

# Knowledge Transfer and Internet Technology in Industrial Districts

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## Abstract

The major aim of this paper is to analyse how Internet can impact on knowledge transfer in Industrial Districts (IDs). In order to achieve this goal after the description of principal IDs characteristics and of the knowledge transfer process in IDs we summarise the degree of adoption of Internet technologies in Italian IDs and finally we transpose the knowledge transfer model in the web scenario. In the conclusions we highlight the main causes of resistance to the adoption of Internet in IDs.

## 1. IDs and knowledge

In the Italian industrial scenario, the ID is a peculiar kind of production model deeply embedded in the social context. Marshall [17] was first in describing the concentration of firms in close geographical proximity as “industrial districts”. According to Marshall this concentration allows all the firms to enjoy the benefits of economies of scale and of technical and organisational innovations which are beyond the scope of any individual firm. Marshall’s IDs are long term, cumulative and depend on co-operation in knowledge creation and innovation.

Contemporary analyses of IDs put much greater stress than Marshall did on the collectivist and institutional basis for successful co-ordination. The ID has actually been defined as “a socio-territorial entity characterised by the active presence of both a community of persons and a population of companies in a naturally and historically delimited area” [3]. The social environment [12] of a typical ID presents the following principal characteristics:

1. A common culture
2. Trust among members
3. Standard of reciprocity
4. Solidarity

In such a reality, tacit knowledge [19] represents the main resource upon which IDs competitive advantage is founded because it is the main kind of knowledge generated and shared in IDs [10] [13] [1].

Some of the knowledge shared by the principal actors in the district can be defined as contextual knowledge [4]

[2], in the sense that it is the collective result of a slow process of knowledge building, experimentation, tacit know-how, interpretation and transposition of abstract knowledge. Within the district, it is the simultaneous evolution of tacit and codified knowledge in firms that has created a significant barrier to imitation from outside. This type of knowledge is “situated” in human actions, and it tends to remain “sticky” within the firms and subcontractors belonging to the district.

## 2. Knowledge transfer process in IDs

Inside the district, knowledge transfer assumes some particular features that are strongly dependent on the specific kind of social relationships that exist among district firms.

As seen in the contextual knowledge approach, knowledge is not merely an “accumulation of information” [7], but is also the output of interpretative and social processes. So, knowledge can be conceptualised as a combination of information and interpretation systems [1]. Following this perspective, knowledge transfer means, from the receiver point of view, not only a passive acquisition but also an activation in the assimilation of the transferred knowledge.

As stated by Gilbert and Cordey-Hayes [1], the process could be conceptualised as composed by five sequential steps: *acquisition* of knowledge from an external organisation; *communication*, that is distribution of knowledge within the organisation; *application* of the new knowledge in the own context; *acceptance* of this new knowledge; *assimilation* of the new knowledge that is the real learning activity that affects individual and organisational behaviour and routines.

From a system perspective the knowledge transfer process is affected by the components of the knowledge system [1] in which is embedded:

- *Actors*: the actors involved in the process may have different approaches in transferring knowledge due to their willingness and ability to collaborate. Individual attributes commonly identified are: openness to share knowledge, trust and prior experience that is the

- history of the relationships among actors and the common knowledge owned by each actor which affects his ability to give and internalise knowledge. Knowledge transfer actually is a cumulative process: the more organisations “speak” the same language the more new knowledge is understandable and absorption (assimilation) capacity increases [9].
- *Content:* the content of knowledge can be variously classified. Relevant dimensions deals with tacitness or explicitness of contents [19]; their equivocality and uncertainty [11]; their instrumental or cultural nature [1]; their simplicity or complexity (which can stress the cognitive and computational capacities of individuals: [22])
  - *Media:* Media are the means by which knowledge is transferred. The relevance of media in the communication processes has been stressed by the rational perspective according to which the features of the media are the key variables that affect individual behaviour. Individuals “rationally” choice media according to their appropriateness to the tasks they have to do. Media choice is not always a rational decision neither media produce standard constraints to behaviour due to the different cognitive frameworks in media adoption and use.
  - *Context:* the context can be divided in internal and external [1]. Internal context refers to all of the organisational variables that affect the knowledge transfer process such as organisational culture, technical skills and behaviours. The external context refers to all the variables that are the conditions in which inter-organisational relationships take place: market characteristics, norms, socio-cultural aspects etc.

