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Business relationships and game theory:

Market co-operation and market competition as embedded prisoner's dilemma

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Abstract

Business relationships and business networks are phenomena of the business world. This paper proposes that the application of game theory (in other words the world of strategic rationality) and social network analysis allows a deeper understanding and a useful typology of business relationships. At the same time this combined approach can be helpful for a scientific explanation of business networks by discovering the formation and development of some network structures. Additionally, it enables the modelling of decision-making in case of interdependency and embeddedness, the quantification of decision outcomes and – with certain limitations – forecasting behaviour of involved actors.

Social network methodology is ideal to analyse the structural features and embeddedness of business relationships. This mutual or embedded influence is essentially in the interaction process which purpose is the exchange, mutual value creation and value sharing. The business relationship itself is a tissue of exchange episodes and connected layers. And in the terminology of social network analysis: the business relationship is a network of multiplex relations.

Concepts and models in game theory seem to be well fitted to deal with business relationships considered as interdependent rational choices. The games can be classified as zero-sum pure conflict games or variable sum pure coordination games. The former type means that players can only act according to their interest while hurting other players, while in the latter type the interests of the players coincide. We may find mixed motive games discussed in applied game theory between these two extreme types, where the conflicting and coincident interests co-exist. We think that business relationships and networks may be better understood with the help of these games. We outline two such applications – buyer-seller market cooperation and market competition between sellers – by using the prisoner's dilemma game.

In both cases we investigate situations where a conflict arose in business relationships between the short term unique interests and the long-term common interests. We try to decrease the high abstraction level – inevitable in game theoretical modelling – by taking into account the social networks forming as a result of business communications, thus we try to improve the explanatory power of the models.

Key words: business relationships, game theory, embedded games, social network analysis

1. Introduction

Business relationships and business networks are phenomena of the business world. This paper proposes that the application of game theory (in other words the world of strategic rationality) and social network analysis allows a deeper understanding and a useful typology of business relationships.

We consider business relationships as a special type of Weberian social relationships, focusing on business activities. The goal of business activities is to realise business interests by exchange and by influencing the conditions of exchange. In this manner business relationships could be understood a more general way containing not only the buyer-seller relationship, but the connections with competitors, regulating authorities or the media. This broader understanding is not different to the IMP approach.

Concepts and models in game theory (Morrow 1994) seem to be well fitted to deal with business relationships considered as interdependent rational choices. Social network methodology (Wasserman and Faust 1994) is ideal to analyse the structural features and the embeddedness of business relationships.

The paper is structured as follows: The first part discusses business relationships. Based on two fundamental IMP models it focuses on the actors and their roles, embeddedness and connectedness. The second part deals with some basic and specific issues of game theory. We present several game theory concepts and possibilities of their application to business relationship phenomena. The next section argues why presented game theory concepts are applicable in the case of business networks and makes a first attempt to do that. The paper finishes discussing some conclusions and limitations.

2. Business relationships

An interactive exchange process between involved people of two organisations could be considered as a business relationship which is always embedded in a business network. Mutual influence is the essence of the interaction process (Ford and Håkansson 2006) and in the course of it they reciprocally influence each other. As a thicker (Håkansson 2006) explanation „interaction is an important economic process through which all of the aspects of business, including physical, financial and human resources, take their form, are changed and are transferred" (Håkansson et al 2009:33). This complex interaction process influences both the knowledge creation and value construction (Håkansson et al 2009). At the same time it deeply influences the exchange process between the two organisations.

The exchange - more precisely the exchange process - is the essence of the business. In this process both parties can obtain those resources which they need and which the other partner disposes of or is able to offer. The missing resource in the case of the seller is usually money but it could also be something else, such as specialised knowledge or information. In the case of the buyer it is always the package of perceived usefulness offered by the seller (Ford et al 1998). In case of organizations, this means the mutual influence and relation of the buyers'

and sellers' uncertainties and abilities (Håkansson et al 1976). This process consists of repeating exchange episodes and has diverse dimensions. Merchandise, money, information and social exchanges are the objects of exchange episodes.

