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Organizational transformations through business technology solutions: from the perspective of Science, Technology, and Society (STS)

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Nowadays, organizations benefit from new technologies because they improve their efficiency and their performance. These technologies are themselves developed within organizations in the form of business solutions in a perspective of transformation and innovation. This paper highlights obvious strategic and operational tools and to demonstrate the cohesion of the evolution of science and technology in society. Whether these are based on scientific research or Research and Development (R & D) in an organizational context, their social and environmental impacts remain intrinsically linked. Thus, from intraorganizational systems to interorganizational systems, there arises connection between stakeholders through ERP software packages upstream (B2B) and an interconnectivity with customers/consumers downstream (B2C) thanks in particular to social networks and digital applications.

Key words: Organizational transformations, business technology solutions, ERP, science and technology, industries transformations.

INTRODUCTION

The development of electronic information and communication management systems, integrated in organizations, often become technological innovations and solve business issues by creating value. Nowadays, we speak about intelligent organizations to qualify those that use new technologies internally and/or also communicate through them externally. From a managerial point of view, the organizational structure (division of labour, hierarchy of tasks) and the organizational culture (vision, mission, and values) would act as determining levers for the success of the implementation of such solutions. Obviously accelerated

by the information revolution, Porter and Millar (1985) demonstrate that no business company can escape these effects because it changes the way of doing business. These authors argue that since competitors are using information for competitive advantage, business leaders recognize the need to be directly involved in managing the new technology. Through a succinct literature review, we will take stock of what is known about the reasons for and places of organizational changes, and then define our research paradigm based on our epistemological posture. Then, from the perspective of science and technology, we will pose the

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research questions that will guide our theoretical approach. This methodological strategy will allow us to elucidate the avenues of reflection that will serve as answers to these questions, and we will then conclude with discussions of the preliminary results in relation to this important theme of organizational transformations through business technology solutions.

LITERATURE REVIEW

Why do organisation transforming?

An organization transforms when it decides to integrate new solutions into its traditional processes that will allow it to solve an existing problem, differentiate itself, or align with new trends or organizational practices in its industry or business environment. In the 1990s, the Internet, which was once a military technology, appeared in organizations and in society as that engine of transformation. The new and newly dubbed digital technologies, meaning based on this infrastructure, took off around those years and organizations adopted them as a cornerstone of their communication and information dissemination strategies. Nwamen (2006: 111) said that the business world underwent a real change with the arrival of new information and communication technologies (NICTs), notably in the acceleration of their pace and the extent of their generalization. Amabile and Gadille (2006: 101); Lefaix-Durand et al. (2006:205) also confirm that the advent, in the 1990s, of information and communication technologies (ICT) renewed the problem of cooperation [...] by promoting computerized exchanges between organizations. Before these respective authors, Porter and Millar (1985), a decade earlier, had already reasoned in strategic terms by noting that these information technologies affected each of the five competitive forces that are the power of the suppliers, of the customers, the threat of new entrants, the threat of substitute products, and the rivalry between existing firms. More specifically, the new technologies increase the ability to exploit the links between activities, whether inside or outside the company (Abecassis and Benghozi, 1998).

Where do organizations transform themselves?

Internally: intraorganizational transformations

The deployment of ICT can provide solutions either to internal concerns of the organization, or to a modification of external relations and the development of communications and articulations with the different partners of the company (Abecassis and Benghozi, 1998; Pettigrew, 2012). In this respect, the Enterprise Resource Planning (ERP) software (Figure 1) shows how

organizations are adapting by developing solutions to share internal information. They operate in the structure of the company's production and marketing cycle, the reorganization of the coordination between the company's functional departments and the integration in the design phases (Abecassis and Benghozi, 1998). Porter and Millar (1985) also consider that the informational revolution affects the rules of competition by creating competitive advantages that give company new ways of outperforming their competitors by giving rise to new professions and by altering the structure of the value chains. More precisely, the new information technologies bring about modifications in the way companies and markets position themselves, but also how they organize the flow of goods and services along value-added chains (Abecassis and Benghozi, 1998). We can thus observe an integration and standardization of processes characterized by the improvement of internal productivity factors and the ability to develop and master increasingly complex products and activities at increasingly lower costs. Through ICTs, the manager of the company masters the information, which allows the company to control its productive systems, commercial, financial, human, and informational management (Nwamen, 2006). On the other hand, Pettigrew (2012: 650) "conceptualize major transformations of the firm in terms of linkages between the content of change and its context and process and to regard leadership behaviour as a central ingredient but only one of the ingredients, in a complex analytical, political, and cultural process of challenging and changing the core beliefs, structure, and strategy of the firm." This consideration of organizational transformation from an organic point of view integrates the variables relevant to the implementation of a technological solution. Thus the ability to lead a technological or strategic change, through leadership, becomes the central element of intraorganizational transformation.