The application of this framework can be very useful for analysing knowledge transfer in IDs.

The actors involved in knowledge transfer in IDs are surely the firms but also all the institutional organisations of the local area: associations, municipalities, banks, venture capitalists, schools, universities form a knowledge network that is crucial for the local development: literature from a cybernetic approach [5] stresses the positive feedback resulting from the interaction between three main actors: Government, educational organisations and business actors.

Consolidated literature [16] [14] recognises that a main feature of ID is the relevance of social interaction in the formation of trust between ID members. Prior experience is supposed to be high in ID due to the relative closure to external interactions and to the common history and cultural background.

Another attribute associated to IDs [21] is the degree of identification of member firms with the district. To share a common identity means to share common cognitive frameworks that facilitate knowledge transfer thanks to the

similarity of meanings. Furthermore a high degree of identification in the ID implies a major involvement in in-group relationships which affect the trust and prior experience variables.

Regarding the context of the IDs, recent literature registers two main trends: the internationalisation of ID firms and the growth of leader firms [6]. Both these trends strongly affect the knowledge transfer process in terms of new knowledge available from the outside and new structuring of the relationships between firms. The leader firm specifically has the role of promoting an intense exchange of knowledge with its supplier firms in order to achieve higher performance.

We can classify the traditional opportunities of knowledge transfer into two different categories with respect to the source of knowledge:

1. The source of knowledge is inside the district: the knowledge is transferred among district members through:
  - Inter-Organisational Relationships (IORs)
  - Informal communication that flows through family and friendship relationships
  - Workers mobility among organisations
  - Spin-offs phenomena. In certain IDs spin-offs are frequent due to the practice of outsourcing activities along the value chain
  - Local educational institutions
2. The source of knowledge is outside the district. The main instruments are:
  - Acquisition of new technologies (embedded in machinery and tools or in patents)
  - Internationalisation strategy: internationalised firms acquire new knowledge from the outside and transfer it inside the district
  - The location of external companies inside the district

With the diffusion of Internet technology, the dynamics below these opportunities of knowledge transfer could be modified. In the next paragraph we will describe the present situation in Italian IDs in terms of adoption of the Internet technology. A further step will be the elicitation of the new opportunities, provided by technology development, in the knowledge transfer process.

### **3. IDs, Internet and Knowledge Transfer**

Internet and ICTs are opening new frontiers to communication and collaboration among firms, and to the relationships with customers. These opportunities have arisen in a period of great changes in the district model.

What emerges from an analysis made by the Federcom [14bis] in 2001 is that, after an initial phase during which firms have used Internet technology only for communication, now they are deploying the Web channels in order to activate online purchase procedures, promoting

some forms of e-commerce, and some one-to-one marketing initiatives. Another step will be the shift towards the e-business model with the consolidation of new collaborating relationships among firms and the opening of new procurement and selling channels (virtual marketplaces).

Federcom's report [14bis] shows that the diffusion of the e-commerce and marketplaces among the Italian district firms is still limited to a small part of the firms. While the adoption of e-mail for inter-firms communications is quite common, IDs websites involve only a small representative of the firms.

From this report emerges a very differentiated situation, where, close to very absorptive and proactive firms, we have a range of traditional firms that consider the digital economy as a constraint instead of an opportunity and want to maintain the classical industrial model of production and communication that have succeeded until now.

ICTs impact upon knowledge in a variety of ways. Firstly the proliferation of cheap decentralised computational power allows the collection, collation, storage and dissemination of data on a scale non foreseeable in the past. Secondly, ICTs facilitates knowledge transfer through exchange of data.

