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ERP DIFFUSION AND MIMETIC BEHAVIORS

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ABSTRACT

The emergence of enterprise resource planning systems (ERP) has often been presented as one of the main factors of organizational change within companies in the course of the last few years. The neoclassical and socio-rational analyses show that ERP adoption is often a rational choice in that it results from a cost-benefit analysis and indeed an optimization calculation. However, as articulated by Rogers' analysis (1983), firms are also influenced by information on the attributes of innovation collected from other members of their social environment. The mimetic chains theory provides a better understanding of the reasons why some companies in situation of uncertainty rely more on the positions taken by others than on their own private calculations thus triggering a process of diffusion by imitation.
In this article, we try to verify this hypothesis on a sample of French companies. For most of the firms, the perceived benefits determine decision-making, securing competitive advantages and the possibility of adopting a transversal organization. However, for a number of companies in situations of uncertainty as a result of the relative lack of pertinence of the information collected, ERP adoption frequently occurs as a result of mimetic behaviour. Over half the companies surveyed acknowledge being influenced by the decisions taken by the leading companies in their sectors.

JEL classification: M15, Q33

Keywords: *ERP, Adoption, Mimetic chain, Diffusion process, Rationality, Economic choice*

I. INTRODUCTION

The emergence of enterprise resource planning systems (ERP) has often been presented as one of the main factors of organizational change within companies in the course of the last few years (Robey, 2002). It presents companies with new opportunities and new challenges as ERP systems are configurable, modular and integrated computer applications whose aim is to optimize a firm's business process via a single referential and standardized business rules. Prior research has mainly addressed the conditions for successful ERP implementations. In our opinion, it has tended to ignore the fundamental issue of the conditions surrounding ERP adoption and diffusion. ERP systems are generally considered as major innovations. Taking innovation to be an idea, a practice or an object perceived as new by an individual or an organization (Rogers, 1995), its diffusion within large and midsize French companies consequently needs to be accounted for. In its simplest sense, diffusion can be defined as "*the process whereby an innovation spreads itself*" (Morvan, 1991). Some scholars differentiate between studies on the "adoption" of innovation and those on its "diffusion". Whereas adoption theories evaluate the characteristics that make an organization receptive to innovation, diffusion theories seek to comprehend why and how innovation is taken up and spreads (Kimberly, 1981). However, following Chatterjee's and Eliasshberg's analyses (1990), we surmise that, for a given population, diffusion implies the adoption of an innovation by the individuals affiliated to it. The most common definition of diffusion is that of Rogers (1995) who regards it as "*a process whereby an innovation is going to be progressively communicated through certain channels to the members of a social system.*" As Mahajan (1990) points out, this definition emphasizes four critical elements: the innovation, channels of communication, a time element, and a social system. The innovation diffusion process cannot therefore be regarded as an isolated phenomenon operating at the level of one individual, but rather as a social event that involves a whole array of actors belonging to a specific community. While Rogers identifies the various influences in the diffusion process among members of the social system in question, he still follows a socio-rational approach as his main focus is on the objective characteristics of the innovation to account for its adoption. Most of the work on the adoption and diffusion of innovation revolves around the characteristics that would ease or slow down its adoption. Yet, it could be assumed, as Alter suggests (1996), that "*the diffusion of an innovation does not represent any economic logic but more of a series of decisions made in a situation of high uncertainty.*" In a context of uncertainty, imitation should be given a central role. The mimetic chains theory points to a path that ascribes a central role to

informational imitation, as individuals seek to evaluate their opinion on the net benefits of innovation by comparing them with the positions taken by others.

The remainder of this paper is organized as follows. Section 1 will introduce the various diffusion analyses that depart from the traditional concept of a purely rational choice in an effort to integrate the influences occurring among members of the social system and the effects of imitation. In Section 2, a statistical study based on a survey of large and midsize French companies will demonstrate that EPR adoption does not occur solely as the result of a rational calculation but is indeed the result of the influence of the social system on an agent, the latter being at times under the pull of mimetic behaviors.

II. THEORITICAL ANALYSIS OF THE DIFFUSION PROCESS: FROM RATIONAL TO MIMETIC ADOPTION

Synthetically taking up the theoretical frameworks of the neoclassical and socio-rational analyses as well as of those on mimetic chains and adoption, we make a number of hypotheses on ERP adoption and diffusion. These analyses correspond to different visions of an individual in his or her social milieu. They can be summarized by the following maxim: “From an isolated agent to a communicating agent under the influence of its social milieu.”

A. Neo-classical analysis of a company’s ERP adoption: an isolated agent’s calculation

Traditional economic theory (Menger, 1892; Walras, 1874) argues that people are rational and attempt to maximize their own utility (Smith 1776). Enjoying perfect information and acting with regard to a future known with virtual certainty, they are, still according to traditional economic theory, “optimizing individuals” who maximize their profit. Von Neuman and Morgensten (1944) have extended this analysis to situations where the only thing an agent knows of the future is the distribution of probabilities regarding possible events. In a situation of so-called “risky future”, a decider is aware of all the possible options that ought to be taken into consideration. He or she can evaluate their consequences and, comparing them under the criterion of expected utility, select the option that maximizes it. Such rationality, termed utilitarian, is based on the principle of a subjective assessment of costs and benefits weighed by their distribution of probability. An autonomous decisional unit, an agent’s behavior is not conditioned by consciously or unconsciously assimilated social habits. The choices of others have no impact on their behavior (independence of the preference functions).