Externally: Interorganizational transformations

According to Simon (1983) in Amabile and Gadille (2006: 98), one of the essential tasks of science and technology is to create and design "efficient information processing systems" supporting decision-making in companies or administrations. Through this information system, we can see how Internet technologies can improve interorganizational relations (IORs). These relationships are often the basis of organizational transformations in which organizations that undertake powerful connections (social, economic, service/technical, etc.) aim to improve their processes or create value in terms of reciprocal benefit (increased product, customer satisfaction, or value chain). Whether NICTs are designed to manage interorganizational applications – which is the case for EDI or certain ERPs for example – or whether they are



Figure 1. Enterprise resource planning.
Source: Insight Solutions Global.

intended to be used in undifferentiated contexts (as for groupware or messaging systems), their development and use in industry are strongly influenced by the weight and the nature of the interorganizational relationship that these technologies back (Abecassis and Benghozi, 1998). The case of the automobile sector shows us that the development of EDIs has the effect of changing an industry and centering the activities and strategic decisions around the equipment suppliers who provide goods to manufacturers of the same type and who can, in fact, be competitors. Cooperation thus becomes essential to the integration of these types of systems.

Cooperation is a phenomenon that can be defined in terms of interdependence and the degree of stability in relationships (Amabile and Gadille, 2006: 103). Several types of cooperation explain the nature of these transformations, among which are sequential transactional cooperation and network cooperation. In sequential transactional cooperation (such as supplier/customer and buyer / seller relationships) or reciprocal transactional cooperation (such as, order givers / subcontractors), information is exchanged essentially between partners (Abecassis and Benghozi, 1998) through a technological infrastructure that communicates interactively via a virtual “cloud” (Figure 2); while network cooperation shares technologies for automating data exchange. This is particularly the case in the use of EDI where suppliers and customers cooperate to create and use shared databases (*Ibid.*).

With regard to this cooperative dimension, organizational transformations are carried out with openness to the outside, which is generally considered to be an uncontrollable environment of the company. Thus, thanks to ICTs, client companies can easily access information that allow them to compare different suppliers and benefit from the best market conditions in terms of quality/price and product varieties (Nwamen, 2006). On another different aspect of cooperation, it is not uncommon in a business environment for competing companies to collaborate in the pursuit of added value. In this sense, Fenneteau and Pellerin-Boucher (2007) argue that there exist both cooperative and competitive dimensions in any economic relationship. These interorganizational practices require partitioned transformations and structuring in order to collaborate only on the aspects of reciprocal exchanges of data, services or products. This type of cooperation can notably be observed in cases of oligopoly, joint venture, or consortium, where competing companies can agree respectively to set a price, define identical offers, exploit a market, or even manage a project conjointly. New technologies thus help in the implementation of intelligent information systems that will change the nature of their relationships by making their standards compatible in order to increase the size of their network and the value for the customer (*Ibid.*). During the 1990s, the intensification of globalization and the development of new production and information technologies highlighted the importance of

