Diffusion of Information Technology Management Capabilities in Global Business: a Comparison of Intra- and Inter-company Experiences

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The comparative analysis highlighted substantial differences in the diffusion process applied. Diverse settings led to disparate transfer processes; the dissimilar traits of the practices being studied also induced substantial differences regarding which transfer approaches would work and which ones would not.

In the intra-company dissemination case, the multinational company studied took a relatively loose, casual approach to the diffusion of the Operations Management practice, compliance with which was not deemed essential but rather a mere productivity opportunity. By contrast, attainment of the integration capability achieved through the Information Systems Architecture practice was considered critical; other mechanisms were applied, such as transfers of key personnel, coupled with management-encouraged job rotation and close monitoring.

In the Inter-company diffusion case, a benchmarking approach proved basically applicable in the case of the Operations Management practice. However, insufficient understanding of the underlying logic in the case of the Information Systems Architecture practice forced the modification of the benchmarking procedure, both in terms of the process followed and of the composition of the benchmarking teams; the modified procedure adopted is summarized in this paper.

In the case of the merger/acquisition studied, the absorption represented both an opportunity for the sharing of the capabilities and a compelling determinant of the need for the diffusion to take place. However, cultural dissimilarity, employee resistance and environmental disparity hindered the rapid diffusion, particularly of the Information Systems Architecture practice.

 This comparative analysis led to the following conclusions:

- Under certain circumstances, firms can leapfrog organizational learning by appropriately stimulating the transfer and adaptation of practices that lead to the development of valuable capabilities, whose unassisted internal development would have taken much longer.
- This diffusion process is hindered by certain characteristics of capabilities; in the case of Information Technology management capabilities, tacit content and context dependency are particularly relevant.
- This diffusion process can be provoked both between different units of a company and across the firm's boundaries; in the latter case, an appropriate collaboration agreement must be previously established.
- Several approaches, discussed in this paper, have been developed, including adapted benchmarking, informal internal diffusion, etc.; their appropriateness in a specific setting can be estimated based on certain parameters (environment disparity, culture and attitude, etc.)

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1. Introduction and objectives

The strategic nature of Information Systems (IS) in today's competitive environment has been clearly established (Ciborra, 1994). The role of Information Systems as facilitators and enablers of strategic options as diverse as vertical and horizontal scope or geographic dispersion, as well as their potential role as stumbling blocks, when not appropriately managed, slowing down or even blocking strategy implementation, have also been extensively discussed. This is particularly the case in global business, which can make full use of the enabling capabilities of IS, such as geographic decoupling, overcoming time and distance barriers, allowing in practice both centralized and decentralized management of geographically dispersed operations, and, since the Internet full-scale implementation, economically supporting "horizontal", peer-to-peer intercompany communication at a global scale.

However, merely investing in Information Technology (IT) does not guarantee achieving those advantages, as shown by the "Productivity Paradox" (Loveman, 1988), or apparent lack of correlation between investment in IT and productivity/ profitability. Achieving technical expertise and adopting the latest, most sophisticated technology does not guarantee success either, as exemplified by a number of well-known high-tech project failures (Barki et al, 1993; Markus and Keil, 1994). Those tangible (investment, Hardware, Software, ..) or intangible (technical expertise,

...) resources, even though required, are not sufficient. They have to be appropriately mobilized through the Information Management capabilities of the firm (Grant, 1995).

Those Information Management or Information Technology (IT) Management capabilities determine what the organization can do, in such aspects as absorbing and operationalizing the IT, integrating it with both the business strategy and the day-to-day business operation, and managing the IT-mediated process of transforming raw data into information, and then into knowledge. Those capabilities can not be either internally developed overnight (due to time compression diseconomies), nor easily purchased (Barney, 1986 and 1991; Amit y Schoemaker, 1993; Dierickx y Cool, 1989; Black and Boal, 1994). They are developed collectively, as opposed to concentrated in designated, easily transferable individuals, and they show high causal ambiguity, therefore facilitating rent appropriation by the firm. These characteristics, coupled with their relative scarcity and their relevance, conform the potential of IT Management capabilities to provide firms with substantial sustainable competitive advantage.