Activities, resources and actor bonds mean the content of business relationships. More precisely as the A-R-A model (Håkansson and Snehota 1995) conceives activities, resources and actor bonds create the three layers on which the different types of connectedness between the buyer and the seller are created.

The business relationship itself is a tissue of these episodes and layers. Or - applying the terms of social network analysis - the business relationship is a network of multiplex relations.

A complex business relationship does not exist alone in isolation but „the supplier – customer relationship as a part of a larger whole, as something dependent on an integrated into its context and points thus to the interdependence or connectedness of relationships" (Håkansson and Snehota 1995:2). The connectedness on the one hand creates an interdependent system. On the other hand „connectedness of business relationships ties companies into a form of structure with peculiar properties that we qualified as a network form of organization and called 'business networks' (Håkansson and Snehota 1995:21).

Thus business relationships are an integral part of a mutually interdependent system which is the business network. This mutual interdependency is present in all the three layers of business relationships. It means that the direct dual connectedness of activities, resources and actors at the same time are an indirect connectedness with other (third) activities, resources and actors. Consequently business relationships are embedded (Grabher 1993) in business networks. Furthermore this embeddedness happens in the totality of the relationship, or to use the expression of Simmel ([1968] 1973) in its peculiar totality, and it occurs in the three different layers as well. Therefore we can state that the activities are embedded in further activities or in the same way resources are embedded in other resources. In that sense of course the actors are also embedded in the business network.

Due to our topic, we have to stop at this stage and ask a simple question: Who are the actors? Applying the interaction approach we consider actors those who are able to organise the connectedness of activities and resources (Håkansson et al 2009), or who intent on doing so. „Although the resources of a business and the activities performed in it have human dimensions, it is only actors that from intent" (Håkansson at al 2009:131). In this sense an actor could be both individual and collective. Organizations even as teams can be collective actors.

In our definition of business relationships in the beginning of this chapter there are groups of involved people and now rightfully we can consider them as actors. Webster and Wind (1972) in their seminal article describe organisations buying behaviour as a process what „includes all activities of organizational members as they define a buying situation and identify, evaluate, and choose among alternative brands and suppliers. The buying center includes all members of the organization who are involved in that process. The roles involved are those of user, influencer, decider, buyer, and gatekeeper (who controls the flow of information into the

buying center). Members of the buying center are motivated by a complex interaction of individual and organizational goals" (Webster and Wind 1972:14). Insofar we do not consider this process to be one-time but in the spirit of the Interaction Model (Håkansson 1982) we regard it as a repeated process. By this dynamic view of the buying centre we can determine the involved people on the buying side.

Analysing the complex exchange process between buyer and seller Hutt et al (1985) define the selling centre. „Organizational members who are involved in initiating and maintaining exchange relationships with industrial customers constitute the organizational selling center. The organizational selling center is an informal decision unit. Its primary objectives are the acquisition and processing of pertinent marketing-related information and the execution of organizational selling strategies" (Hutt et al 1985:34-35). The selling centre could also be interpreted in a dynamic way. We conclude that the actors of a business relationship are the members of the dynamically defined buying and selling centres.

Therefore the members of the buying and the selling centres are those persons amongst whom the human dimension of the interaction process is taking place. So in a business relationship the connection is generally between two collective actors (buying and selling centres, namely between two informal groups). At the same time, there are also connections among individuals, mainly but not only between the salesperson and the purchasing agent (Spekman and Johnston 1986) and moreover between the two organisations. The latter is described by the logic of the Interaction Model (Håkansson 1982).

One of the most important goals of the interaction between actors that is to say of the social excahnge is the trustbuilding. Trustbuilding „is a social process which takes time and must be based on personal experience" (Håkansson 1982:25). At the same time "companies and individuals as actors in business networks are bounded in their perceptions, knowledge and capabilities and therefore different from each other. Their behaviours change as their perceptions, knowledge, capabilities and intent change" (Håkansson and Snehota 1995:192).

