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The Coordination Issues of Relocations? How Proximity Still Matters in Location of Software Development Activities

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Abstract

The objective of this article is to investigate the dynamics of relocations at the micro-economic level. By proposing a grid of "dynamics of proximities", we focus on the coordination issues which seem to be missing from most of analyses carried about relocations. We apply our framework to software development activities. The proposition we develop in this paper is the following: mobility, ICT use and modularity reduce the need for geographical proximity and favour relocations but, in order to succeed, relocations need to have the support of organisational and institutional proximities to ensure effective coordination between entities and individuals.

Keywords : relocation, software development, dynamics of proximity, coordination.

Les délocalisations sous l'angle de la coordination :
Une lecture par les catégories de la proximité appliquée au logiciel

Résumé

L'objectif de l'article est d'interroger les dynamiques de délocalisation à l'échelle sectorielle. Il privilégie une entrée par les échelles spatiales de la coordination des acteurs engagés dans le processus productif et il se focalise sur le secteur du logiciel en ce qui est emblématique de la médiatisation croissante des délocalisations, notamment dans les secteurs de haute technologie mobilisant une main d'œuvre qualifiée. Une première partie présente la démarche analytique de la l'économie de la proximité. Une lecture des potentialités de délocalisation ne considérant que les facteurs de coordination à distance, lisibles selon les besoins de proximité géographique est ensuite proposée et confrontée aux faits. Contestable, elle est alors complétée par la prise en compte des facteurs organisationnels et institutionnels (renvoyant aux dimensions organisationnelle et institutionnelle de la proximité) de mise en œuvre et de pérennité des délocalisations.

Mots-clé: délocalisations, industrie du logiciel, dynamiques de proximité, coordination.

JEL : F23; L23; L86; R30

1. Introduction*

The topicality of relocations can be read in the increasing amount of media coverage of the phenomenon and its supposed social effects. Their quantitative growth is often viewed as a consequence of economic globalisation and trade liberalisation. But it is its qualitative evolution which holds today all the attention (Arthuis, 2005; Brunel, 2006; Fontagné and Lorenzi, 2005[1]) because the phenomenon has recently been extended to the whole of the industrial and services sectors, including activities with high technological contents.

Beside macro-economic analyses, the phenomenon seems to need more micro-economic and empirical studies, particularly in these kind of sectors (high value added) and functions (highly skilled workforce). Moreover, the focus must be placed on coordination issues. But, at the sectorial level, economic literature seems to pay more attention to the peculiar development of these sectors in the emergent countries rather than to the international dynamic of relocations. For example, a lot of research has been done about Indian or Chinese software industries (Arora *et al.* [2001]; Li and Gao [2003]; Ajitabh and Kirankumar [2004]; Athreye, [2005]…). At the analytical level, the lack of micro-economic analyses has been highlighted, particularly in the special issue of the *Journal of International Management* published on 2007. By developing management analyses, the authors have shown how wage differentials are only one factor among others and how further research on the coordination issues of relocations is needed (Bunyaratavej, Hahn, and Doh [2007]; Kedia and Lahiri [2007]; Kshetri [2007]).

According to these remarks, our paper has two objectives. The first is to pave the way for a micro-level analysis of the relations between proximity and relocations in order to try to clarify the phenomenon. Secondly, its objective is to test this analytical gird in a peculiar sector. Because of the myth that "everything can be relocated" which particularly concerns the ICT (Information and Communication Technologies) sectors, we have chosen to focus on the case of the software development. Three reasons explain this myth. There is firstly the immaterial nature of the product which reduces its transportation costs; secondly, the use of ICT which allows management and coordination from a distance and thirdly, the modularity of the product which allows spatial division of labour between production sites. Software development activities appear to exhibit these three specific parameters. One could therefore herald the explosion of relocations lead by the criteria of the cost of labour. When then are all these activities not relocated if the cost of labour is so much lower in China or in India? Various estimates of the development of such activities continue to measure its impact as relatively marginal. In the sector, offshore activities in 2005 represented no more than 2.8 percent of the global software market. In the United States, which represent 80 percent of the international offshore software business (and more than 60% of Indian exports), relocations accounted for 10 percent of the value added of the sector in 2004. In France for the same year, the phenomenon accounted for no more than 2 percent of turnover. In Europe, offshoring activities are mainly concentrated in the United Kingdom[2].

The persistent difference between the reality of relocations and the myth indicates that proximity is still an important criterion in firms' choice of where to locate its productive units.

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* This paper is a rewritten version of a French article « Proximités et délocalisations. Quelques évidences à partir du cas du logiciel » published in *Revue d'Economie Régionale et Urbaine,* 20008-3.

[1] Here are quoted French reports as an example. The same could be done for any country.

[2] This assessment is based on different studies, notably those of the Forrester, IDC and PAC research groups, summarised in SYNTEC (2006). Syntec is the professional trade organisation for the software sector in France.

It is primarily the need for geographical proximity that determines which activities can potentially be relocated and which cannot. However, as shown by Rallet and Torre [2005] the two notions of geographical proximity and location are often confused and substituted for each other. It is thus important to consider a second sort of proximity that is not geographical but relational, which ensure effective coordination between entities and individuals. In doing so, we are in better position to understand why the phenomenon of relocations is of little importance in a sector where one would expect to find many more.

