Capitalising Knowledge Exchanges: An Interpretative Model

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Abstract: In today's economy, companies establish intense interactions with trading partners: co-design teams and other formal/informal structures are commonly used to implement collaborative knowledge creating processes. However, companies not only learn from R&D but from all the operational or managerial activities that are involved in trading. Business relationships are often represented just in terms of "economic transactions", namely the material acts of exchanging goods and money. However, the act of trading involves an intense exchange of knowledge between the parties. Companies learn from all the operational or managerial activities that are involved in a business relationship; so, it is important to understand the mechanisms by which they can capitalise knowledge exchanges with trading partners. To represent these processes, the paper employs and develops the model of *knowledge transaction* proposed in a previous study: a knowledge transaction is defined as *the act of exchanging valuable pieces of knowledge*. The model is applied for representing and interpreting the mechanisms of inter-firm interactions that are involved in economic transactions between a seller (more precisely, a supplier) and a buyer (i.e. a client firm). Since any economic transaction implies a number of communications *before*, *during*, and *after* the material exchange, and these communications *carry pieces of knowledge*, consequently they involve a number of knowledge transactions. Each piece of knowledge has a value for both the "sender" and the "receiver". Consequently, a knowledge transaction implies a "payback" that may consist in another piece of valuable knowledge.

To validate the usefulness of the model of knowledge transaction, a case-study analysis of inter-firm business relationships and economic transactions in a group of interacting firms (i.e.: the SAP network) is proposed. The case-study, that focuses on the identification and analysis of knowledge transactions occurring in trading, allows to verify the potential usefulness of the model, to highlight the current elements of weakness of this research line, and to suggest the points of a future research agenda.

Keywords: knowledge exchanges; knowledge value; intellectual capital; knowledge transaction; interpretative model; case-study

1. Introduction

In their seminal work, Cohen and Levinthal (1989) have indicated that a firm's ability to assimilate and apply fresh knowledge coming from other companies is essential. In today's economy, companies establish intense interactions with trading partners: co-design teams and other formal/informal structures are commonly used to implement collaborative knowledge creating processes (Preiss 1999; Beesley 2004).

However, it should be noted that companies not only learn from R&D but from all the operational or managerial activities that are involved in a business relationship. Very often, the business relationships are represented in terms of *economic transactions*, intended as the act of exchanging goods and money between two economic players. In this paper, it is argued that, to perform an economic transaction, the parties need to exchange several pieces of information and knowledge (Gebauer and Scharl, 1999). In other words, any economic transaction is not an atomic and indivisible action, but can be split into different activities or steps, which in turn imply the exchange of messages. Many communications *before*, *during*, and even *after* the material exchange are performed, for instance: requests for proposals, product specifications, technical and scientific data, commercial information, administrative data, etc.

Each of these communications imply an *exchange of knowledge*. In fact, a message, whatever its form, carries *valuable knowledge*, which is transferred between the seller and the buyer: this is confirmed by the fact that the experience and the lessons learned in a transaction can be used for future transactions and, thus, represent a piece of knowledge that become part of the company's knowledge capital.

To represent this process, it is proposed to employ the model of *knowledge transaction* developed in a previous study (Bolisani, 2009), and defined as the *the act of exchanging valuable pieces of knowledge*: according to this model, each piece of knowledge has a value for both the "sender" and

the "receiver", and a transfer of knowledge implies a "payback" that may consist in another piece of valuable knowledge.

This paper develops the model of knowledge transaction and applies it for depicting the mechanisms of inter-firm interactions that are involved in economic exchanges between suppliers and customers. To validate the usefulness of the model, a case-study analysis of a network of firms (i.e.: the SAP system) is proposed.