Within this framework, ERP adoption is an investment to be made if it creates wealth. An investment opportunity is evaluated according to the level of wealth it will create, assessed with the various tools and criteria available under neoclassical financial theory such as the net actual value criterion (NAV). Investment sub-optimality is measured in relation to the maximization of a firm's value as stipulated by modern financial theory. The purpose of this theory is not so much to account for investment decisions but rather to prescribe normative rules to select optimal investments. Charreaux (1999) provides a perfect summary of the nature of this traditional theory: "*In its traditional form, the neoclassical financial theory is nothing but a normative investment choice theory that merely offers a monetary evaluation of investments or, more exactly, of the stakes of the holders involved. Under the value of the stakes criterion, the agent supposed to decide – the designation of the decider being itself exogenous - chooses within a given set, investment projects whose value is determined in relation to purely technical imperatives and to the state of the environment.*"

Hypothesis 1: ERP adoption is the choice of an isolated agent who, under the financial theory, makes an optimization calculation.

This microeconomic analysis incorporates substantial shortcomings. It does not accurately depict the real behaviors of agents who are in situations of "limited rationality" (Simon, 1957) because of "reduced cognitive capacities," imperfect information and difficulties associated with the treatment of uncertainty. Furthermore, individuals are not isolated; they belong to a social milieu from which they generally derive their benchmarks.

B. Socio-rational analysis

Under the socio-rational concept of diffusion whose prevailing diffusion model is that of Rogers (1995), diffusion is promoted by the characteristics of the innovation (see Schumpeter for a taxonomy), as well as those of the adopters, their social systems and their milieu. Innovation will be adopted only where the individuals concerned are convinced of the interest or the gains they may derive from it, given the information at their disposal. Indeed, for Rogers, any decision pertaining to the adoption of innovation, which will also determine its diffusion, is essentially based on an adopter's perception of the innovation. This is an idiosyncratic and rational approach that defines the best way for a decisional unit to attain the target goal. It is a sequential stage process in the course of which an individual or a decisional unit move from an initial introduction to the innovation (1), to the formation of an attitude

toward it (2), to the decision to adopt or reject it (3), to the realization of the new idea (4) and finally, to confirmation of the decision to adopt (5).

[INSERT TABLE 1 HERE]

Zaltman *et al.* (1973) refer to Rogers' first two stages as the initiation phase. In the course of the first stage, individuals will seek to become acquainted with the novelty, its functionalities and pros and cons and will subsequently form their own opinion of it. This will enable them to articulate an attitude to adopt. During this phase, innovation is mostly evaluated by the decisional unit. The last phase, termed the implementation phase, includes the realization and confirmation stages. In the course of the first of these stages, the realization stage, the innovation will be implemented. Subsequently, a decisional unit will be able to confirm it as a new practice. On the other hand, it is always possible to abandon the innovation after its initial use. It is in this sense that Rogers defines adoption as "*the decision to make full use of innovation as the best practice available.*"

Under the socio-rational concept, the social system plays a critical role in the diffusion process. The diffusion of innovation is assimilated with a communication activity in the course of which information regarding a new idea is shared among previously informed and non-informed members. The two main channels of communication are the *mass media*, the fastest way to reach others, and *interpersonal channels*, based on direct relationships among individuals. According to Frambach and Schillewaert (2002), the involvement of decisional units in an information network facilitates the spread of information on innovation as well as its adoption. Innovation surfaces within a social system and it is also within a social system that the diffusion process takes place. Lind and Zmud (1991) stress that added interaction among members of a social system increases the speed at which innovation is adopted as well as its rate of adoption. In particular, they insist on the perceived characteristics of innovation to explain the probability and speed of innovation diffusion within the social system (Gatignon and Robertson, 1985). These elements play a fundamental role during the persuasion stage in the course of which the decisional unit assesses whether or not to adopt the innovation. Rogers and Shoemaker (1971) argue that the evaluation of innovation by potential adopters involves five attributes:

- A relative advantage or "perceived utility," which is the degree of superiority of an innovation over other existing innovations;
- Compatibility, which determines the degree of coherence with the values and previous experiences of individuals;

- Complexity or “ease of use,” which represents the degree of difficulty in understanding or using innovation;
- Testability or the possibility, whether small or strong, of trying out innovation in a limited way;
- Observability, which determines the degree of visibility of innovation by others.

Several studies have established empirical ties between the perceived attributes and the adoption of innovation. Davis (1989) and Adams (1992), for example, found a significant link between “relative advantage,” “ease of use” and the adoption of technological innovations. As part of a meta-analysis, Tornatzky and Klein (1982) noted that three characteristics (compatibility, relative advantage and complexity) have a substantial impact on the adoption of innovations. While the first two attributes facilitate adoption, complexity slows it down. Ostlund (1974) suggests adding “perceived risks” to these characteristics insofar as anything novel conveys uncertainty. In our opinion, this is included in the “complexity” attribute which takes hesitation due to novelty into account.

Hypothesis 2: The perceived characteristics of innovation determine a decider’s adoption behavior.

A review of the management research literature highlights the relative advantages of an ERP system, its compatibility with the logic of the supply chains strategy, its complexity and the risks associated with the project. ERP-related advantages are technical, operational and strategic. Businesses adopt ERP packages in order to benefit from inter-functional homogeneity, and to have a one and only similar system with a one and only similar database, a similar man-hardware interface for all workstations and a single administrative system for the various applications. Adoption puts an end to possible data incompatibilities (data re-entering….). It also puts an end to existing parallel systems which tend to duplicate the same functionalities as a result of the acquisition of separate software for each autonomous unit. It cuts down interface maintenance tasks and reduces the complexity of the information system architecture. ERP modularity and broad exportability, at operating system level as well as at the levels of the database management system or network, enable businesses to upgrade their information systems more easily. They can thus make do with the modules corresponding to their initial needs and subsequently improve their information system by acquiring new complementary modules. The time-span for the installation of a module varies greatly, requiring at least 6 to 8 months; 2 to 5 years are required for the installation of the main modules (finance, accounting, cost control, purchase, sales, logistics, manufacturing and human resources). However, the simultaneous deployment of different modules may be faster in the case of a Big Bang installation, reserved for very

large organizations. Unlike traditional applications that have a limited life span, ERP systems are standard software that evolve continually as new upgraded versions regularly come out.