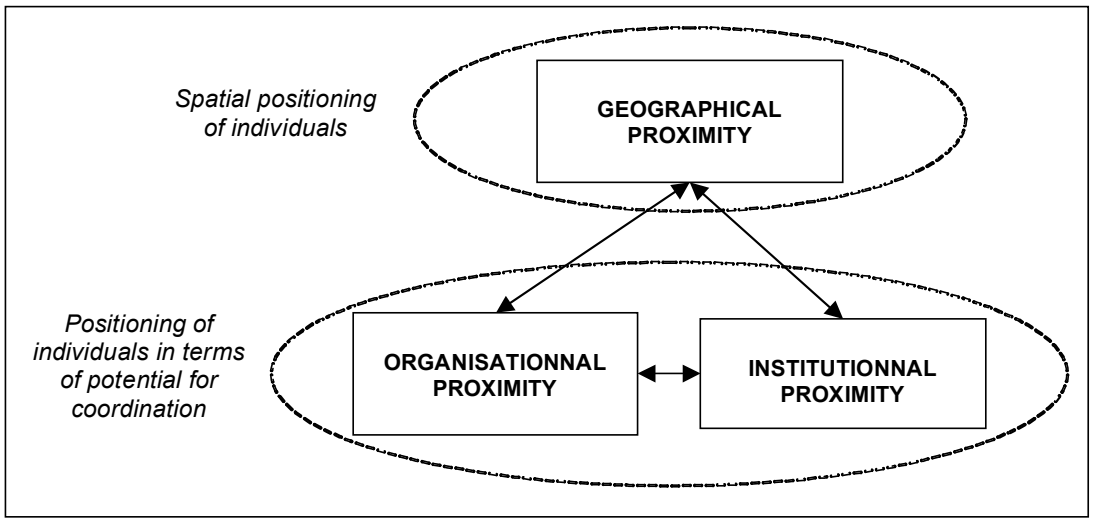
The first section presents the gird of analysis based on the work done by the French group "*Dynamics of Proximity"*. The second section deals with the relations between geographical proximity and relocation. After making some general propositions, it discusses the weight of the "permissive factors" of relocation in the case of software development. The third and fourth sections focus on coordination issues and make some general propositions about organisational and institutional "factors of achievement" of relocation. Each kind of proposition is discussed in the case of software development. We base some of our comments on the empirical study by interviews we have carried out in 2006 among 'location' managers of software companies.

2. The proximity dynamics framework: overview

Considering that firms choose locations simply in order to minimise costs of production is too limited in order to understand why relocations are or are not implemented by companies. More detailed analysis is required of the issue of the coordination among entities and between workers who interact both locally and globally. To do so, we propose to use the proximity dynamics framework.

The researchers of the French group "*Dynamics of Proximity"* have developed the notion of proximity that includes the spatial dimension of coordination, highlighting how this dimension improves our understanding of the mechanisms of coordination (Rallet [2002]). Hence, geographical proximity is a condition that permits coordination but coordination cannot take place without another form of proximity, not geographical, but relational, which is linked to the capacity of individuals to share and coordinate with each other. **Geographical proximity thus means the spatial positioning of individuals while relational proximity – in its two forms, organisational and institutional - means their respective positioning in terms of potential for coordination** (figure 1).

Figure 1: The proximity dynamics' framework



Geographical proximity is usually expressed in terms of the distance in kilometres that separates two units (individuals, organisations…) but it doubly relative (Rallet and Torre [2005]). On one hand, it is related to the means of transportation and so cannot be measured only in terms of physical distance as this physical distance must be weighted to take into consideration the time and the cost of transport. Geographical proximity is thus a social concept (Gilly and Torre [2000]) which depends notably on political decisions that enhance both physical access (through transportation infrastructure) and virtual access (through ICT infrastructures) to a given location. On the other hand, geographical proximity is also a relatively subjective concept, depending on the judgements made by individuals concerning the distance that separates them.

Organisational proximity refers to coordination inside an organisation where the organisation is understood as a "space of defined practises and strategies by agents with the set of rules set by institutions" (Kirat and Lung [1999]).

Institutional proximity expresses the adhesion of agents to a common space of representations, of patterns and of rules of thought and action (Ibid).

These two forms of relational proximity are not commonly used by all the members of the research group. For some of them, there is only one kind of relational proximity: organised proximity. According to Rallet and Torre [2005], it means the ability of an organisation to make its members interact: "the organization facilitates interactions within it, and anyway, makes them *a priori* easier than with units situated outside the organization". But two logics of organised proximity are clearly distinguished by the authors (Ibid, p.50):

- the **logic of belonging**: "two members of one organization are close to each other because they interact, and because their interactions are facilitated by (explicit or implicit) rules and routines of behaviour that they follow";
- the **logic of similarity**: "two individuals are considered as close because they are 'alike' i.e. they share the same system of representations, which facilitates their ability to interact".

The authors use "organisation" as a generic term to define all types of system of structured relations without prejudging its form. It could be a company, an administration or a community. This approach creates problems because it does not clearly identify the frontiers of an organisation: what is 'inside' and what is 'outside'. Interactions thus occur only within a pre-existing organisation. Moreover, this definition seems to mean that people who are "similar" belong to a common organisation. This is misleading because to feel similar does not systemically involve a feeling of belonging to a specific and identified community[3]. Although each approach has different objectives, they are nonetheless close. To a certain extent, one can assimilate the "logic of belonging" to that of organisational proximity and the "logic of similarity" to that of institutional proximity.

