

# Developing Sustainable B2B E-Commerce Scenarios in the Chinese Context

## A Research Proposal

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### Abstract

*This paper outlines the theoretical concept of a study currently under way in China. Its main idea is to explore the sustainability of centralized inter-organizational systems for supply chain management as proposed by Markus et al. ([8]). The study draws on institutional theory in both its older and its newer versions. This theory is used for selecting the method of data collection as well as for deriving hypotheses and defining our notion of sustainability. To facilitate the development of hypotheses, a simple theory-based scheme for classifying industrial institutional structures is developed which, however, needs further refinement. It is envisaged that the study will be extended in a second stage to replicate findings in other countries in order to assess the influence of government policy and of institutional structures residing on the level of a whole country.*

### 1. Introduction

China is rapidly catching up on western methods of management and management information systems. However, the fact that China started implementing these methods and systems with a time lag of about 30 years provides for fundamentally different base line conditions as compared to those which have prevailed in the West. Thus, the question arises if Chinese companies should follow the same development path in terms of management information systems as did the West.

This research will probe into one idea proposed by Markus et al. ([8]) which suggests an alternative development path. Essentially, this idea is to create a centralized integrated management information system into which all members of a whole supply chain can tap in order to conduct business as well as to control internal operations. The advantages of such a system, which will be referred to as 'inter-organizational supply chain management system' in this paper, are:

- Ex ante integration across the supply chain vs. ex post integration (substantially lower development and maintenance costs).
- Real time data, industry-wide (reducing negative effects such as the so-called bull-whip effect, cf. [7]).
- Realization of economies of scale in the operation of management information systems (one of the reasons for outsourcing and application hosting).

In addition, the Chinese context seems to favor such a model for several reasons:

- Less skepticism towards hierarchical and centralized structures.
- Less emphasis on corporate boundaries (which are, thus, more permeable).
- Relatively higher level of distrust towards employees requiring internal controls akin to those used with respect to suppliers and customers.
- Removal of the crucial bottleneck of creating management information systems in China: skilled IT personnel.

However, such a system poses daunting problems too, especially with regard to its governance. Therefore, this research will evaluate this model for a variety of institutional structures which are distinct in certain, theoretically derived aspects between industries. In addition, in a second phase the study will be extended into an international context to investigate the influence of government and national institutions on the sustainability of such a system.

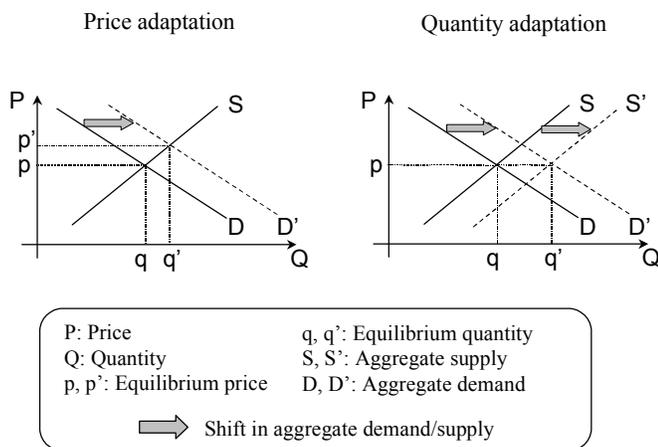
The theoretical underpinning for the hypothesized effect of institutional structure on the sustainability of this new B2B e-commerce scenario consists of institutional theory. Specifically, we will draw on three theoretical concepts derived from the older and the newer versions of institutional theory in order to derive a scheme for classifying industrial institutional structures. In addition, we will also use these concepts to define what we mean by sustainability.

The structure of the paper is as follows. In the next section, we will briefly outline two 'supply chain

adaptation mechanisms' in order to define the type of problem to be addressed by an inter-organizational supply chain management system. Next, we will describe the three theoretical concepts used for this study (Section 3). In Section 4 we outline the method for data collection to be used and in Section 5 we develop the classification scheme for industrial institutional structures including the description of four stylized or 'ideal' types. Section 6 describes the set hypotheses to be tested in this study and Section 7 summarizes the paper and points out open issues.