Relative advantages are also organizational, with ERP systems challenging organizational concepts based on functional specializations. The analytical unit is no longer the function regrouping similar activities but the process running across a company's main functions (Davenport; Short 1990). The organization is no longer divided into large functions but becomes transversal with macro-processes that run across it. From an operational standpoint, companies can expect lower operating costs, productivity gains (McAffe 2002) and better registration of orders (fewer redundancies and simplified data-entering procedures). Adoption facilitates the acquisition and diffusion of information within and without a company by removing certain restrictions and making requests easier. It reinforces operational flexibility, defined as the capacity to deal with inventory shortages, short-term demand fluctuations and manufacturing issues related to product modifications, by giving the actors concerned access to relevant information and enabling them to communicate among themselves to make the necessary adjustments when faced with a problem. Advantages may also be strategic. ERP systems improve reactivity to customer requests (for example, new orders) by impacting in real time on the entire production system of the activities and functions concerned (manufacturing and supply planning).

A review of the literature, notably Bingi *et al.*, (1999) points to the complexity of ERP implementation and its attendant risks. The authors note that the scope of ERP system applications, their complexity and high level of integration present the organizations that put them in place with significant challenges. Apart from the risk of overspending and not meeting deadlines (CIO survey mentioned by Cosgrove, 2001), dissatisfied users and a poor quality system is also a risk as a result of implementation. To configure ERP software, the project team and users must have broad expertise. So much so that many studies report the lack of in-house expertise as a main source of failure (Barki *et al.*, 1993, Scott and Vessey 2002). Relying on software experts or appropriate training to improve the level of in-house expertise or to remedy users' lack of experience (Schmidt *et al.*, 2001) is very costly. With regard to the software adaptations required, the lack of ERP system flexibility (Bancroft *et al.*, 1998) and the significant gap between the targeted process and the process encrypted in the software may well be sources of risk and undesired results. The scope of the changes required in the light of the process envisioned is another source of risks (Bancroft *et al.*, 1998).

Adoption is compatible with a supply-chain approach. The flow of products, services and funds along the value chain generates a significant mass of information that can be used to make decisions with regard to value-chain management. To ensure that the information is relevant, reliable and accessible in time and place, there needs be an adequate information technology architecture. While the first generation of ERP adoptions were limited to one site and the second involved implementations on several sites of a same firm, the third generation focuses on coordinating implementation on several sites and in several companies. Such systems must have the capacity to communicate along the value-chain with business organization systems as well as with individual customers using different platforms. The components needed for supply chain management include request applications, inventory management systems, planning and launching production systems, planning and launching transportation systems, customer relations management systems and automatic sales force management. Some applications combine several phases of the value chain. Evaluation of ERP performance by managers and CFOs is done from a benchmarking perspective that enables them to compare their current information system with the best ERP systems in terms of specific functions (accounting, sales, logistics…). Firms can collect ERP information from adopting or non-adopting companies and from outside advisers such as organizational consulting firms or pre-sale computer engineering consultants. The latter can even organize on-site introductory sessions. While the socio-rational theory takes the social system members' influence into account, other theories include the observation that the choices made show signs of mimetism.

C. Mimetic chain and innovation diffusion

The postulates of a neoclassical analysis have thus shown their limits since rationality cannot be omniscient. The analysis is limited, a rational decision being no more than an ideal which has nothing to do with the reality of facts (Simon; 1957). Given that interactions among agents or organizations mutually influence their decisions through imitative behaviors that have nothing rational about them within the precepts of the neoclassical theory, a window is therefore open for irrationality to come into play. As Le Bon writes (1911), "*for each of our acts, the unconscious part is immense and that of reason very tiny.*" Mimetism can thus be a highly relevant concept in accounting for certain economic phenomena, and is at the basis of many major current business science theories.

This is the case with the theory of organizational learning, for example, according to which certain organizations imitate others, letting the former absorb the experimentation and research costs (Lant and

Mezias 1990), or with institutional theory which stipulates that organizations seeking legitimacy copy practices adopted by others (Di Maggio and Powell 1983).

An analysis of the diffusion process does not escape the logic of imitation either. As early as 1903, Tarde (1890) was already talking about "imitation laws." The diffusion of innovation takes place among individuals belonging to a specific social milieu. In this context, interactions among these decisional units create influential situations in which the behavior of some is likely to be conditioned by those of others. Generally, innovation spreads within a social milieu out of mimetism, with some individuals taking decisions after observing the attitudes of prior adopters.

Mimetism is caused by uncertainty in the face of novelty. In such conditions, innovation will be adopted mimetically since adoption by the first adopters will be interpreted as an act from which they draw benefit in accordance with the information available (Greve and Taylor; 2000). Uncertainty leads deciders to use comparative social motives to evaluate the new practices adopted by others (Greve; 1998). Burt (1987) defines the conditions under which these contagion phenomena occur among individuals. Behavior contagion implies the existence, on the one hand, of an individual or so-called *ego,* who has not yet adopted novelty and, on the other, that of another, so-called *alter*, who, on the contrary, has already taken it on board. Social structures will operate in such a way as to create circumstances between these two individuals that make the *alter* sensitive to the *ego*'s evaluation of innovation. Such circumstances may be competitive situations, interpersonal communication or any other contact that brings the *alter* closer to the *ego*.

This is *informational* mimetism, where one person imitates another because they are assumed to be better informed (Deutsch and Gerard; 1955). The first person will try to evaluate their beliefs and opinions by comparing them with those of their reference group (Festinger; 1950, 1954) and will conform to the former all the more should they have doubts about their own expertise (Hochbaum; 1954) and need to deal with a difficult or ambiguous task.