[3] The authors themselves recognised that organised proximity could involve interactions between individuals from different organisations or between organisations.

3. Needs for geographical proximity and relocations

3.1. Gird of analysis

The question of where to locate an activity (so the question of relocate it or not) firstly depends on the need for geographical proximity which can be measured by the frequency of physical interactions that is needed to achieve the appropriate level of coordination between individuals and/or units involved in the production process. The choice of one site over another is directly linked to the perceived need for these interactions and, when this is perceived to be very high, this implies that units will be more likely to be located close together.

However, the link between location and physical interactions is not binary: the need for geographical proximity does not automatically mean sharing the same site (co-location). The notion of the frequency of interactions is thus introduced because it is recognised that the need for geographical proximity is not necessarily permanent. This is true even for activities often associated with the need for shared tacit knowledge, such as research and development or activities needing input for 'co-production' from both users and suppliers (Carrincazeaux, Lung et Rallet [2001]). There may be a need for proximity at certain stages of an activity or for specific short periods during the production process. It is thus possible to distinguish between two types of needs for geographical proximity. The first involves **temporary** requirements for geographical proximity, so temporary co-location, for example, by sending teams of dedicated personnel for a specific period. The second occurs when the need for physical interaction is more diffused and necessitates **transitory** co-location, for example, through business travel allowing meetings all along the production process. The choice of a "**proximity location**" meets these needs for physical proximity. Rallet and Torre [1998] define the proximity location as follows: two entities are proximity located if it is possible to travel from one to the other and back, and to interact, in the same day. Coordination by proximity location (without sharing the same site) depends heavily on how frequently physical interactions are necessary.

Our assumption is thus that the potential for relocate an activity directly depends on the frequency of physical interactions that is needed to achieve coordination. It is clearly recognised that three mains factors make coordination from a distance easier: ICT use, mobility and modularity.

- *Proposition 1*: **ICT use** (virtual mobility) reduces the need for geographical proximity, as the frequency of the need for physical interaction is reduced.

Comment: The degree of virtual mobility depends on how individuals who have to interact master the tools of ICT, as well as more purely technical matters – in particular, access to the appropriate ICT infrastructure.

But ICT did not make disappeared the needs for geographical proximity (face to face) between interlocutors (Gaspar and Glaeser [1998]), even if this proximity is now temporary.

- *Proposition 2*: For the coordination by proximity location to be effective it must be assumed that the interacting individuals are physically **mobile**.

Comment (1): The degree of mobility influences strategies of location in cases where the requirements for geographical proximity are temporary or transitory. Where the need for proximity is permanent, co-location will be needed irrespective of the degree of mobility. Where there is no need for physical interactions, choosing a location depends on other

criteria, in particular on the means and costs of transportation, qualifications and costs of available labour and means and costs of communication.

Comment (2): As with the concept of distance, mobility depends on subjective factors in addition to physical ones. The reduction in the cost of transport and the increasing availability of transport facilitate the development of the physical mobility of individuals but it naturally varies depending on the generation and the sector of activity. For some jobs, the need for physical mobility seems obvious as it is included both in the employment contract and in the working practices.

Combining these physical and virtual forms of presence; such mobility offers individuals the ability to act simultaneously locally and globally at the same time, being "here and there" (Rallet and Torre, [2005]). Let us consider now that companies are seldom single-activity or single-function and that an activity usually implies different stages which in turn involve varying needs for geographical proximity. We thus come to the third element to be taken into consideration - modularity.

- *Proposition 3*: **Modularity** makes coordination from a distance easier because it is a key factor of the international division of labour (Berger [2005]; Moati and Mouhoud [2004]). *Comment (1):* We have to consider modularity in its two forms, technical and functional.

Technical modularity consists to divide a product in several reusable components which can be produced by different units and assembled together in another one. It leads in relaxation of the needs for geographical proximity between workers acting in the production of these components.

Functional modularity consists to divide an activity in several more or less independent stages. It leads in the decreasing of the frequency of physical interactions between actors involved in these different stages, for example between suppliers and customers all along the production process in the case of co-production by users and makers.

Comment (2): Technical and functional modularities not necessarily coincide and necessarily vary from one sector to another (Frigant and Talbot [2005]). One should consider each of them in terms of the physical interactions required between workers and between customers and suppliers for each stage of each activity and among them.

The links between the frequency of the physical interactions required and the location of production units are summarised in table 1. This general table can be used for interactions with customers, interactions with partners or sub-contractors, or interactions within a company during the production process (between workers, between workers and managers, between functions…). Broadly, there are three mains types of "location". They are linked, one by one, with the three forms of relocations[4] which depend on the physical distance between the site of production and that of consumption (final or intermediary).

- "**Offshoring**" is the common term used for long distance relocations (for example by American or European companies to India or China).

- "**Nearshoring**" is the term used for relocations to a country near the national territory (for example Brazil for the United States or North Africa for France).

- "**Onshoring**" (or relocations within the national territory) is the term used when companies import workers and pay them according to the salary norms in their own countries.