## 2. Supply chain adaptation mechanisms

There are basically two adaptation mechanisms for a market to be in equilibrium, price and quantity adaptation. These are illustrated in Figure 1 (each graph shows the reaction to an autonomous shift in demand from  $D$  to  $D'$  under a system of price adaptation and quantity adaptation respectively).



**Figure 1: Price and quantity adaptation**

The quantity adaptation mechanism implies that the supply chain is responsive enough to increase or decrease the supplied amount as demand varies in the short term. Whenever this is not possible, the only way to match supply and demand is by adapting the price. This is true in those cases in which changing the supplied quantity is constrained either by the physical production process (as in agriculture) or by intentional restrictions (as in the case of company stock and foreign exchange).

This research will focus on industries (potentially) characterized by a quantity adaptation model as it is here that the integration of supply chains becomes meaningful. This is not to say that industries characterized by a price adaptation model have nothing to profit from information technology. On the contrary, the model of stock

exchanges can be emulated in electronic systems leading to the concept of electronic markets ([12]). However, the interaction pattern between industry players is fundamentally different as is the thrust of these systems.

## 3. Theory

This study will draw on institutional theory, both in its older version as represented by Commons and in its newer form as represented by Powell and DiMaggio. Specifically, it will use the following concepts:

- Institutional legitimacy
- Organizational fields
- Rationing transactions

### 3.1. Institutional legitimacy

So-called Neo-Institutionalism originally set out with the contention that the demands of (technical) efficiency and institutional legitimacy are often contradictory ([9]). For this reason, organizations maintain a 'gap' between their operations (which must be technically efficient) and their formal structures (which must conform to institutionally prescribed norms). This assumption has later been given up as unpractical since technical efficiency and institutional legitimacy are empirically inseparable ([11]). However, DiMaggio and Powell have put forward a related idea which constitutes a second branch of Neo-Institutionalism and which potentially proves more fruitful, namely that under conditions of substantial uncertainty organizations will draw on institutionalized rules as 'models' to increase their legitimacy which, in turn, will provide access to crucial resources ([4]). Thus, the concepts of efficiency and legitimacy are not related in a contradictory, but a complementary way: If efficiency measures cannot be established, organizations will seek recourse to socially accepted (i.e. institutionalized) norms to justify their actions. This idea is akin to some concepts advanced in new institutional economics, namely by Douglas North who developed the idea of ideology as a transaction cost reducing device ([10]).

As the subject under study, B2B e-commerce scenarios, is characterized by a high degree of uncertainty regarding (technical) efficiency, it can be expected that study participants will heavily draw on institutionalized norms in order to cope with this uncertainty. These norms will reflect what is accepted as 'good organizational practice' in their industries as well as more deeply ingrained shared assumptions. As they will draw on the same type of institutionalized norms, their recommendations and comments are likely to be similar.

This concept also provides a first element of our notion of sustainability. An inter-organizational supply chain

management system must reinforce existing institutional rules in order to be sustainable as only then will it be furnished with sufficient legitimacy in the face of substantial uncertainty about its technical efficiency. However, as institutional legitimacy concerns the 'deep' layers of institutional structure, we assume that this aspect unfolds only on the societal level which cannot be investigated in the first stage of this study. Based on the arguments outlined above (see Section 1) we hypothesize that there will be a favorable bias towards a centralized supply chain management system. This assumption needs to be verified/falsified by replicating this study in other countries which supposedly are characterized by different shared assumptions as is planned for the second stage of this study.