Actors' behaviour is always deeply influenced by the fact that all actors any time are constantly in two different situations. The actor knows a small number of its partners very well. These partners create the small-world of the actor (Milgram 1967, Barabási [2003]2008 chapter 4). „All actors have a small world that makes sense to them" (Håkansson et al 2009:133). There are so many other partners who are not known deeply enough or with whom the actor only has an indirect connection. They all together mean the actor's wider network (Håkansson et al 2009). One form of an indirect connection is when the indirect partner is inside of the small-world of a close partner. „In both these worlds, actors attempt to balance two forces: The necessity of reacting to the actions of others; and the possibility of influencing others" (Håkansson et al 2009:134).

Actors are embedded players. It is true independently that the actor is either an individual or a collective one. Embeddedness appears in several forms and levels in case of business relationships. We use the term vertical embeddedness when people in an organisation make decisions influencing each other - deliberately or not. It could also be the case of a selling or

buying centre. On the other hand we use the term horizontal embeddedness when business partners, buyers and sellers make decisions mutually influencing each other.

The variety of actors (Håkansson et al 2009), the heterogeneity of business relationships (Alderson 1969), and the mutual influence realized through the interaction process (Håkansson 1982) are especially important to understand actors' behaviour and especially to forecast or predict their future behaviour. The actors' embeddedness makes predictability more difficult. Embeddedness increases the need for a management of reacting (Håkansson and Snehota 1989) of which the central problem is just the partner's behaviour predictability.

On the whole "the network of business relationships is both a prison and a tool" (Håkansson and Snehota 1995:42).

3. Game theory

First of all let's consider some basic ideas about game theory. Afterwards we present the market cooperation as a Prisoner's Dilemma-game. Last, we analyse market competition as an institutionally embedded Prisoner's Dilemma-game.

Basic concepts[1]

The strategic interactions – an important type of rational choices – are characterized by the interdependence of decisions: the decision maker has to take into account the expected behaviour of the others and also the others' anticipation of his behaviour. Strategic choice is the topic of game theory. In a game all players (actors) have a certain set of options ("strategies"). The outcome of the game is determined by the players choosing an element of the set of their decision alternatives. The player can rank the outcome of the game according to their preferences. There are three types of interdependencies in strategic situations:

- each players' payoff depends on the payoffs of all other players;
- each players' payoff depends on the choice of all other players;
- each players' choice depends on is anticipation of all other players' choices.

Game theory considers such situations from two perspectives. Non-cooperative game theory describes decisions from the viewpoint of the individual rational decision maker. Individual rational choices however may have consequences which are more disadvantageous for all players than other strategies. The theory of cooperative games on the other hand assumes that this may not happen. Primarily because in such games – as in bargaining situations – joint strategy selection is possible, agreements and the redistribution of a cooperative surplus can be guaranteed.

[1] Based on Elster 1986. For a more detailed introduction to game theory see for example Morrow 1994, Osborne 2004.

Non-cooperative games can be further classified. First, there are zero-sum games and non-zeros-sum games. Zero-sum games mean that the sum of the payoffs is constant, the strategy selection of the players determine its distribution only. Thus the gain of one player necessarily means the loss of the other. In non-zero-sum games the strategy selection of the players determines not only the distribution of the payoff, but its size as well.

Zero-sum games describe pure conflict situations. Non-zero-sum games may be pure coordination games, or mixed motive games (conflict and coordination situations at the same time). Coordination situations are described by the theory of coordination games. The solution of such coordination problems may be for example the rule which prescribes using right (or left) lanes in transportation. While everybody follows the same rule, the actions of the individual do not really matter: the interests of the players coincide – more or less.

In mixed motive games player may choose between two strategies – cooperation (C) and defection (D). In case of two players the following four combinations apply:

	Choice of the "Ego"	Choice of the "Alter":
X:	C	C
Y:	C	D
Z:	D	C
W:	D	D

In Prisoner's Dilemma situations the players order these outcomes (strategy combinations) the following way: Z-X-W-Y. The natural outcome of the game is mutual defection, which is although a Nash-equilibrium (individually optimal) – no players would improve their own payoff by altering his strategy unilaterally –, but is not a Pareto-optimal solution of the game, since both players would've been better off by choosing Cooperation. In the Chicken game on the other hand the preference order of the strategy combinations is Z-X-Y-W. The worst outcome of this game is not unilateral cooperation, but mutual defection. In the Assurance game the preference order is X-Z-W-Y. All parties are ready to cooperate, but only if it assured that the other will also do so. The two-player games can easily be generalized for n-person interactions, as will be shown later.