Deciders in a situation of uncertainty will therefore end up observing the adoption behavior of other members of their community. On the basis of their observations, they will thus develop their own behavior by aligning with the practices of others. Imitation occurs insofar as innovation adoption by a decision-making unit increases the probability of others doing the same (Greve; 1998). Several innovation diffusion models informed by research on the epidemiological spread of diseases have been developed on the basis of this mimetic hypothesis. Mansfield's model (1961) in economics, and that of Bass (1969) in marketing, are the most renowned.

The mimetic chain theories whose reference model is that of Bickhchandani *et al.* (1998) ascribe the status of a communicator emitting and receiving informative signals to an agent belonging to a social system. Hirshleifer (1995) notes that the way information is conveyed among various individuals can take different forms as individuals can observe either all the information held by others or the result of their private calculation or only the actions by firms that have already made a choice. As actions speak louder than words and information borne out by actions is the most credible, he argues that agents only observe positions taken by others before them. When faced with a choice, agents will form their initial judgment on the basis of their private information. Among other things, they will observe the positions taken by other agents before them and infer their opinions. They may review their opinion if their initial idea is contradicted. They act out of "pure mimetism" when they rely exclusively on the positions taken by others.

This mimetic chains model assumes the existence of a sequence of individuals (see Figure 1 for example), each one opting to adopt or reject as a result of their private calculations and their observations of the positions taken by others. To make it simpler, let us assume that objectively, adopting an innovation is better than rejecting it (in so far as this decision has higher net advantages than the other alternatives). Individuals who are neutral to risk make a pros-and-cons calculation on the basis of their personal information: e.g. from an advert, an article, talking to an acquaintance. They are sure of their choice with a probability *p* and ascribe the same degree of confidence to the positions taken by others. They compare this private signal with the positions taken by their predecessors.

In Figure 1, we observe that the first individual, A, makes a choice based solely upon their private signal because they are the first to decide. If A gets signal 'H' favorable to adoption (private calculation consistent with the correct decision to adopt), A will adopt; if A gets the contrary signal 'L', A will reject. The second individual, B, deduces A's private calculation from the position taken by the latter. If A decides to adopt and B has a private signal H consistent with A's position, then B will adopt. If, on the contrary, B's signal is L, then B will infer that there are equal chances that it is as much in his interest to adopt as it is not to do so, in other words there are equal chances of the innovation being adopted by B as there are of it being rejected. The third individual, C, will adopt innovation as long as A and B have previously adopted, even if C's private signal L is unfavorable. All it takes for the first two individuals to initialize an up or down cascade is for both of them to adopt or, on the contrary, not to adopt. At the close of the first two choices, the probability of having no cascade is only $p\ (1-p)/\ 2 + p(1-p)/2 = p-p^2$.

[INSERT FIGURE 1 HERE]

Welch's informational cascades describe how rapidly people converge toward a decision to adopt or not and how the weight of an individual evaluation on the merits of such and such an emerging idea diminishes (Bikhchandani *et al.;*1998). If the first individuals in the sequence adopt a new product based on its merits, their having adopted it will provide a signal to other potential adopters. A number of them will adopt the new product as a result of being influenced, at least in part, by preceding adopters. As the number of adopters rises, the signal to other potential adopters becomes increasingly stronger and more and more of them will adopt. Once the information derived from the decisions of others begins to exceed an individual's private evaluation, the process starts gathering momentum or cascading toward conformity among all deciders. At that point, new adopters convey no additional private information to the market. Rational individuals will buy information – get "private signals" in cascade jargon – only up to the point where the information yields no more net benefits than the following signals emitted by others.

Contrary to other forms of social conformity, informational cascades are fragile. Triggered by a small amount of information, they can also be reversed by new information. A cascade can be broken and reversed by an individual with a more precise signal because agents know that the behavior of most individuals carries no information and is purely imitative (the definition of a cascade). A company can be guided in its choice to adopt an ERP system by implementations already completed by its competitors. It can collect information on their positions while attending inter-professional meetings or industrial shows or through reading accounts in specialized magazines such as 01 Computer.

Hypothesis 3: The position taken by other companies determines a decider's adoption behavior.

Hypothesis 3 bis: The position taken by a company depends more on the positions taken by other companies than on its own private signal (or private calculation).

[INSERT FIGURE 2 HERE]

III. AN EMPIRICAL ANALYSIS OF ERP DIFFUSION: THE DETERMINING INFLUENCE OF THE SOCIAL SYSTEM

This study on ERP adoption and diffusion focuses on small and midsize French companies that we asked to describe the conditions and reasons for adoption or non adoption. We voluntarily excluded companies that are subject in this particular respect to the decisions of their holding companies and are therefore not free to make ERP implementation choices. In this second part, we first introduce the study's empirical methodology. We then seek to validate the hypotheses articulated in part one. In the process, we determine the extent to which the choices are rational or mimetic and how the influence of others impacts on implementation choices.

A. Developing a questionnaire and making variables operational

The first stage in the collection of field data for hypothesis-testing purposes was to put together a questionnaire. Drafting a questionnaire represents "the instrumentation" of the study hypotheses, and the questionnaire is the tool with which these concepts are measured (Thompson; 1987). The choice of a questionnaire as an empirical investigative tool is justified by the hypothetical-deductive methodology adopted. Our questionnaire was organized around the hypotheses, variables and dimensions defined in the preceding part. The aim was to explore the conditions surrounding ERP adoption. The questionnaire included essentially close-ended questions in the form of dichotomies or attitude scales (from Lickert to 7-point scales). On the basis of the literature review and the interviews given, we translated the different theoretical concepts and variables into several indicators or items (annex 1). We verified the internal coherence of each scale through a factorial analysis conducted with the Kaiser-Barlett test and Conbrach's alpha coefficient. In keeping with Perrien's proposals (1984), we accepted a scale whenever alpha was superior or equal to 0.5.