### 3.2. Organizational fields

The notion of organizational fields is another core concept introduced by DiMaggio and Powell and described in the following manner:

"The structure of an organizational field cannot be determined a priori but must be defined on the basis of empirical investigation. Fields only exist to the extent that they are institutionally defined. The process of institutional definition, or "structuration," consists of four parts: an increase in the extent of interaction among organizations in the field; the emergence of sharply defined inter-organizational structures of domination and patterns of coalition; an increase in the information load with which organizations in the field must contend; and the development of a mutual awareness among participants in a set of organizations that they are involved in a common enterprise ..." ([4], p. 148)

The authors claim that once an organizational field is established organizations in this field become subjected to institutional pressures which cause them to make their organizational structures more similar while the process of forming an organizational field is a process of structuration ([4]). However, structuration is not a process which ends once a structure has emerged; rather, the main thrust of structuration theory is that structures have to be continually reproduced ([5]). Similarly, institutions cannot be seen as entities having a one-way impact on activities (of organizations) as these activities can change them in the process of reproduction. Nevertheless, the concept of organizational fields provides a useful starting point for this research as it contains some specific characteristics which can be invoked when discussing the process of structural reproduction and also in delineating the empirical object.

The concept of organizational fields has two implications for this research. The first one is methodological.

If organizational fields are made the unit of analysis, then their extent and constituency must be determined in the process of doing empirical research, specifically by drawing on three of the four criteria given in this definition (i.e. by following interaction patterns, identifying patterns of domination and coalition, and soliciting patterns of mutual awareness).

Second, together with an organizational field structures of domination and patterns of coalition emerge. This insight provides another aspect of our concept of sustainability, namely that an inter-organizational supply chain management system must reproduce these structures and patterns once they have emerged in order to be sustainable. Otherwise, powerful constituencies will actively oppose such a system and successfully prevent its development.

### 3.3. Rationing transactions

Commons distinguishes between three types of transactions that "exhaust all the activities of the science of economics" ([2], p. 68). These are (1) bargaining (market) transactions based on a purchasing contract or a contract of manufacture; (2) managerial (hierarchical) transactions based on an employment contract; and rationing transactions. The latter are defined as follows:

"... they are the negotiations of reaching an agreement among several participants who have authority to apportion the benefits and burdens to members of a joint enterprise." (id.)

The creation of an inter-organizational information system is a case of such a joint enterprise unless it is enforced by the state (which would be a managerial transaction) or emerges as a service provided by a third party (i.e. via a bargaining transaction). The important contribution of this concept over that of organizational fields is that it identifies a decision making body which has "authority to apportion benefits and burdens to members." Although an organizational field may exhibit a structure of domination or patterns of coalition, this does not necessarily imply such a decision making body. Thus, although it would be possible to establish sustainability of B2B e-commerce scenarios by drawing on the concepts of institutional legitimacy and organizational fields alone, it would not be clear how these could actually emerge (apart from being created by the government or a profit-oriented third party). The concept of rationing transactions provides an empirical lens for identifying conditions which would support the *emergence* of sustainable B2B e-commerce scenarios. This condition is that a decision making body must exist which has sufficient authority to apportion benefits and burdens of operating an inter-organizational supply chain management system. In addition, this authority must also be reproduced in the

process of creating such a system in order for this body to support it.

#### **4. Method**

As this study focuses on a type of system which does not yet exist, it is necessary to 'explore the future' rather than the past. This can only be done by drawing on the opinions and intentions of people supposed to have a major influence on the fate of an industry. However, individual intentions and opinions may err widely or, at least, vary when several individuals are questioned. Therefore, it is necessary to invoke the forces which will also be at work when actual industry developments play out.

As role play is used to elicit 'theories in use' ([1]) from organizational members since it is assumed that the same factors will shape their 'played' behavior as do with regard to their actual organizational behavior, this study will make use of a technique known as Delphi Study in which the interactions between industry participants are mimicked by first obtaining comments regarding the study object (in this case, the sustainability of an inter-organizational supply chain management system) and then feeding back a summary of all comments to study participants. They will then have to comment again on this feedback. If their comments deviate from this feedback, they are asked to give reasons for this deviation. This can be repeated several times. By this way, study participants are pushed towards a consensus. Typically, a total of three feedback rounds is sufficient to create a consensus among study participants ([3]). The methodological assumption is that this consensus will reflect 'objective' forces at work in an industry.

The risk of this method is, of course, that it is highly susceptible to manipulation by the researchers. One way to reduce this risk is to ask individuals not otherwise involved in the study to summarize participants' responses.

