

Understanding the Impact of ERP Standardization on Business Process Performance

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ABSTRACT

Enterprise Resource Planning (ERP) systems have currently become tools that enable organizations to standardize business processes. They offer rich functionalities based on best practices. The purpose of this chapter is to study the impact of this standardization on organizations with reference to the different theoretical hypotheses linked to the relation Information Technology / organizational change and according to four firm's cases (Airports of Paris, Pechiney, France Telecom and L'oréal).

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I. INTRODUCTION

Enterprise Resources Planning (ERP) is currently a great success with companies and its implementation has entailed remodelling management information systems (MIS), and above all, reconsidering management procedures within the organization. Henceforth, ERP systems are now tools that enable companies and multinationals to standardize their management processes. They offer rich and proven functionalities, based on best practices. Thus, most global companies are already equipped with ERP systems¹ and more and more medium-sized companies are trying to build up unified information system based on this software package. «ERP meet the requirements of universality: that everyone should work in his own language and understand each other» (Mourlon & Neyer, 2002).

The introduction of ERP systems in organizations then induces a standardization of management processes that has been called for by organizations to help them lay the foundations of an international system and assist them with their globalization strategy.

However, this standardization of organizational cultures can fail to produce the expected results. “The implementation of ERP aims to change the organization but this process can prove risky” (Besson, 1999). So, then what are the effects of this standardization induced by ERP-Systems on organizations?

To answer this question, we conduct an empirical study in four firm’s cases (Airports of Paris, Pechiney, France Telecom and Loréal).

After attempting to illustrate and define the ERP concept, this chapter shows the standardization potential of this tool. It then presents the effects of this standardization in accordance with the different theoretical approaches to the relation information and communication technologies versus organizational change.

II. THE ERP CONCEPT

Nowadays, ERP systems appear to have made their mark and become the standard for company information systems. Historically, company functional systems were developed on different equipment with different methodologies: realizations were thus generally heterogeneous both in terms of data representation and processing modes. This entailed many communication problems and some difficulties to control processing operations. Thus, the concept of ERP appeared in the form of integrated software packages whose purpose was to improve global coherence while contriving some form of modularity. It is thus an information system composed of standard functional modules directly linked to a single data base and that covers all the company’s processes. Moreover, an ERP system is more often than not a solution with an international dimension, capable of managing multilegislation, multilingual, and multicurrency contexts. Information feedback from the subsidiaries of a group, which are in different countries, has become possible. This is a major advantage in a globalization context since legal and linguistic environments are structuring levers for companies.

In parallel, other software packages have been developed to complement ERP to improve certain low performance functions or to add new ones. Most of these applications concern decision support: the whole system is then called SO-ERP or System Organized around an ERP.

In spite of the diversity of ERP systems offered on the market, the architecture and the functioning of these software packages are similar. They are organized in modules, each module covering one of the major functions of the company, including the data processing for the different management processes involved². The accountancy or the financial modules often form the core around which the other modules are organized.

III. ERP AND STANDARDIZATION

The characteristics described below, have led corporations and multinational groups to consider ERP as tool that standardize processes within their organizations. Indeed these tools meet the requirements of local regulations (accounting plan, legal statements and multilingual management). ERP systems have thus enabled multinationals to lay the foundations of an international system, and support their globalization strategy.

A. The Evolution of Standardization in Organizations

The basic purpose of standardization is to achieve the most efficient use of resources. The most important resources being the employees, standardization has always focused on the best use of human resources. Adam Smith mentions work standardization in his book "A guide to the wealth of nations". The next great step came with Taylor's research, in which he talked about standardizing all types of work. Eventually, as work became more and more complicated, people were trained to perform specific tasks. This was the beginning of the era of professionalism: it meant standardizing people. Nowadays, with the development of economic activity, increasingly large companies and the modernization of management methods, we are witnessing the standardization of organizations.

Until recently, information technology did not play a significant role in standardization. As organizations developed and competition increased, companies were led to improve performance. As work became more and more mechanized, Production, Finance and Human Resources were the first departments to be computerized. Financial accounting Software (FAS), the Payroll Package had a great impact on these three departments. This was the great step towards the organized entry of information technology into companies: the standardization of departments within organizations. The next logical step for any company was then to extend the standardization concept across all departments within the organization. And since each department is necessarily linked to another, a comprehensive suite called Enterprise Resource Planning (ERP) led to the standardization of work practices.

