



The impact of the material properties of an Information System on the user's practices: case study of a sales system

L'impact des propriétés matérielles d'un Système d'Information sur les pratiques de ses utilisateurs : étude du cas d'un système de ventes

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Abstract: Information Systems (IS) play an essential role in organizations, often going beyond their status of material artifact. In our case study of a large external advertising company, the role of the Information System in managing the media offer is crucial. The aim of this paper is to understand and to analyze the impact of changes in the material properties of a Sales Information System on the users' practices as part of the sales process through the application of the perspective of weak sociomateriality. For this research exercise we used a qualitative approach based on 42 semi-structured interviews conducted as part of a longitudinal study from 2011 to 2018, complemented by observation and documentary analysis. Our case study shows that as multiple ways of imbrication between material and human occur in organization, users' practices change and can become observable and analyzable. It also demonstrates the permanent and sometimes temporary changes in the material properties of an IS, thus affecting practices in the organization.

Key Words: Sociomateriality, Practices, Information System, Imbrication, Case study.

Résumé: Les Systèmes d'Information (SI) jouent un rôle essentiel dans les organisations allant souvent au-delà de leur statut d'artefact matériel. Dans notre étude de cas d'une grande société de publicité, le rôle des Systèmes d'Information dans la gestion de l'offre publicitaire est crucial. L'objectif de cet article est de comprendre et d'analyser l'impact des changements des propriétés matérielles d'un Système d'Information commercial sur les pratiques de ses utilisateurs dans le cadre du processus de vente en déployant la perspective de la sociomatérialité faible. Pour cette recherche, nous avons utilisé une approche qualitative basée sur 42 entretiens semi-directifs menés dans le cadre d'une étude longitudinale de 2011 à 2018, complétée par de l'observation et l'analyse documentaire. Notre étude de cas montre qu'à mesure que de multiples imbrications entre le matériel et l'humain se produisent dans l'organisation, les pratiques des utilisateurs changent et peuvent devenir observables et analysables. Elle démontre également les changements permanents et parfois temporaires des propriétés matérielles d'un SI, affectant ainsi les pratiques dans l'organisation.

Mots clés: Sociomatérialité, pratiques, Système d'Information, Imbrication, Etude de cas.

1. INTRODUCTION

In the current context, an organization must be part of an overall system that includes social actors, practices and technologies.

One of the important aspects in the study of the organization today is the changes and dynamics in the interaction between the actors who constitute it and shape it through their practices, especially since these changes can be facilitated or constrained by the significant development of information and communication technologies (ICT). Thus, a question arises:

"How do the material properties of a sales system affect the practices of its users? Case of JCDecaux's sales Information System (Odex) in the Middle East".

This article highlights the results of an empirical study conducted within the JCDecaux Middle East organization to explain and analyze the impact of the material properties of a sales system called Odex on the practices of its users over time, based on a longitudinal study.

To conduct this research, we used the perspective of weak sociomateriality (Leonardi, 2011, 2012, 2013) to understand how technology affects the sales process in the organization. We based our analysis on the data of the company operating in the Middle East outdoor advertising sector, which invested in 2012 in a sales system (Odex) to help its sales department better manage its processes; from the initial client prospecting to the display of the advertising campaign on the outdoor screens.

social aspects related to the practices of the actors in the JCDecaux Middle East Organization.

2.1 Study of materiality and practices through the Weak Sociomateriality perspective

Against the strong sociomateriality (Orlikowski, 2007, 2010; Jones, 2014) that considers that social and material exist only in their "intra-action" (Jones, 2014; Barad, 2003), weak sociomateriality (Leonardi, 2010, 2012, 2013) considers that the properties of material and social agencies can be identified and studied separately. The interaction between the two agencies is identified under the concept of imbrication (Leonardi and Barley, 2008). Given that we decided to approach our field according to 2 separate axes: practices and materiality of the IS. We decided to mobilize the weak sociomateriality in our case study (refer to Table 2 in the Appendix for a detailed comparison between the Weak Sociomateriality and the Strong Sociomateriality).