The special appeal of this method is that it can be integrated with the theoretical framework. First, identifying the sample by a process of 'nomination' of experts is compatible with the definition of an organizational field as described above (see Section 3.2.). Second, it can be assumed that individuals involved in this study will take recourse to institutionalized norms rather than criteria of technical efficiency as the future development of B2B e-commerce is characterized by a high degree of uncertainty thus providing an underlying potential consensus among study participants (see Section 3.1.). Finally, in this process actors are likely to reproduce patterns of domination and coalition as they will support only those solutions which would, at minimum, not threaten their current position in the organizational field (Section 3.2.).

This method can also be used in order to identify potential decision making bodies for rationing transactions (see Section 3.3.) and their ability to enforce an inter-organizational supply chain management system by studying the pattern of mutual awareness and nominations. However, this last point also illustrates another important aspect of applying this technique within the current theoretical framework: This study would actually be part of the process of institutional definition of an organizational field and it could even be part of a rationing transaction. This must not necessarily be a drawback. However, it will be important to keep this possibility in mind when interpreting and, indeed, creating the data.

#### **5. Variables**

In the first stage of this study, we will investigate the influence of industrial institutional structure on the sustainability of an inter-organizational supply chain management system. In its second stage, the influence of the role of government and national institutional structures shall be investigated by replicating the study in other countries. Here, we only develop the variables for the first stage of the study, i.e. 'industrial institutional structure' as the independent variable and 'integration models' as the dependent variable.

##### **5.1. Industrial institutional structure**

Choosing industrial institutional structure as the main independent variable for this study follows from the set of theories that form the basis of this study. The main arguments extracted from the three theories discussed above are: (1) An inter-organizational supply chain management system represents a new and unproven technological solution so that views of industry experts and participants about its sustainability will be shaped by institutionalized norms. This concept predicts that views of industry representatives and participants will converge although it is not clear in what direction. As indicated above, we initially assume that there will be a bias towards a centralized system in China but emphasize that this has to be explored empirically in the study's second stage where it is planned to replicate results in other countries. (2) Once an organizational field has emerged, structures of domination and patterns of coalition exist that will have to be reproduced for an inter-organizational supply chain management system to be sustainable. (3) A decision making body able to allocate benefits and burdens of such a system in a rationing transaction must exist in an industry to help create an inter-organizational supply chain management system even if it would otherwise be compatible with institutionalized norms and structures of domination/patterns of coalition.

Thus, the crucial question for the possibility of developing and sustaining an inter-organizational supply chain management system in the first stage of this study is whether an organizational field and a body able to make rationing transactions exist in an industry. Combining these two concepts results in the simple classification scheme shown in Figure 2. Obviously, it is impossible that a decision making body able to administer rationing transactions exists if an organizational field has not yet emerged. However, the emergence of an organizational field does not guarantee that such a body exists.

Rationing transactions possible	Yes	X	Dominated Explicit forms
	No	Fragmented	Implicit forms
		No	Yes
		Organizational field exists	

**Figure 2: Classification scheme for industrial institutional structures**

Tentatively, we are using four stylized or ‘ideal’ types of industrial institutional structure as examples of combinations of our theoretical dimensions in this classification scheme. However, it should be noted that there might be other examples or a better way of fine-graining the classification scheme in order to arrive at ideal types of industrial institutional structure in a more systematic fashion. These preliminary types are:

- Fragmented industrial institutional structure.
- An industrial institutional structure dominated by one company.
- An industrial institutional structure with implicit forms of horizontal coordination.
- An industrial institutional structure with explicit forms of horizontal coordination.

A **fragmented structure** is characterized by a large number of players with each having only a small share of their overall market both in terms of product and factor markets. Thus, they have little influence on the strategies of their suppliers and customers. Also, since their customers represent but a small fraction of the overall market volume, the information each player receives about the market situation via sales orders is limited; therefore, obtaining an accurate picture of the overall market situation generally requires additional data collection efforts. As a consequence, each player’s actions are mainly based on signals emitted from their immediate

customers in terms of types of goods required, prices, and quantities (creating bull-whip effects, cf. [7]).