2. Model of knowledge transaction

The model of *knowledge transaction*, introduced in a previous work (Bolisani, 2009), is defined in analogy with the traditional definition of economic transaction. An economic transaction is the activity of *exchange* between a seller and a buyer: the parties are willing to accept the exchange because they expect to gain an economic value or a personal utility. In a barter market, the exchange is paid "in nature" (i.e. the seller sells a piece of goods and receives another). When the payment is in the form of money (which is, of course, the general situation), the seller receives money that can be used to buy other items from other sellers.

Whatsoever, the two situations have a common feature: the seller transfers the property or control of "something" to the buyer, and obtains a *payment* in turn (figure 1). A transaction involving the supply of services can be defined similarly.
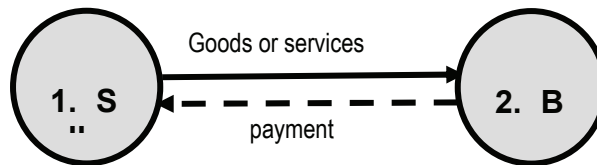

Figure 1: Economic transaction

By exploiting an analogy with this concept, a *knowledge transaction* is defined as the act of exchanging valuable knowledge (figure 2): player "A" transfers a piece of knowledge to player "B" and, as a payback, obtains another piece of knowledge from B. Assuming that the two players are willing to exchange their knowledge because they expect to receive another piece of knowledge that they need and do not possess (for instance, something that completes their understanding of a phenomenon, of the functioning of a device, etc.), we can conclude that the situation is similar to the traditional notion of economic transaction mentioned above.
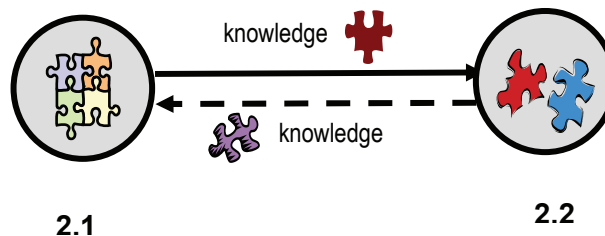

Figure 2: Knowledge transaction

Although a knowledge transaction implies a process of communication, the notion differs from that of "message communication" or "information transfer", and even from that of knowledge transfer as usually defined in KM (Boyd et al., 2007): in the notion of knowledge transaction defined above, there is an emphasis on the *economic value* associated to the piece of knowledge exchanged. This also recalls a traditional distinction in the KM literature (Boisot, 1998; Tiwana 2000): while data just refer to measures of "facts" and phenomena, and information is the meaning ascribed to those data, we talk of *knowledge* as data and information which *have value* because they enable decisions or actions. Therefore, the exchange of knowledge is more linked to the *purposes and intentions* that the players have when they trade. Since trading requires the willing to exchange something with the purpose to achieve some goals, the economic evaluation of these goals implies a *cognitive process* and not simply an exchange of "pure" information or data. In other words, although the communication process between traders is based on some form of messages that contain data and information, the act of trading is not the automatic consequence of these messages, but is mediated by a cognition process that enables the traders to evaluate the economic significance of those messages. This is what knowledge transaction is intended to model.

2.1 Business relationships and knowledge transactions

A business relationship can be defined as the set of activities of communication, physical exchange, and money transfer that involve two business partners (e.g.: a seller and a buyer, a supplier and a customer, a company and a consumer, etc.). In the literature, the business relationships between two companies are often treated as an indivisible or *atomic* act of economic transaction: the seller transfers the property of a product to a buyer, which in turn pays an amount of money. However, even though the economic exchange is generally the ultimate purpose of a business relationship, this act needs analysing in terms of its complexity (Gebauer & Scharl, 1999; Sarkar et al., 1995), in particular:

- a business relationship is not simply an atomic economic transaction, but rather a set of complex activities that the parties need to perform;

- the transaction itself can be split into subsequent steps (for instance: the initial contact, the negotiation, the contract, and the execution of the material exchange);

- each step involves different actions and decisions, and requires the exchanges of several messages; trading is not only a flow of goods/services and a flow of payments: there is also a flow of *communications* for defining the trading conditions, executing the material change, controlling the activities of the trading partners, etc.