Leonardi (2012, 2013) considers that the term "sociomateriality" is used to highlights the role of the material in all situations considered as social and to focus on the consequences of the interactions between the human agency and the material agency. It is through that perspective that materiality is defined as the arrangement of the physical and/or digital materials of an artifact in particular forms, that persists through time and space, while practice is the space in which social and material agencies become constitutively indivisible through the imbrication process (Leonardi, 2013).

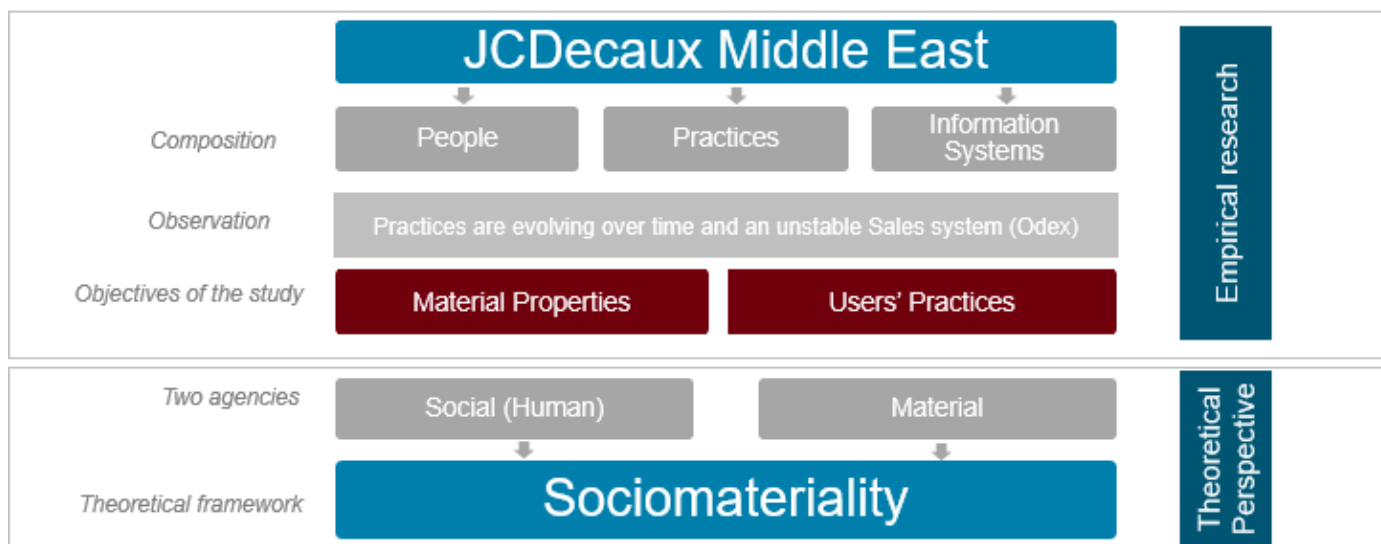


Fig -1: The context of the research and the theoretical choice

2. THEORICAL BACKGROUND

The materiality of an Information System (IS) essentially refers to its properties: what it is made of, how it works and what its characteristics and functionalities are. We have chosen to use the perspective of weak sociomateriality to investigate the materiality and the

While any object is the result of a process of social elaboration before being interpreted and used in social contexts (Latour, 1994; Pinch et al., 1989), any social action is only possible through the use of multiple forms of materiality. From this perspective, it is not the objects that are sociomaterial, but the practices. Leonardi considers the

materiality of technologies as independent of humans and persistent across time and space. Such perspective is particularly necessary given the dynamic, distributed and interdependent nature of the technologies in use today and the multiple and unusual ways in which they guide and will continue to guide organizational realities and practices.