Players may be engaged in relationships with suppliers and customers for an extended period of time. On this basis, idiosyncratic inter-organizational procedures may have evolved facilitating smooth flow of goods and payments. However, as each player only represents a small fraction of the overall market, players are always able to switch to new customers or suppliers without much difficulty which prevents idiosyncratic investments in relationships. Changing market conditions tend to trigger such adjustments as sellers are seeking higher prices under expanding demand conditions and buyers are seeking lower prices under contracting market conditions.

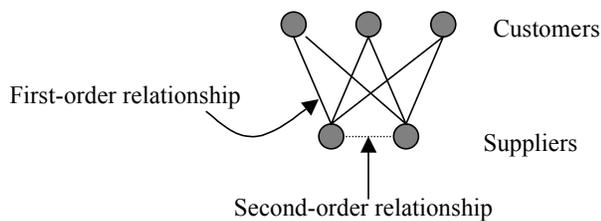
The large number of players also prevents the emergence of direct (implicit) forms of horizontal coordination. Explicit forms of horizontal coordination (via industry associations) have limited internal sanctioning power (by definition; if otherwise, see ‘explicit forms of horizontal coordination’ below) and are generally externally focused (lobbying).

Thus, fragmented structures would not qualify both as an organizational field and as a form of rationing transactions.

In summary, fragmented structures are characterized by

- large numbers of industry players,
- very small market shares for each,
- no implicit or explicit forms of horizontal coordination implying that
- market signals are mainly taken from immediate customer sales orders,
- market activities are based on this limited amount of information,
- transaction relationships may extend over an extended period of time,
- idiosyncratic procedures may have evolved and
- no idiosyncratic investments in relationships are made.

**Implicit forms of horizontal coordination** emerge from long-term first-order (vertical) relationships which can also trigger the emergence of second-order (horizontal) relationships (see Figure 3). This type of structure implies a relatively small number of players which have about equal shares of the overall market. Thus, switching to new suppliers or customers entails substantial shifts in market structure and is therefore rather unlikely to happen. As a consequence, long-term relationships can be built which also enable idiosyncratic investments in relationships. However, as players try to integrate vertical processes more tightly, they might be required to coordinate their activities with competitors in order to prevent the creation of multiple bilateral systems (which process creates second-order relationships).



**Figure 3: First and second order relationships**

In summary, implicit forms of horizontal coordination are characterized by

- a relatively small number of players,
- which share the market more or less equally implying that
- long term relationships can be built,
- idiosyncratic investments in relationships are possible and
- second-order horizontal coordinating relationships can emerge.

Implicit forms of horizontal coordination can thus be defined as an organizational field but there is no decision making body for allocating benefits and burdens of an industry-wide initiative among players as this structure is based on bilateral relationships.

**Explicit forms of horizontal coordination** are based on industry associations<sup>1</sup> which are able to exert internal sanctioning power. This power can be based on (1) control of an essential natural or authoritative resource (such as a license to operate); (2) normative authority (legitimacy). Under this condition, the threat of expulsion from the association can be used to enforce intra-industrial coordination mechanisms. This condition implies that individual players are not too big (in which case they would be sufficiently self-sustained and could not be disciplined) while they can also not be too small (since then free-riding could not be prevented unless membership is enforced by the state). Also, typically, this type of association takes a long time to develop so that old industries are more likely to have them than are new ones. These industries, however, must not be characterized by a high level of economies of scale in which case a dominated structure would be expected.

In summary, explicit forms of horizontal coordination are characterized by

- mid-sized players,
- medium levels of economies of scale,

<sup>1</sup> The term ‘industry association’ is used in its broadest meaning including all explicit forms of voluntary associations between companies involving first-order and second-order relationships such as trade associations and alliances. Interlocking directorates and joint ventures, however, would be excluded as they generally do not include second-order relationships.

- relatively high age and
- dependence on some natural or normative resources implying that
- industry associations have emerged
- which have a high potential for enforcing intra-industry coordination mechanisms.

Explicit forms of horizontal coordination thus classify as organizational fields capable of rationing transactions.