We made the use-of-financial-tool concept operational by asking the firms surveyed if they used the NAV, the internal return rate (IRR), pay-back period or any other tools to decide whether or not to adopt. Starting with a review of the literature on ERP systems and their advantages, complexity and compatibility with strategy, we identified sets of items to identify the various perceived attributes. In order to confirm the objective dimensions on which CEOs base their choices, we conducted a principal component analysis (PCA) of the three sets of advantages. The PCA indicated that CEOs foresee three kinds of benefits to ERP adoption: strategic, organizational and, given better information and decision-making management, even operational ones. A second PCA confirms that impediments to adoption are

linked to two dimensions: the complexity of ERP implementation and the cost of the organizational changes required. To measure the quality of the information systems and relevance of ERP watch, we adopted the idea according to which a representation is relevant if it is appropriate for the action and satisfies its user (Reix 1999). Relevance is determined mainly according to its degree of exhaustiveness, finesse and clarity (or lack of buzz). We added two other representation characteristics to these two main ones: richness (an aptitude to translate all aspects of reality) and reliability. Concerning the analytical method used to validate the hypotheses, we resorted to non-parametric methods of statistical inference that indicate probability trends. Unlike a parametric model that presupposes knowing the law pertaining to each observation (except in the case of large samples), a non-parametric model provides greater flexibility regarding the possible form and nature of observational laws. This choice also finds its justification with respect to the strength of these techniques and their advantages in terms of efficiency and validity (Lehman 1975).

B. Study results

a. The vision of an isolated 'maximizing' agent: a narrowing vision

In keeping with Barbara Farbey's analysis (1994) conducted on computer investment choices, we observed (see Table 2) that almost half of the companies surveyed do not quantify project profits and costs. We can assert that with a 90% level of confidence, the percentage of companies resorting to a NAV-type financial optimization calculation is between 18% and 42%, and between 41% and 67% for the IRR. In addition, it is quite possible that some companies use these rational procedures somewhat obliquely and resort to this calculation only to justify their choices.

[INSERT TABLE 2 HERE]

According to Farbey, Target and Land (1994), it is nonetheless difficult to quantify the profitability of software projects because of their extremely broad boundaries, interactions with other changes, and uncertainty over their life-span, among other things. Some companies resort to economic calculation methods but a great many of them do without. Observing in the next paragraph that only a small number of firms appear to be satisfied with their ERP watch, we believe that the information collected is not perfect and that choices are thus not purely rational. Hypothesis 1 is only partially validated. It is therefore crucial to check whether an agent making a choice is isolated or whether they belong to a social milieu from which they are drawing information.

b. A socio-rational realistic vision

Under a so-called socio-rational perspective, it is essential to determine the nature of the communication channels used by the members of this social system and to check if adoption can be accounted for by the perceived attributes of innovation. In order to identify the extent to which decisions are based on a pro-and-con analysis, we asked the CEOs to evaluate the ERP utility (benefits procured), and the compatibility with their strategies and complexity on a 1 to 7 scale.

[INSERT TABLE 3 HERE]

On the whole, CEOs have mixed opinions on ERP compatibility with strategy (with a 90% confidence level, the means is between 4.25 and 4.5) and on strategic benefits. Their positions vary depending on whether or not they have adopted ERP packages. In keeping with Rowe's studies (1999), advantages in terms of decision-making and information management are acknowledged to a far greater extent by all the actors (with a 90% confidence level, the mean of this scale is between 4.25 and 4.5). While adopters see ERP systems as opportunities for organizational change, they all express concerns over the difficulties inherent in creating the conditions for successful change. They are particularly concerned about mandatory training costs, hardware changes and staff resistance to the new software.

In order to determine the impact of these various opinions on choices, they were cross-checked with the decisions made by firms. As seen in Table 4, which shows the results of the Wilcoxon-Mann-Whitney tests, the perception of *decision-making, strategic and organizational advantages* is key to the decision on whether or not to adopt an ERP software package. Our results confirm the existence of empirical links between the perceived attributes of an innovation and its adoption (Davis; 1989, and Adams; 1992). Using the Chi2 test, we can conclude that strategic compatibility and the perceived benefits of innovation act as facilitating factors in ERP adoption (the significant test levels are under 1%). On the other hand, we observed no significant relationship between perceived complexity and a firm's choice.

[INSERT TABLE 4 HERE]

With regard to the importance of the social system in the diffusion process, we listed the sources of information whereby the respondents had heard of ERP packages (see Table 5). The mass media was the most frequent source - the specialized press, trade fairs and internet – and, to a lesser extent, in-house and outside advisers such as organizational consulting firms, computer engineering firms and

integrators. This last source of information is the most significant in the case of adopters, consequently advisers can be said to play a facilitating role. Outside advisers operate as filters, capturing information and conveying it to deciders. The information and advice they impart substantially influences the decisions made, all the more so if the information and advice appears exhaustive, simple and clear. By making companies aware of ERP organizational benefits, organizational consulting firms become vehicles for adoption.

In-house or outside resources available for information purposes vary from one company to another. Not all companies enjoy a high-performing business intelligence in IT (as illustrated in Table 5) based on the quality of their information system. Firms frequently consider their information efforts as mediocre or even insufficient (this is true of one in two companies) and the relevance of the information collected is perceived as average or even weak. The rate of receival of magazines (mainly) is correlated to the evaluation of a company's in-house effort to be kept informed on information system updates.