2.2 Imbrication of Social and Material

In their studies, Leonardi and Barley (2008) suggest the notion of imbrication; by focusing on "the interweaving of material and social". In his 2011 article, Leonardi points out that routines and technologies are the infrastructure that imbrication of human and material agencies produce. In other words, he considers that "if we were to examine routines and technologies under a microscope, we would find that each one is made up of the same basic building blocks: human and material agencies" (Leonardi, 2011, p. 151).

The metaphor of imbrication is in several ways useful for explaining the interweaving of human and material agencies for the study of practices in the organization. First, imbrication suggests that human and material agencies are efficient in producing results (e.g., practices or technologies) only when they are joined together, but that their interdependence does not belie their distinct characters (Leonardi, 2011).

Secondly, because the metaphor of imbrication sensitizes us to the production of durable patterns, it reminds us that all interactions between human and material agencies produce an organizational residue (Leonardi, 2011), it's the case of routines or technologies, which representations persist in the organization in the absence of their creators. In fact, when human and material agencies intertwine to produce routines or technologies, these models are characterized by their durability.

3. CASE STUDY: JCDECAUX'S SALES SYSTEM (ODEX) IN THE MIDDLE EAST

This case study is based on a PhD thesis that has been defended in June 2019 and one of the authors of this article is an employee since 2015 of the organization being studied. The choice of this organization as a case study is justified partly theoretically, and partly by methodical opportunism as described by Gerin (1989, 2004).

This organization is responsible of one of the regions of a French international company operating in the outdoor advertising. Created in 2008 in the Middle East, this region now consists of 5 subsidiaries and is positioned in a highly competitive market where the efficiency of the sales teams determines the achievement of revenues. The managing directors of the subsidiaries as well as the sales managers expressed the need to equip their department with an information system to optimize sales and better monitor the implementation of the department's activities. Our study focuses on the impact of the material properties of the Odex sales system on the practices of users, who are mainly salespeople.

3.1 Research Methodology

The integration of a sales management information system into an international company is characterized by the emergence of interactions between different actors of the organization and the system in place, which inevitably impacts the organizational practices and processes. It is therefore interesting to examine and understand how the material properties of this system impact the practices (social and material) of the users. Given the exploratory nature of our research subject, we adopt a qualitative approach (Yin, 2013), based on a single-case study (Dumez, 2016) conducted within JCDecaux Middle East. We mobilize a research protocol based on participant observation, documentary analysis and 42 semi-structured interviews with users in the sales department. A cross-tabulated data collection techniques have been used during our research. Triangulation of data and sources allows information to be compared and aggregated, increasing the internal validity of this research.

The empirical research is based on forty-two semi-structured interviews conducted as part of an in-depth longitudinal study that took place between April 2011 and March 2018 and was based on a process-based analysis of the sales IS Odex. We stopped adding new interviews once we reached saturation on the categories of our thematic analysis (refer to Table 3 in the Appendix for the interview guide). The interviews' data was subsequently coded and analyzed using Nvivo 12 (refer to Figure 2 in the Appendix, which represents three examples of analyses carried out in Nvivo 12).

The figure below is an illustration of the materials used in our qualitative study.

Fig -2: A combination of different materials in the qualitative study to insure the empirical validation

3.2 Case study: JCDecaux Middle East (ME) and Its Sales Information System (Odex)

The case study has been conducted in a French international company operating in the outdoor advertising. The company's name is JCDecaux and comprises three segments: Street Furniture, Transport Advertising and Billboards. The company is the world leader in the first two segments and number 1 in Europe in the Billboards segment. JCDecaux's business model can be summarized as the installation of furniture/assets in cities (airports, shopping centers, streets, metros, etc.) enabling them to take advantage of many services (bus shelters, self-service bicycles, mobile device charging stations, etc.), in return, these services are financed by advertising spaces that will be sold to brands (advertisers, clients) for a fixed duration.