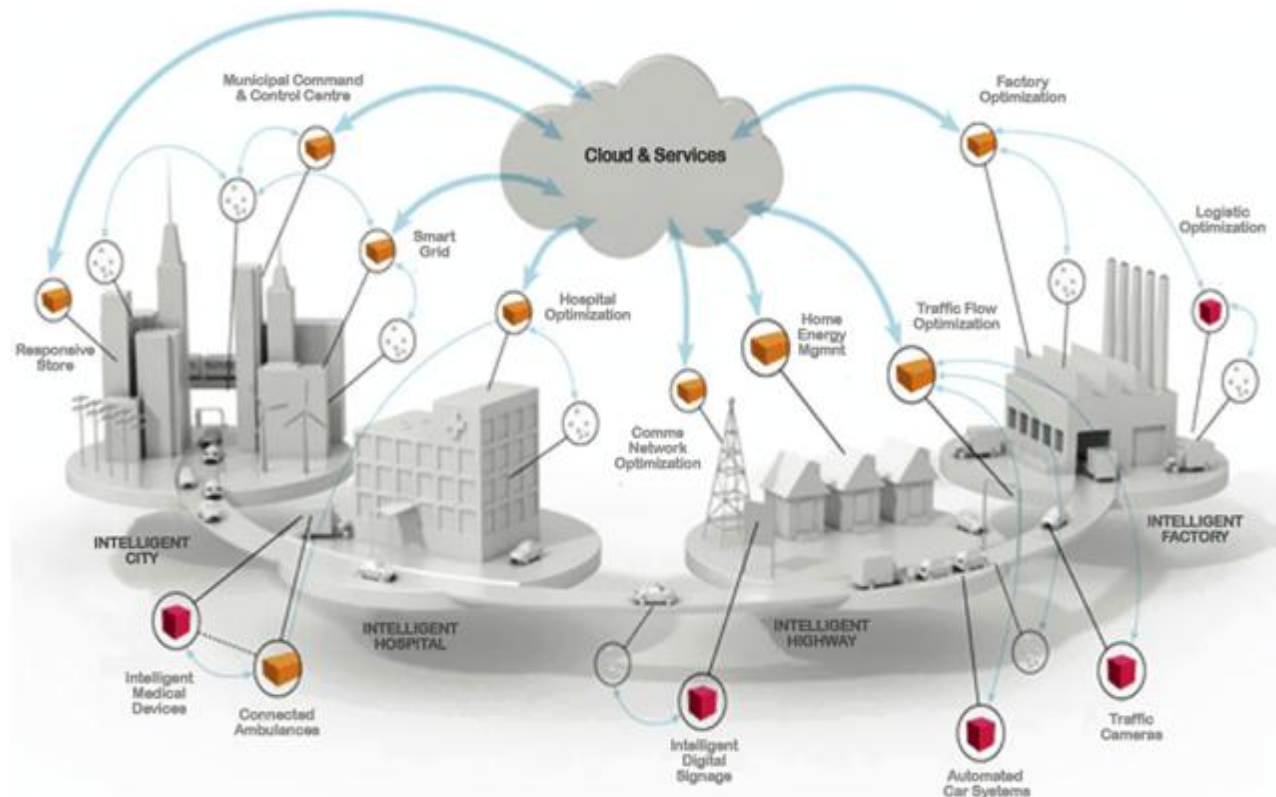


Figure 2. Cloud and Infrastructure Services
Source: Net Solutions.

“interconnections” between organizations (Lefaix-Durand et al., 2006). The latter are indeed profoundly affected by the technical developments of applications, by the trans-sectoral strategies of firms that require cooperation and collaboration between companies present in different sectors or segments of a given industry (Abecassis and Benghozi, 1998).

EPISTEMOLOGICAL POSTURE

By closely observing this structural and analytical logic of organizational transformations, we favor a positivist posture due to the scientific nature of information systems and technologies. Our managerial vision of these transformations is then part of an interactive and deductive logic of action combined with decision. This empirical-formal rationality implies radical structuralism (Figure 3) as a research paradigm, which postulates that organizations are real, objective, concrete “things” whose essential nature can be known and whose measurable characteristics determine human behavior (*Ibid.*). As an organizational decision-maker, the search for added value is the main lever for the implementation of a technological or strategic solution in an organization. This pragmatic management style arises from personal

experience and reflection on the outcome of our actions within organizations (Gillberg and Vo, 2011).

RESEARCH QUESTIONS

From the perspective of Science and Technology, the first question to be asked is what is the modus operandi of organizational transformations? If the functioning or management of the organization is based on technology (“technological organization”), it would logically implement transformation through innovative solutions. However, if the technology is developed by the organization (“organizational technology”), it would generate a technological innovation system. This leads us to ask the following two research questions:

1. What are the implications of technology within the organization?
2. What are the effects of organizational technology on its transformation?

