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Exploring the Role of Inter-Organizational Information Systems within SMEs Aggregations

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Abstract

Interorganizational Information Systems (IOIS) will play a relevant role in shaping competition in the next years. Even though companies have become extremely efficient in managing information and logistics inside their boundaries, communication and coordination among partners is still far from effective. Both obsolete technologies and very scarce ICT supported interorganizational process are found in practice. In a global market where the entire supply chain is involved in company success, the proper design and implementation of an IOS is becoming mandatory. SMEs, and in particular those inside industrial aggregations, could greatly benefit from IOIS implementation, however a widely accepted IOS adoption theory is still lacking. Focusing on the description of an industrial aggregation this paper proposes a framework, its implementation and a field test on 70 companies belonging to an industrial district, to understand the relationships among aggregation's main players. The analysis of the results proved that this approach offers useful insight for the comprehension of the aggregation and suggest its use as a pre-design IOIS tool.

1. Introduction

One of the most peculiar organizational structures characterizing the way small and medium sized enterprises (SMEs) manage their relationships with partners is the one referred to as industrial “district” or “cluster”, that can be generically defined as a

network of enterprises located in a limited geographical area which share part of their processes, especially production and logistics (Marshall, 1922; Williamson, 1985).

It is claimed that the evolution of information and communication technologies (ICT), and in particular Internet-based technologies, provides these networks with new opportunities to effectively support the management of supply chain activities, by supporting the flow of materials with a more efficient way of communicating and sharing information (Morrel and Ezingard, 2002; Shapiro, 2001).

At the same time, SMEs face the challenges of the globalization process that, changing the relations among firms, requires the creation of new alliances and new forms of cooperation based on trust. Moreover, competition itself is shifting from the simple firm to firm model towards competition between extended supply chain networks.

In this latter case, the integration between companies is essential to reach new competitive advantages; in particular, Information and Communication Technology (ICT) enabling the integration at different organizational levels is proving necessary to grant enterprise competitiveness. In the past few years hardware and software developments (e.g. mobile devices and web services) have led to strategic business applications supporting information exchange also across the boundaries of firms. Together with those, new promising technologies, such as the Radio Frequency Identification (RFID) systems, apparently make it easier to integrate information flows at the inter-organizational level, which represent the subject of the Inter-Organizational Information System (IOIS) discipline.

Current research on IOIS and, at the application level, the development of business to business (B2B) e-Commerce systems are focusing on solutions that enable enterprises to reengineer their structure and change them into flexible organizations cooperating with their clients, suppliers and partners (Hong, 2001). These solutions aim at creating value along the entire supply chain by improving collaboration, work specialization, information sharing and quickness of response, i.e. improving those characteristics that make those SMEs that belong to industrial aggregations competitive.

However, although the main adoption factors of an IOIS have been the subject matter of previous studies (Morrel and Ezingard, 2002) the fulfillment of these objectives, a critical success factors model, the role of IT in the formation of networks (Medina-Garrido *et al.*, 2005), or the sustainability of an effective IOIS (Kumar *et al.*, 1998) are not yet established. Moreover, very few studies tried to assess the possible effects that districts or business associations (Pigni *et al.*, 2005) have on IOIS adoption and ICT use in genera

The proposed framework is a first attempt to contribute to the assessment of a methodology for the evaluation of both the feasibility and the typology of IOS adoption within industrial aggregations. In order to fulfill these objectives and thus supporting practitioners and researchers in the assessment of IOIS in this context, a survey-based implementation is presented. The main concept behind the framework is that IOS design should be based on the understanding of what aggregation's actors are actually "exchanging" thus providing the necessary guidelines for IOIS implementation. A survey is then deployed on 70 companies belonging to a recognized industrial district to validate the conceptual framework. The results show the ability of the proposed approach to identify and analyze relevant patterns for IOS design and acting as an IOIS pre-design tool.