Since its creation in 1964, the organization's strategy has been to strengthen its worldwide presence and is now present in 75 countries and employs more than 13,000 people. In 2008, the company created its first subsidiary in the Middle East region and more specifically in the United Arab Emirates. The Middle East Region has 298 employees, 98 are salespeople (33% of the staff) and 5 subsidiaries supervised by a Middle East regional structure created in 2011: Dubai and Northern Emirates (created in 2008), Qatar (created in 2008), Saudi Arabia (created in 2010), Oman (created in 2012) and finally Abu Dhabi (created in 2013). Our study will focus on this region and more specifically on the Dubai subsidiary, the first entity in terms of revenues and to implement the Odex sales system in 2012. This subsidiary is also chosen because of its geographical proximity to JCDecaux Middle East's Regional Division.

In 2012, without much experience in choosing an IS as it was previously imposed by the corporate entity in France (SAP and Saphir (BO) for financial management, Bee for the Intranet), JCDecaux Middle East began the selection then the implementation of a sales management system, which was highly requested by the Dubai subsidiary, which was no longer able to absorb the workload generated by the large quantity of information related to its clients portfolio. The choice and deployment of the "Odex" sales system was carried out by the Regional entity.

Seven years later, this system is now being deployed in all the region's subsidiaries. Odex is considered the main IS of the region and groups 3 areas of the organization: Sales including Marketing, Operations and Finance. The purpose of this system is to integrate all the commercial, financial and technical information from these three departments to make it available to decision-makers. It is an Information Technology (IT) solution developed by a South African supplier and that should ensure the achievement of the main milestones of a sales process, i.e. monitoring the availability of advertising assets for future advertising campaigns, making bookings and establishing media offers for existing clients or future clients (prospects).

Two years after the last implementation of this system, many discussions between the IT Department of the region and the sales departments of the subsidiaries took place to

think about ways to integrate this system into users' practices to better optimize the sales process.

The study of the evolution over time of sales practices and the material properties of the Odex system was essential in our study to understand the interaction between these two components of the sales process. Our empirical research was carried out through a sociomaterial reading.

3.3 Qualitative Data Analysis and Results

The analysis of the key information raised in the verbatims collected by Department and by Organization concerning the role of the Odex System in the practices of the actors underlines the importance of an infrastructure (hardware and software) which is considered essential and preliminary to meet business needs, particularly in a medium or large company. In the case of JCDecaux Middle East, its sales information system (Odex) is used to cross advertising as-sets (products) with people (salespeople) in order to identify areas of improvement or, on the contrary, areas of risk.

3.3.1 Role of Odex material properties in Users' practices within JCDecaux ME

The changes in practices associated with the introduction of Odex in JCDecaux Middle East would not only concern the physical attributes of the technology but also the transition from physical materiality to the non-material property of the technology (at least in the sense proposed by Leonardi, 2012). Thus, the variety of accessible data and alter-native presentation formats provided by Odex, as well as the remote accessibility to files (introduction of the Inter-net), can both be considered as contributing to changes in the practices of managing and monitoring in the organization. In fact, the Managing Director and the Sales Manager of each subsidiary can now judge the performance of the salespeople in real time by connecting to the platform. Replacing paper data with computerized ones has allowed decision-makers to limit the manual calculation of sales indicators and to have an easily accessible history and image of actual performance, thus contributing to decision making in a shorter time compared to past practices. The distribution of work between teams also becomes more flexible thanks to the transition from physical materiality of the information to informatization of the data via Odex (salesman A must contact prospect B to sell him the furniture/asset C).

This empirical study within JCDecaux Middle East reinforces the idea of Orlikowski and Scott (2004, p. 455) who consider that "materiality is an integral part of human activities and relationships". In our results, we can identify different non-human actors, artifacts or not, such as reporting documents, technical baseline for advertising furniture, meeting minutes, Excel tools, etc. Some of these material tools play a central role in the organization. Thus, the progress of the installation of advertising furniture and the productivity and performance of the teams can only be understood and discussed because they are materialized by technical documents (sheet that records the life of the furniture from installation till its availability to be sold) and reporting (especially commercial reporting).