B. The Standardization of Business Processes

Beyond its tool aspect, ERP is above all a management concept. Its implementation has externalities on the overall functioning of the company. It affects two major elements: the information system and the organizational processes.

Indeed, the systems organized around an ERP are presented as a solution to the dispersion and fragmentation of information problem in companies. They use integrated client-server technology and set up large data bases which considerably improve the

availability and the circulation of information in the organization: all the information is captured once, is accessible at every level of the organization and is available in real time. The implementation of ERP is coupled with a standardization of the processes based on the benchmarking offered by the software chosen. Thus, the implementation of an integrated management software package induces two sorts of standardization: inside the organization and outside it.

1. Standardization inside the Organization

An ERP is based on a single referential: all the data and the objects used by the different modules are defined in a single standardized format and managed by only one type of software (very often a relational database management system). In the same way, user interfaces are defined identically, whatever the modules. Thus, capture screens and financial statements can appear in the same form whatever the language of the user.

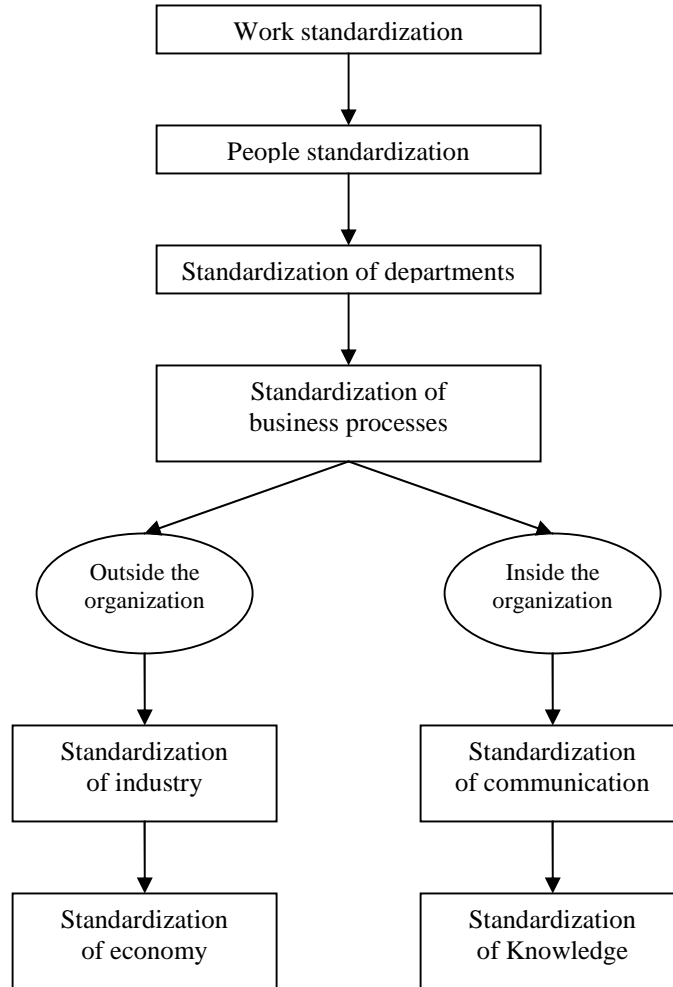
ERP systems offer technological evolution that corresponds to the introduction of intranet transactional architectures and technologies linked to the Internet. Thanks to its standardized communication protocol, the Internet has contributed to the improvement of the system of data exchange. Data exchange is easier and access to applications has extended to a larger number of users.

This is standardization of communication within the organization induced by ERP. In addition, this expansion of data sharing technologies has led to job sharing without geographical constraints. This development has extended to a new concept "knowledge management", which involves the standardization of knowledge throughout the organization.

2. Standardization outside the Organization

The first ERP systems were custom-built. But very soon, new ERP systems appeared that offered a major advantage, that is to say, not only were they better than their predecessors, but they also aimed to optimize management processes. Thus, the engineer who designed the integrated software package based it on process models stemming from best practices in the sector (the know-how of the best companies in a given sector is capitalized on). Lee and Lee (2000) describe ERP systems as a basis for the best practices and best management processes, offering methods that are recognized as the most advanced in the business world or in a given industry. The analysis of best practices enables the publisher of software packages to define a set of management rules which constitute a standard for a given sector. This then brings about the standardization of business processes not only on the scale of the organization, but also on that of the entire industry. We even believe that with the continuous development of the new information and communication technology industry, the next step will lead to a standardization of the economy.