This study is focused on the dynamic, organizational learning process of developing, implementing and applying these capabilities (Teece and Pisano, 1994; Nonaka and Takeuchi, 1995), and specifically on their intentional, company-driven diffusion, both within the boundaries of the company and through partnership agreements with other organizations.

The intra-company diffusion process is especially critical in global companies, that must conduct business in diverse geographical and cultural environments while at the same time operate a seamless, integrated set of Information Systems. The term "information archipelago" (McFarlan et al, 1983), initially coined to describe isolated functional systems, could also become applicable to the non-integrated information islands that might develop within these global companies if they do not succeed in spreading and uniformly implementing Information Management capabilities, particularly those related to information integration capabilities.

The intentional inter-company transfer or diffusion of these capabilities between partners has twofold implications. On one hand, it can be analyzed as one option for accelerated organizational learning; in that case, the existence of a partnership relationship merely represents an *opportunity* for learning from the accumulated knowledge of the partner (or for capitalizing one's accumulated experience, by demanding some type of compensation from the partner in exchange for the know-how transfer). On the other, the partnership relationship, in an increasing number of cases, might represent *both* an *opportunity* for the sharing of these capabilities and a compelling *determinant* of the need for the diffusion to take place. In a growing number of cases, such as IT-enabled alliances (Applegate et al, 1996), long term strategic alliances or mergers and acquisitions, the business relationship among partners (or, in the case of mergers and acquisitions, among what used to be different companies, and often from an operational perspective still are, even though with a common owner) requires a level of integration between the Information Systems of the partners well beyond conventional, standardized, arm's length EDI approaches (Gutiérrez and Durán, 1997).

This intra- or inter-company diffusion is complicated by two peculiarities of capabilities that are particularly applicable to Information Management capabilities: tacit knowledge content, and their contingent or context-specific nature.

- *Tacit content*. Information Management capabilities are embedded in the organizational routines or practices. They represent a know-how that can only partially be codified and made explicit;

the tacit, not codifiable knowledge is particularly difficult to transfer, especially between culturally dissimilar environments, in which the lack of a shared reference framework hinders communication.

- *Contingency.* The complex organizational routines or practices upon which these capabilities are based are not equally appropriate in all organizational contexts. An organizational routine or practice that might induce a high level of performance in a process under a given set of circumstances (size, culture, technological sophistication, etc.) might prove counterproductive in another environment, whether it is a disparate subsidiary within the same firm or a different company. Since it is not the capability (the "effect") that gets transferred, but rather the practice or routine (the "cause", in the hope that the "effect" or capability will follow course), intentional capability diffusion must provide for contextual adaptation.

In this study, we analyzed and compared the diffusion process in the three settings described before, namely:

- *Intra-company dissemination*. We analyzed the process used by a multinational company to spread these capabilities across different geographic and business environments within the company.
- *Inter-company diffusion as a learning opportunity*. We analyzed the management-led, intentional, benchmarking-based process of IT management capabilities transfer employed by two cooperating partners, a multinational company and a large Spanish company.
- *Interorganizational diffusion both enabled and required by a new partnering/merging agreement.* We analyzed a case of a large merge/acquisition, and how the acquiring multinational company attempted to instill its IT management capabilities into the culturally very dissimilar Spanish acquired company (neither the multinational nor the Spanish company were the same as in the previously mentioned study cases).

For this comparative analysis we concentrated upon the diffusion process, in each setting, of two IT management practices that we feel are, when taken together, representative of the set of practices that materialize the IT management capabilities: the Operations Management practice (encompassing how computers and data centers are managed, and how computer applications are supported) and the Information Systems Architecture practice (encompassing how computer application development is required to comply with a global set of restrictions, such as principles, models or standards, to achieve the target level of integration).

In-depth exposure to each of the study cases was facilitated through the direct, substantial involvement of at least one of the authors in the management of each of the processes being analyzed.