[INSERT TABLE 5 HERE]

While the socio-rationale analysis accounts for the choice to opt for an ERP software to a large extent, the low relevance of the information collected through the ERP watch nonetheless leaves some organizations uncertain and, as a result, they do their best to compare their analyses with the opinions and practices of others when making a choice.

c. Mimetic chains and influence of the positions taken by other companies

The results set out in Table 6 indicate that the positions taken by other companies have a significant influence on their choices. Two out of three firms acknowledge that their choices were influenced to some extent by the positions taken by other companies which have or have not yet adopted ERP systems. Some companies have more influence than others. More than one in two firms acknowledge being influenced by the decisions made by the leading firms in their sectors (37% and 63% of the total firms with a 90% confidence level). The influence of innovative or high-performing companies is also determinant for almost a third of them. Geographic proximity, on the other hand is not a determining factor. In keeping with the mimetic chains theory, the positions previously taken by certain other firms influence the choices made. One firm in five reports being influenced by the adoption decision made by other companies. In accordance with the mimetic chains theory, we reject the hypothesis of

independence between frequency of adoption and the firm's decision to adopt, as the table below shows.

[INSERT TABLE 6 HERE]

Our results corroborate those of Webb and Pettigrew (1999) who, taking a partly neo-institutional approach, show how a strategy initiated by a leader will spread in the inter-organizational field. When leading opinion-makers contemplate adopting a strategy for the first time, their behaviors are subsequently copied by others (Greve 1998). Companies will imitate the actions of firms which, being successful in the market, benefit from a good image and high prestige (Burns and Wholey, 1993). An organization's prestige is linked to its manufacturing efficiency, profitability and growth (Scott, 1992). Burns and Wholey (1993) and Haveman (1993) show that the most profitable firms operate as models for others. Companies competing in one sector are attentive to the strategic maneuvers of highly profitable firms that make the market attractive to potential newcomers.

Our study shows that firms do not merely observe the positions taken by other companies but collect their own private signals. However, as the signals collected are often of poor quality, the presuppositions made under the mimetic chains theory remain valid. Information collected from firms that do not adopt ERP is considered as precise and exhaustive in 8.6% and 6.9% of cases. Although information collected from ERP-adopting firms is of better quality, only 36.2% of the signals are termed precise and 24.1% exhaustive. Since adopters' signals do not have higher homogeneity (opinions collected from adopters are perceived as highly heterogeneous in 40% of cases versus 57% of cases among non-adopters), they do not have much more influence. The 14% of firms surveyed that report they do not collect signals emitted by others, resort more than others to optimizing financial tools (IRR and NAV) (with a risk of error below 5%, the test is meaningful).

The influence of others on adoption choices is all the more insignificant as the relevance of the representations provided by ERP watch is high (the Kendall rate is -0.219, then this coefficient is significant at 5% level). Others' opinions are all the more compelling since they are homogenous, precise and exhaustive and correspond to the private calculations of those surveyed. The signals collected from third parties may even call private calculations into question. Accordingly, 32% of the firms report having been strongly influenced by a private signal from non-adopting firms that have opinions at variance with their own calculations. Taken as a whole, these results are consistent with the mimetic chains theory, with the exception that the information collected from third parties is not limited solely to the positions taken (partial validation of Hypothesis 3).

C. ERP adoption: a synthesis model

We can conclude that strategic compatibility and the perceived benefits of innovation are facilitating factors in ERP adoption (the significant test levels are under 1% with the Chi-2 test). We then use a logit type regression model to explain the adoption of an ERP (variable dichotomic Y = 1 if adoption of a ERP and Y=0 in the contrary case) by the variables previously defined: strategic fit with a sector's strategy, informational and decision-making management benefits, strategic benefits, organizational benefits, ERP complexity and organizational risks, frequency of ERP adoption (appendix n°1). The adjustment is of good quality as the values of the r^2 of Nagelkerke and the 79,3% of correctly classified observations attest. Wald's statistics show that determining factors in the probability of an ERP adoption include: the organizational benefits, the strategic compatibility with a sector's strategy, the perception of frequency of ERP use and the firm's size. Other variables are excluded from the analysis as they are not significant. Adoption based on frequency and perceived attributes is the most prevalent.

[INSERT TABLE 7 HERE]

CONCLUSION

The literature on the adoption of information technologies and on organizational changes enables us to identify three main strands; technological determinism, an organizational imperative and an emergence perspective. Markus and Tanis (2000) deem ERP research to be an important theme in view of the costs and risks associated with ERP projects and because of their integrative dimensions, implementation issues and the conditions surrounding the adoption and use of these technologies. Our study is in keeping with a productive research process that purports to better comprehend the adoption and diffusion of innovations. Having administered a questionnaire to over fifty large and midsize companies from various industrial sectors of activity, our study shows that the perceived attributes of innovation influence ERP adoption. ERP-adopting firms believe this innovation to be compatible with their strategies. The perceived benefits encompass decision-making, securing competitive advantages and the possibility of adopting a transversal organization. Our study corroborates prior research demonstrating that ERP adoption enables dysfunctional processes to be detected and exposes organizational slack (Besson; 1999). However, ERP diffusion is hindered by the complexity of

implementation and the costs of the organizational changes required. Some companies are concerned by staff resistance to change and an inability to create favorable conditions to successfully make the changes required by ERP projects (Saint Leger; 2004). Organizational consulting firms, engineering firms and integrators also play a role in ERP diffusion by transmitting information about the ERP packages and projects implemented in their clients' companies. However, for a number of companies in situations of uncertainty as a result of the relative lack of pertinence of the information collected, ERP adoption frequently occurs as a result of mimetic behavior. Over half the companies surveyed acknowledge being influenced by the decisions taken by the leading companies in their sectors.