[4] The definition adopted here is that of the French Finance Commission, which defines relocations as all trade-offs made by firms that result in unfavourable decisions in relation to the location of activities and employment on the national territory (ARTHUIS, 2005).

Onshoring, of course, depends on labour legislation and, for example, while it is allowed in the United States, it is banned in France.

Table 1: The links between frequency of physical interactions and location.

Need for geographical proximity	Permanent	Temporary or transitory	None
Type of location	Co-location	Proximity location	No impact. Choice of site which will depend on other factors
Potential for relocation	Not possible to relocate (*onshore possible)*	Potential relocation *(nearshore)*	Potential relocation (*offshore*)
Structure of production sites	As many sites as there are target markets or productive partners	One structure for several markets or partners, proximity located.	One structure for several markets or partners

3.2. Empirical study: the case of software development

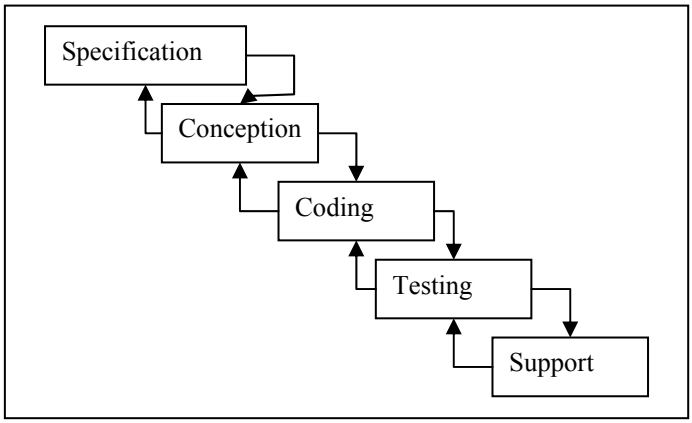
For software development, one should consider that mobility and ICT use seem obvious. In this sector, physical mobility is clearly included in the contract of employment and in the working practices and not surprisingly, ICT companies are themselves amongst the earliest users of ICT. Moreover, because the product is immaterial, there is not cost of transport. So, to begin to distinguish between activities which can be relocated or not depending on the requirements for geographical proximity, software development firstly needs to be broken down into several stages (functional modularity). Then, we have to take into account the need for geographical proximity in each of these stages, between customers and producers and also between workers (or between entities) involved in these different stages (technical modularity).

Broadly, one can consider that software development is categorised into "on-demand" (or "custom") developed software mainly produced by ITSCs (Information Technology Services Companies) and generic software produced by software publishers. ITSCs and publishers are the two dominant actors of the software sector. Following the model set by giants like Microsoft, Oracle or SAP, software publishers produce generic software destined for mass markets. ITSCs (IBM services, LogicaCMG, Sopra…) aim to respond to the need for adapting IT tools to the different businesses of their customers, and to the need for adaptation of their customers' practices to IT tools. They provide global solutions usually by using standardised components. The software developed by ITSCs are of use only to a limited number of customers usually working in a particular and similar sector (they are often called trade-oriented software).

On-demand software development is broken down into the same stages as when writing generic software because this division refers to software engineering (figure 2). The first stage of "specification" consists to describe the future program (what it has to do), i.e. to list all the functions needed in it. The second stage of "conception" consists to check these functional objectives against technical constraints, i.e. to technically describe the program (how the functions will be realised). The third stage of "coding" means "writing software", i.e. translating technical conception into an operating program a computer can process. Finally, software are testing (fourth stage) and have to be integrated in the information system in the

last stage of "support" which occurs all along software are used (technical assistance, improvements and corrections).

Figure 2: The waterfall model of software development



Source: Adapted from Arora *et al. [2001].*

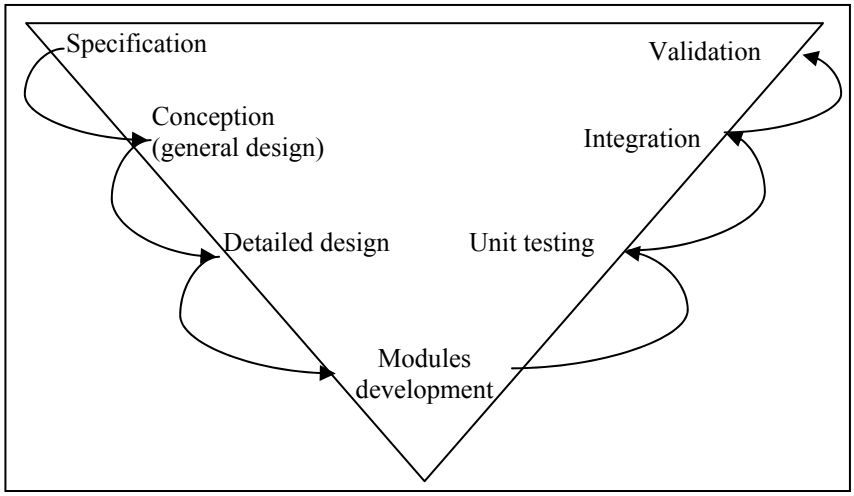
Regarding location issues, the main difference between these two kinds of software development is that customers are involved in the production process of on-demand developed software while they are anonymously taken into account in the pre-stage of market research in the case of generic software.