In summary, any economic transaction implies a number of communications *before*, *during*, and *after* the material exchange. It can be easily assumed that these communications *carry pieces of knowledge*, or better they involve processes of knowledge transactions. In turn, these knowledge transactions imply economic evaluations.

It is easy to recognise that a significant number of knowledge transactions occurs even in the simplest economic transaction, as is for instance described in Bolisani (2009) with the toy example of trade between a baker and a consumer (figure 3). The representation of this process allows to make some important points. First, every communication in this process *has* a cognitive implication, which requires reflecting on the way each message is produced, received, and used: The delivery of any message implies a selection and codification of knowledge, and its reception involves a learning activity. Secondly, each transfer of knowledge involves an economic value: Seller and buyer carefully select the knowledge that they want to give or take, based on personal value judgements. As is highlighted in figure 3, to complete the trading activity, the baker needs to give some valuable piece of knowledge to the potential customer (e.g. what shop is that, what bread it sells, what the price is, etc.) and the consumer has to repay this knowledge with other valuable contents (i.e.: what the consumer likes, what price she/he can afford, etc.). It can also be said that the exchanges of knowledge have a value *before* and even *regardless* that the material transaction is finally carried out: For instance, if the consumer realises that the price of that shop is too high, this can stop the economic transactions but still represents a useful piece of knowledge that can be used in the future (namely: the consumer has learnt that there is a shop that sells bread at a specific price, which can be used for comparisons and future evaluations).

This can also be clearer if we mention other situations, well beyond the hypothetical and simple example described before. Let us consider a firm whose job consists of carrying out projects for other companies (for instance: the implementation of a new plant). This activity implies a complex economic transaction, whose significance can't be restricted to the activity of delivering a product and getting a payment.

The provider (seller) and the customer (buyer) need to exchange several messages well before the material exchange is performed: customer's needs and system requirements, technical specifications, design proposals, bids, orders, invoices, etc. These messages carry *pieces of knowledge* that have great value for the two traders. For the seller, the experience made with a customer can be of use for a future projects, or to design another new products. Similarly, the customer may use the knowledge acquired in the initial steps of the interaction to compare the offers of other suppliers. Again, we can claim that knowledge exchanges have themselves a value.
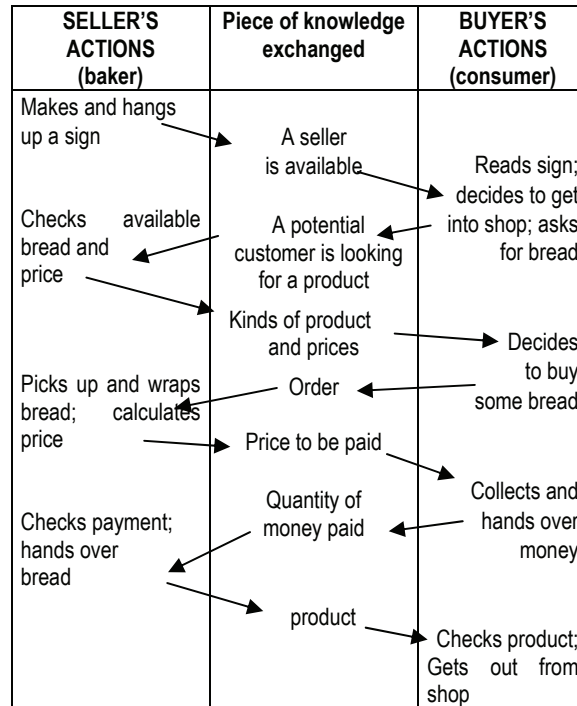
SELLER'S ACTIONS (baker)	Piece of knowledge exchanged	BUYER'S ACTIONS (consumer)
Makes and hangs up a sign	A seller is available	Reads sign; decides to get into shop; asks for bread
Checks available bread and price	A potential customer is looking for a product	
	Kinds of product and prices	Decides to buy some bread
Picks up and wraps bread; calculates price	Order	
	Price to be paid	Collects and hands over money
Checks payment; hands over bread	Quantity of money paid	
	product	Checks product; Gets out from shop