How could players be motivated to avoid the social trap (the conflict between individual and social optimum) hidden behind these situations? Some suggest that repetition itself improves the chances of cooperation by enabling the sanctioning of defection (Axelrod 1984). Others emphasize the role of centralized social institutions, and argue that such rule enforcing mechanisms can guarantee the solution of society level cooperation problems (e.g.: Olson 1965, Schotter 1981, Mueller 1989). Sociologists on the other hand – abandoning the narrow rational and self interested motivations – often tend to discover the solution in morality, ethical values, and social norms (e.g.: Elster 1985, Etzioni 1988). They also emphasize the effect of social networks and the effect of social/institutional embeddedness on rational behaviour (e.g.: Granovetter 1985, Opp 1987, Burt 1992).

Market cooperation as socially embedded PD-game

Let's take the following simple example. A buyer and a seller interact on the market (Opp 1987). Let's start out from the standard postulates of rational choice theory (Osborne 2004): suppose that the buyer and the seller (A_1 and A_2) are instrumentally rational (utility maximizer) and selfish, moreover, the game is played only once (and the players know it). Make the traditional assumptions complete with the analysis of socio-matrices: there is no social relation between them, they are socially isolated. In terms of graph theory they form a null-dyad (see socio-matrices 1).[2] In the simplified model situation the buyer and the seller can choose whether they co-operate (behave according to the rules) or defect (behave opportunistically; cheat the other player in the form of hurting the quality or paying conditions of the market transaction). The payoff matrix 1 shows the possible outcomes of the simplified strategic interaction and the players' ordinal utilities and their preference orders.

Payoff matrix 1

		A_2	
		C	D
A_1	C	2,2	0,3
	D	3,0	1,1

Socio-matrix 1

	A_1	A_2
A_1	-	0
A_2	0	-

C: Co-operate (behave according to the rules: keeping the quality or paying conditions of the market transaction)

D: Defect (behave opportunistically: hurting the quality or paying conditions of the market transaction)

Preference order of A_1: DC>CC>DD>CD

Preference order of A_2: DC>CC>DD>CD

We can see that the buyer and the seller find themselves in the Prisoner's Dilemma situation. The natural outcome of the game is mutual defection, as both players' dominant strategy is to behave opportunistically, cheating the other. The solution is optimal from the point of the short-term individual interest but suboptimal from the point of the long-term common interest: though none of the participants can improve their own position with a unilateral step, but the CC outcome of the game provides a better result for both players. In another way: the

[2] The main diagonal of the socio-matrix is empty as we examine social relations and exclude reflexive relations.

solution of the game is Nash-equilibrium and Pareto-suboptimum. Consequently, the buyer and the seller fell into such a social trap where significant strain arose between the individual and collective interests. Will the situation change if they are *continuously* interacting on the market?

Let's modify the first example. The buyer and the seller are continuously interacting on the market on the long run (Opp 1987). Henceforward the players play the game several times and do not know which game will be the last interaction (assumption of "infinite iteration"). In iterated Prisoner's Dilemma situations it may be worth trying new strategies (Axelrod 1989). Suppose that from now on the players can choose between the *always defect* (AD, always behave opportunistically) and the *Tit for Tat* (TFT) strategies. TFT: in the first game the player co-operates (behave according to the rules), then in the rest of the games the player always does what his partner did in the previous game (if his partner behaved according to the rules, he behaves according to the rules too, if his partner behaved opportunistically, he does so). Let's introduce into the model the W probability parameter which refers to the players' subjective expectation while considering the iteration of the game. Its value can change between 0 and 1: if the players know that they will play the game only once (*model 1*), then W=0, but if they are completely sure of the iteration of the game, the value of the probability parameter is 1. (Simply, the value of W is the same for both players.) *Payoff matrix 2* provides information about the possible outcomes of the game and the players' payoffs under the above conditions.[3]

Payoff matrix 2

A_2

A_1	TFT	AD
TFT	2/(1−W), 2/(1−W)	−1+1/(1−W), 2+1/(1−W)
AD	2+1/(1−W), −1+1/(1−W)	1/(1−W), 1/(1−W)

The natural outcome of this game *(Payoff matrix 2)* depends primarily on the W value.[4] If W is low, namely the players see very little chance of the iteration of the game, the natural outcome is mutual AD, as AD is the further dominant strategy for both players. In other words: if the players don't trust in the continuation of the interaction for the long term, they

[3] For details of the calculation of the utilities in the payoff matrix see: Szántó 2008.