In relation to the on-demand software development activity as a whole, the need to interact with customers is initially temporary when it concerns the initial stage of functional specification (customers and producers design software together) and in the final stage of integration at the customer's site. It thus becomes clear that for on-demand software development, initial and final stages require interactions with customers so are usually located close to the customer. Temporary co-location is needed during these stages. The need for geographical proximity becomes transitory throughout the production process (stage 2-4) as customers and producers meet to discuss progress on the project and throughout the life of the product because technical assistance will involve specific physical interactions interventions (linked to the support contract entered into by the two parties). These requirements can be met by business travel.

Technical modularity plays a quite important role in the development process, for both kinds of software development. Functional specification and technical conception appear independent of one other and, as such, it could be considered feasible to relocate technical conception from functional specification. However, in reality, they are actually usually closely linked because they are carried out by the same employees. Both of these two stages have to be co-located (close to customer pools in the case of ITSCs).

As regards the coordination between initial stages, production stage (coding and testing) and final stages (integration and support), the need for physical interactions is mainly transitory but it depends on the quality of the technical conception. The more closely specified the software, the easier it is to coordinate its development from a distance through ICT use and occasional meetings between workers involved in the different stages. So the development stage can be relocated (offshore) either entirely, or for some technical modules depending on the degree of technical modularity. In the case of software development, technical modularity refers to the "V-cycle of development" which is schemed in figure 3. It has been developed because software development cannot be as linear as shown in figure 2.

Figure 3: The "V-cycle" model of software development.



Source: Adapted from Printz *[2001]*.

Indeed, the primary input is human knowledge and brain force but one human cannot develop software alone. For example, developing a data base management system will cost between 300 and 600 years to a single developer. Following BALDWIN and CLARK (2000) or SAKO (2003), modularity has at least two dimensions which meets two key issues of software development:

- "modularity in conception" which consists to prepare coding by independent modules so which allows parallel development by teams geographically dispersed (between 300 and 600 developers during 1 year in our example);
- "modularity in production" which consists to develop reusable modules which can by modified and adapted for new uses.

Lastly, final stage may also be partially (according to the remarks made about interaction needed with customers) relocated in the same way as for the development stage and to the same location, because software bugs are fixed by those who wrote them.

In fine we can see in table 2 the theoretical potential for relocation in the software development activity that depends on the requirements for geographical proximity between stages and during stages.

Table 2: The potential for relocation in the case of software development activities

Stages	"On-demand" software development	Generic software development
Specification	Proximity location (nearshore)	Relocation (offshore)
Conception	Proximity location (nearshore)	Relocation (offshore)
Coding	Relocation (offshore)	Relocation (offshore)
Testing	Proximity location (nearshore)	Relocation (offshore)
Support (1) Integration and on-site technical assistance (2) Technical maintenance	Proximity location (nearshore) Relocation (offshore)	Relocation (offshore)

This initial distinction partly explains the difference in the degree of relocation between the United States and Europe. The main reason for this is linked with the requirement for geographical proximity with customers which explains that relocations are easier for software publishers than for ITSCs. And what we know is that there are much more software publishers in the United States[5] which clearly dominate this branch of activity at the international level. On the other hand, the phenomenon is limited in Europe where ITSCs are clearly the main component of the software sector (excepted for United Kingdom where relocations are higher than in the rest of Europe). For ITSCs, the potential for relocation is lower, because of the physical interactions needed with customers.

In the peculiar case of mulit-units ITSCs, the question of relocations seems important because of their current reorganisation that has been termed "industrialisation." Historically, the location of ITSCs was determined by the level of geographical proximity required with customers for whom they offered on-demand and specific services. As they emerged in the 1970s, the location of their units was thus guided by the location of their customers. MAY (2004) termed this the "agency model" of ITSCs' location in which there are as many agencies as there are customer pools, and each agency operates independently of the others in terms of management, human resources etc. and offers all the services proposed by the company. May demonstrates that there were two inter-related evolutions that led ITSCs to rethink their spatial allocation from the mid 1990s. The first was the increased possibility of coordination from a distance through improvements in ICT. The second was the increasing technical modularity allowing the redeployment of technical and human resources. The agency model was replaced by a model termed "service centres" where organisation is closely linked to what is produced and not to customer markets. Resources and production can thus be pooled and shared in the service centres which are not responsible for the commercial interaction with customers. Each centre has its own technical specificity and is linked with the others and with central agencies. There are no longer as many agencies as there are customer pools but one agency for several ones. They remain business orientated and take care of customer relations and achieve coordination between centres.

A study carried out in 2005 by PAC and Syntec on the French case showed that 80 percent of "service centres" are located in France, 15 percent elsewhere in Europe and only 5

[5] In addition, labour laws allow onshore relocations in the United States.

percent outside Europe (SYNTEC 2006). It shows that most of the new service centres have been located on the national territory. In addition, those that have been relocated they have tended to be located nearshore rather than offshore**.** Why have these service centres not been relocated, given that Table 2 shows that this is possible? Moreover, relocations are limited, including for publishers (in 2005, offshore activities represented no more than 2.8 percent of the global software market).

It seems that an approach based solely on the requirements for geographical proximity does not explain everything.

4. Organisational proximity and relocations

The links between organisational proximity and the potential for relocation depend:

- (1) on the specificity of the rules and routines taking place in the working acts coordination;
- (2) on the ownership strategies of the company in relation to the technologies it has developed that are integrated throughout the production process.