Figure 3: Communications and knowledge transaction in a toy example of business relationship (Bolisani, 2009)

3. Knowledge transactions in business relationships: a preliminary case-study

The hypothesis is that the model of knowledge transaction proposed before is useful to investigate the following questions:

- how do companies learn from their business relationships?
- How do they capitalise the knowledge exchanged during these relationships?
- What mechanisms do they use to exchange valuable pieces of knowledge during the different steps of business relationships and economic transactions?

To verify the potential usefulness and representation power of the model, this paper proposes a preliminary case-study, which is a first step of a broader research programme. The model of knowledge transaction is applied to investigate how companies exchange knowledge and how these knowledge exchanges are capitalised and used for improve the business potential.

3.1 Description of the case-study

To address these questions, the case study research instrument (Yin, 1989) is utilised. The unit of analysis is not the single firm but, rather, a *group* or *network* of business partners. The analysis started from the leading company, and then proceeded by identifying the principal other companies with which the company interacts. The identification of these companies was based on the partners that cooperate on a *business project* with an economic purpose. Collaborating companies were considered those that have sufficiently regular and non banal relationships, and interact by means of a significant process of knowledge exchange. The knowledge exchanges occurring among them were analysed, along with the various steps of the business project (from product definition, to production, delivery, and after-sales assistance). This was done by analysing each company, not focusing on its specific experience but, rather, on the nature and characteristics of inter-company interactions. The knowledge exchanges between companies and the problematic aspects of their execution were analysed.

The collection of data for the case-study was performed by means of systematic semi-structured interviews with managers, based on a check list that reflected the object of study. For a cross-analysis

of validity, supplementary information was collected from other sources (mainly: documental materials, company and industry literature, interview to independent experts). Additional information about the environment where companies operate was also collected. This was done both with the help of CEOs, managers and experts interviewed, and with the analysis of the existing literature and previous case-studies. The study was mainly conducted in 2008 and 2009.

The case-study considered here is that of the "SAP system" and, particularly, the business project represented by the development and implementation of an ERP system for a client firm. SAP (Systems Applications and Products in Data Processing) is a leading software company specialising in ERP software, with a global sale organisation covering over than 50 countries. Founded in the '70s, the company has grown steadily. It currently employs about 51.000 people of 120 different nationalities and amounts about 9 billion € of total sales. Created to sell specialised cost-accounting software for large customers, the company now sells its core ERP product, comprising several modules for many industries and application fields, to both large and small clients all over the world.

The company organisation has a strictly centralised R&D activity, while sales are managed by subsidiaries in various countries especially for the large clients. Small and medium-sized clients (which are the focus of this analysis) are served by means of a network of independent local dealers. Broadly speaking, the SAP system comprises these companies:

- SAP itself, which is the leading company;

- licensed dealers operating in the various local markets. These companies are generally small IT service providers that participate in the implementation of a specific ERP application for a final client.

- Providers of supplementary technologies (for instance, hardware systems) and competing vendors: these companies are often essential in an ERP implementation project.

- Clients themselves: these are the *companies that pay* for an ERP implementation, and their inclusion in the network is important because they have a significant role in the definition of the system requirements.

- Scientific organisations, including public labs and universities.

- Other service providers.

In this study, the analysis is restricted to a part of this system. In particular, the focus is on the business relationships between:

- SAP and its local dealers

- Dealers and final clients

Figure 4 depicts the scope of the case-study investigation and the companies analysed, i.e.:

- SAP

- Two Italian local dealers (i.e.: INFRACOM and ICM.S)

- Three Italian clients (Fashion Box – apparel company; Fiamm – car components; GIV – wine-maker)

Analysing the experience of companies operating at the same level, comparing and integrating the information collected about them and their ERP projects, made it possible to build the general picture of the business relationships – and the consequent knowledge transactions –between: a) the leading company (SAP) and a generic local dealer, and b) the local dealer and a generic final client (Figure 5).