[4] Of course it also depends on the utility values of the original payoff matrix. These values become particular values in particular analyses. In our example the given (abstract) value has a more technical rather than an essential significance.

will behave opportunistically. For example, if we substitute W=1/3 value into *Payoff matrix 2,* the result will be:

Payoff matrix 2.1

		A_2	
		TFT	AD
A_1	TFT	3,3	0.5,3.5
	AD	3.5,0.5	1.5,1.5

Let's have a look at the changes if we substitute W=2/3 value into *Payoff matrix 2:*

Payoff matrix 2.2

		A_2	
		TFT	AD
A_1	TFT	6,6	2,5
	AD	5,2	3,3

Payoff matrix 2.2 shows that the players have no dominant strategy at all if the players see a high probability of the iterated interactions. The game has two Nash-equilibriums: mutual AD and mutual TFT. Both players' best reply is AD for AD strategy and TFT for TFT strategy. If A_1 expects A_2 to always defect, his best reply will be to defect as well. In reverse order: if A_2 expects A_1 to always defect, his best reply will be to defect as well. This solution is a Pareto-suboptimum too. If A_1 expects A_2 to play TFT strategy, his best reply will be to choose TFT strategy. In reverse order: if A_2 expects A_1 to play TFT strategy, his best reply will be to choose TFT strategy. But this solution is already a Pareto-optimum: it ensures the success of individual and collective optimum interests.

As we have seen above, if W value is high, AD is not the dominant strategy of the players in the two-person iterated Prisoner's Dilemma game. That means, if the players trust in the continuation of the interaction, and they contribute W a relatively high subjective probability value, then there is a chance of reaching the Pareto-optimum equilibrium. From now on this kind of subjective expectation is called *iteration-trust*. In our experiment if *iteration-trust* is high, the outcome of the game depends on the players' mutual expectation. The condition of the evolution of a spontaneous cooperation is that both persons must expect their partner to play TFT strategy. This mutual subjective expectation is called *strategy-trust* from now on. A low level of strategy-trust means that both players expect that his partner will play AD strategy, whereas a high value means that the partners mutually expect each other to play TFT

strategy. Thus we may have reason to expect an evolution of spontaneous co-operation in iterated Prisoner's Dilemma games, if the level of *iteration-trust* and *strategy-trust* is high. Consequently, if the players both trust in the iteration of the interaction and the partner's TFT behaviour, then they have a chance of escaping from the social trap.

The following questions arise: When can we expect the formation of high level iteration-trust and high level strategy-trust? In other words: what kind of social/interpersonal relations can contribute to the evolution and continuation of a high level of iteration-trust and a high level of strategy-trust? Can we explain the evolution of high level iteration and strategy trust in terms of social embeddedness, which may result in market cooperation?

The iteration of the two-person Prisoner's Dilemma provides the possibility of the formation of a certain social relation between the buyer and the seller during long run interaction on the market. There is a bigger probability, that the players get acquainted with each other during the continuous interaction - due to social learning mechanisms –, and gain mutual experiences about each other rather than they would further remain socially isolated. Thus the probability of creating either a positive (sympathy, friendship, intimacy) or a negative (antipathy, hostile or distrustful) relation between the buyer and the seller is much higher, than that of creating no social relation between them at all (Khanafiah and Situngkir 2004). Let's assume in the model, that the probability of the formation of sympathy and antipathy relations is equal. On its basis four logically possible dyad-configurations can develop. The first two ones are unbalanced, and the last two ones are balanced configurations (Taylor 1967). If sympathy and antipathy are present at the same time in the dyad (*socio-matrices 2.1*), then this relation will not remain for long, whereas mutual sympathy and mutual antipathy (*socio-matrices 2.2*) can be regarded as stable relations.

