised development (scenario 1: FO), a development under company-owned outlet (scenario 2: COO) and an optimal development under a mix rate (optimization). Even if it is possible to draw some common outlines, we will present each kind of results for each kind of networks.

Bakeries networks:

One of the most important points one should notice is that, in a network which tends to grow with company-owned outlets (COO), the cash-flow per outlets tends to be stable after the fiftieth quarter whereas the operator’s cash-flow seems to grow at a fixed rate. To our mind it is essentially due to the fact that the only way an operator can lever more cash is to open new outlets (Emmerson, 1982) when he chooses to manage his development with company-owned. Moreover, this phenomenon comes from the growing cost of control of the whole outlets thanks to agency theory, and it is also due to the use of a part of the cash flow to financing the new outlets.

If the operator chooses to manage his development only with franchisees (FO), it seems to be a good strategy in the first two periods; we can observe that the cash flow is sharply depreciated after those two quarters. Our modeling shows indeed that the growing number of franchisees compared to
the stable number of company-owned outlets tends to reduce the ability of the operator to control his network in terms of uniformity due to local responsiveness (modeled with the LORATE variable that generates uniformity costs) of the franchisee for example. Also, even if the franchisees can serve the demand better, after the eleventh period, thanks to Lagrange and Féniès (2005) it conducts the operators to resize up his supply-chain to face the franchisees’ demand. This cost is reported on all the outlets and we can see this in the last quarter. Moreover, from the third to the eleventh quarter, the operator’s cash flow increases. In our opinion, this increasing is due to the ability of the franchisees to innovate (here modeled with the INRATE variable) and to generate new ideas that tend satisfying better the demand.

Thanks to a growth balanced between company-owned outlets and franchisees, we notice that the operator’s cash flow tends to grow at a constant rate. Moreover, if we can observe a little reduction of the operator’s cash flow periodically, it is only due to the purchasing of company-owned outlets (these purchases are reported all over the outlets as show in “the operator’s cash-flow per outlets” graphic). But, at last we do not observe any phenomena such as costs of control or uniformity cost which are set to zero by our modeling. If we compare the three kinds of results, it is obvious that the third one is the best: managing the development of the network by maintaining a stable mix of franchisees and company-owned outlets seems to offer the best results for the operator in terms of cash-flow compared to a growth by adding company-owned outlets or franchisee outlets. Moreover, this latest result also shows the efficiency of the choice of a mixed network for the outlets themselves. Besides, our results tend to show that company-owned structure seems to be a better choice than a whole franchised system.

Fast-food restaurants networks:

We can represent our modeling results for the fast-food chains on fig. 6. As Far as our second set of data is concerned, it is obvious that results are not so different. In fact, we can observe that growth of the networks follow the same rules: our results tend to demonstrate that a development under a whole company-owned strategy is better than with a whole franchised growth. The results are the same with the third set of data (seen on fig. 7). Even if this latest result is the same for all tested networks, we can notice here some specificity that seems to come from the higher mix rate and numerous outlets at the beginning of the simulation. First of all, if networks are developed under a mix of company-owned and franchised outlets mode, the result will not be very different from the franchised mode in term of final mix rate. It will also be less significant in terms of cash flow per outlet or for the operators at the final stage. Even these considerations what is different for those networks between the different kind of growth is the way of achieving these final states. Variations on cash flow (per outlets or for the operators) tend to show tow important steps in the growth: at the period 3 for the franchised mode and at the period 9 for the two other modes. In the first case the cash flow collapse comes from the same reason as seen before: this is due to a cost of control at a growth threshold. Here it is a such impact that it take a lot of time to recover loses: there are no need for resizing operators’ supply-chain at period 9 while growth under company-owned or mix mode implies a such thing as seen in bakery case. In the case of franchise growth, we notice however a little weakening of the operator’s cash flow but it’s only due to less entries of franchisees in the networks, probably due to networks that are becoming less attractive.
Traditional restaurants networks:

In that latest case, as we have assumed it, things seem to be different. Indeed, a big part of the activities of the networks is made in the outlets themselves. However, we still observe that a development under a mix mode is preferred to a development under the company-owned mode, itself preferred to a development under a franchising mode. Here, for the three modes of growth, the role of the operators’ supply chain is less important and that’s why we don’t observe near the last periods a resizing of the supply chain that could seriously affect operators’ cash flow. In the other hand, the collapse of operators’ cash flow around period 7, in the case of a growth trough franchising, is due to a loss of control of the operators of their franchisees. Effectively, as we have notice it, this kind of networks requires fewer products from the operators’ supply chains however the delivery of raw products through the supply chains is a way to strengthen the concept uniformity. In the case of a franchise growth, and because of the franchisees ability to locally react these latest factors generate growing costs of control or uniformity costs.

In this particular case of traditional case and always because of the way of producing final products, company-owned outlets are more able to be autonomous and this fact reduce agency costs and the need for the operators to motivate outlets’ managers: we do not observe a growth of coordination costs during the development of the networks (Brown, 1998).
CONCLUSION

We will apply the proposed modelling process on 3 networks types:

- A bakery networks composed of a supply chain producer and a retail outlet that sells the products made by the operator of the network in his own factories (Paul, La Mie Caline, Saint Preux, La Croissanterie, Brioche Dorée, St Preux…)

- A traditional Restaurant Franchise network composed of a supply chain producer and retail outlets that transform products made by the operator of the network in his own factories (Flunch, Courte Paille, La Boucherie, Buffalo Grill, Dell Arte, la Pataterie, Hippopotamus…)

- A fast food restaurant franchise network composed of a supply chain producer and retail outlets that transform products made by the operator in his own factories (Mac Donalds, KFC, Quick, Domino Pizza, Class’Crouté…).

These case study are elaborated by data issued from the French Federation of the Franchise (from 2006/2012) that provides annually data from networks.

We show that the plural form is more efficient in generating cash flow for the operator, whatever the studied networks. This form is, in fact, the best choice for an operator that wants to develop his network while balancing challenges such as growth, uniformity, local responsiveness and global adaptation. This approach links together two research fields: a strategic one with the choice of the statutory form of the outlet in a mixed franchised network and a tactical and operational one that optimizes the cash flow in supply chains.

Fig. 7. Results on Traditional Restaurants
Considering the choice between companies owned and franchised outlets, our work is fully compatible with numerous works on scarcity resources and agency theories. Moreover, as Bradach shows it, mixed networks are networks, which are able to manage development efficiently. We also show that this development in outlets numbers is also the most linear development in the operators’ cash flow compared to the two other growth forms. We notice also that the mix rate is not a normalized rate: it depend of the network’s type and it is not an exact rate but a range.

An original contribution can also be seen in the coupling of two domains that are franchise distribution and supply-chain management. However, it is important to notice that this approach is based on French networks that have the specificity of being food oriented. All things considered, this work has to be further pursued to be generally applied to numerous cases of franchised organizations because of the initial conditions that influence the results (higher mix rate, higher number of outlets, a.s.o….)

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