As figure 5 shows, the trading relationships between the parties may be simply depicted in terms of the economic transactions they underpin. However, the purpose of the knowledge transaction model is to investigate what lays beyond the economic transactions, and to highlight the value of knowledge which is exchanged during these transactions. This is described in the next section.
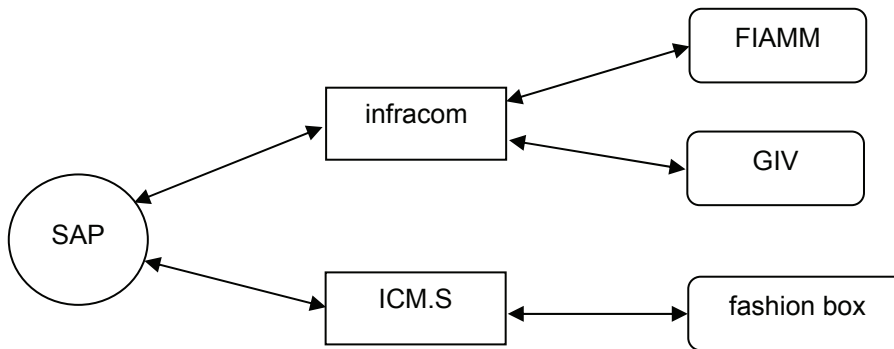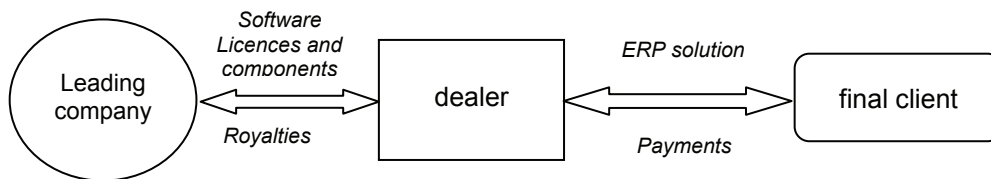
Figure 4: Investigated companies

Figure 5: Analysed business relationships

4. Steps of a new ERP project and knowledge transactions

The ERP software is not just a standard product: any ERP implementation for a particular client is always a combination and adaptation of distinct software modules, some of which can be standard components but others are written or tailored in accordance with the specific needs of the final user. In the ERP business, there are two moments that are strictly integrated and are repeated in a continuous cycle: first, there is the definition of the main components (the "software bricks" or "building blocks"), which is mainly the responsibility of the leading company; second, there is each specific implementation, which implies the integration and configuration of the various software modules for implementing a specific ERP application. Generally speaking, we can speak of "ERP projects" meaning that any ERP implementation is a specific project that combines standard and customised elements.

In this process, it is possible to identify different steps. The knowledge transactions are described in relation to these (figure 5). The reader can note that this picture is a necessary simplification of the more complex relationships that occur in an articulated supply chain like that examined. The purpose is just to highlight the usefulness of the knowledge transaction notion in understanding the main inter-firm interaction mechanisms. For simplicity's sake, some important activities (e.g. negotiation) have been omitted or described generically. In addition, only the case of implementation success is considered, although the case of failure would also provide interesting elements.