Fig. 1
The evolution of standardization in organizations



IV. RESEARCH METHOD

This chapter describes the main results of a research study that aimed to propose a set of guidelines for the impact of business process standardization on management, when implementing an ERP. Four case studies involving big companies were retained. The first case study was undertaken at L’Oreal Group International, a leader in cosmetics and beauty. The second case study was carried out at Pechiney Group, the world’s fourth largest producer and transformer of primary aluminum. The third case study was conducted in “Aéroport de Paris” Group (ADP), the leading airport group in Europe. The fourth case is that of France Telecom (FT), first French telecommunication

company. The first three groups use the same ERP: the last generation of SAP: SAP R/3 while France Telecom uses Oracle Applications.

We select for this work a hybrid exploration of empirical observations and theoretical knowledge. Indeed, we initially mobilized concepts and integrated the literature concerning our research object. And then we lean on this knowledge to give sense to our empirical observations. The explorative character of this research drove us to choose a qualitative approach. The empirical research was conducted using a semi-structured interview method. Altogether 20 management controllers and managers from different levels were interviewed in the four companies of our sample.

For the data analysis, we chose to use the method of matrix analysis proposed by Miles and Huberman (1984). This mainly for two reasons: first, it is simple, rigorous and asks less time than the other methods of content analysis; second, it corresponds perfectly to the data collected through interviews. This method consists in analyzing the results by drawing a matrix where all the questions appear in the top of page (columns) while the referees are identified on the side of page (lines). Visually the subjects emerge clearly from such a shaping, made by direct reference to the transcriptions of interviews.

V. ERP: EFFECTS OF STANDARDIZATION AND ORGANIZATIONAL CHAGNE

The standardization of management procedures induced by ERP can have very varied effects on organizations. It appeared essential to position the different case studies in relation to the different theoretical theses on the relation of ICT³ versus organizational change. In the literature on the subject, three competing approaches are generally used to describe this ICT vs. organizational change relation: the contingent approach to technological determinism, the intentional approach and the emerging approach.

A. The Effects of Standardization According to the Technological Determinist Hypothesis

1. The Contingent Approach to Technological Determinism

According to this hypothesis, ICTs of exogenous origin strongly determine and restrict the structure and the practices of organization management. The use of the same technology automatically or almost automatically entails the same effects in all organizations. Leavitt and Whisler (1958), as well as Simon (1977)⁴, estimate that ICTs can cause lasting changes to organizations and to the nature of managerial work. Leavitt and Whisler (1958) estimate that the development of ICTs could generate centralization and a reduction in hierarchical levels. Simon (1977) claims that middle managers should stay on and that structures could become more complex with the development of transversal links. Leavitt and Whisler's vision comes within the scope of the theory of contingency, which was to develop subsequently and which considers technology as one of the main determinants in the structure of organizations.

In 1977, Chandler, a company historian asserted that the invisible hand of managers has replaced the invisible hand of the market where new techniques and market expansion have enabled an unprecedented volume of products to pass through

the different stages of production and distribution at an unprecedented pace. He illustrated the case of the big railway companies which could not have developed without the telegraph, which enabled people geographically scattered to communicate. Technologies and more particularly ICTs could thus be decisive in explaining the development of large companies and their structures.

According to Berry (1983), management instruments (e.g. ratios, matrixes, computerized management systems) determine behavior and thus act like invisible technology. In his view, these instruments (conceptual or material) simplify reality, structure the behavior of agents, generate local logics often opposed to reform, regulate the balance of power and condition the coherence of an organization.

Rowe (1999) explains the considerable development of the market for ERP software in the last few years (though these systems are very costly for companies) by the fact that the marketing of ERP is based on a determinist explanation of standardization and on the transferability of some of the knowledge linked to experience.

2. Pechiney: Optimizing Management Processes

Strong data and language standardization simplifies communication and reduces the difficulties of training users. It obliges all the entities in a same company to work in the same way, which facilitates comparisons between the different units; the consolidation of data and the exchange of information.

The standardization induced by ERP has thus enabled Pechiney to lay the foundations for an international system and thus accompanies them in their globalization strategy. When SAP R/3 was implemented, operational processes such as the follow-up of customer orders, manufacturing management, accountancy were studied, modeled, and optimized since ERP is designed around best practices. The customer company thus benefits from these best practices when it harmonizes the organization around its information system.