The emerging discussions from these questions aim to establish the scientific basis for the evolution of science and technology within organizations and in society. Ziman (1987) explains that the external sociology of



Figure 3. Sociological paradigms and organisational analysis.
Source: Burrell and Morgan (1979).

science simply considers it to be a social institution, integrated in society and performing certain functions for society as a whole, in the same way than other institutions associated with law, religion, political authority, and so on. Science is then considered as an instrument at the service of society and organizations. This author also informs us that the most striking influence of science on society is the generation of essentially new technology from basic, discovery-oriented research. However not all advanced technology arises from basic science. Some organizations develop their own technology. In this case, they rely on research and development (R&D) and industrial science to achieve their aim. In contemporary discourse, the notion of scientific "research" is generally closely linked to the notion of technological "development" (Ziman, 1987). At this level, it is legitimate to question whether technology is an applied science. A distinct set of arguments challenges the idea that technology is an applied science (Sismondo, 2010). The controversy that arises from this question enriches the parallel development of science and technology for the benefit of organizations and society. Some people working in STS assert the idea that science and technology are not sufficiently well-defined and distinct from one another for there to be a definite relationship between them (*Ibid.*). Ziman (1987) believes that all sciences are generating their respective technology and all technologies are generating their respective science. In the context of organizational transformation, it is important to know that science and technology are levers of change within organizations and

society. The role of science in society is therefore inseparable from the role of technology (*Ibid.*).

From a practical perspective, the link between basic applied research is part of a "linear model" that traces the path of innovation from fundamental research to applied research to development, and finally to production (Sismondo, 2010). This suggests that an organization dubbed "technological" benefits from increased productivity emanating from its technology integration. Moreover, scientific knowledge is a resource that engineers and inventors can draw on and perhaps increasingly do draw on but overall, it is not a technology driver (*Ibid.*). Technoscience, biotechnology, and nanotechnology are examples of organizational technologies that turn into innovation in society.

METHODOLOGY

Our positivist epistemological posture outlined above has oriented our approach towards exploratory method, following a deductive logic that allows us to start from existing organizations in order to explain the observed or future changes (Chalmers, 1987) (Figure 4). The empirical approach then consists of selecting or identifying organizations/companies in the three existing business models (for-profit organization, cooperative organization, and non-profit organization) in order to observe intraorganizational and interorganizational implementations in the industries or sectors such as trade, distribution, agribusiness, pharmacy, education, culture, transportation, hospitality, etc. of the respective models, or in crossover organizations, in the latter case.

Two complementary strategies are available to us to collect and analyze the data:

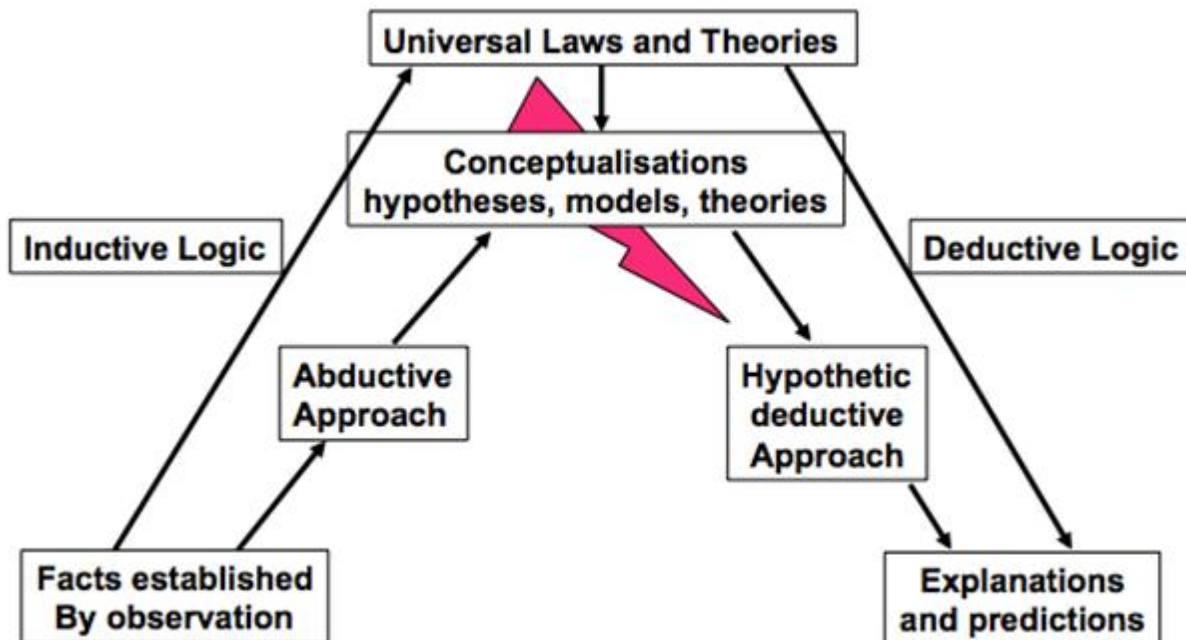


Figure 4. Modes of reasoning and scientific knowledge.
Source: Adapted from Chalmers (1987:28).