A **dominated structure** exists if one player in an industry has the ability to coordinate the other players’ activities. This generally implies that this player has a large share of the total market. However, it is not necessary for this player to be a monopolist. Rather, this player may have established strong relationships with a set of other players which enables it to communicate new policies efficiently which will reduce uncertainty among the other players. Thus, dominance can be based on the ability to absorb transaction costs for other players rather than sheer market power.

In summary, a dominated structure is characterized by

- one large player (in terms of market share),
- a high degree of interdependency between players implying that
- valued relationships with the dominant player have emerged
- which are used to absorb uncertainty in the industry.

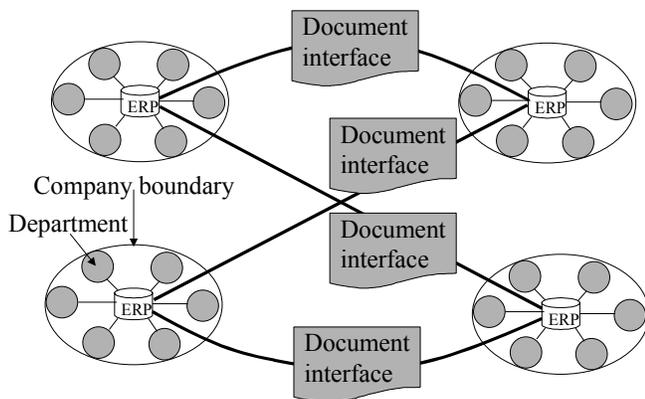
Dominated structures also satisfy the criterion of organizational fields and of being able to administer rationing transactions as a dominant player, to a certain extent, can allocate burdens and benefits of an industry-wide system among suppliers and customers and possibly even competitors.

Although ‘ideal types’ are derived from the quantitative variables ‘number of industry players’ and ‘distribution of market share’ (plus, in some cases, additional variables such as industry age and degree of interdependence), threshold values for these variables to separate the four types of industrial institutional structure are hard to determine. In addition, threshold values may be contingent upon other factors such as level of economic development and extent of government involvement. Therefore, the characteristics implied in the qualitative description of these quantitative variables (such as existence of industry associations with intra-industrial sanctioning power) will be used for operationalizing industrial institutional structure rather than absolute values for the quantitative primary variables.

## 5.2. Integration models

The ‘western’ model of integrating supply chains begins with intra-company integration. Historically, enterprises first developed functional information systems

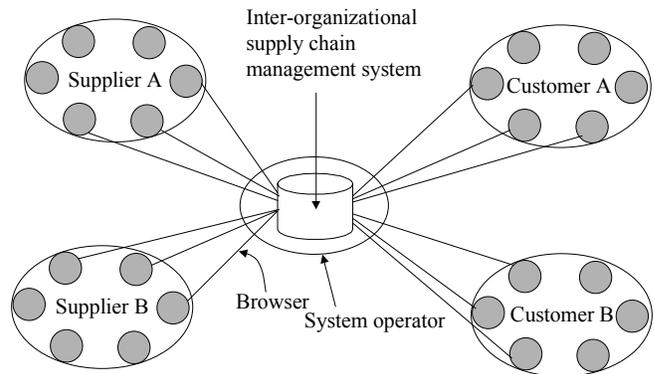
which were later integrated into enterprise systems. As this integration was initially based on custom-made interfaces between any pair of two applications, maintaining these integrated systems became very costly and difficult (for this reason, these systems are known as 'legacy systems' in industry jargon). In order to rid themselves of high maintenance costs, companies started to replace legacy systems by standardized, integrated enterprise systems known as Enterprise Resource Planning (ERP) systems. However, in order to do the next step, integrate whole supply chains, the same problem emerges on a higher level as encountered before regarding the integration of functional systems within enterprises. Now, ERP systems are integrated using custom made interfaces on a bilateral basis (Electronic Data Interchange, EDI, cf. [14]). Although there are many initiatives to standardize these interfaces, such standardization can go only so far. Specifically, the pragmatic level and, less so, the semantic level of computer-to-computer communication are so complex as to warrant a bilateral approach ([6], [13]). Figure 4 illustrates this approach.