As a continuation to this study, it would be interesting to observe the mimetic effects within the framework of multi-site companies and to further study the communication channels that ensure ERP diffusion (Oliver and Romm 2002). Even if the size criterion did not appear to be determinant, it can be assumed that the use of communication channels is contingent.

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Appendix n°1. Internal Coherence of the Proposed Scales

Compatibility with the sector's strategy	*Conbrach's alpha*
ERP fits in perfectly with our company sector's strategy ERP provides perfect verticality for our company's main business ERP fits in perfectly with the sector-based supply chain strategy	0.91
Advantages in terms of information and decision-making management	
Better management of information flows Integration of information and system flows Better operation trackability Decisional help Improved access to information Shortening of decisional cycles Better information with which to decide	0.85
Strategic advantages	
Better reactivity to customers' needs Improved company image with customers Provides a response to key customers' requests and pressure Increasing interaction and communication with customers and suppliers More flexibility Lower costs Smaller inventories	0.85
Organizational advantages	
Reinforced control over in-house operations Increased expertise among managers Allows the organization to be rebuilt around processes rather than functions Reinforced coherence	0.85
ERP Organizational risks	
Organizational changes caused Cost of training required Required hardware changes Staff resistance to new software	0.61
Relevance of ERP information	
Information is exhaustive Information is precise Information is reliable Information is clear Information is rich	0.91

Table 1: Rogers's Innovation Diffusion Model Perceived characteristics

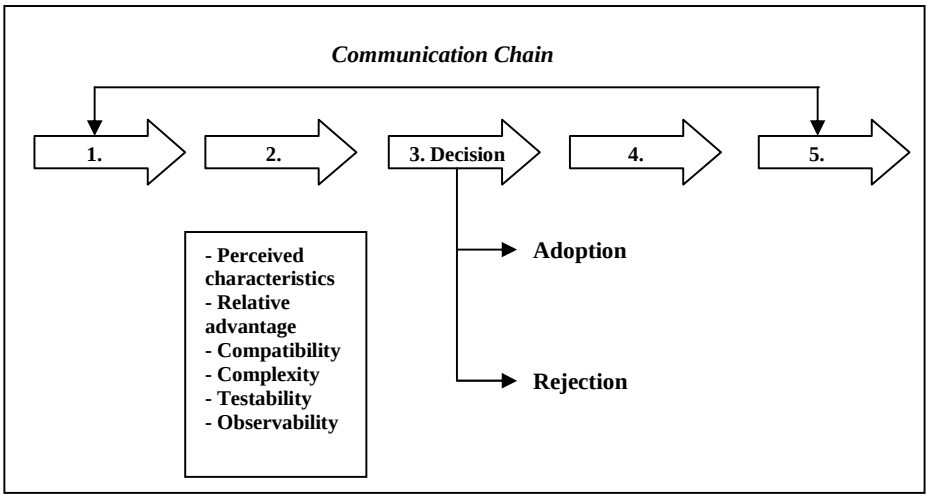

Figure 1: Mimetic Chains Illustration

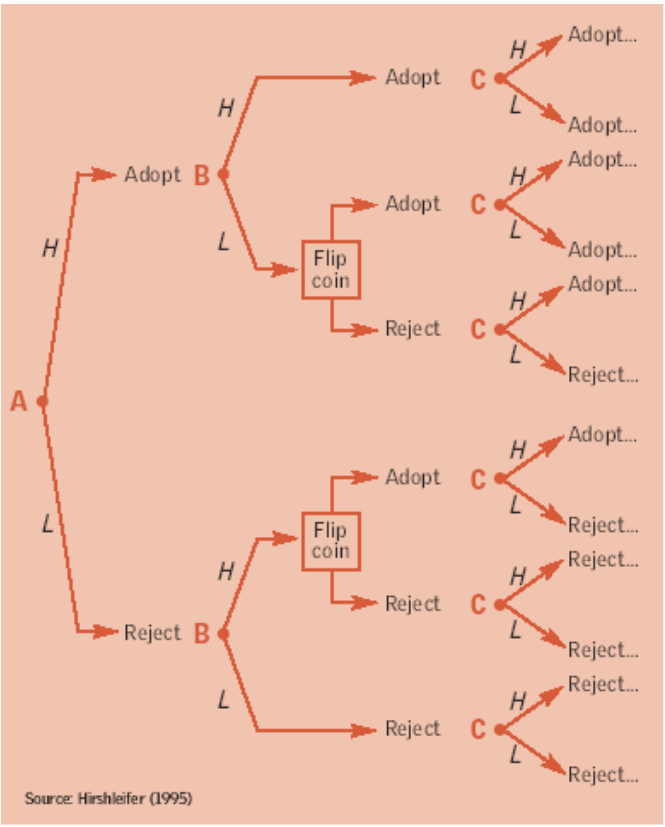

Figure 2: Model of research

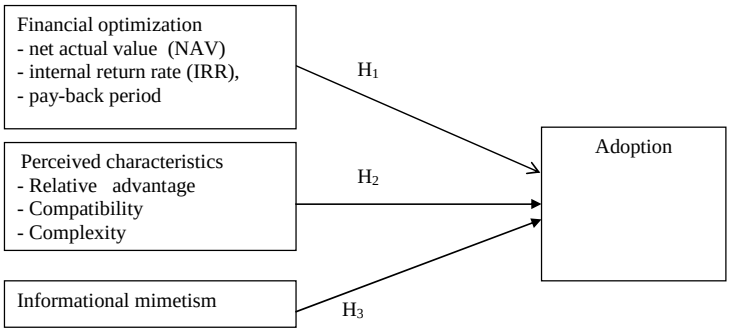

Table 2: Use of Economics Calculation and Choice

	Total of firms (=58)		**Adopting firms (=37)**		**Non-adopting firms (=21)**	
	%	CI	%	CI	%	CI
- Evaluated a project using an NAV calculation	30%	18%-42%	17%	6%-30%	52%	29%-73%
- Evaluated a project using an IRR calculation	55%	41%-67%	51%	34%-66%	61%	37%-81%