2. Intra-company dissemination

The analysis of the process used by the multinational company participating in the study to spread these two Information Management practices across different geographic and business

environments revealed that the diffusion process was largely dependent on the peculiarities of the practice being disseminated, which are discussed below.

2.1 Differential characteristics of the Information Management Practices studied

For the purpose of this study, the most relevant differences between the two practices whose diffusion is being analyzed are those related to the peculiarities that hinder diffusion, as discussed above: context-dependency and tacit content.

2.1.1 Context-dependency

Both capabilities turned out to be context-dependent, thus requiring adaptation; however, the specific dependencies or ways in which the appropriateness of each routine was contingent on the organizational context were much clearer in the case of the Operations Management practice, thus greatly facilitating the adaptation.

This was a consequence of the way in which the organizational learning process that led to the initial development of both practices took place. The development of the Operations Management practice followed a fairly rational, structured, systematic course. Even though there was a certain amount of learning by doing and learning from mistakes, the basic logic behind most elements of the practice was understood. The relationship between the various aspects of the practice and the benefits achieved, the costs involved and how these were influenced by the characteristics of the organizational unit in which it was to be implemented, such as size or level of technical expertise, were identified and justifiable.

On the other hand, the Information Systems Architecture practice was developed through a far less structured trial-and-error process. This is not to say that learning took place through merely random exploration of all possible alternatives; obviously, the initial set up and the ulterior development of this complex practice was facilitated and cross-fertilized by the contributions of a number of highly skilled and experienced employees, who had at least an intuitive understanding of which approaches might work, and therefore were worth trying, and which ones could be discarded downright. However, beyond this initial "filtering", the learning process was based on a gradual consolidation of those routines that contributed to the Information Systems integration capability, and a tendency to replacing those that showed little or negative contribution. The underlying logic, assuming one existed, was not the basis for these choices; actually, the "official" verbalization of this logic was developed only after the fact, when the routines were already established, and was used more to "rationalize" and communicate the practice than to develop it. Therefore, without a thorough, reliable understanding of the underlying logic, there was no solid foundation for the adaptation process, since the dependencies of the appropriateness of the routines on the environmental variables was unknown.

2.1.2 Tacit content

It follows from the discussion above that the Operations Management practice was comparatively easier to explicitly codify. The underlying logic, the network of relationships, and the ensuing

routines, were better known and easier to explicate. Like any organizational routine, it did have its share of tacit, non codifiable components, but in comparison to the Information Systems Architecture practice they were less critical.

Two specific aspects might deserve highlighting. One is the "formal", "theoretical" or "after the fact" nature of the explicit formulation of the Information Systems Architecture practice, that would, by the way, be vehemently negated by its writers. This does not imply that it is either false or wrong; however, it illustrates the fact that the existence of a well-structured model and documentation of the practice, that claims to be all-encompassing, does not necessarily guarantee that there are no substantial areas of poorly understood, tacit, not codifiable knowledge that is essential for its implementation. The other aspect illustrated by this analysis is the existence of different "levels" at which a practice can be coded or made explicit, ranging from informal and merely indicative, such as informal verbal descriptions, to formalized and comprehensive. At the "formal" end of this spectrum, this study highlights the importance of the computer applications as a way of coding in detail various aspects of a practice. In this case, various computer applications had been developed to support the implementation of the Operations Management practice. They were intricately related to the detailed operational procedures, and therefore served to convey significant components of the "know how"; attempts to develop similar tools for the Information Systems Architecture practice were hindered by its tacit component.

2.2 Dissemination process

The two practices being analyzed had somehow different intracompany diffusion targets. The Information Systems Architecture practice was basically applicable only in those subsidiaries undertaking Information Systems development or procurement, while as the Operations Management practice was, in principle, equally applicable in any subsidiary (all subsidiaries had substantial IS operations), and therefore required wider distribution. On the other hand, the compliance requirements were much more relaxed for the Operations Management practice. Any way of operating that achieved adequate service levels was, in principle, acceptable; diffusion of the practice was considered more an opportunity for harvesting existing capabilities than a business prerequisite. Conformance with the Information Systems Architecture practice, however, was deemed essential to achieve the required integrability of the systems being developed.

