COOPETITION IN INFOMEDIATION:

GENERAL ANALYSIS AND APPLICATION TO e-TOURISM

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Abstract

Since the economic and managerial fields integrated the Internet tool, new opportunities were created. Among them, information management aiming at helping to make the "best choices" became a central topic in e-management. New types of intermediaries appeared in the virtual world as `interorganizational information systems'. Actors who join these systems and take part in the development of these virtual commercial places play an atypical game: on the one hand, they cooperate in the same virtual entity of reticular form and, on the other hand, they remain individually in competition with one another since they are in a common market with comparable goods and services. How should we address this competitive game? Our paper tries to answer this question by qualifying the collaboration of "coopetition" between platform members and competition between various online platforms. Moreover, in order to avoid any confusion, we propose a distinction between `electronic marketplaces' and `online information platforms'. We apply our general analysis to the case of e-tourism.

Key Words

Infomediation; Coopetition; Online Information Platform; Electronic Marketplaces; Tourism economy

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1.   Introduction

The integration of the Internet within human organizations and, in particular, in the mechanisms of business administration has already caused multiple organizational changes. Some economic actors disappeared while other actors appeared because of the opportunities created by the Internet and, in a more general way, by the revolution associated with the information and communication technologies (ICT).

Among these new actors of the virtual economic field, we find the *interorganizational information systems* (IIS), which enable buyers and sellers to participate in a common market to exchange information on the products, to compare the characteristics of various products and, if necessary, to carry out online transactions. The IIS are perceived at the same time as means of treating and diffusing information, and as new resources enabling firms to increase their competitiveness (Baile and Trahand, 1999). Within the framework of this article, we propose to distinguish between two types of virtual places: the *electronic marketplaces* (EMP) and the *online information platforms* (OIP). Whereas the first type allows buyers and sellers to operate and to conclude online transactions, the second type focuses more specifically on the informational exchange without playing a role in the transaction.

The two types of IIS often coexist within the same sector. For instance, in the tourism sector, online directories (OD) are an example of OIP. Their business is defined by the gathering of the whole existing and recognized supply of holiday services (flights, accommodations, leisure parks, restaurants, etc.). This information is then available on one place (the OIP's website) in order to propose an aggregate offer to the attention of buyers (tourists seeking places for their next holiday time). On the other hand, online booking centers (OBC) are an example of EMP; these virtual travel

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agencies allow users to choose a product, to carry out the reservation, and even to secure the payment of the stay by electronic payment.

Going beyond the mere terminological distinction between EMP and OIP, we aim to analyze the main similarities and differences between these two types of IIS. On the one hand, the two types are both characterized by the paradox of any participation in an IIS: by offering similar goods and services, all the suppliers present on an EMP or an OIP are competitors, but at the same time they collaborate in making this virtual marketplace successful. On the other hand, EMP and OIP differ in the services they offer to their participants, but compete for the participation of the same sets of users (basically, sellers and buyers). Moreover, the competition between EMP and OIP takes place within an intricate web of externalities: (i) within an IIS, there are indirect network externalities (buyers favor the participation of more sellers and sellers favor the participation of more buyers); also, because sellers compete with one another, there are negative externalities among them; (ii) across different IIS, the benefits offered to users by one IIS are likely to spill over to another IIS (because users can "multihome", i.e., they can register with several IIS) and free-riding may then occur. Our objective in this article is to propose a rigorous framework in order to disentangle these various effects and, thereby, to highlight the main management issues surrounding competition and cooperation both within and among IIS. Throughout the paper, we illustrate our general analysis through the case of e-tourism (with a special focus on the nature-based tourism sector).

The remainder of the article is organized as follows. In Section 2, we replace the concept of IIS in its context, namely the context of market intermediation. We contrast the theories of "disintermediation" and "re-intermediation"; we describe how *infomediation* is a concept that rises directly from the "re-intermediation" theory and, thereby, we explain why it is necessary to distinguish between EMP and OIP. . In Section 3, we study the collaboration paradox on an OIP by referring to the concept of *coopetition*, which combines competition and cooperation. In Section 4, we formalize the intuitions drawn from the previous sections by analyzing developing an industrial organization model. In

Section 5, we broaden the perspective by considering the competition between several IIS. Finally, in Section 6, we conclude by stating a number of important questions and issues for future theoretical and empirical research.

2.   Intermediation and ICT

In order to understand what an IIS is and what are the implications of the distinction between EMP and OIP, it is necessary to refer to the intermediation theory. Actually, these virtual entities are concretely represented by intermediaries, whose functions rise directly from the evolution of the intermediation in parallel with the evolution of ICTs over the last decades.

An intermediary is an economic agent who helps a supplier/seller and a buyer/consumer to meet and to carry out a particular transaction, either by buying to the supplier in order to resell to the purchaser, or by simply helping these two protagonists to find each other (Spulber, 1996). Let us notice that in both cases, the intermediary does not derive any utility from the consumption of the exchanged goods (Biglaiser, 1993). His profit either comes from the margin of its buy and resell operations or is represented by the wage for his intermediation role. The work of an intermediary generally leads to a centralized offer by minimizing research costs for the two parts of the transaction (Rubinstein and Wolinsky, 1987).