**Figure 4: The EDI integration model**

A logical alternative to this approach is to replicate the ERP idea on the level of a whole supply chain, i.e. to move to a centralized processing model ([8]). An inter-organizational system such as this is, of course, extremely complex and it would seem appropriate to start with some basic logistical functionality such as inventory management. In its simplest form, this system would consist of a table with rows representing product items and columns representing supply chain members. The system would then record the movement of product items along the supply chain. The next step could be to create a financial accounting layer on top of this inventory system. Subsequent extensions could include internal cost control

systems and even enterprise resource planning systems. This model is illustrated in Figure 5.



**Figure 5: The centralized processing model**

The crucial point of such a system regards its form of governance. How can industry players trust that their data will not be misused if their data are not under their control? In addition, how can they ensure that their internal requirements will be met by ongoing system development and maintenance efforts as different industry players might have divergent interests? Thus, such a system is characterized by a very high degree of uncertainty which is the reason why we chose an institutional approach to investigate its sustainability.

An open issue not yet addressed by this model is the possibility of multiple membership in several supply chains. This issue would have to be addressed before developing a concrete system as part of a feasibility study. The issue of institutional sustainability as defined here, however, is not directly affected by this potential problem.

## 6. Hypotheses

The following four hypotheses will be explored in this study.

*H1: An inter-organizational supply chain management system is sustainable in a fragmented industry but can only be created externally.*

A fragmented industry does not qualify as an organizational field. However, for this very reason industry participants would be able to support an inter-organizational supply chain management system since they need not be afraid of giving up an established position within an organizational field. Regarding the possibility of creating such a system, a fragmented industry has no decision making body for conducting rationing transactions. Therefore, such a system could not be created by industry participants themselves but only by

managerial transactions (i.e. by government order) or bargaining transactions (i.e. by a profit-oriented third party).

*H2: An inter-organizational supply chain management system is not sustainable in an industry characterized by implicit forms of horizontal coordination.*

Implicit forms of horizontal coordination are characterized by a dense network of bilateral relations which might lead to coalitions involving first and second order relationships which, however, are exclusive since they are based on efforts to create competitive advantage. Thus, an inter-organizational supply chain management system would disrupt this network and any individual competitive advantage based on it too.

*H3: An inter-organizational supply chain management system is sustainable in an industry characterized by explicit forms of horizontal coordination.*

Explicit forms of horizontal coordination such as industry associations are able to sanction members if necessary and thus enforce an inter-organizational supply chain management system. As this body already has clear decision making structures, it will also be able to conduct rationing transactions. Therefore, such a system could be created as well as sustained in an industry characterized by explicit forms of horizontal coordination.

*H4: An inter-organizational supply chain management system is sustainable in industries by one player.*

An industry dominated by one player has the means to create an inter-organizational supply chain management system since the dominant player can create it if it deems such a system advantageous. The dominant player can also design the system in such a way that it will create a collective good.

## 7. Summary

This paper presents the outline of a research project that probes into the sustainability of inter-organizational supply-chain management systems. Such systems would represent a rather radical technical and organizational alternative to the currently dominant mode of external systems integration by creating one central system for supply chain members into which they tap for exchanging data but also for managing and processing data for internal purposes. We have proposed to base such a study on institutional theory. Specifically, we use the concepts of institutional legitimacy, organizational fields, and rationing transactions to develop a set of hypotheses and to define our notion of sustainability. In addition, we have created a simple scheme for classifying industrial institutional structures based on our theoretical framework and described four idealized types in more detail. Regarding the method of data collection to be used in this study, we have proposed to use a Delphi Study method which choice is also based on one of our theoretical

concepts, namely the notion of organizational fields. Apart from the task of data collection, this study will have to proceed further in two directions. First, it will be necessary to refine the classification scheme in order to derive ideal types of industrial institutional structures in a more systematic way. Second, in its second stage the study will be extended to an international context in order to investigate the influence of government and national institutional structures on the sustainability of a centralized processing model for supply chain management.

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