The following figure illustrates the process of imbrication that exists between Odex's material properties and the practices of its users:

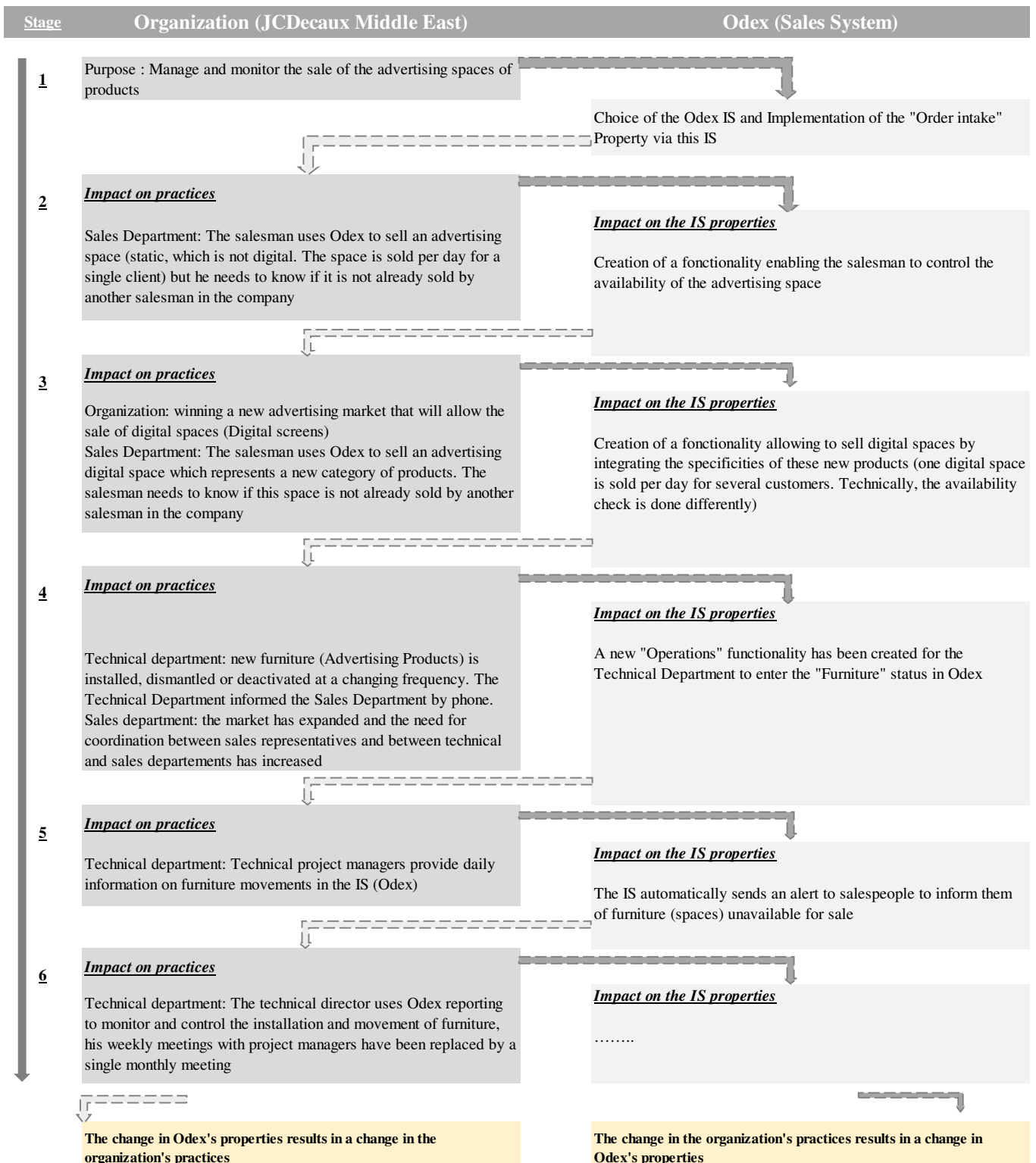


Fig-3: Imbrication between Practices and Odex as a Sales Information System

3.3.2 Use of Odex system and evolution of users' practices

By studying the use of the Odex system by the departments of the JCDecaux Middle East organization, we can see that the evolution of the system's practices (and the impact of the practices on the system) varies over time and according to the user's profile, as different properties are added to the system.