4.1 Analysis of knowledge transactions

As mentioned, the initial activity of the leading company is to define the main components of the ERP software (the "software bricks"), which are then used and combined for building each specific ERP implementation. In this step, the leading company produces software modules and other service elements (e.g. user manuals, documentation, process models, etc.), by integrating and incorporating elements of precious knowledge already possessed or generated internally by the R&D departments. Essential elements of this knowledge are then passed to the dealer by means of documentation, training courses, or certification programmes, sometimes with a fee – which testifies its value. They will then be used to build customised ERP solutions for the clients. This essential knowledge of the ERP product is also important because the dealer can formulate marketing policies for the local makets: demos, illustrative literature, and guidelines for agents are produced.
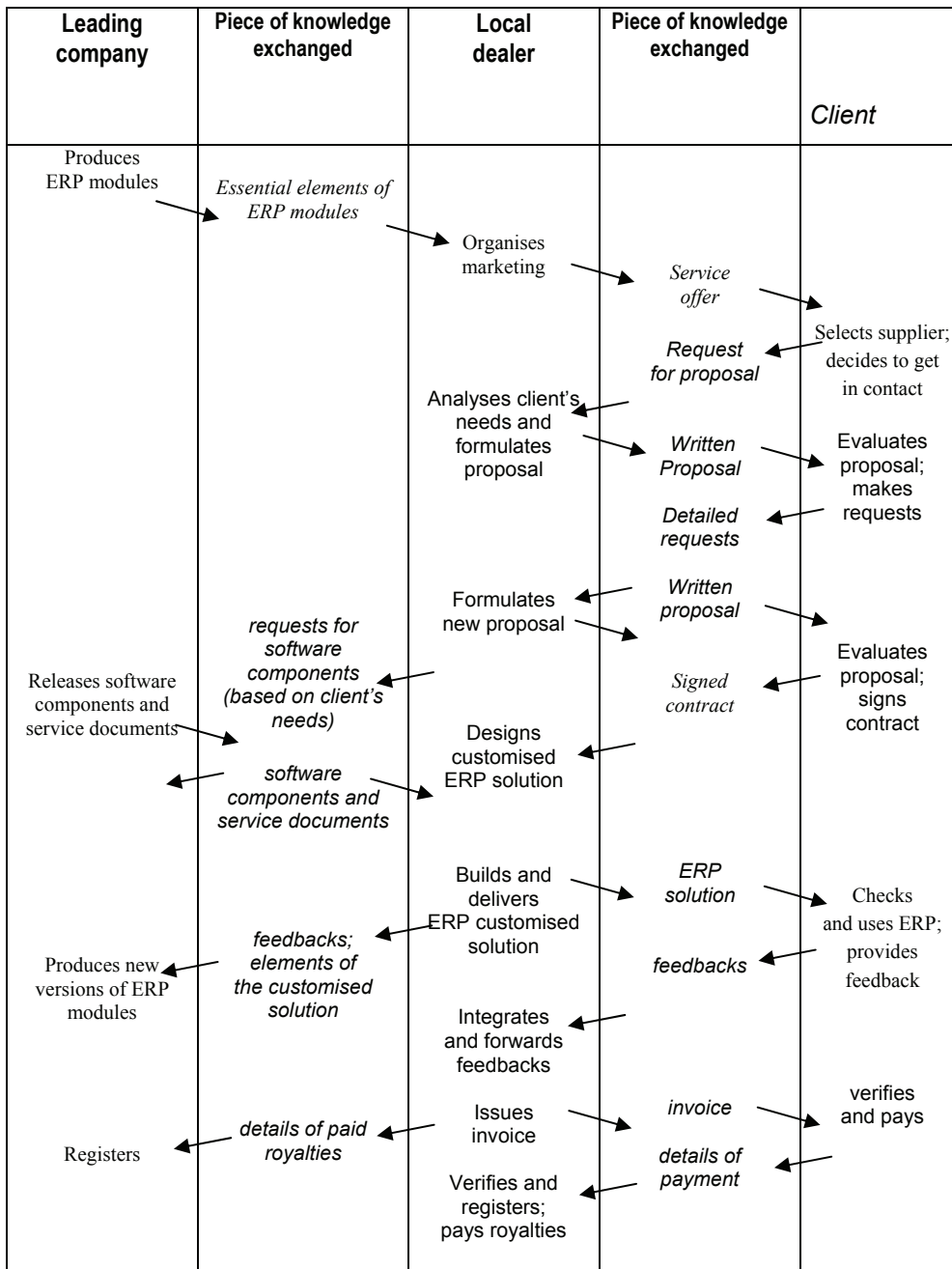
Leading company	Piece of knowledge exchanged	Local dealer	Piece of knowledge exchanged	
				Client
Produces ERP modules	*Essential elements of ERP modules*			
		Organises marketing	*Service offer*	
			Request for proposal	Selects supplier; decides to get in contact
		Analyses client's needs and formulates proposal	*Written Proposal*	Evaluates proposal; makes requests
			Detailed requests	
		Formulates new proposal	*Written proposal*	
Releases software components and service documents	*requests for software components (based on client's needs)*		*Signed contract*	Evaluates proposal; signs contract
	software components and service documents	Designs customised ERP solution		
		Builds and delivers ERP customised solution	*ERP solution*	Checks and uses ERP; provides feedback
Produces new versions of ERP modules	*feedbacks; elements of the customised solution*		*feedbacks*	
		Integrates and forwards feedbacks		
Registers	*details of paid royalties*	Issues invoice	*invoice*	verifies and pays
		Verifies and registers; pays royalties	*details of payment*	