2.2.1 Operations Management

Consequently, diffusion of the IT Operations Management capability or know how, initially developed basically in the large headquarters (HQ) operation centers and materialized in the implementation of the Operations Management practice, took place largely at the initiative of the adopter subsidiary, and in a gradual manner.

As a first step, the HQ operation centers provided to interested subsidiaries written documentation describing how Operations Management was carried out there, roles, responsibilities, tasks, etc. The above mentioned supporting computer applications, along with their user manuals, were also provided.

Casual visits by subsidiary IS management personnel to the HQ operation centers, while staying at the HQ to attend other meetings, provided the opportunity to observe the actual functioning of the Operations Management, as well as to maintain informal discussions with key personnel.

With this information, involved subsidiaries decided the elements of the practice, as well as the supporting tools, that were considered applicable in their particular environment. Formal discussions were then held with the HQ operation centers management, to agree on a support plan. This support plan typically involved training, visits or short stays of subsidiary technical personnel with their HQ counterparts, support visits by the HQ technical staff to the subsidiaries at critical points of the implementation plan, as well as discussions between the subsidiary IS management and the HQ operation centers management on such issues as changes to the organizational design, roles, responsibilities, procedures, etc.

2.2.2 Information Systems Architecture

The distinct peculiarities of this practice, outlined in section 2.1, coupled with the differences in diffusion requirements, led to a substantially different dissemination process.

The multinational company analyzed had a policy of "excentralized" application development, meaning that business applications for all subsidiaries were basically common, and developed, from a "logical" point, centrally, only once for all subsidiaries. However, from a geographical and organizational point of view, the Application Development Groups (ADG) were dispersed over various subsidiaries; each group developed applications of one type (e.g., call handling applications were developed by an "excentralized" development group in one country, financial applications by another ADG in a different country, etc.) for all the others. Therefore, the target integration context for the developed applications was the same for all groups (they all had to be integratable in the standard application portfolio of any subsidiary). Even though the practice was context-dependent, and the Application Development Groups applying it were based in dissimilar subsidiaries, the practice was dependent on the target context (where the developed applications would have to be integrated and executed), that was common, and not on the context of the Development Group (i.e., it did not substantially depend on the characteristics of the business environment in which the Applications Development Group was located).

Consequently, in this specific case there was little need for contextual adaptation. On the other hand, it was considered that thorough implementation of the practice was indispensable in order to achieve the required integration capability.

This strict conformance requirement conditioned the practice transfer process. As in the case of Operations Management, both the written documentation describing the Information Systems Architecture practice and the (limited) supporting computing tools were distributed to new ADG's. However, this written documentation and the "casual" visits and occasional support, while appropriate for the Operations Management practice, was not deemed sufficient in this case. When establishing new Application Development Groups, key positions were filled with personnel coming from established ADG's, who had fully internalized the practice and were well acquainted with its implementation. Job rotation between ADG's, in spite of their geographical dispersion, was

strongly encouraged. Internal audits and checks were performed to evaluate the implementation of the practice.

In spite of all these measures, it was perceived that achieving truly homogeneous implementation of the practice in many different ADG's was difficult; this was a major argument in limiting the number of development groups, in spite of the pressure exerted by the subsidiaries (each of which would have liked to get their share of centrally-funded "excentralized" resources).

3. Inter-company diffusion as a learning opportunity

In order to perform a comparative analysis between the intra-company dissemination described above and the process of diffusion across the firm boundaries, we studied the procedure followed by two cooperating but organizationally distinct partners.

Therefore, we analyzed how a large Spanish company transferred and adapted to its own circumstances these two practices, Operations Management and Information Systems Architecture, initially developed and implemented in a multinational company with which they had established a partnership. However, as opposed to the next case discussed below, this partnership did not *require* the transfer of the practices, since the business relationship that existed was not dependent on the integration of the respective Information Systems; the existence of the partnership was merely an opportunity, an enabling factor making possible the cooperation required for the transfer.