2. Conceptual Framework

2.1 Inter-Organizational Information Systems

IOIS can be defined as an “[...] information and management system that transcends organizational boundaries via electronic linkages with trading partners [...]”. The IOIS purposes are to share data, business applications, and information, and to provide the business partners with the capabilities of electronic transactions about buying and selling goods and services (Eom, 2005).

The “tri-core model” proposed by Swanson (1998) to describe the impact of ICT on firm activities, can be used to highlight ICT applications of an IOIS. The model identifies three types of innovation processes considering the impact of ICT on organizations:

- Information system activities. The first innovation typology influences only the activities that are directly related with ICT. An example could be an IOIS based on a software application which manages data exchange across an inter-organizational network.
- Administrative activities. The second typology includes solutions specifically developed for administrative functions, as, for example, software that manages accounting processes.
- Technological activities. The third and most widespread innovation typology integrates ICT with intra-business core activities (in particular manufacturing or production activities), but also with inter-business activities. Well known examples are MRP (Material Requirement Planning) systems or CIM (Computer Integrated Manufacturing) systems.

In recent times, many companies have recognized in their IOIS a key factor for their growth (Eom, 2005; Hong, 2001). In fact, an IOIS can be a source of innovation and competitive advantage, thanks to faster and less expensive information exchange, better quality of information managed (related to the number of firms that take part in the network) and conversion costs reduction that can encourage collaboration between firms (Hong, 2001).

2.2 SMEs Aggregations: Clusters, Districts and Associations

The academic literature concerning industrial aggregations is extremely rich and highly differentiated. After Marshall introduced the concept of external economies and industrial districts in the 1920's (Marshall, 1922) the strategic relevance of aggregation, especially for SMEs, has become a major research field within organizational studies, particularly during the last decade (Coe, 2001; Enright and Roberts, 2001; McDonald and Vertova, 2001). The growing complexity and instability of global markets has led a plethora of authors to analyze different forms of industrial aggregations, including how such aggregations can help enterprises to increase their competitiveness (Bernal et al., 2002; Hoover, 1948; Macneil, 1980; Marshall, 1922; Micelli and Di Maria, 2000; Nassimbeni, 1998; Paniccia, 1998; Varaldo and Ferrucci, 1997).

The widest recognized forms of industrial aggregations in literature are represented by clusters and industrial districts, frequently seen as synonymous or akin, dividing authors between supporters of industrial districts as a specific case of clusters and those theorizing clusters and districts as two different phenomena. Moreover, there are other significant forms of industrial aggregations, such as business or industrial associations, industrial parks, and networks. Within such a heterogeneous environment, it is necessary

to identify a common ground of the different forms and definitions of industrial aggregations. The OECD specific Focus Group defined clusters as “network of production of strongly interdependent firms, knowledge producing agents, bridging institutions and customers, linked to each other in a value adding production chain” (Roelandt and Hertog, 1998).

The main characteristics of a cluster are the linkages and interdependence between different subjects that generate value increasing the competitiveness and innovativeness. Following this definition, many authors (Enright and Roberts, 2001; Gordon and McCann, 2000; McDonald and Vertova, 2001) have described the industrial district as a “cluster of firms in a particular industry that have constructed local networks with firms in supporting industries, and also with the local community”. This definition, however, seems to underestimate the effects that the characteristics of geographical localization and relation with the local community entail. Therefore, a more comprehensive approach should consider with authors like Becattini (1990) and Markusen (1996) who focus on the specific characteristics of industrial districts.

More precisely, instead of dealing with the dichotomy between clusters and districts, we suggest that the complexity of the subject can be better approached by employing a “bottom-up” approach, i.e., identifying and developing a typology of aggregations according to a framework that specifies the relevant parameters that identify the companies belonging to an aggregation. At a preliminary analysis, the size of the company, its geographical location, its industrial sector and wideness of market area represent meaningful dimension of such a framework (McDonald and Vertova, 2001). In a preliminary theoretical study specifically focusing on industrial districts Ravarini (2003) suggested that two major dimensions should be considered:

1. the type of competitive advantage a company can achieve; from this perspective it is possible to distinguish the Marshallian competitive advantages (common to all kinds of industrial districts) from the “peculiar” competitive advantages (that can be achieved only by specific industrial districts due to historical, cultural, territorial reasons) (Marshall, 1922; Varaldo and Ferrucci, 1997);
2. the critical actors, i.e. organizations playing key roles within the network of the district (associations, banks and public administration; internal suppliers of direct goods; manufacturing companies; intermediaries; external suppliers of indirect goods; business clients).