Figure 7: Knowledge transactions in ERP software delivery

In addition, the connection of the dealer to the brand of the leading company is an important signal to the market: the clients can "know" the certified references of the dealer. All this represents precious pieces of knowledge for the clients, that can evaluate and compare the different suppliers, and can then decide to contact the dealer and initiate a negotiation.

The outcome of a negotiation is a contract, but before a contract can be signed, the client has to pass several pieces of knowledge to the dealer: knowledge of its internal processes, information needs, business strategies, etc. These are valuable cognitive elements for the dealer: even in case the negotiation fails, the dealer can acquire better understanding of the potential ERP market.

By combining the pieces of knowledge coming from the client, and those coming from the leading company, the dealer is able to formulate a proposal and to deliver it to the client. The contents of this proposal represent value for the client, that can now evaluate and compare different proposals coming from distinct suppliers, and formulate additional requests. In turn, these additional requests enable the dealer to improve its proposal; also, they represent cognitive elements that can be used in the future with new clients that have similar needs. It is very frequent that the experience made with a

client is then used with other clients. So, we can conclude that companies capitalise the knowledge exchanged with their partners: this negotiation activity becomes valuable experience that can add to the "capital" of the dealer.

For the dealer, the signed contract represents the signal that the negotiation has been concluded positively, and that the efforts made so far have been valuable: the dealer is now enabled to invest other elements of knowledge in the project. The design of the ERP customised solution can now start. The dealer combines the knowledge of the client's needs with that of the ERP standard components that are provided by the leading company (software codes, documentation, additional services, etc.). Here, it is worth noting that the leading company selects the pieces of knowledge that can be passed to the dealer: actually, only the elements that are strictly useful to the dealers are delivered, while those that represent the core competitive factors of the leading company are kept private. As a confirmation, it can be noted that the ERP software is generally not available in source code. The dealer repays the leading company with knowledge about the client's needs and about the ERP implementation under design: these elements represent precious knowledge for the leading company, because it can use them for updating its ERP standard modules, as is explained below.

The dealer can now configure the ERP solution, and can deliver the essential elements of it to the client. Clearly, not all the pieces of the involved knowledge are provided: the client just needs to acquire the elements that are sufficient for using the ERP system but without too detailed elements (for instance, the way the system has been designed), which remain private.

After the client has checked and evaluated the system, some feedbacks can be passed back to the dealer – for instance: possible problems, or the acknowledgement of a good job. The dealer can also forward these cognitive elements to the leading company, for which they are very precious since they improve its knowledge of the final market and they enable the production of innovative modules that can be appropriate for similar clients and will be proposed in future ERP implementations. Finally, invoices and administrative documents as well as payments will be issued. Their registration represent the closing step of the economic transaction, but also the opportunity to record the experience in the internal archives.