4.1. How organisational proximity matters in working acts coordination

Organisational proximity firstly concerns the coordination between working acts. As a social construct, it is specific to an organisation and linked to the way it is organised. It refers to the mode of coordination within an organization; so to its organisational routines. As Reynaud [2005] has shown in her reflexion about the concept of "routines", four meanings of the term can be distinguished by combining tow distinctions: individual/organisational and static/dynamic (table 3). Our argumentation is based on this typology.

Table 3: The four meanings of the term 'routines'

Types of behaviour Learning capacity	Individual	Organisational
Static	"Skills"	"Standard operating procedures"
Dynamic	"Individual capability to solve new problem"	"Organisational routines"

Source: Adapted from Reynaud *[2005, p.856]*.

- **Organisational behaviour**: Because routines cannot be easily transferred from one organisation to another, one must take into account the level of specificity of organisational routines.

Proposition 4: The stronger are organisational routines, the fewer working acts could be long-distance coordinated, and therefore could be relocated.

Comment (1): Dynamic organisational routines involve dynamic learning capacity so are called the "repertories of actions" (Pentland and Reuter [1994]). They refer to the change ability of organisation routines (Reynaud [2005]) so they are clearly the stronger ones.

Comment (2): Static organisational routines (standard operating procedures) refer to the simple decision-making rules adopted by the firm that need minimal information (Reynaud [2005]). In an evolutionary language, they constitute the memory of the organisation (Cyert and March [1963]; Nelson and Winter [1982]). They may too limit the potential for relocation. Of course, some elements of them may be specified in the contract of employment

and job descriptions, such as the need for mobility. Nonetheless, the majority of these routines remains specific to the members of the organisation as they interact in the production process (working routines) and is linked to the specific compromises of the company (wage relations, management…).

- **Individual level**: furthermore, organisational proximity refers to the degree of tacitness of working acts. It is clearly high and determinant in the "individual capability to solve new problems without undermining the general functioning of an organisation" (Reynaud [2005]) because it refers to the 'search' capability that Nelson and Winter [1982] defines as the capability to advance through a process of trial and error. At the opposite, these authors define "skills" as the capacity to execute the same task repeatedly. But static routines can be 'tacit' so cannot be clearly standardised. As the static/dynamic distinction, we prefer here consider what Storper and Salais [1997] termed the "degree of standardisation/specialisation of working tasks" which helps them to distinguish two types of working tasks. 'Specialised tasks' are linked to the idiosyncratic character of the worker and, for these tasks, an essential element in coordination is the confidence afforded to the employee. 'Standardised working tasks' are those "that anyone can do". They can be assessed by general and objective criteria such as ISO norms.

Proposition 5: The more feasible it is to assess tasks with general and objective criteria, the more likely it is that these criteria could replace internal coordination (in this case, organisational proximity means the sharing of these criteria.). The less it can be, the more internal and face-to-face coordination are required.

Comment (1): Following our discussion about geographical proximity, "international norms and certifications" can be viewed as a fourth factor of coordination from a distance.

Comment (2): In this light, taking into account organisational proximity allows us to better address the question "can an activity (a stage of an activity) be relocated?" It directly depends on the degree of externalisation of the activity being considered or, in other words, the ability to do the task from a distance. This means understanding the weight of organisational constraints in the coordination of working tasks. Already, with this analysis, we understand more clearly why execution tasks are more easily relocated than those related to design, as they are more easily assessed. It also clarifies why companies frequently relocate their activities within existing subsidiaries where organisational proximity has already been attained rather than use international subcontractors. This is particularly true when there are no objective criteria for job assessment. This analysis also helps us to understand why 'onshoring' (the integration of foreign workers within the existing organisation) can sometimes be preferred to 'offshoring' (the integration of one or several managers/workers of the organisation in a foreign organisation).

4.2. Organisational proximity as "logic of belonging": intellectual property issues

Secondly, organisational proximity (the "logic of belonging" of organised proximity) can be understood as what belongs to the company. Of course, coordination form a distance may partly depend on the codified or tacit nature of the technologies concerned but also on the ownership strategy of the company in relation to these technologies. What is important here is to consider what is, and what is not, strategic for the company in relation to questions of technological transfer, so of property rights, secret protection or know-how it doesn't want to be shared. In this way, organisational proximity can be understood as relating to what belongs to the company, i.e. what it wants to be shared only by its members.

- *Proposition 6:* Even if a technology appears to be one that could be easily transferred because it is already codified or could easily be codified, a company could choose to maintain control over it either through trade secrets, through intellectual property rights or by refusing to allow licences on patents. So the company could choose to relocate by creating subsidiaries rather than sub-contracting with local companies.

Comment (1): According to our remark about the main limit of the notion of organised proximity, the frontiers of an organisation can be more easily defined with this approach, as it becomes more feasible to distinguish an "inside" and an "outside."

Comment (2): Taking into account this dimension allows us to address the two questions: "what activities does the company want to relocate?" and "what are the organisational forms taken by the relocation?" Even if design tasks could be relocated, this will not necessarily occur, because of ownership issues. When relocations do occur, they generally tend to happen in the form of subsidiaries or majority stakes in order to retain control over technologies and over profits linked to these technologies. The same holds for operational tasks, even though they may be relocated in the form of international sub-contracting.