The cross-analysis of these two indicators should make it possible to identify of six possible types of IOIS suitable to support e-business in industrial districts (therefore defined as “eDistrict solutions”).

To draw a complete picture about industrial aggregations, another typology should be introduced: business or industrial associations. Although different for aims and characteristics from clusters and industrial districts, they represent undoubtedly a relevant and widespread form of industrial aggregation: they provide companies with social activities, collective services and represent the interest of their members (Bennett and Robson, 2001; Doner and Schneider, 2000). In doing so, industrial associations can support their members in joining their competence to provide customers integrated services and reducing information asymmetries between members and clients/suppliers, by means of controlled contracts or collective brands. Including business associations in our analysis makes it recommendable to add a new dimension to the framework describing an industrial aggregation: the type of external services available to its members.

Finally, it is necessary to take into account how and to what extent ICT can influence the creation and development of industrial aggregations. Under the assumption that ICT is an instrument and not the aim of innovation, it is reasonable to state that an aggregation of SMEs can benefit from the development of ICT solutions specifically designed to satisfy their requirements. Categorizing such requirements could add other relevant dimensions (related to ICT applications) to the framework (Caldeira and Ward, 2003; Cragg, 2002; Duhan et al., 2001; Levy and Powell, 2000).

2.3 Towards a Framework of IOIS in Industrial Aggregations

The results of previous studies (Ravarini et al., 2003) provide a theoretical support to the hypothesis that ICT solutions can effectively support the processes of companies belonging to industrial districts. This assumption, combined with the high potential of SMEs as a target market for eCommerce solutions, explains the attempts that a number of software vendors have carried out in recent times to arrange ICT-based solutions that specifically support inter-organizational information transaction across industrial aggregations.

However, pioneers experienced many difficulties in providing software systems that could offer a real competitive advantage, mostly because of a misalignment between the characteristics of the available technological solutions and the actual requirements characterizing the industrial district as a whole (Micelli and Di Maria, 2000; OECD, 1999). In fact, the development of such solutions has been largely based on the specifications of larger companies, which often turn out to be very different from SMEs' (Micelli and Di Maria, 2000; Poon, 1999).

These remarks show the opportunity to explore how to fill this gap, to study how ICT solutions should be developed in order to meet the requirements of SMEs belonging to industrial aggregations. This objective can be fulfilled only through the understanding of the characteristics of the information flows within those networks, which in turn can be achieved after a deep study of the relationships occurring inside and across the boundaries of such networks.

With respect to such concern, a noteworthy contribution to the analysis of IOIS is Hong's matrix (Hong), which allows the identification of 4 different functions that an IOIS can alternatively carry out basing on a bi-dimensional analysis (Figure 1):

- the type of support the IOIS provides,
- the type of linkage the IOIS supports/enables.

This second dimension is particularly relevant to our study because it highlights the role the firm takes in the network of its relationships. To do so, two extreme types of linkages are indicated by the matrix: vertical relationships, occurring between companies participating in value creation with different hierarchical roles, and horizontal relationships, where the firm coordinates its activities with other companies that fulfill the same objective.