2.1   The theory of disintermediation

With the development of ICTs and more specifically the Internet, the traditional intermediary enters reluctantly in direct competition with decentralized electronic exchanges where consumers and producers meet in order to negotiate directly the final prices and the transaction terms. The Internet is thus perceived as a virtual means that establishes direct relations between suppliers and consumers.

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This is the central assumption of the disintermediation theory, which contends a gradual elimination of the various actors of the value chain (Malone and all, 1987).

However, there are several reasons for which this assumption cannot be validated in its extreme version (disappearance of any economic actor acting as an intermediary). Firstly, it is difficult to believe in a completely digitalized market because of technological barriers. Undeniably, the current state of technology does not make it possible to find satisfactory electronic equivalent for all types of transactions. Secondly, the concerned actors may not always find it beneficial to make the transactions become entirely electronic, be it for strategic reasons or even to ensure that information remains private (Brousseau, 2002). Finally, the producer is not always able to ensure a routing of his products towards the purchaser. Indeed, even if negotiations, contractual agreement and invoicing (electronic payment) can be made digital, the routing of the product remains a material problem. The space proximity and the physical meeting between protagonists thus remain significant (Brousseau, 2002).

Consequently, the disintermediation assumption is not entirely justified since it is stated only in terms of cost reduction (transaction costs theory), without tackling the question of the added value of intermediation and the role of the intermediary as an economic agent (Benda, 2004; Tran, 2004).

*2.2   From electronic intermediation to infomediation*

The previous analysis leads us to conclude the following: while it is clear that the existence of the intermediaries is not threatened, it is also clear that their role has to change considerably (Bailey and Bakos, 1997). Consequently, one can expect an adaptation of the traditional intermediaries to the new needs generated by the information society, but also the emergence of new virtual actors with a tendency to exploit specific niches (Brousseau, 2002).

The so-called "re-intermediation theory" finds its roots in the latter observation. It comes as a reaction to the preceding disintermediation theory, which is considered as too peremptory and not realistic enough. Behind the re-intermediation term thus hides the electronic intermediation which, as we mentioned earlier, is inherent in IIS. IIS turn out to be essential from a strategic point of view, since information on the Internet reaches an extreme level of complexity (in quantitative as well as qualitative terms), which casts serious doubts on the earlier argument according to which the Internet minimizes search costs (Giaglis, 2002). In addition, IIS represent a significant medium for firms confronted with an increasingly uncertain environment, as it allows sharing information in a very short period of time (Baumard and Benvenuti, 1998).

An electronic marketplace (EMP) is defined as an IIS that allows and facilitates Internet-based commercial relationships among multiple buyers and sellers (Akoka and Lang, 2002). Concretely, EMPs are virtual shopping malls. In the existing literature, it is usual to find EMP and online information platform (OIP) used as synonyms (Benda, 2004). However, we wish here to establish a distinction between these two virtual entities. While an EMP clearly allows participants to trade directly among themselves, the OIP only aims at providing information (Spulber, 2003). In the present article, we refer to an OIP as any system whose objective is to collect the information available on particular products and services in order to present it in a comprehensive, organized, synthetic and easily accessible form, to the attention of the buyer. Consequently, it represents an information tool and not a transaction tool, as is the case for an EMP. An OIP can thus be considered as a type of innovating intermediary thanks to which information, relayed on the Internet via its platform (the online directory), gains in credibility (Oxley and Yeung, 2001). To support this terminological differentiation, the literature has coined the term of « *info*mediary », which usefully characterizes an OIP.

An infomediary is traditionally defined as a merchant of information. As illustrated on Figure 1, this information concerns either the buyer (case 1) or the supplier (case 2) of goods and services. In case

1, the infomediary collects data concerning a particular population of buyers, he analyses and structures this data to obtain useful information that he then sells to a supplier, which is directly concerned with the population and the corresponding market (Ngo Mai and Raybaut, 2005). Hence, the infomediary in contact with the market follows the evolution and the tendency of this market and contributes to a certain extent to the development of the offer (Giaglis, 2002). In case 2, the infomediary collects data about multiple producers and suppliers of the same good or service in order to propose this data, after treatment, to the potential buyers present on this market segment and requesting a high degree of transparency and comparability of information.
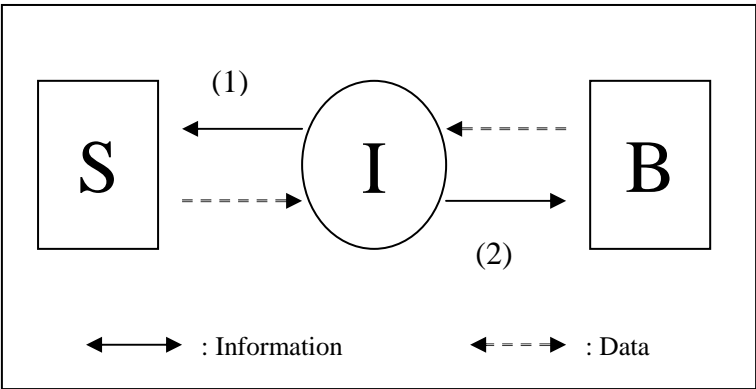
Figure 1: Configuration of the infomediation and structure of flows