CI: Confidence intervals at 90%

Table 3: ERP Perceived Attributes

	Total of firms (= 58)			**Adopting firms (= 37)**			**Non adopting firms (= 21)**		
Perceived attributes	Mean	Median	CI	Mean	Median	CI	Mean	Median	CI
Strategic compatibility	4.15	4.38	4.25-4.5	4.72	5	4.5-5	3.14	3.25	2.4-3.91
Benefits in terms information and dec making management	4.96	5	4.83-5.16	5.35	5.33	5.16-5.5	4.27	4.33	4-4.33
Strategic benefits	4.1	4.14	3.71-4.28	4.42	4.29	4.14-4.71	3.53	3.57	3.14-3.71
Organizational benefits	4.44	4.75	4.5-4.75	4.89	4.75	4.75-5	3.64	3.5	3.17-3.66
ERP complexity and organizational risks	4.01	4	4 – 4	4.08	4	3.82-4.25	3.89	4	3.92-4

CI: confidence intervals of the mean at 90%

Table 4: Evaluation of ERP Benefits, Compatibility and Complexity

	Strategic compatibility	Benefits in terms of information and decision-making management	Strategic benefits	Organizational benefits	Organizational complexity
Non-adopters average rank	17.14	14.79	18.02	15.00	26.21
Adopters average rank	36.51	37.85	36.01	37.73	31.36
Wilcoxon Test coefficient	360.00	310.50	378.50	315.00	550.50
p-value	0.00	0.00	0.00	0.00	0.26

Table 5: ERP and Information Systems

	Total of firms (= 58)		**Adopting firms (= 37)**		**Non adopting firms (= 21)**	
Having heard of ERP through :	%	CI	%	CI	%	CI
- An organizational consulting firm	37.93%	25-50%	43.24%	21-61%	28.57%	11-50%
- A computer engineering firm	37.93%	25-50%	43.24%	21-61%	28.57%	11-50%
- Integrators	24.14%	14-35%	29.73%	10-47%	14.29%	3-33%
- An in-house executive	65.52%	52-77%	59.46%	38-76%	76.19%	53-92%
- Another company executive	3.45%	0,1-10%	5.41%	0,5-16%	0.00%	-
- The specialized press	74.14%	61-85%	64.86%	44-80%	90.48%	68-99%
-Internet	51.72%	38-64%	51.35%	29-68%	52.38%	29-73%
- Professional trade fairs	60.34%	47-72%	51.35%	29-68%	76.19%	53-91%
Regularly receiving a fiscal journal	90%	80-96%	90%	76-96%	90%	69-99%
Importance of the source of information (0 to 7):						
- An organizational consulting firm	3	3-4	5	3-6	3	1-3
- A computer engineering firm	3	2-4	4	2-5	2	1-3
- Integrators	4	3-4	5	3-5	3	1-3
- An in-house executive	5	4-5	5	4-6	4	1-5
- Another company executive	3	2-4	4	2-5	2	1-3
- The specialized press	4	4-4	4	3-4	4	3-5
- Internet	3	3-4	3	2-3	4	1-4
Quality of the business intelligence in IT (0 to 7):						

Its anticipatory function or capacity to reveal computer-provided opportunities	5	4-5	5	4-5	4	4-5
Its capacity to satisfy your need for information	5	4-5	5	4-5	4	3-4
Its capacity to convey information for decision-making purposes	4	4-4	4	3-5	4	4-5
The relevance of the information conveyed by the watch	4	3-4	4	3,4-4.8	4	3-4
Effort made to be kept informed of information systems news (0 to 10)	6	5-6	6	6-7	5	4-6

CI: confidence intervals at 90%

Table 6: Influence of the Positions Taken by Others

Agents reporting being strongly influenced in their choices	**Surveyed**		**Surveyed having**		**Surveyed not**	
	%	CI	%	CI	%	CI
- by the adoption decisions made by other companies	20.70%	11-31%	29.70%	10-48%	4.76%	0-22%
- by the choices made by geographically close companies	8.60%	3%-17%	8.10%	0-23%	9.50%	0-28%
- by the choices made by innovative companies	32.80%	21-45%	40.54%	19-58%	19.05%	5-39%
- by the choices made by companies hailed as leaders	50%	37-63%	43.24%	21-61%	61.90%	38-81%
- by the choices made by high-performing companies	56.90%	43-69%	54.05%	32-71%	61.90%	38-81%

CI: confidence intervals at 90%

Table 7: Logit Regression Model

Classification table						
Observed		Predicted				
		Adopter ERP		Correct		
		No	yes			
ERP adoption	no	20	1	95.2 %	-2 Log likelihood	20.732
	yes	2	35	94.6 %	Cox & Snell R Square	0.614
Overall Percentage				94.8 %	Nagelkerke R Square	0.841

Variables in the equation	B	S.E.	Wald	df	Sig.	Exp(B)
ORGABENEFIT	3.750	1.752	4.58	1	0.034	4.245
STRATEGCOMP	4.523	1.870	5.850	1	0.016	92.133
FREQUENTADOPTION	1.446	0.681	4.512	1	0.034	4.245
SIZE	1.417	0.824	2.959	1	0.085	4.125
CONSTANT	-15.649	5.731	7.456	1	0.006	0.000

ORGABENEFIT: Organizational benefits
ERPCOMPLEX: ERP complexity
STRATEGCOMP: ERP compatibility with the sector's strategy
FREQUENTADOPTION: ERP adoption frequency
SIZE: Firm's size
Confidence interval at 90%