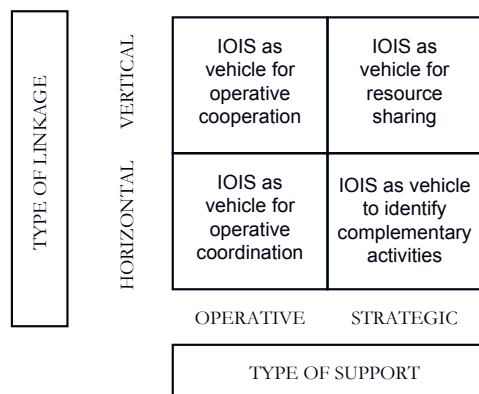


Figure 1: Hong's (2001) IOIS functions matrix

The study of the information flows among districts members together with Hong's IOIS functions matrix can allow a better understanding and design of IOIS. At this scope, detailing aggregations' horizontal and vertical linkages allow the identification of four categories of main players. Horizontal linkages are attributed to competitors, because of the common value activities performed, and to supporting organizations (services), pooled resources which linkage is generally unrelated to the straight value chain. Conversely, vertical linkages relate to the value adding process typical of buyer/seller and supply chain relationships.

This paper proposes a simplified approach to IOIS investigation, to support practitioners and researcher in its assessment within an industrial aggregation. The emerging framework extends Hong's model and suggests a possible implementation, turning it into an operative tool. Through an effective questionnaire the main identified aspects are investigated. The methodology and the results of the survey are explained in the next sections.

3. Methodology

This section details the procedures for the design and deployment of the survey and for the data collection and analysis.

3.1 Questionnaire Design

The conceptual framework has been applied to the design of a questionnaire aiming at investigating the characteristics and eventually recognizing common patterns of inter-organizational relationships within an industrial aggregation.

Such a research instrument, intended for the entrepreneurs of SMEs, has been designed for short, direct interviews, which typically represent the most effective way to collect data among SMEs.

The questionnaire is structured in six sections.

Sections 1 and 2 are dedicated to collect basic demographic data on the firm to circumstantiate the context in which companies operate. In further detail, section 1 examines the characteristics of the firm itself (McDonald and Vertova, 2001), while section 2 is focused on the basic aspects of the relations with other organizations, such as the degree of concentration of similar companies in the same geographical area

(Krugman, 1991), or the degree of specialization of the firm (Coe, 2001; McDonald and Vertova, 2001).

Each of the remaining five sections examines in detail the relationships between the firm and each of the critical actors identified in Ravarini's (2003) framework of eDistrict solutions (associations, banks and public administration; internal suppliers of direct goods; manufacturing companies; intermediaries; external suppliers of indirect goods; business clients).

Section 3 refers to the *competitors*, in the attempt to identify - besides their geographical location - the type of horizontal relationships occurring between the firm and its competitors within the aggregation, according to the classification proposed by Bengtsson and Kock (1999):

- Reciprocal coexistence, characterized by the almost complete absence of any economical exchange between actors, and typically consisting in one or a few large companies controlling the local market;
- Cooperation, characterized by frequent economic and social exchanges between actors bound by social, knowledge, legal or economic relationship;
- Competition, the most typical type, where interactions between competitors are based on imitation and the power is informally distributed among them on the base of the market share they own.
- Co-opetition, characterized by both economic and non-economic exchanges where power in the cooperative side of the relationship is based accordingly to the value chain functional aspect. Whereas, on the competitive side, power is based on the actor's position and strength. Cooperation is generally based on trust or formal agreement, while competition depends on the actor's strength and position in the business.

Section 4 investigates clients along three dimensions:

- the type (primary or not critical) and the localization (internal or external to the aggregation) of the clients;
- the frequency of interactions with the clients, essential to understanding the way the aggregation works (Markusen, 1996) and basic requirement for the definition of an IOIS aimed at supporting the aggregation itself;
- the type of information related to the value chain the firm exchanges with clients: this is important to understand its degree of dependence on the clients (Donaldson and Toole, 2000; Enright, 2000).

Section 5 investigates suppliers along the same three dimensions already presented for the clients.

Finally, Section 6 analyses the relationships between the firm and all the not commercial actors operating in the geographical area where the aggregation is located, in order to identify from which actors the firm frequently requires or receives services and, therefore, exchanges information (Bennett and Robson, 2001).