So, groups resulting from multiple mergers or companies disorganized by fast growth can thus find a rational framework to structure themselves. Bancroft *et al.* (1998), Davenport (1998), Bingi *et al.* (1999), Adam and O'Doherty (2000), Parr and Shanks (2000), and Summer (2000) specify that ERP is associated with a set of management processes based on best practices and composed of knowledge which ideally should be transferred to organizations. This knowledge is produced outside the organization, by a group of experts and is introduced in the organization in addition to existing knowledge. Implicitly or explicitly, this supposes a "transfer of knowledge" between two separate entities — the expert who develops the information system and the organization. On one hand, this transfer results in a better functioning organization. On the other, it results in the benchmarking of work procedures, methods and rules.

B. The Effects of Standardization According to an Intentionalist Hypothesis

1. The Intentionalist Hypothesis

According to this approach, the structure of an organization is the result of a deliberate strategy freely decided by the managers. Managerial perception and will are the main explanatory elements in the conception of organizations.

From this perspective, ITCs are mere tools that managers adopt and use according to their needs. As early as 1977, Galbraith presented the different alternatives available to managers to adapt to the uncertainty of the environment. They can either reduce uncertainty (e.g., by changing the environment) or increase the organization's information processing capacity (by developing transversal links or by designing higher performance information systems).

Following the example, Galbraith, Tushman and Nadler (1978) estimate that to answer the needs for information, managers are not forced to develop their information system. They can adapt the structure of their companies or choose among other optimal solutions according to the context.

For Daft and Lengel (1986), companies need information systems, not only to deal with uncertainty, but also to face up to the ambiguity of any situation. The richer a system is in terms of information quantity, the more it helps in dealing with uncertainty, but it also generates more ambiguity. Managers have to try and determine the information system that is best adapted to their needs.

This research work falls within the scope of a normative and contingent approach to the conception of organizations, namely that there are several optimal solutions according to the context. It is the manager's duty to look for them. ICTs are the means available to managers who have to be adapted to the strategy of the organization.

Thus, to avoid the unforeseen effects of a strong standardization of management processes induced by the use of ERP, organizations have adopted alternative solutions.

2. L'Oréal: Personalizing ERP to Adapt It to the Organization

The managers in L'Oréal consider that one of the key factors of the success of their company partakes of its capacity to differentiate units and to personalize the processes. So, standardization can weaken essential sources of competitive advantage. So, L'Oréal opted for more personalization by reconfiguring some modules.

However, configuration does not authorize all company fantasies. It is often up to the company to adapt its procedures to those of the tool. The operating process of an ERP system is invariable from one company to another. "Configuration only acts at the margin, through the choice of the fields available on a screen or a document, for example" (Coat and Favier, 1999).

The final system will then depend, on one hand, on the limited possibilities and high additional costs of the adaptation of ERP, and on the other hand, on the often divergent needs of different users.

3. France Telecom: Limiting the Use of ERP to the Internal Information System

In France Telecom (FT), managers choose to limit the use of ERP system to the back office (accountancy and human resource). For the front office (account management, customer service), they continue to use their in-house information system.

In fact, they consider that one of the key factors of their success partakes of their capacity to differentiate units and to personalize the processes. However, an ERP can weaken essential sources of competitive advantage. Indeed, for some activity sectors

(mainly banks and insurance), one of the essential competitive advantages is the information system. These companies devote huge investments, both technical and human to master the information systems they have developed, implemented and used. For FT managers, adopting an ERP for the front office would be “an unacceptable regression”. In fact, the pooling of software packages between user companies and the resorting to best practices foreseen as standard in ERP, constitute the main danger when it concerns the core business. This revolutionary tool, which should provide decisive competitive advantage, is likely to be immediately available to the competition. That is why in FT, they use ERP for the back office, but retain in-house software for everything that concerns price fixing and customer relations, their “*core business*”.

C. The Effects of Standardization According to an Emerging Hypothesis

1. The Emerging Hypothesis

The emerging hypothesis attempts to make a dialectic synthesis of the two antagonistic approaches presented previously. According to this approach, the use and the consequences of ICTs emerge unexpectedly from social interactions. Managers choose a new ICT and define objectives once it is adopted, but its implementation takes place in an already existing organization and its use is therefore not wholly predetermined. ICTs only have potential effects on the organization.

According to David (1998), when a management tool is introduced within an organization, its members adapt the tool to their needs, but at the same time, the tool has an influence on the behavior of the players. Indeed, the contribution to knowledge generated by the tool alters both the cognitive schemes of each of the organization members and social relations.