For infomediation to exist, it is necessary that the activity add some value, exactly as for traditional intermediation (Benda, 2003). If information relates to the buyer side (case 1), there is room for an infomediary only if the supplier is not able to observe, to collect and to treat the data itself. If information relates to the seller side (case 2), the infomediation activity is useful if it is difficult for a buyer to observe the whole supply of goods and services (this can be attributed to various reasons: very fragmented market, difficult access to information, lack of time, consumer not very inclined to support the research costs, etc.).

As an illustration, web sites such as *toprural.com* or *ruraltrip.com* are online directories and act as infomediaries in the nature-based tourism sector. Information concerns the supply of tourism services

as noted above (referred to hereafter as the « suppliers ») and is proposed to people organizing a city trip or any other kind of holiday (the « buyers »); it is useful to recall that the tourism sector benefits considerably from the possibilities offered by the Internet. Indeed, a large range of transactions related to the tourism sector is nowadays very common (buying plane tickets on the web; participating to holidays online auctions; searching sunny destinations on the web instead of using paper catalogues; etc). In such a context, the presence of an OIP can therefore prove to be necessary and justified.

General	Interorganizational Systems	Information (IIS)
Category	Electronic Marketplaces (EMP)	Online Information Platform (OIP)
Example	Online Booking Centre (OBC)	Online Directories (OD)
Activity	Intermediation	Infomediation

Figure 2: Organization of concepts (acronyms)

In the online tourism sector, EMP can also be identified as online booking centers (OBC), i.e. virtual travel agencies on which it is possible to choose a product, to carry out the reservation, and even to secure the payment of the stay by electronic payment. As for the case of traditional agencies, OBC are remunerated on the basis of a commission, which is generally directly integrated by marking up the basic price of the product established by the supplier. Contrary to the OIP, an EMP, such as the OBC, does not support informational transparency. Firstly, regarding product information, we have already noted that OBC do not post the real prices of the products or services: prices include an additional fee (the commission) that is meant to compensate the OBC for its services. Secondly, regarding information about suppliers, OBC maintain it secret in order to prevent buyers from directly contacting suppliers and thereby, bypassing the OBC's intermediation. Indeed, an increasing number of suppliers are equipped in computer systems, which allows them to manage themselves the requests and services related to the booking. Figure 2 summarizes the comparison between EMP and OIP.

In Section 5, we continue to present differences between theses virtual places. We now turn to the analysis of the relationships between participants in the same platform.

3.   Coopetition on an online information platform

Before analyzing the links existing between OIP participants, we will first see why these different actors join an OIP. As for a buyer, the benefit of joining an OIP is twofold. Firstly, the buyer has access to a large number of suppliers in a single place, which clearly reduces his search costs. Indeed, as we mentioned before, the profusion of information currently available on the Internet does not make it possible any more to consider this medium of communication as a low search cost tool. Let us notice that if the monetary cost has strongly dropped (because telecommunication tariffs have been in constant fall over the last years), the search cost due to the constant growth of the mass of information on the Internet appreciably increased (as Varian et Lyman -2002- document it, 550 billion new documents and more than 7,5 million Web pages are created every day). Secondly, the buyer is confronted with information coming straight from the supplier, which guarantees prices that are not skewed by a commissioning mechanism and also a direct bond with the supplier to start a transaction.

Concerning the supplier, his interest is economic as well as strategic. The economic advantage stems from the fact that by joining an OIP the supplier partly externalizes his promotion function to an agent, which carries it out at a lower cost (economies of scale) and facilitates coordination between the two sides of the market. Participating in an OIP also yields strategic benefits as it allows the supplier to access new markets and thus to gain new market shares at the expense of suppliers who remain outside the OIP (Benda, 2004). However, the supplier who joins an OIP is forced to share these competitive advantages with the rival suppliers who already joined the OIP.

In her work about EMP, Benda identifies three types of suppliers on the basis of their perception of the stakes they have in the collaboration: *refractories*, *non refractories* and *proactives* (Benda, 2004). Instead of giving a formal definition for each category, we adapt it hereafter to our OIP model in the nature-based tourism sector.

Refractory suppliers are not present on an OIP because they consider that their own online promotion methods –generally a homemade web site– or their other advertising campaigns are largely sufficient. In the majority of the cases, these suppliers ensure an effective presence on the Internet by using their advanced competences in computer science. By doing this and despite lower means than those implemented by the OIP, they attract enough visitors to be satisfied.