*Socio-matrices 2.*1: unbalanced dyads

	A_1	A_2
A_1	-	−
A_2	+	-

	A_1	A_2
A_1	-	+
A_2	−	-

Socio-matrices 2.2: balanced dyads

	A_1	A_2
A_1	-	+

A_2	+	-

	A_1	A_2
A_1	-	–
A_2	–	-

In the players of the unbalanced and instable relations mental discomfort and psychical strain can arose. In order to reduce strain the players try to achieve balanced and stable relations: with the help of certain dissonance-reduction mechanisms they form their relations so as to develop mutual sympathy or mutual antipathy (Zajonc 1960, Taylor 1967, Hummon and Doreian 2003). Mutual sympathy can remain for a long time. Experiencing long term mutual antipathy is even better for the players – as they can handle strain somehow – than an unbalanced relation. At the same time mutual antipathy can get even worse and finally lead to a break up of the relation.

Let's consider our example again: if the buyer and seller are continuously interacting on the market, they get acquainted with each other over time. It is very likely that mutual sympathy-antipathy relations will evolve between them. It is probable too, that these relations will become balanced in the form of mutual sympathy or mutual antipathy. As we have seen above the iteration of buyer-seller relation will probably lead to the cessation of the original null-dyad situation. In other words: It is very likely that relatively stable and balanced social relations between the players will form as a by-product of the iterated market interaction. Mutual sympathy positively and mutual antipathy negatively influences the evolution of high level iteration-trust and high level strategy-trust.

Market competition as institutionally embedded PD-game

Consider a simple game theoretical model of market competition. The stakeholders in the market competition have –according to Simmel's classic reasoning (Simmel 1968) – two choices: they may use the honest or dishonest tools of market competition. The former one corresponds to cooperation (C) in game theoretical terms, while the latter corresponds to defection (D). Dishonest tools (e.g.: price cartels, quality declining, cheating consumers etc.) may be used to maximize profit in the short run, but that would lead to market collapse. In game theoretical terms: the stakeholders on the market are in multi-person Prisoner's Dilemma situations, where their dominant strategy is the use of dishonest tools. As a result a Pareto-suboptimal equilibrium emerges, and consequently dishonest market behaviour gets common in the market.

In the modelling approach the players can choose between honest (C) and dishonest (D) tools of market competition in a quasi-n-person Prisoner's Dilemma where player A is "Me" and player B is "Everyone else".

		B: “Everyone else"	
		D	K
A:"Me"	D	DD	DK
	K	KD	KK

The possible outcomes of the game from the viewpoint of “Me” are as follows:

DD: *universal egoism*, where everybody is dishonest;

DK: the "*free-rider*" outcome, where “Me” is dishonest and “Everyone else” uses honest tools;

KD: cynically put it’s the ‘*sucker’* (pathetically put it’s the ‘*martyr*’) outcome, where ‘Me’ is honest, while “Everybody else” is dishonest;

KK: *universal cooperation,* where everybody is honest.

How would the rational and selfish player order the outcomes of this game? The preference order is the following: DC>CC>DD>CD. (This is the same order as it was in the two-person PD-situation.) What characterizes such situations? Using dishonest tools is the dominant strategy, therefore this is the best choice for each player regardless of the other players choices. The outcome of the game will be universal egoism: individual rationality will result a suboptimal outcome, a social dilemma: all competitors on the market will use dishonest tools.

However, competitors on the market may recognize that they would be better off if they could exclude (or at least minimize) the use of dishonest tools of competition. This has two forms according to Simmel (1968). The use of dishonest tools may be constrained ‘between individuals’, by means of voluntary bi- or multilateral agreements, or ‘above individuals’, by means of moral and legal rules. It’s easy to see that voluntary agreements can’t effectively constrain the use of dishonest tools, because the choice between respecting the agreement (cooperation) and breaking the agreement (defection) results in a similar Prisoner’s Dilemma situation. Thus we can conclude that constraining dishonest market behaviour with legal and moral rules (a solution ‘above individuals’) may result in – in accordance with Simmel’s classical thoughts – improved quality and decreasing prices for the benefit of the consumer.