4.3. From myth to reality of relocations of software development activities (1)

The notion of organisational proximity is based on the idea that interactions are favoured between members of a company because they share a set of rules, of specific know-how and organisational routines, be they formalised or not. Tacking into account its role for the achievement of coordination through propositions 4 and 5, we can better understand two main tendencies of relocations of software development activity:

- (1) On one hand, proposition 4 could help explaining why it is impossible to choose locations solely based on labour costs: aside from these costs, reproducing organisational proximity is not easy to achieve. In addition to the risk of starting to work in unfamiliar territory, there is the risk that organisational proximity will not develop sufficiently for the coordination to be effective. This helps explain the tendency for multi-location exhibited by ITSCs**.** Using their networks of pre-existing subsidiaries that were originally oriented to local markets and with whom they share organisational proximity, they are able to gain some of the benefits of relocation without losing organisational proximity. This explains why ITSCs are not relocating their activities to the same areas.

- (2) On the other hand, proposition 5 explains the opposite tendency that some limited and specific geographic areas could emerge as "offshoring clusters". Shared certification between **suppliers and customers** are forms of organisational proximity that allow for coordination from a distance of individuals who are not part of the same organisation. Relocations are thus frequently directed to certain 'territories' known as clusters that are well known for offering a specific concentration in certain activities with specific norms in place for measuring their performance. In India for example the existence of CMM[6] norms allows companies to easily assessed coding. Because over half of the CMM level 5 in the world are in India (Arora *et al.* [2001]), at least two "publishing clusters" have emerged there: Bangalore and Hyderabad. The same goes for Israël for security and antivirus technologies.

[6] CMM (Capability Maturity Model) is a model for evaluating an assessing the progress of software processes. It involves five levels of evolution towards 'mature' processes: initial, reproducing, defined, mastered and optimised.

But, also in this case, why offshore relocations usually take the form of creating subsidiaries rather than sub-contracting with local partners? In order to understand the organisational choice for relocations made by software companies, we have to consider together with proposition 5, proposition 6 linked with ownership issues.

- (3) Technological transfer could partly explain why relocations of conception functions (technical conception) are of little importance so why it is currently the testing and coding stages that are usually relocated. But conception (research development or technical conception) begin to be relocated. In this case, it is easy to understand why companies prefer creating subsidiaries rather than sub-contracting. But the same goes for coding and testing tasks while they can be relocated simply by using foreign sub-contractors as intellectual property rights (IPR) allow companies to retain added value. In spite of the policy reforms to reinforce IPR protection made by emergent countries – such as in the 1990's in the case of China and India (Prevezer [2007]), relocations in the software publishing sub-sector have been achieved mainly through the creation of subsidiaries or by majority stakes. IPR protection is not sufficient to limit technological transfer. IPRs exist to make it illegal for the source code to be read from the object code[7] because source code includes all the specifications of the software, i.e. all the knowledge incorporated in (created in the technical conception stage). So giving another party access to it (to code or to test it) means giving her access to all this knowledge[8], despite IPR protection. In order to avoid this knowledge going outside the organisation, firms are more likely to make the choice of establishing subsidiaries or majority stakes rather than entering into international sub-contacting arrangements.

5. Institutional proximity and relocations

The links between institutional proximity and relocations both concern working acts coordination and relationship between suppliers and customers.

5.1. Working acts coordination issues: how 'near'-shore refers to the institutional proximity shared

Institutional proximity means that two individuals, two entities or two geographical zones, share a common system representations which make their interactions easier. So the first main role of institutional proximity lies in the **choice of location for new sites or new trading partners**, including international sub-contractors, in particular when objective criteria for labour assessment do not exist. Institutional proximity presupposes that there exists a common language which pre-exists the interaction. It allows two individuals who do not belong to the same organisation, or two organisations, the capacity to interact without sharing a site, even temporarily, because each one reacts to and evaluates the actions of the other in the framework of a shared set of values, without having to have these explained. Coordination is supported by a set of conventions, where the term convention refers to a system of reciprocated expectations held by participants in the convention (Salais [1989]).

- *Proposition 7:* The choice of location, the answer to the question "where can the company relocate?", thus depends on the institutional proximity which refers to the sharing of

[7] Source code is the version of software written in programming language that can be understood by humans. Once it is translated into machine language it is object code, which can operate a computer but which cannot be understood by humans.

[8] This access depends on cognitive capabilities of workers to read it. In the case of emergent countries where conception functions begin to be relocated, these capabilities seem now obvious.

a common culture, of common social or political norms, or of similar education or training systems.

Comment: This kind of need for institutional proximity clarifies what "nearshore" means. As proximity is not only physical, the 'near' in 'nearshoring' not only refers to the "geographical" dimension of proximity generally used but to the institutional proximity shared by actors (or by countries). The choice of 'nearshoring' does not only answer transitory or temporary requirements for geographical proximity but the need for institutional proximity in relation to coordination from a distance. However, it is not ICT use which reduces the frequency of physical interactions but it is institutional proximity which actually allows the reduction of the requirements for physical interactions. ICT could simply be seen as a technical way to support this coordination from a distance.