Non refractory suppliers are participating in the OIP as long as their participation in it gets them a higher turnover. Moreover, they require that the profits be higher than the cost of participation. If the OIP is in its development stage, such suppliers minimize their participation (for example by subscribing to the free promotion formula) while waiting to see whether the OIP's development will be beneficial for them or not.

Proactive suppliers are also on the OIP. They consider that the OIP can help them at various levels. Firstly, they are convinced that as an actor of the nature-based tourism sector, a successful presence on the Internet is essential. Secondly, they find the OIP useful to benefit from a virtual quality window, which will give a positive image of their services. Thirdly, they note an increase of buyers' requests and so of their sales, even if it is difficult to quantify these repercussions.

Whether they are non-refractory or proactive, suppliers collaborate in the construction and the development of the OIP simply through their participation in it. From this point of view, it seems correct to say that they act like partners pursuing a common goal: the mutualisation of means in order to conquer a larger share of the market. However, from the fact that these suppliers propose services

and products relating to the same sector (possibility of comparability), they remain competitors. Actually, we wish to underline the paradoxical character of an ambivalent relation between several suppliers active on the same market, which can be established conceptually in two steps: initially, cooperation between economic agents to achieve a satisfactory common goal for all (in the present case, an increase in the market size); then, competition between the same agents in order to enjoy individually the benefits of the cooperation (here, the largest possible share of the market).

Such a competing collaboration is usually justified by three goals: the research of a critical size, the costs mutualisation and the introduction of barriers for new entrants (Tran, 2004). For the nature-based tourism sector, the research of a critical size is fundamental since the sector is represented by many private owners, often with a one-product offer and for which the tourism activity is complementary to a principal one (e.g., agriculture). In this context, it is easy to understand that cost mutualisation appears as a natural way to a widened and effective action. Lastly, given that the sector under review remains largely open (the supply increases significantly every year), the participation to an OIP can, from a strategic point of view, be used to avoid strong competition by establishing barriers to entry.

(2 suppliers et 1 OIP)	S2 participates in the OIP	S2 does not participate in the OIP
S1 participates in the OIP	**Coopetition**	Advantage in S1
S1 does not participate in the OIP	Advantage in S2	**Competition**

Figure 3: Competition and coopetition

The main characteristic of the *coopetition* phenomenon (Koenig, 1996; Nalebuff and Brandenburger, 1996) is to combine simultaneously a collective strategy (*cooperation, i.e.* participation to the same

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OIP and contribution of each supplier to the development of this OIP) and several individual strategies (*competition* as the participants to the same OIP remain competitors with one another). Coopetition is a helpful theory to analyze tourism economics and strategy. Moreover, the concept has been recently used in the case of tourism firms (Pesämaa and Eriksson, 2006; Della Corte and Sciarelli, 2006).

Figure 3 illustrates this concept starting from two competing suppliers active on the same market and potentially on the same OIP. If the two agents stay out from the OIP, they play the traditional game of competition. If only one of the suppliers join the OIP, then he has a competitive advantage over the other, insofar as he benefits alone from the entire common infrastructure created. However, it is obvious that for this participation to be transformed into a durable competitive advantage, it is necessary that the OIP gives itself the means of being known from the market. Lastly, as we already described it, if both suppliers join the OIP, they play the ambivalent game of coopetition: competition is strong because suppliers are on an equal foot, but joint participation makes the OIP more attractive for buyers, which increases expected profits for both suppliers.

We now develop an industrial organization model to formalize this situation and also to consider the pricing strategy of the OIP owner.

4. A formal model of coopetition on an OIP

Let us start with a simplified situation with only two suppliers of rural accommodation, noted i and j, and a single infomediary The inverse demand function for the service provided by supplier i is given by $p_i=1+m_i-q_i-dq_j$, where

- p_i is the price for one unit of service (say, e.g., one night per person in the accommodation),

- q_i and q_j are the quantities of service provided respectively by suppliers i and j (these quantities can be thought of as the accommodation capacity, e.g., the number of rooms or of beds)

- $d \in (0,1)$ is an inverse measure of product differentiation between the services of the two suppliers (the lower d, the more services are differentiated; for $d=0$, the two services are totally differentiated and the two demands are independent; at the other extreme, for $d=1$, the two services are seen as perfectly substitutable), and

- m_i indicates the "market-exposure" (or "brand recognition") of service i (the larger m_i, the higher the willingness to pay of each consumer whatever the quantities q_i and q_j produced by the firms).

Before competing *à la* Cournot on the product market (i.e., suppliers simultaneously set their quantity, taking the quantity of the rival as given), suppliers decide whether or not to adhere to an infomediary of the type of *ruraltrip.com*. The infomediary charges suppliers a fixed fee F for registration. Being listed on the infomediary's website has the effect of increasing the supplier's market exposure (with respect to self-promotion via other means). Moreover, infomediation generates network effects insofar as each supplier's exposure further increases when the other supplier also registers with the infomediary. As explained above, such network effects can be justified by scale and scope economies in promotional activities enjoyed by the infomediary, and because consumers are willing to pay more for both services when they are given the opportunity to compare them more easily. We translate this idea by assuming that $m_i=0$ when supplier i does not adhere to the infomediary, $m_i=m$ when supplier i is the only supplier who adheres to the infomediary, and $m_i=M$ when both suppliers adhere to the infomediary, with $0<m<M$.