What we have to investigate is in what sense these technologies might enhance our capabilities to store and reproduce knowledge. If knowledge is distinct from information, as we state, we have to question whether it is possible to find a way to reproduce it through information exchange. The issue seems not to be so difficult when we deal with explicit, or codified, knowledge, but it becomes more complex when knowledge is tacit (the main source of competitive advantage in IDs [19]). Traditional technologies for data storage as databases and datawarehousing are clearly inadequate to catch this kind of knowledge. The adoption of Internet related technologies that allow exchange of images, sounds, pictures, videos and so on ("richer" media that decrease the uncertainty and equivocality of the message [11] and increase the amount of visible social cues [23]), according to a rationalist perspective could increase the capacity of transferring tacit knowledge. According to a social constructivist perspective [15] however, the knowledge transfer is not a deterministic outcome of the increase of media richness but an emergent result of social interaction patterns among actors and technology.

Knowledge transfer in IDs through Internet is therefore:

- 1- strongly affected by the social structures and processes that characterise IDs
- 2- facilitated by sharing information and not only codified knowledge.

Even adopting a rationalist perspective, if tacit knowledge can't be easily transmitted through the media, the possibility to transmit information regarding who has,

where is, and how to achieve tacit knowledge is clearly enhanced by Internet. For example virtual communities and online curricula stores indicate who has a particular skill or competence; IDs marketplaces show where particular knowledge is and ICTs provide a mean to contact the sources of knowledge.

Therefore the opportunities of knowledge transfer are increased by Internet but the social factors remain the actual enabler of knowledge transfer as summarised in Table 1. There is another effect of Internet technologies: the increasing opportunities of interaction that Internet provide can affect the social factors themselves. For example, the creation of an ID website can increase the identification of the members in the district and so enhance the potential knowledge transfer. The new opportunities of interaction can increase the prior experience each member has of the other.

**Table 1. Knowledge transfer opportunities**

Traditional opportunities	Web-based opportunities	Enabling ID social factors
<i>IORs</i>	<i>Marketplace</i>	<i>Trust</i>
<i>Informal communication</i>	<i>Virtual communities</i>	<i>Prior experience</i>
<i>Workers mobility</i>	<i>Online Curricula</i>	<i>Identity</i>
<i>Spin-offs</i>	<i>Online Best Practices</i>	<i>Common culture</i>
<i>Educational organisations</i>	<i>E-learning</i>	
<i>Acquisition of new technology</i>		
<i>Internationalisation</i>		
<i>External companies</i>		

## Conclusion

As Rullani [20] points out IDs and Internet are both self-organising systems, in which the network structure emerge from the bottom.

Despite this common genotype, IDs and the web at the moment seem to stay as separate phenomena, as the empirical evidence has shown [8] [18]. Internet allows for the multiplication of the value of knowledge, which, when codified, can be easily exchanged. In a shorter scale, districts have made the same thing, by using effective self-organising processes on a kind of knowledge principally tacit, embedded in a specific territory. In this way the district know-how has pervaded the local system and has been managed interactively, in personal relationships among customers and suppliers, institutions and economic agents. This situation presents one main disadvantage with respect to the virtual net: the local embeddedness with its

tacit element represents a limit to the value that knowledge can acquire.

This framework shows that while Internet strongly enhance the opportunities for knowledge transfer in IDs, it is not obvious that the cognitive strengths of district relationships would be improved inside the web, nor that the personal relationships would be powered by the shift to the real time virtual interactions. The main problem is just the possibility to overlap the local and the global network.

The resistance to the introduction of new technologies in IDs derives from several reasons: first of all, the traditional knowledge transfer model for the districts presents a variety of opportunities for sharing knowledge and the Internet seems not to offer the same broad range of possibilities. It depends principally on the richness and the stratification of relationships among district firms, and Internet, at present, seem not to be able to catch this complexity.

Secondly, district firms are reluctant to abandon the industrial model that succeeded during the last decades.

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They are unwilling to risk the shift towards virtual business models. It is also due to the lack of skilled workers able to face the new challenges presented by Internet. Some improvement on this direction would probably derive from the entrepreneurial turnover, with the entrance of new generation of entrepreneurs, more familiar with new technology.

A third motivation is lack of co-ordination: the initiatives carried out by districts to approach the Internet are often the result of personal initiatives and they are not perceived as a common strategy from the whole district.

We think that a great effort should be made by local institutions and associations by sponsoring the creation of common websites or marketplaces in order to reinforce the trust of the firms in the virtual media and their awareness that Internet is a great opportunity for the district as a whole to increase the efficiency of the activities and the reputation of the entire system.