This transfer was perceived by the Spanish company as an opportunity for accelerated organizational learning. An adapted benchmarking approach was utilized (Camp, 1995; Durán et al, 1996); however, as in the previous case, the peculiarities of each practice led to differences in the diffusion process.

3.1 Operations Management

In this inter-company diffusion, the contextual adaptation required was significant. Not surprisingly, the operations environment of the Spanish company (size, technical proficiency of the staff, management attitude, culture, labor relations, ...) was farther apart from the multinational company than one subsidiary from another in the previous study case.

However, as discussed in 2.1.1, the Operations Management Practice had been developed through a fairly rational, structured, systematic process. The underlying logic was basically understood, as well as the dependencies between the major design decisions or major benefits and the characteristics of the environment in which it would be implemented. Consequently, the methodologies described in the benchmarking literature were applicable to determining which aspects of the multinational's practice would be applicable in the local company, which would not, and what modifications were required.

Documentation describing existing procedures and computer based supporting tools were particularly useful in the process. Once the practice was understood and the documentation an computer applications were gathered, the selection of applicable elements and the adaptations required due to the differences in environmental parameters (size, etc.) could be evaluated. This evaluation was carried out by a team of IT management specialist, coming both from the Spanish company and from a consulting organization; very limited direct involvement of personnel from the "reference" multinational was required (as suggested by most benchmarking methodologies).

A sensible estimate of the foreseeable benefits deriving from implementation of the practice in the Spanish firm could also be derived based on the multinational's experience; this estimate was utilized to perform the cost-benefit appraisal required for management approval.

3.2 Information Systems Architecture

However, the underlying logic behind the Information Systems Architecture practice was not well understood; the practice itself had developed, to a large extent, through a trial-and-error process. These practices have the highest potential for providing sustainable competitive advantage, since they reflect years of experience with alternative approaches and are particularly difficult to imitate and to internally develop. In those circumstances, the initial attempts showed that the description of the business practice as such (the Information Architecture, in this case), however well documented, was not sufficient for the extrapolation process. The problem was that, given that the underlying logic was not known, there was no reliable approach to determining which aspects of that practice were still applicable in the context of the Spanish company, which aspects had to be discarded and what modifications should be introduced.