In sum, we consider the following three-stage game: in the first stage, the infomediary sets the registration fee F; in the second stage, the two suppliers observe F and simultaneously decide whether

or not to join the infomediary; in the third stage, given the level of market exposure of the two services that follows from second-stage decisions, the two suppliers choose the quantity of services they provide. We solve the game backwards for its subgame-perfect Nash equilibria.

We start by solving the Cournot game suppliers play at stage 3. Assuming for simplicity that the marginal cost of production is equal to zero for both suppliers,[1] supplier i's profit function writes as $\pi_i=(1+m_i-q_i-dq_j)q_i$. Setting to zero the derivative of profit with respect to q_i, we derive supplier i's reaction function: $q_i(q_j)=(1/2)(1+m_i-dq_j)$. Proceeding in a similar way, we derive supplier j's reaction function as: $q_j(q_i)=(1/2)(1+m_j-dq_i)$. Solving for the system of equations in two unknowns given by the two reaction functions, one finds the Nash equilibrium quantities:

$$q_i^*=(2-d+2\,m_i-d\,m_j)/(4-d^2) \quad \text{and} \quad q_j^*=(2-d+2\,m_j-d\,m_i)/(4-d^2).$$

Some simple manipulations show that equilibrium profits are equal to the square of equilibrium quantities: $\pi_i^*=(q_i^*)^2$. In the above expressions, the exact values of m_i and m_j depend on the adhesion decisions made by the suppliers at stage 2. There are four subgames to consider: (1) if no supplier adheres to the infomediary, then $m_i=m_j=0$; (2) and (3) if supplier i (resp. j) adheres while supplier j (resp. i) does not, then $m_i=m$ and $m_j=0$; (4) if both suppliers adhere to the infomediary, then $m_i=m_j=$M. Substituting the previous values in the equilibrium profits, we obtain the following payoff matrix, which we will use to solve stages 1 and 2. (We assume that $m<(2-d)/d$ to guarantee positive equilibrium quantities in all instances).

	Non adhesion	Adhesion
Non adhesion	$\left(\frac{1}{2+d}\right)^2, \left(\frac{1}{2+d}\right)^2$	$\left(\frac{2-d-dm}{4-d^2}\right)^2, \left(\frac{2-d+2m}{4-d^2}\right)^2 - F$
Adhesion	$\left(\frac{2-d+2m}{4-d^2}\right)^2 - F, \left(\frac{2-d-dm}{4-d^2}\right)^2$	$\left(\frac{1+M}{2+d}\right)^2 - F, \left(\frac{1+M}{2+d}\right)^2 - F$

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[1] Alternatively, prices can be interpreted as mark-ups over the marginal cost.

Before looking for the equilibrium adhesion decisions at stage 2, we want to illustrate what *coopetition* means in the present setting. As explained in the previous section, coopetition mixes some form of *cooperation* (which is translated here by the assumption that *M>m*: market exposure is larger when both suppliers register with the infomediary) and of *competition* (adhesion decisions are strategic: they are carried out with a view to affecting the environment in which product market competition is played). To assess how these two opposite forces balance each other, we compute how equilibrium profit changes when the other supplier also registers with the infomediary. Simple computations establish that:

$$\left(\tfrac{1+M}{2+d}\right)^2 - F > \left(\tfrac{2-d+2m}{4-d^2}\right)^2 - F \iff \Delta_m \equiv \tfrac{M-m}{m} > \tfrac{d}{2-d} \equiv t(d).$$

In the latter inequality, the left-hand side, Δ_m, is the percentage increase in market exposure generated by the other supplier's presence on the website (it measures the network effect). The threshold on the right-hand side, $t(d)$, is a decreasing function of the degree of product substitutability d.

The inequality is interpreted as follows: when the network effect is strong enough ($\Delta_m > t(d)$), the cooperation effect dominates the competition effect and each supplier welcomes the rival's registration with the infomediary; otherwise, the competition effect dominates and each supplier would rather remain the only subscriber to the infomediary's service. In the latter case, the benefit of increased exposure is more than offset by the fact that the rival supplier also enjoys the same benefit and becomes thereby a stronger competitor on the product market. Note that this situation is more likely to arise the larger the value of d. Indeed, when d increases, the two accommodation services become closer substitutes, competition is fiercer and as $t(d)$ increases, the inequality is satisfied for a narrower region of parameters. As an illustration, the inequality is always met when services are totally differentiated ($d=0$) as $t(0)=0$. At the other extreme, $t(1)=1$, meaning that a 100% increase in market

exposure is necessary to have the cooperation effect dominating the competition effect when the service is homogeneous.