5.2. The institutional proximity shared with customers: the choice to keep national locations

Secondly, institutional proximity matters in the **relationship between customers and producer**s when suppliers design their products and services with their customers and because, eventually, customers assess their quality. They thus need a common language in order to support this relationship. This language may have been developed throughout previous interactions and this language expresses the confidence customers should have in their suppliers.

- *Proposition 8*: It is also institutional proximity that explains the fact that companies still keep their sites in their customers' country, via co-location or proximity locations (but on the national territory), although some of these activities can potentially be relocated.

Comment: As a social construct, geographical proximity is not only a condition that permits interactions to occur but it is also an effect of institutional proximity (Rallet [2002]). Co-location of customers and suppliers may, in fact, lead to a permanent requirement for geographical proximity but as time passes this requirement becomes less strong and it is institutional proximity which determines the choice of co-location, be it permanent or temporary.

5.3. From myth to reality of relocations of software development activities (2)

On one hand, institutional proximity makes coordination easier because individuals involved in the process share it. It initially concerns the existence of "historic" proximity between ITSCs and customers. Institutional proximity refers to the sharing of common social or political norms. An example of this would be for example suppliers and customers who are experienced in tendering for public markets and who hesitate to contract directly with foreign offshore companies, such as Indian ITSCs. While the location of the agencies of an ITSC may originally have been decided with geographical proximity as the primary concern, following proposition 8, the decision to keep them during a period of re-organisation can be explained by the need for institutional proximity. One specific stage of the production process could be conducted either at the customer's site, at the ITSC's one, at a foreign subsidiary or with an offshore partner, but it is one of the main roles of ITSCs to maintain relationships with their customers, through national agencies which carry out the initial and the final stages of the process. These agencies are determined to maintain this role despite the growing competition which today comes mainly from Indian ITSCs**.** As shown by May [2004] in her analysis of the reshaping of proximity of ITSCs, ITSCs maintain their national sites in order to translate the previous need for geographical proximity into a strategic asset. This is

particularly true in relation to Indian competitors who are currently establishing on the national territory. But in order to be short-listed by customers, who are themselves well informed of the cost advantages of offshore, ITSCs have to possess offshore capacities. An ability to claim both offshore capacity and local agencies is an important strategic tool in the battle to win business. It is in order to preserve their national locations that ITSCs have engaged in relocation. This also explains why Indian companies are attempting to buy European ITSCs rather than simply establish subsidiaries in order to obtain more market share in developed markets by taking advantage of the institutional proximity they do not themselves possess.

On the other hand and as regards the coordination of working tasks (proposition 7), institutional proximity, linked to the requirement for temporary geographical proximity, explains for example the choice by French companies to locate their service centres in France but outside Paris and in countries institutionally "near" such as North Africa. Institutional proximity does not only imply a common language but also involves, for example, a similar kind and level of IT training. While North African students do not actually study in France, their courses are close enough to those in France for them to share many common cognitive maps which make it much easier for them to work together with French graduates. It is thus not only the need for geographical proximity which explains the development of service centres near-shore but also institutional proximity. In the same way, the fact that US companies have relocated to India is not simply because of the potential for relocation of software publishing activities on the offshore form. Sharing institutional proximity means that many of these relocations can almost be classified as being near-shore**.** The same can be said for relocation towards India by many UK companies. This can also explain why, despite its low labour costs, China has not become a favoured site for US relocations, as there still remains a significant institutional gap.

6. Conclusion and further research

The paper had two linked objectives, theoretical and empirical.

- At the 'theoretical' level, the objective of this paper was to pave the way for an analysis of the relations between proximity and (re)location of productive activities in order to try to clarify the phenomenon of relocations by focusing on coordination issues. This paper has shown that the deterministic analysis should be rejected: mobility, ICT use, modularity and low transportation costs are only prerequisites for relocation to the extent that they are reducing the requirement for geographical proximity. Relocations cannot be explained simply as a trade-off between the need for geographical proximity and production costs. Therefore, they do not depend solely on technical criteria such as modularity, but on organisational and institutional proximities which may or may not facilitate coordination from a distance. Further work on this analytical gird has now to be done in two directions. Firstly, by applying it to others sectors in order to test the eight propositions we have made here and to refine them. Secondly, by developing a more dynamic gird, particularly by clarifying the game between the three logics of proximity in order to consider where they are complementary and where they can be substituted for one another and to allow measuring their combined effects on relocations issues.

From an empirical point of view, taking into account institutional and organisational proximities has allowed us to explain the current dynamics of relocation of software development activities. While it is often cited as a sector with a high potential for relocations, the reality indicates that deterministic analysis which tries to establish a directly causal link between technical issues and relocations, is inappropriate. Coordination costs are much higher

than communication or labour costs. In dynamics, the divide between geographical proximity and 'relational' proximity can enrich our comprehension of relocations, firstly by the 'permissive' factors (linked to the needs for geographical proximity) which explain if they could occur and secondly by the 'factors of stability or achievement of relocations' (linked to institutional and organisational factors) which open the way for further research. The first will consider the question of the trajectories of relocations (how and why they 'come back' on the national territory and how and why they move from one to country to another to another such as in the case of call-centres…). Following Andersen [2006], the second will pay attention to the feedback effect of relocations, i.e. the ability for high tech companies located in less developed areas which benefit from relocations to use them as a platform to penetrate high tech markets in developed countries.

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