The approach finally adopted for deciding which components of the practice adopted by the multinational company would be applicable in the local firm is summarized in Figure 1.
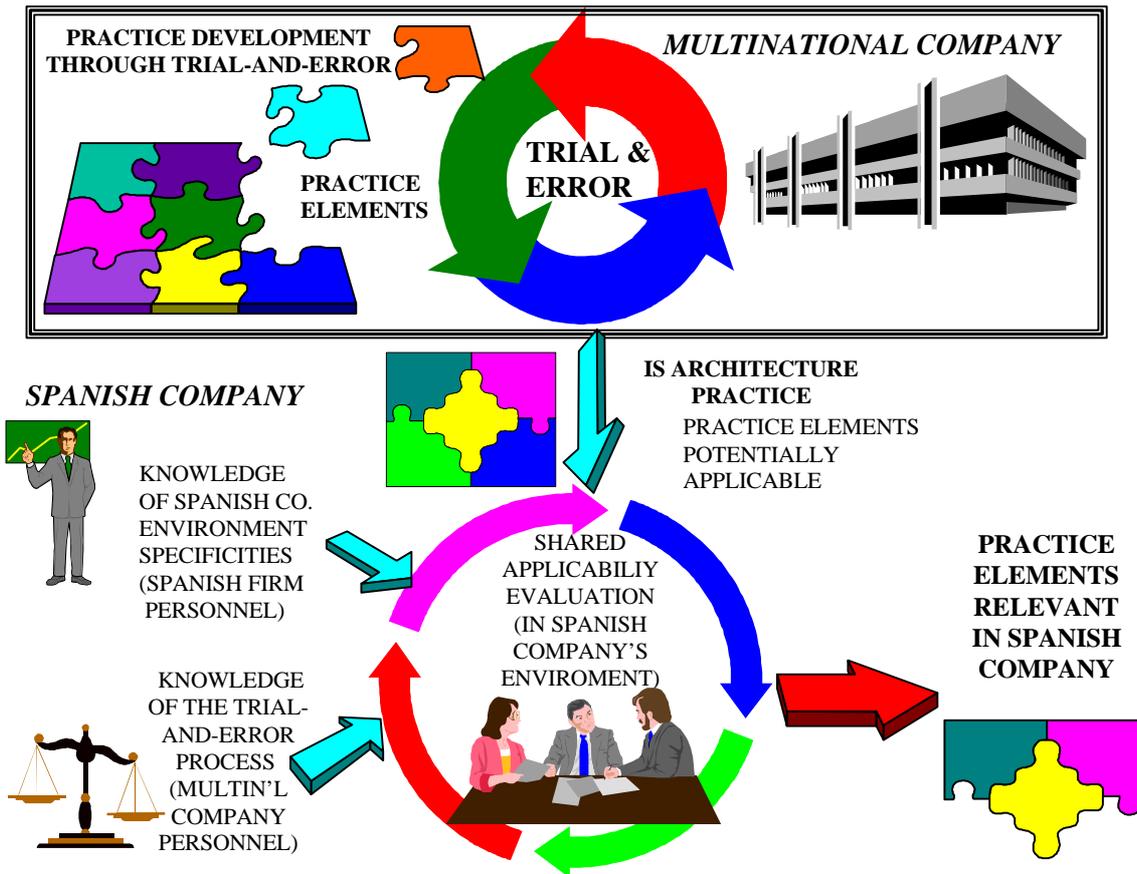
Figure 1.- Selection of Information Systems Architecture practice elements deemed relevant in the Spanish firm's environment

The figure shows, at the top, the iterative approach originally followed by the multinational company to define the Information Systems Architecture practice. Viable practice elements were actually implemented, and their contribution to the objectives monitored. Those providing the best results were consolidated in the final practice (obviously, this is an idealization / simplification / rationalization of the trial-and-error process followed).

Elements contained in the practice finally adopted by the multinational company were then considered "candidates", potentially applicable in the Spanish company. In order to determine both which of these potentially applicable components to choose and how to adapt them to the specifics of the target environment, two inputs were required. First, like in the case of the Operations Management practice, experienced personnel from the Spanish company, fully acquainted with its differential characteristics, had to be involved. Second, in this case it was essential to involve personnel from the multinational company, that knew in depth not only the resulting practice, but specially the trial-and-error process that had led to it.

With these inputs, discussions were then held to try to re-construct the trial and error process, but in the environment of the target company. Thus, the team had to estimate whether the **process** of trial-and-error, if conducted under the circumstances of the Spanish company, would have led to the

same conclusions, i.e., would have led to the adoption of the same practice elements. The outcome of the exercise, for each element, could be the inclusion in the Spanish company Information Systems Architecture practice, the rejection, or the specification of the modifications to be performed. This approach captures a much richer information about the original trial-and-error process, thus reducing the amount of expensive and slow trial-and-error based organizational learning required in the Spanish company after the implementation.

4. Interorganizational diffusion both enabled and required by a new partnering/merging agreement

The third setting studied in this paper was illustrated by the case of the acquisition (officially presented as a merger) by a multinational company of a very disparate, large Spanish firm, with which it had previously established several partnering agreements (neither the multinational nor the Spanish company were the same as in the previously discussed study cases).

This acquisition meant that the Spanish company theoretically became a subsidiary of the multinational, therefore from a formal point of view it could be argued that the situation was similar to that analyzed in section 2, Intra-company dissemination. However, from an organizational learning point of view the cultural and operational dissimilarity between the two former companies did not suddenly vanish simply because of the ownership transfer; thus, the process of practice diffusion was more similar to an inter-organizational transfer than to an intra-company transfer.