We now turn to stage 2 of the game. If we suppose first that registration with the intermediary is free (F=0), then we can show that it is a dominant strategy for each supplier to adhere to the infomediary. So, *under free registration, the unique Nash equilibrium is such that both suppliers adhere.* The analysis is slightly more complex when registration is not free. Consequently, for the sake of the exposition, we choose arbitrary values for two parameters, namely $d=1/2$ and $m=1$. The payoff matrix rewrites then as:

	Non adhesion	Adhesion
Non adhesion	$\frac{36}{225}, \frac{36}{225}$	$\frac{16}{225}, \frac{196}{225} - F$
Adhesion	$\frac{196}{225} - F, \frac{16}{225}$	$\frac{36(M+1)^2}{225} - F, \frac{36(M+1)^2}{225} - F$

Comparing payoffs, we can characterize the Nash equilibrium at stage 2 according to the value taken by F and M:

- No supplier adheres if and only if $F \geq (196-36)/225 = 0.711 = F_1$;

- A single supplier adheres if and only if (i) $F \leq F_1$, and (ii) $F \geq (36(M+1)^2-16)/225 = F_2$; it can readily be checked that for these two inequalities to define an open interval (i.e., for $F_2 < F_1$), it is necessary that $M < 1.211$;

- Both suppliers adhere if and only if $F \leq F_2$.

The intuition behind these results is straightforward. When the network effect is not too strong ($1=m < M < 1.211$), there are three possible Nash equilibria: for a low registration fee, both suppliers adhere, for an intermediate fee, only one supplier does, and for a high fee, no supplier adheres. For stronger network effects, there is no fee such that only one supplier adheres: they both adhere (low fee) or they both refrain from doing so (high fee).

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We are now in a position to derive the infomediary's optimal conduct in the first stage of the game. We distinguish between two cases. When the network effect is strong (i.e., for $M > 1.211$), either both suppliers register or none of them does: the infomediary's optimum is thus clearly to choose a registration fee just below F_2 and have both suppliers adhering. On the other hand, when the network effect is not so strong (i.e., for $M < 1.211$), the infomediary has the additional possibility of setting the higher fee F_1 so as to attract a single supplier. This would be the optimal option if $F_1 > 2 F_2$. Simple computations establish that the latter inequality is equivalent to $5 - 6M - 3M^2 > 0$, which is never satisfied as, by assumption, $M > m = 1$. We therefore conclude that the infomediary always finds it optimal to set a low registration fee so as to attract the two suppliers. This conclusion is, however, particular to the present special case, as we now discuss.

The previous model can easily be generalized to an arbitrary number of suppliers, $N > 2$, by letting the exposure parameter m_i be equal to αn when supplier i adheres to the infomediary along with $(n-1)$ other suppliers (where $\alpha > 0$) and, as before, equal to zero when supplier i does not adhere. As above, we solve the three-stage game backwards. Supposing that n (with $0 < n < N$) suppliers have joined the infomediary at stage 2 of the game, we denote by $\pi^{in}(n)$ the equilibrium profit at stage 3 of a typical supplier who joined the infomediary (and who is thus is among the n "in" suppliers); similarly, let $\pi^{out}(n)$ denote the equilibrium profit of a typical supplier who did not join the infomediary (and who is thus among the $N-n$ "out" suppliers).

Let us first give a more precise assessment of the coopetition phenomenon. As above, we want to assess how a member's equilibrium profit changes when an additional supplier joins the infomediary. We therefore compute the difference $\pi^{in}(n+1) - \pi^{in}(n)$. Focusing here on the case of homogeneous products (i.e., $d=1$), we can readily establish that *the change in profit is positive if and only if the infomediary comprises less than half of the population of suppliers* (i.e., if $n < N/2$). The corollary of this result is that, as the infomediary grows larger than this critical size, the equilibrium profit of each

member decreases when an additional firm joins the infomediary. The intuition for this result is akin to the one we described in the case with two suppliers. In such a setting, the enlargement of the infomediary's member base induces two simultaneous contrasting effects on the members' profits: on the one hand, the members benefit from the increase in the demand they face (a positive "exposure effect"), but on the other hand, they suffer from increased competition due to the increased demand that their competitors enjoy as well (a negative "competition effect"). As a result, there is a critical size after which the admission of new members in an infomediary has an adverse effect on the initial members' profit.

Now, turning to stage 1 of the game, we would like to measure how much a supplier is willing to pay in order to become the nth member of the infomediary. This supplier would be willing to pay up to its change in profits: $f(n) \equiv \pi^{in}(n) - \pi^{out}(n-1)$, i.e., the difference between the profit after joining the infomediary (when n suppliers are with the infomediary) and the profit before joining (when only $n-1$ were with the infomediary). It can be shown that $f(n)$ first increases with n, then reaches a maximum and then starts to decrease with n; the reason for the decrease is to be found in the competition effect which makes $\pi^{in}(n)$ decrease with n for $n > N/2$. The function $f(n)$ can be interpreted as a demand function for the infomediary's services: for a given quantity of service (i.e., for a given number n of members), $f(n)$ indicates the highest price (i.e., membership fee) at which the service can be sold. The optimal level of the membership fee can thus be indirectly obtained by letting the infomediary select the optimal number of members, i.e., the number n^* that maximizes the infomediary's profit, $\Pi(n) = nf(n)$. Some line of computations establish that the first derivative of $\Pi(n)$ with respect to n is negative at $n=N$. This implies that the infomediary never finds it profitable to induce full membership: *the infomediary's optimum is to attract a strict subset of the existing pool of suppliers*. The intuition for this result is again to be found in the coopetition phenomenon.