Reix (1999), Marciniak and Rowe (1997) and De Ronge (1998) consider that the emerging hypothesis is the most realistic of the three, but that it still needs to be confirmed empirically.

Finally, the effects of standardization induced by the introduction of an ERP on the functioning of an organization are somewhat unforeseeable. As Besson (1999) says: “an ERP project is like a laboratory in which organizational coherence is being reconstructed”. Reix (1999), when talking about ERP, adds that “the results of this reconstruction are uncertain: it is an emerging process and not an action that can be rigorously planned”.

2. Effects Tempered by the Organizational Context

Man has the ability to constantly examine and revise practices in accordance with the new information he receives (Giddens, 1991). Company leaders are currently aware of the standardization effects of ERP. They can actually choose these with a view to introducing structural change and modifying the behavior of the other organization members. The intentionality hypothesis then appears to be fully justified. But if we push this reasoning further, everything becomes more complicated. The other members are also aware of the maneuvering of the decision makers. In the end, the reflexivity of man, makes the consequences of this standardization of management procedures unpredictable, and thus supports the emerging hypothesis. The integrated software

package whatever its degree of standardization will be influenced by the organizational context in which it is implemented.

The ERP system is confronted with the organization, characterized by some of the relations between the individuals who are part of it and by values and rules which are not necessarily consistent with the rules imposed by the system. Thus, the relation established between the ERP system and the organization is characterized by circularity and complexity. What kind effects of business processes standardization induced by ERP in a given organization is a question with no preliminary answer (except in a determinist perspective)?

3. ADP: The Flip Side of the Coin

As demonstrated by Merton (1940), any action undertaken to produce efficiency generates a certain amount of inefficiency. Thus, the adoption of ICTs generates efficiency and also some dysfunctioning, that is to say, unpredictable consequences. This is how, in ADP, standardization due to ERP, in the first stage, facilitated coherence within the organization, but in the second stage, reduced the organization's ability to innovate by limiting variety. It improves short term efficiency, but also limits the local experimentation that favors apprenticeship. Moreover, this standardization restricts the scope of choice and the possibility to follow the reactivity of the company in different activity sectors. It is simpler and faster to revise processes and find the right configuration when dealing with one country or one company. It becomes very complex to implement an ERP system when having to consolidate management rules and data in several companies or countries. It can actually become a utopian challenge.

On the other hand, the intervention of an outside integrator for the ERP implementation is founded on an implantation methodology based on the use of standardized processes resulting from best practices. This constitutes a major change in the organization of companies. Davenport (1998, p. 122) stresses the dangers of such a practice: "An ERP system, due to its intrinsic nature, imposes its own logic to the strategy, organization and culture of the company." Integrators and editors of ERP systems structure the processes so that they reflect best practices, but this corresponds to their vision of best practice which is not necessarily the same as the client's. "In some cases, the system will lead to the better functioning of the company, however, in other cases the bias of the system is likely to clash with the interests of the company." (Davenport 1998, p. 125) Indeed, in the past, companies chose systems which adapted their own processes, which in turn required rewriting some of the software's data processing lines so that it best complied with the organization conditions. However, in ADP, managers think that with SAP, it is their company which chose to adapt its processes, which triggered an upheaval in internal culture and posed threats to the entire organization.

VI. CONCLUSION

The different theoretical approaches to the relation Information and Communication Technologies versus Organizational Change can give a first answer to the effects of ERP standardization on business process performance.

In a determinist approach, standardization results in the optimization of business processes and helps companies develop their globalization strategy.

In an intentionalist approach, managers have to look for and find a subtle balance between an over costly adaptation of the software package to the characteristics of the organization (which reduces the benefits of standardization) and imposing too brutal change to the organization (which can result in undesirable effects).

Finally, the emerging approach brings to the fore the great incertitude concerning the expected effects of standardization which can generate inefficiency and subsequently constitute a non-negligible risk for the entire organization.

In our opinion, it is very important to carry out an in-depth study of this question with a wider field research, so as to observe the real effects of the uniformization of the organizational sub-cultures generated by ERP systems. The results of this research work could constitute, in our opinion, hypotheses for future research.

ENDNOTES

1. 7 in 10 of the highest profit making companies and 9 of the top 10 in terms of stock market capitalization are equipped with SAP (the undisputable market leader of ERP-systems). (Source: Curran et al., 1998, in R. Scapens et al., 1998)
2. In the case of SAP R/3 (the most current ERP in the world), a process is a set of activities using and producing data.
3. Information and communication technology
4. In Markus and Robey, 1988

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