As can be seen, in technical terms the economic transaction is only a minimal part of the entire process of value exchange: many transfers of knowledge, o, it is better to say, *knowledge transactions* occur in the process, and they represent a way by which the companies can exchange valuable elements that are used during the current transaction or will be used for future projects.

5. Conclusion

This case-study allows to verify the potential usefulness of the model and to highlight the current points of weakness of this research line. It seems that the most encouraging points of the proposed model are these:

▪ the model focalises the specific issues beneath the economic exchange: in order to conduct any trading relationship, the partners need to communicate relevant pieces of knowledge, and without these exchanges the economic transaction is virtually impossible. Even an apparently unvaluable message to a business partner is a piece of knowledge that can be used by that company for other purposes. Also, the model clearly shows that knowledge transactions imply a bilateral transfer: each piece of knowledge has a payback, in the form of another piece of valuable knowledge. All this makes it possible to explain how economic value can be generated, irrespective of the success or failure of the economic transaction itself. The notion of knowledge transaction proposed here allows to understand the mechanisms through which companies can capitalise the experience made in the business relationships with trading partners;

▪ The essential feature of the model is that there is a lot of knowledge exchanged, even when the companies are just "responding to a request" (e.g. an order specification, a logistic request, etc.), which is often the key operative aspect in a customer-supplier relationship. During the life-cycle of a business relationship, there is often an implicit distinction between the "knowledge-intensive" activities (i.e.: R&D, co-design, etc.) and the "operational activities" (namely: management of orders, deliveries, etc.). The notion of knowledge transaction helps to highlight that companies can learn from the whole range of interactions with business partners. The accumulation of apparently marginal pieces of knowledge contribute to the capability of the companies to develop and sustain their business.

▪ in addition, the model can shed new light on specific but critical aspects. For instance, the mechanisms that can be employed for protecting the knowledge elements that are the source of competitiveness. On the one hand, it is virtually impossible to protect all the knowledge that a company possesses, because the act of trading requires some kind of openness: as the model of knowledge transaction shows, to get knowledge from others we have to give pieces of our knowledge. On the other hand, it is necessary to distinguish between the parts of knowledge that have to be and can be protected, and those that necessarily need to circulate (or at least it is better they circulate freely). The model highlights that this examination is necessary in all the steps of an economic transaction, and the notion of knowledge transaction can be of help here. New reflections on the real usefulness of the typical mechanisms for protecting a company's "intellectual capital" (such as: copyright, patents, contractual agreements, etc.) become possible;

This study can represent a starting point for the development of both theoretical frameworks and managerial guidelines. However, the proposed model has some point of weakness that it is worth to recall and can represent the points of a future research agenda, and in particular:

▪ *complexity*: splitting an economic transaction into its elementary knowledge transactions can be a difficult task (incidentally, this issue clearly emerged during the case-study). In principle, every communication between two parties can be interpreted as a knowledge transaction. It may be necessary to limit the analysis to general categories, thus avoding an excessive degree of detail. In the described case, many activities involved in an economic transaction can be expanded and analysed in more detail. Here, this was sufficient to show the potential of the knowledge transaction model, but in a practical case it would be necessary to define a level of detail that balances representation power with manageability;

▪ *knowledge value*: the analysis provided so far considers the value of knowledge only in qualitative terms. Since the model of knowledge transaction assumes that the knowledge exchanged has a value, it would be important to measure that knowledge in economic terms. Unfortunately, the issue of knowledge measurement is still debated, and this reflects on the model of knowledge transaction itself. This problem represents an additional area of research for improving the quality of the model;

▪ *empirical validations*: so far, the model has been tested with one case-study, but the empirical validations should be extended. This will allow to better evaluate the explicative and predictive potential of the model.

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