In the next section, we extend the discussion to a setting where several intermediaries compete for both suppliers and buyers. In particular, we consider the entry of an OIP in a business environment in which another intermediary is already active.

5.   Platform competition: a collective competitive game

Several empirical studies show the importance of the competing advantages related to the participation in an EMP (Benda, 2003; Brousseau, 2002) and of the integration of the Internet –and the ICT in general– to the strategy of the firm (Fernández and Nieto, 2005). However, if one considers the same market or common branch of industry, it is possible to meet several EMP, which enter mutually in competition (Tran, 2004). This latter phenomenon can be seen as a move of competition from an individual dimension (agent against agent) to a collective dimension (platform against platform).

In order to shed some light on this platform competition, we can rely on the industrial organization theory and its concept of two-sided market. Indeed, with online platforms we are in the presence of positive indirect network effects since the more agents are on one side of the platform (e.g., suppliers), the higher the agents' utility on the other side (e.g., buyers). In the previous section, we developed a model with only one intermediary. Now, we intend to see what occurs when a second intermediary enters the market.

We apply again our analysis to the nature-based tourism sector. As described in Section 2, we can identify two types of IIS in this sector: online booking centres (OBC) and online directories (OD). To understand how these two types of IIS may compete with one another, we first need to deepen the characterization of their similarities and differences (as summarized in Figure 4).

At first glance, OIP and EMP seem to be relatively similar since both are electronic places that provide higher "market-exposure" to the seller and attract a great number of buyers. Nevertheless, their roles are quite different. In the one hand, EMP act as traditional intermediaries, which means that they do not just play a role of matching both sides of the market. They provide a complete service from the beginning to the finalization of the transaction, so that both sides never enter directly in contact. For providing this service, EMP generally charge a commission, which represents transaction costs and a profit margin. On the other hand, OIP only play an information role. They do not care whether the transaction works successfully out, but they improve coordination between the two sides of the market, allowing buyers and sellers to manage the whole transaction by themselves. In this latter case, it is not longer possible for the infomediary to control transactions, so that they prefer to charge one or both sides of the market with a fixed fee. So, we retain, for the analysis to follow, that an EMP set prices charged for usage and that an OIP set a system of membership fees (Rochet and Tirole, 2004).

EMP *(OBC)*	**OIP** *(OD)*
Ensures a restrictive promotion (without informational transparency)	Ensures a wide promotion (with informational transparency)
Becomes actor of the transaction	Remains outside the transaction
Endorse responsibilities as for the realization of the transaction	Endorses responsibilities as for the veracity of information
The intermediation cost is generally supported by the buyer	The infomediation cost is generally supported by the supplier

Figure 4: Some major differences between EMP and OIP *(nature-based tourism sector)*

Figure 4 presents the most outstanding differences between an EMP and an OIP as we conceive them here. This shows that these two different IIS do not respond to identical needs. In fact, an EMP is more specifically addressed to a supplier who wants to outsource his sale function, whereas an OIP responds to a promotion need. Hence, while a supplier who is not able (or does not want) to ensure

transactions tends to join an EMP, a supplier who is not able (or does not want) to ensure its promotion function tends to join an OIP.[1]

We now turn to the nature-based tourism market structure and our concrete business examples. Some OD as *toprural.com* or *ruraltrip.com* are profit-maximizing infomediaries (private venture), so that they should optimize their revenues. Thus, with a membership fee system, the maximizing solution is to attract many participants paying the fee, independently from the number of interactions (we assume realistically that in the case of an OIP, agents are not charged for usage; usage is indeed hard to monitor or to quantity because transactions are conducted outside the platform). Things are different with an EMP. Indeed, an OBC as a profit-maximizing intermediary has to maximize the number of transactions. However, since we are in a two-sided market, the decision of joining the platform from one side depends on the expected size of the other side. As shown, e.g., by Armstrong (2004), an intermediary may subsidize one side of the market in order to generate a higher volume of trade and thus a higher profit. We also demonstrated in the previous section that an infomediary finds it optimal to set low registration fees so as to attract a large number of potential suppliers. For instance, *ruraltrip.com* decided to proceed in several successive steps. Firstly, the firm referred for free on its website all the officially recognized owners (but with only one of their different accommodations). This basic service is called "Simple Trip". At the same time, web surfers can visit the site for free and find the information through an adapted research browser. We thus observe that an OD let both market sides of the market access for free. Obviously, this leads to a growth of the potential buyers' number since the website proposes a large amount of accommodations and relevant information in comparison with OBCs. Secondly, in consequence of the first move, suppliers find it interesting to be confronted with so many potential buyers and therefore have a willingness to pay in order to be more visible. Clearly, as "Simple Trip" is a free service both for buyers and for suppliers, it cannot