In the light of the above we may say that only institutionally, legally and morally embedded market competition will result in an increase of consumer benefits: The consumer will be the *tertius gaudens* (laughing third) in this case – according to the argumentation of Simmel.

4. Game theory application to business relationships

s argued at the first part during the discussion of business relationships and business networks, the predictability of partners' behaviour is one of the greatest challenge. It is caused by the complexity ant the activities of embedded actors From a theoretical perspective, the question is why and how business relationships and consequently business networks are being created and change. From a managerial perspective, the predictability of a partners behaviour concerns the problem of planning as well as the problem of relationship management. In relation to planning, predicting partners' behaviour asks the question if we can speak about planning at all. In case of business relationship management the main issue is the assumption of the partner's future, expected reactions or feedback. From both the theoretical and the managerial perspective predictability is mainly related to the actors.

Based on the presentation in the second part we assume that it could be useful to apply game theory when studying business relationships and business networks. Firstly, we argue that game theory deals with the alternatives of particular decisions of two actors who are in a sort of mutual relation with each other and whose decision certainly influences the other. The players (the actors) can be both individuals and collective actors.

Secondly, game theory makes a difference between one-time and frequent games. In our case this means the possibility to handle one-time and frequent exchange episodes. The interaction process is characterised by frequent exchange episodes (Håkansson 1982).

Thirdly, using socio-matrices game theory allows us to take consideration social embeddedness to a certain extent. Socio-matrices could model the actor bonds' embeddedness and consequently the connectedness of the actor layers (Håkansson and Snehota 1995).

Fourthly, the quasi n-players games give a possibility to learn more about a larger slice of the business network. More precisely it allows to study the behaviour of more or of whole actors of a network and to analyse in which way this behaviour influences other actors outside of this network. Otherwise using the expression of Georg Simmel we can analyse the *tertius gaudens* effect or situation.

The laughing third (*tertius gaudens*) is the central player of Simmel's competition theory. Namely the real winner of the competition is not one of the competing actors but a third actor (*tertius gaudens*) to whom favour, satisfaction the competition is going on (Swedberg 2003). As result of this the competition „offers subjective motives as a means of producing objective social value", as Simmel was cited by Swedberg (1994:272). It means that as the result of competition the objective social value the customer find a package of usefulness (value) on the market of what he buys. Thus, economic exchange is happening and is at the same time social exchange too.

As we have seen in the section on game theory, frequent games grow the players' co-operative abilities. Perceptions about the likelihood of recurrences force co-operative behaviour. Research results by Opp (1987) strongly support this. In our paper we consider the players (the actors) co-operative behaviour to be a result of the game. As we have seen

frequent games model the interaction process quite well. The result of frequent games is clear. Co-operation behaviour is more advantageous for players (actors) then desertion or opportunistic behaviour.

A possible illustration: Hungarian hospitals business relationships

In this preliminary stage of our work we introduce specific business relationships in the hospital market as a possible illustrative case for this highly new approach of the market for the future. We think that business relationships in the hospital market in Hungary are suitable for our investigation for several reasons. This market is very concentrated, there are only a few actors who know each other quite well and market cooperation does exist. We focus on business relationships between public hospitals as buyers and drug wholesalers as suppliers. Former research of Simon, Mandják and Szalkai (2009) pointed out that the real goal of these relationships is complex and the social side of the relationship plays an important role (Simon, Mandják and Szalkai, 2008).

From the economic sociology point of view business relationships are a type of social relationship. Social actors might be individuals or organizations. In our case the buying center of hospitals, the selling center of suppliers, or the organizations themselves are considered to be social actors of the relationships.