Table 1: Structure of the questionnaire

Section of the questionnaire	References
1. Demographics	(McDonald and Vertova, 2001)
2. Relationships with third parties	(McDonald and Vertova, 2001) (Storper and Harrison, 1991) (Coe, 2001) (Roelandt and Hertog, 1998) (Costa Campi and Viladecans Marsal, 1999) (Enright, 2000) (Markusen, 1996) (Roelandt and Hertog, 1998) (Simmie, 1998)
3. Relationships with competitors	(Coe, 2001) (Enright, 2000) (Markusen, 1996) (Bengtsson and Kock, 1999)
4. Relationships with clients	(Coe, 2001) (Enright, 2000) (Markusen, 1996) (Donaldson and Toole, 2000) (Hong, 2001)
5. Relationships with suppliers	(Coe, 2001) (Enright, 2000) (Markusen, 1996) (Donaldson and Toole, 2000) (Hong, 2001)
6. Available services	Assinform Report 2003; (Markusen, 1996) (Bennett and Robson, 2001) (Broad, 2001)

3.2 Data Gathering

This study focuses on companies belonging to the taps, fittings, and valves industry, one of representative of “Made in Italy” design products. In particular the surveyed companies belong to the industrial district of “Cusio-Valsesia” located in the North-Eastern part of the Piedmont Region, in Northern Italy. This area roughly manufacture 1/3 of the Italian export in the industry and represents the 5% worldwide and a 9-10% of EU industry’s exports (HS 84.81 Taps, cocks, valves and similar appliances for pipes, boiler shells, & tanks) (Fortis and Nodari, 2001).

Small business represents the 90% of the companies in the area, however the industry is quite concentrated as the first 10 companies accounts for the 40% of the total turnover of the entire district (Fortis, 1999).

Table 2: Number of companies, related frequency, companies' density every 100 employee, percentage interviewed, clustered by size [adapted from ISTAT census 1996 in (Baici et al., 2002).

Employees	N	%	N/100 e	% interviewed
1-9	229	59	9	9
10-49	122	31	33	32
50-250	36	9	43	25
> 250	3	1	15	67
Total	390	100	100	

Considering the impact of this industry on the total number of companies in the territory, it is possible to identify five main areas:

1. an area of deep impact where at least the 81% of the companies work in industry or related sectors;
2. an area of high impact where companies in the industry or related sectors range between 61% and 80%;
3. an area of mid impact where companies in the industry or related sectors ranges between 41% and 80%;
4. an area of low impact where companies in the industry or related sectors ranges between 21% and 40%;
5. an area of very low impact where companies in the industry or related sectors ranges between null and 20%.

The questionnaire was intended to be addressed to more than 210 companies; however after a preliminary phone contact only 70 of them showed interest in the study and were consequently interviewed. Companies were surveyed according to the identified criteria of size and area of impact. The entrepreneur itself or the CEO, in larger organizations, was the person directly interviewed.

Table 3: Size and area of the interviewed companies.

Area	Number of companies	Companies' Size			
		Micro	Small	Medium	Large
Deep Impact	37	11	20	4	2
High Impact	26	8	15	3	-
Mid Impact	2	-	1	1	-
Low impact	4	-	3	1	-
Very Low Impact	1	1	-	-	-
TOTAL	70	20	39	9	2
		28%	56%	13%	3%

In terms of company size the resulting sample does not present a perfect fit with the total population observed in the area. On the other hand, the very high coverage of district main areas and companies by size (other than micro), can be sufficient for the reliability of the results considering the general concentration of the market.

4. Main Results

The interviewed companies are extremely specialized in specific activities of this industry value chain, in particular in the assembly (28,7%), turning (26,2%) and polishing phases (14,6%) without significant differences among companies' size categories. However, an in-depth analysis of these figures shows that smaller firms tend to provide the base process of industry's complete value chain by acting as a flexible network of subcontractors. This is even more evident in the relationship between micro and small-medium companies. In this context the main difference between small and medium organizations is the higher specialization of smaller firms in one or two processes whereas larger organizations cover a broader range. It should be noted that these "accessory phases" are generally more important in order to guarantee a high quality of the final product.