Under those circumstances, the new relationship among the organizational groups involved (the multinational's headquarters, HQ, and the local company) represented both an *opportunity* for capabilities sharing and a compelling *determinant* of the need for the diffusion to take place; the need for coordinated operation required a quantum leap in the level of integration between the Information Systems of the constituent units.

4.1 Operations Management

Similarly to the situation discussed in 2.2.1, there was an attitude of flexibility regarding the uniform implementation of the Operations Management practice; any way of operating that guaranteed adequate service levels was acceptable, specially during the initial stages. In this case, there was an additional stumbling block for the rapid implementation of the practice: its contextual dependency on the technological infrastructure.

A task force, including staff from both companies and outside consultants, was formed to explore opportunities for either swift transfer or gradual convergence to the practice. After the initial analysis, three distinct areas requiring different approaches emerged:

- *Off-limits practices, requiring immediate correction*. In spite of the relative laxity in the requirement of implementation of the practice, some of the current practices were beyond the

limits of what the acquiring company considered acceptable. As an example, some obscure outsourcing agreements, whereby an external data processing company performed a number of operations tasks in a way that could be considered a liability or at least a risk for the acquiring company, had to be rapidly canceled.

- *Step-by-step convergence where constrained by contextual dependency*. The contextual dependency of some elements of the Operations Management practice on certain characteristics of the environment, such as the Information Technology paradigm embraced (e.g., mainframe vs. distributed open systems) hindered their fast adoption. In those cases, since those blocking characteristics could not be modified abruptly, a medium term convergence plan was prepared and implemented.
- *Transfer of applicable elements*. For the rest of the elements in the practice, an approach similar to that described in 3.1 was found applicable. Two differences with the setting described there might be highlighted. On one hand, implementation was facilitated by the existence of a strong management push; on the other, the subjective resistance, feeling of being overturned, etc., made technical staff even less receptive to changes than in the case of the inter-firm transfer.

4.2 Information Systems Architecture

In this setting, promoting the accelerated diffusion of the integration capability through the transfer of the Information Systems Architecture practice proved far more difficult. A similar task force, formed to analyze the issue, identified serious difficulties hindering the transfer, stemming from the characteristics previously discussed:

- *Tacit content*. The impediment to the diffusion of the practice represented by its tacit content was compounded in this case by several circumstances:
    - Cultural disparity, between the multinational and the acquired company, aggravated by the subjective resistance.
    - Some of the approaches described in 2.2.2, that could be utilized to overcome this issue, were much more difficult to apply here, since relocation of the multinational's staff to an already overmanned acquired company, in a heavily regulated, protected labor environment was both troublesome and expensive. The top IS responsible was replaced by a multinational's experienced employee, but it was not feasible to replace the middle management.
- *Context dependency*, given the dissimilarity in environments, in such aspects as culture, technical background or information technology paradigm.

Given those difficulties, it was considered that achieving the desired level of integration capability in a short period of time was not feasible. Development projects in the acquired company were either halted, or allowed to continue but with a local scope, accepting the fact that they could not achieve the standard level of integrability.

5. Conclusions

The comparative analysis of these diverse settings for Information Technology management capabilities diffusion, namely:

- Intra-company dissemination.
- Inter-company diffusion as a learning opportunity.
- Interorganizational diffusion both enabled and required by a new partnering/merging agreement.

led to the following conclusions:

- Under certain circumstances, firms can leapfrog organizational learning by appropriately stimulating the transfer and adaptation of practices that lead to the development of valuable capabilities, whose unassisted internal development would have taken much longer.
- This diffusion process is hindered by certain characteristics of capabilities; in the case of Information Technology management capabilities, tacit content and context dependency are particularly relevant.
- This diffusion process can be provoked both between different units of a company and across the firm's boundaries; in the latter case, an appropriate collaboration agreement must be previously established.
- Several approaches, discussed in the paper, have been developed (including adapted benchmarking, informal internal diffusion, etc.); their appropriateness in a specific setting can be estimated based on certain parameters (environment disparity, culture and attitude, etc.)

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