The buying center in the case of a drug purchase consists of several different professionals whose aligned work is necessary. According to the law, it is the chief pharmacist's duty to prepare the order, to deal with the order and to realize the drug purchase. The selection of drugs to be purchased is assisted by the Committee of Drug Therapy. The Committee consists of the chief physician, other physicians and the chief pharmacist. The order is signed by the chief physician, by the financial director and by the director-general of the hospital. Controlling is responsible for monitoring the drug consumption and the hospital's informatics is also needed to assure the background of the procedure. In case of public procurement, there is an external public procurement expert who takes part in the procurement. This is the general process of signing the contract. The participants and their role vary by hospital and by each individual purchase. As a vertical embedded situation the decisions of these participants influence each other through the whole drug procurement process. As a horizontal embedded situation the buyers (hospitals) and sellers (drug wholesalers and manufacturers) make decisions influencing each other. For example, manufacturers usually give gifts (drugs for free) for the hospitals. Nowadays manufacturers do not ship the drugs directly to the hospitals but through wholesalers. The wholesaler passes on the discount to the hospital.

The introduction of the characteristics of these business relationships are based on the findings of personal interviews. The interviews were made for another research (Simon, Mandják and Szalkai, 2009) in order to reveal the buying behaviour of hospitals. In the qualitative research five different hospitals were included, and in this current study we report the experiences of one selected hospital. The interviews were conducted in a large county hospital (the largest in the country except university clinics) with the chief pharmacist and the

financial director and at the market leader drug wholesaler with the representative responsible for hospital buyers. In the selected hospital the procurement procedure described above goes in a continuous, smooth way. The chief pharmacist is responsible for drawing up the list of drugs to be purchased, the financial director sets up the allocation and countersigns the order and the director-general assumes an obligation.

The existence of market cooperation in the business relationship was confirmed by the buyer and the supplier as well. The chief pharmacist claimed that: "We can cooperate very well. We have very good relationships with all of our suppliers. Everybody have a stake in this." These statements support the micro model of market cooperation in economic sociology. When daily problems occur, for example a false delivery, they can solve it in a flexible way. Cooperation is always encumbered with conflicts, in this case most conflicts originate from financial problems of hospitals, as public hospitals have a strict budget for procurement. In order to maintain a good cooperation, the wholesaler ensures appropriation for the hospitals and even if hospitals exceed the limit, lifesaving drugs are delivered anyway. In case of financial problems conflicts can be solved through personal relationships. For example a specific person in the hospital's buying center (e.g. financial director or chief pharmacist) who has a good personal relationship with the representative may make a phone call asking for help. This behaviour supports the social embeddedness in the macro model of market cooperation. The opportunity for opportunism is basically the payment deadline non-compliance from the hospital, but opportunistic behaviour is hardly characteristic in this market. The only reason for opportunism might be the bad financial situation of the buyer.

Application of game theory models and strategic situations in these business relationships might be interesting for further investigations. Game theories can also help to understand the structure of the business relationships in the hospital market since this market is small and transparent. On the basis of the characteristics introduced above, business relationships of Hungarian public hospitals can be an illustrative case for the application of game theory to IMP approaches in the future.

5. Conclusions and limits

In our paper we have tried to apply game theory to better understand business relationships and business networks. More precisely we looked at how game theory could be fit to study a complex interaction process and the behaviour of the embedded actors of this phenomenon. Finally, we presented the case of Hungarian hospitals as an illustration only.

Our first conclusion is that the application of game theory seems to be possible to analyse business relationships, embeddedness and business networks. It can be useful to better understand the behaviour of mutually dependent actors. Applying game theory could be helpful to deal with the problem of partner's predictability.

Our second conclusion relates to frequent games. Game theory proves that frequent games increase the probability of the actors' co-operative behaviour and consequently lower the

opportunistic actions. It makes an important contribution to the trust building process, especially the *iteration* and the *strategy trust*.

Our third conclusion concerns competition. The laughing third (*tertius gaudens*) approach combined with the application of the game theory gives a network based framework to study the complex effect and the value creation role of competition.

As our paper is only a first approach of course it has several limitations. Game theory has a high level of abstraction. As a starting point it has a quite simple assumption about the player's behaviour. Also, it says that the normal behaviour is an opportunistic one.

Game theory could be applied mainly to actor bonds and perhaps only partly to the other components of the Interaction Model (Håkansson 1982). The same problem could arise in relation to the two other layers of the A-R-A model, namely activities and resources (Håkansson and Snehota 1995).

Nevertheless after this first step we are convinced that game theory application could offer a certain contribution to the IMP approach and to our understanding the business landscape.

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