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[1] Clearly, reality is a bit more complex than that as an EMP also achieves a promotional role, and as sellers have the opportunity to simultaneously register with and EMP and an OIP (for instance, a supplier may go to an OIP because this gives him a larger promotion scope, and simultaneously adhere to an EMP in order to increase his sales). The latter phenomenon is usually referred to as "multihoming". Considering the complexities resulting from multihoming (which can also exist on the buyers' side) goes beyond the scope of the present analysis.

represent a viable business model in the long term. However, by attracting a large number of buyers, it makes it possible to charge suppliers for advanced services. That is why *ruraltrip.com* has set up the "Gold Trip" service (alike "Silver" and "Gold" Promotion in the case of *toprural.com*), which enables the owner to benefit from a preferential treatment with many advantages (e.g., all accommodations referred; individual page for every accommodation; complete description and pictures available; priority positioning in search results; personal owner account; etc.). In Section 4, we concluded by saying that a platform does not have any interest in full membership. Clearly, if all the owners subscribe to the "Gold Trip" service the preferential treatment disappears and there is no competitive advantage anymore. Such a situation can arise when the membership fee is set at such a low level that everyone finds it interesting to pay. Again, because of a different pricing model, an OBC works according to different rules, but is active on the same market and, therefore, competes with OD for both buyers and suppliers.

Let us now have a closer look at the competition between an EMP and an OIP. As we just showed, "platform competition" is particular in that both IIS simultaneously compete on both sides of the market. They both try to get a large number of buyers and a large number of sellers "on board", knowing that each side is more willing to participate the larger is the participation of the other side. Additional complexities, here, come from the facts that (i) EMP and OIP offer differentiated services and use different pricing modes, and (ii) buyers and sellers keep the opportunity to transact directly, i.e., without using the intermediation services provided by the EMP or the OIP.

To model the situation under review, suppose that the buyer's opportunity cost to transact without any intermediary (say '*r*') is lower than the commission (say '*c*') announced by the intermediary (recall that contrary to *ruraltrip.com*, an OBC charges the buyers side). In this case, the buyer has a clear incentive to transact directly with the supplier so as to avoid the costs for using the platform set up by the intermediary. Thus, the buyer will join the OIP since it allows him to find the relevant information and to contact directly the supplier, and so to benefit from the intrinsic price of the accommodation

(say '*p*'). However, note that the buyer is not always aware of all the alternatives, so that he may transact on an EMP even if normally he would prefer to pay no commission and transact himself directly, supporting by the way the transaction costs.

Suppose now that both intermediaries benefit from the same "brand-recognition" (they have equal chances to be joined by either the suppliers or the buyers) and propose exactly the same products. Moreover, whether joining an OIP or an OBC, the supplier sets the same price *p*. From the buyer's point of view, the most explicit difference between both IIS is the price difference. One more time, the buyer will transact through the OBC only if the following inequality is true: *p+c<p+r*, so if *c<r*. If *c=r* the buyer is indifferent between both platforms. Alternatively, note that if *c>r* is true for all the buyers, than the size of OBC's buyer side will decrease to zero and the OBC will disappear from the market. In such a world, there exist only equilibria in which all buyers and sellers go to a single marketplace, the OIP. This result is similar to what Caillaud and Jullien (2003) predict about price competition between similar two-sided platforms.

6.   Discussion and research questions

In this paper, we introduce various business issues related to intermediation and electronic markets. First, even if intermediaries will continue to play a role in the digital economy, we note that they will be increasingly confronted to infomediation. Indeed, infomediaries emerge nowadays as a new category of intermediaries in a business context where buyers and sellers interact more easily with one another but still need to process a lot of information. Second, whether they are buyers or sellers, participants in the same virtual platform are in a particular position since they cooperate to the collective success of the platform while they remain competitors. We refer to the strategic concept of 'coopetition' to describe this ambivalent reality. Third, we develop an economic model built on industrial organization theory and considering a platform as a two-sided market. The main analytical

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results drawn from this simple model are that (i) suppliers might suffer from the participation of other suppliers in the same platform (because the competition effect might be stronger than the demand expansion effect), and (ii) the platform owner never finds it optimal to attract all suppliers. Fourth, differentiated platforms can be present in a single market and compete with each other. We also note the importance of the pricing structures and of market exposure.

A number of testable hypotheses come out of this article and pave the way for future research:

- On an OIP (resp. EMP), the infomediation (resp. intermediation) cost is supported by the supplier (resp. the buyer);

- When an OIP and an EMP coexist, buyers tend to multihome (i.e., register with various IIS), whereas suppliers might multihome in the short run, but prefer to singlehome with the OIP in the long run;

- Beyond competition between various types of IIS, there exist positive externalities between their activities, which are advantageous for each of them.

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