The data gathered from section 3 strongly support the evidence of a local network of small, specialized firms supporting larger players. When asked about the localization of their main competitors, 80% of both micro and small companies indicated the main district areas, the same in which they operate. It is extremely interesting to note that 73% of the companies have relationships with their competitors mainly concerning informative (51%), productive (47%) and social exchanges (35%). Moreover, the declared coexistence (76%) with the competitors and the low relevance of economic exchanges (12%) confirm the presence of "an actor's dominating position or strength, and this means that dependence is present, as the smaller actors are in the hands of the larger actor" (Bengtsson and Kock, 1999) typical of the cited coexistence profile.

Conversely, these results find confirmations in the buyer/seller relationships that the firms belonging to the district engage. Section 4 and 5 of the questionnaire analyze that issue.

Even though all companies have major customers outside the district area (62% of micro and small, and nearly all medium-large), smaller firms show a higher presence of their main customers in the district (40%) compared to larger ones (27%). There are no relevant differences between these two groups in terms of information exchanged with their customers. In particular, the information exchange regarding the manufacturing process is frequent and mainly concerns product quality (89%), manufacturing (54%), marketing (39%) and design (23%). Outbound logistics, instead, is focused on delivery terms (92%), shipping (50%) and packaging (44%). Companies' marketing and sales information exchange is intended for products promotion (74%) and sales (56). Other activities like market research and adv campaign are only marginal, probably because of the subcontractor nature of the interviewed firms.

On the supplier side the situation reflects the network nature of the district: more than 60% of the responses indicate the local as the main source of their suppliers. The residual 40% of extra district relationships can be explained with the transaction regarding raw materials like brass bars, supplied from other parts of Italy. On the supplier side, the manufacturing process is characterized by information flows directed to the correction of possible defects (88% of respondent). Other relevant information regards product manufacturing itself (56%) and the development of new materials (42%). The analysis of the supply side information exchange pattern highlights the interest of companies as having an effective and streamlined supply chain: they require their partner to promptly provide information on delivery terms (82%) and cooperate on specific procurement

needs (67%). All the exchanges on the supply side seem to point toward the deployment of an effective and efficient supply chain aiming at obtaining high quality and design products. Relationship, other than transaction based, have a high degree of trust involved (9% are very confident of their suppliers, 51% are confident, 39% average confident, whereas only 1 company is unconfident of its suppliers), and are long term (90%).

The further investigation of the information exchanged with business partners has allowed the identification of key outsource and service providers. Obviously, banks are one of the major partners of each company, thus it is not surprising that more than 80% of the interviewed companies buy or request their services. Less obvious is instead the similar proportion of software houses' services, probably because of the relative small size of the interviewed firms and their typical lack of any IT strategy. However, these competences and skills are required, both for any Internet venture, feasible for companies with the observed international vocation, and internal IT management. Thus, outsourcing seems to be the most effective solutions district's companies have found to their IT needs. A similar response rate is observed for business consultant: a structural presence for small and medium size Italian company. Other services requested and bought are from temporary work and advertising agencies, from technical consultant and lawyers.

The Local Chamber of Commerce's and business associations' services are requested by only 30% of the surveyed companies, underlining a possible deficiency of their propositions. Even more concerning is the very low level of interaction between companies and the local government (municipality and region) whose services are requested by less than the 10% of the sample.

Finally, although not surprising in the Italian context, the extremely low involvement of universities: only two companies bought and requested their services.

5. Discussion

The proposed framework has provided a comprehensive tool for the analysis and description of the relationships between companies and their business environment. This task was accomplished through the investigation of competitors, customers, suppliers and service provider. Each separate analysis has made it possible to understand the underlying relationship and related information exchanges, thus allowing the discussion of possible IT use to support district's activities.