1. Scientometry as a secondary data collection method
2. Surveys as a method of collecting primary data

Scientometry

Scientometric data are developed from the Web of Science database. A search made with the terms "technological organizations" OR "organizational technologies" allows us to locate the organization in the field of science and technology and to pull the articles and journals related to our theme. Then, we create the filter.

Surveys

Firstly, we will seek to survey a sample of various organizations on the transformations that are taking place following their implementation of business technologies such as ERP. Abecassis and Benghozi (1998) explain that this integration is sometimes thought out on a local level (at the level of the terminal and the design of the workstation, as is the case with the Intranet), sometimes at the central level (client-server architecture, integrated databases, etc.) or it is outsourced to certain operators or electronic mediators (broadcasters and distributors, or technology providers). This method consists of evaluating the implementation of a solution such as SAP or *PeopleSoft* through a questionnaire survey, which will consist of measuring the productivity and/or resistance to change variables on additive satisfaction scales (Likert type), then proceeding to multivariate analysis (correlations and multiple regressions) between the variables with the help of the SPSS software. This will allow us to explain our hypothesis, and even to generalize them by extrapolation. Which means determining the levels of integration of the solutions by the organizations and the degrees of transformation of the latter following this implementation. Secondly, we will carry out another parallel study of the same nature on organizations that develop their own technologies in

order to predict the effects of these on their transformations and their societal implications. This research explores the *modus operandi* of organizational transformations and therefore, answers the two research questions.

PRELIMINARY RESULTS

This paper highlights the processes of integration of technological business solutions and organizational transformation through these solutions (ERP, information systems, etc.) and also the development of innovative business solutions based on new technologies (digital applications, technological infrastructures, communication interfaces and EDIs, etc.).

Our practical objective is to contribute to the understanding of organizational technological changes, to their impact on management paradigms, and their impact on society. An explanation of the usefulness of the optimal management of organizational information (change resistances, leadership, adverse effects, conflicts and rejections, etc.) and the development of technological solutions by organizations lead the transformations that we consider positive (added value, surplus value) and make them more competitive and actuals.

DISCUSSION

We are well aware that new technologies are not the only causes of the changes we studied; however, a certain

number of these changes could not have taken place without the development of new technologies (Abecassis and Benghozi, 1998). Humans, thanks to their leadership, can, all on their own, transform the organizations. After all, are they not at the origin of these technologies? Do we also believe that an organization changed by technology will no longer remain human? There are many questions, notably of an ethical nature, and many dilemmas arising as to how much and what space new technologies and automated infrastructures should take within organizations and in society. However, opinions are mixed as to the effect of emerging societal and environmental issues, but the organizational advantages (profitability, process simplification, etc.) tend to take the upper hand as the quality of human life is improved, etc. So, what does the future hold?

Conclusion

As observed in our paper, organizations have transformed over the years at the macro level thanks to the integration of new technologies and the standardization of their internal processes (management, governance, information system, communication, R&D, etc.) – which are intraorganizational transformations; and in their collaboration and/or cooperation strategies with their various external stakeholders (customers, members, suppliers, subcontractors, industry, market, etc.) – which are interorganizational transformations and follow the business logic of Business to Business (B2B), Business to Government (B2G) or Business to Consumer (B2C). These transformations make them more intelligent and profitable (added value), and more competitive in their operating methods or their business relationships. Thus, the effect of new ICT innovations materializes both internally and externally (Abecassis and Benghozi, 1998). An empirical perspective of this work would be to carry out this study effectively at the level of traditional business models (for-profit or not-for-profit organizations, cooperative organizations, etc.) or to consider studying these organizational transformations at the sectorial level (commerce, distribution, agri-food, pharmacy, education, culture, transportation, hotel industry, etc.) in order to better understand and observe the changes that are taking place and their impacts on contemporary society.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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