The observed district is characterized by a network of smaller companies acting as subcontractors of larger organizations and generally bound in local, long term and trust-based buyer/seller relationship. The focus on operations, timing and quality assurance emerges as typical among the investigated firms, reflecting that the objective of these companies is the manufacture of a final very high quality product, in order to face global competition and leveraging "Made in Italy". This behavior is reflected in the information exchanged both with suppliers and customers, reinforcing the evidence of a network of small firms. In this context, however, it appears that the main information flows relate to the operation/supply management, whereas an effective strategic cooperation is not present. This latest hypothesis is corroborated by the lack of collaboration among competitors: companies coexist, are aware of each other, but generally don't do business together. Hong's matrix would suggest, in this context, an IOIS for operative cooperation, but the development of a technological infrastructure supporting these relationships is not straightforward: it originates from the agreement of the different actors across the whole supply chain making standardization issues a priority. Hong already made clear that the complexity of relationships among companies could be hardly reduced to straight horizontal or vertical linkages and a sharp division between operational and strategic support. In fact, a relevant group of services are needed by all the companies in the

district: the use of appropriate ICT could enable the effective pooling of these resources and, consequently, the coexistence of both vertical and horizontal linkages within the district. Furthermore, even though the exchanged information is typically operational, their coordination seems to relate more to the strategic use of ICT to gain competitive advantage based on the increased responsiveness of the entire supply chain.

Government services, though not really a concern for the surveyed companies, could effectively fill the gap by providing new eGovernment opportunities. These services appear to be of operative and pooled nature, but are provided by government institutions at different levels (from central to local).

6. Conclusions

The main difficulty in studying industrial aggregation is the complexity of the subject. The number of and the differences among the main players make generalizations efforts extremely hard. Literature suggests interesting frameworks and models for both buyer and seller dyadic relationship and single supply chain. The present paper approaches the problem by considering the very nature of an industrial aggregation characterized by relationships that occur among a plethora of different partners. Only by understanding these relationships it is possible to design an effective “supportive” IOIS thus likely avoiding projects failure.

Therefore, although an answer to the “IOIS sustainability” question was not possible through this study, the emerging IOIS characteristics for this district can give interesting clues.

First of all, supply chain issues seem to be a first priority for the surveyed SMEs. This result could be partially biased because of the industrial nature of the districts, whose focus is obviously on manufacturing, but other explanations are equally feasible. The repeated application of the model in different times could highlight IOIS lifecycle patterns. For example, the observed focus on operations could be the first phase of an IOIS development (as the information flow is observed) whose focus is still on the main value adding process. Consequently, the scarce interest in collateral services or a strategic use of IOIS could imply that these services are indeed interesting for companies only in more advanced phases. On the other hand it is a clear signal of the need for SMEs of a coordinating IOIS. The current research instrument was able to identify, in the surveyed environment, that larger firms bound smaller organizations in subcontracting relationships. As a consequence, they could act as initiator of an extensive IOIS adoption.

The descriptive power of the outlined tool seems to be effective in expressing the IOIS requisites in general terms, thus acting as a pre-design tool. Compared to Hong’s matrix this tool allows a broader view of the district environment, characterized by the concurrency of multiple sub-IOIS. The bottom-up approach used for the understanding of the industrial aggregation can be effectively used to shape a planning methodology as well. Instead of an initial definition of IOIS goals, and the subsequent design of the system, the proposed tool could be used for the investigation of current inter-organizational flows. As a checkup tool it could provide an appropriate description of the “as is” situation, extremely useful for a better planning of the “to be” scenario (i.e. the observed strong resource pooling opportunity for services could allow the creation of shared services).

Further research efforts could extend the current tool including a technological dimension. In particular it could give clues on the “ICT readiness” of companies, thus providing suggestions for system and platform design. Moreover, the replication of the study in different aggregation contexts could allow for comparative studies and the final

assessment of the cognitive power of the tool itself. Similarly, repeated deployment of the questionnaire in the same context could provide useful patterns of IOIS adoption and life cycle. Furthermore, the joint analysis of the technological dimension and the comparative analysis of geographic and time patterns could shed light on the enabling effect of different ICT for IOIS use and adoption.

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