If the system was equipped from the beginning with these different options and properties (generation of reports, qualification of proposals, realization of predictions...), it only produces effects on the organization when they are discovered and practiced by human actors.

Our study shows that each new property that has been added to the technology is motivated by a purpose and has an effect (often unexpected) on the organization. Leonardi (2011) discusses the ambivalence of technological artifacts, as long as all material properties are present in the tool from the beginning, but it is when users discover or appropriate them for a specific purpose that allows these properties to have effects on the organization.

Odex has made it possible to boost practices and encourage users to take initiatives, it has also constrained work methods, which has forced users to seek alternative solutions (Excel, emailing, Powerpoint, phone calls, etc.).

The practice of a technology depends on the human agency taking into account the properties of the IS, understood as its materiality, but also the properties registered by the IT team (external developer + internal team), and those added by the user during previous practices (data entry, settings...). It also depends on the knowledge, skills and expectations of users about the system, which depends on the attachment and meaning that the past practice experience has generated in the user profile (40% of the interviewed users compare Odex to CRM systems and mainly to Salesforce).

4. DISCUSSION

In This article shows how the material properties of an IS impact the practices of its users in the organization. The discussion of the results is based on two ideas, that will be completed by the contribution of our study.

4.1 An Imbrication between Social and Material that adapts Users' Practices

The analysis of the results of this research study highlights the fact that the practices resulting from the imbrication process encompass a human and material agency that inevitably interweave as a result of interactions between technology and human. It is as a result of these interaction processes that sociomaterial imbrications create and modify organizational practices over time which adapt to the material properties of an IS.

As multiple ways of imbrication between material and human agencies occur in organizations, practices will change and can become visible and analyzable. In this way, these practices can be considered as flexible structures that develop and change to serve one or more organizational objectives. These practices evolve over time to reflect the variability of the material features of the given system.

We can observe the practice of control such as the sale by a salesman of an advertising furniture at a price determined by the marketing department as a complex process that influences and shapes practices in the sales process. Similarly, exchanges between marketing and salespeople before any order is placed are also mixed with technology in order to influence the configuration, nature and deployment of practices across the IS.

4.1 Evolving practices and permanent and/or temporary changes in the material properties of an IS

The results of our study in terms of practices show that there have been different types of changes in the materiality of the IS in relation with the new practices. For example, at least two types of changes can be identified. One is a temporary change in the materiality of the IS for experimental purposes, the other is a more permanent change. A temporary change in the materiality of the IS reflects the situation when new practices emerge to serve an immediate objective. For example, the practice of viewing all contracts on the Odex system interface to serve the immediate purpose of "checking that all sales are properly reported in the system". The other change comes at a time when practices have emerged to serve a long-term objective. For example, responding to the sales process, from the consideration of a proposal to generating and printing the contract. Therefore, we could argue that the change in the materiality of an IS can be temporary if it has a single purpose and can be durable if it becomes a common practice.

The distinction between the two types of change in the materiality of an IS mentioned above can be understood in terms of the level of organizational impacts. Awazu et al. (2007) studied the changes made to an Excel sheet and found three levels of change significantly related to the level of impact on the organization. This study has been transposed to our case to illustrate these three levels:

- The first level is "individual": in this case, people modify the parameters of the sales IS to make it useful for their purposes.
- The second level consists of making modifications to facilitate collective or group use, including adding a functionality.
- The third level is a modification of the system itself to further promote organizational practices.

It is clear that the impacts of changes in the materiality of an artifact, whether temporary or permanent, on organizational processes would be different in each case. Further studies on how and when new practices become routines as opposed to temporary practices that are never replicated would be useful.

The three elements of organizational impacts resulting from practice mentioned above have important consequences for the implementation of technologies and should be further explored.

4.3 Contributions of our study of Materiality and Practices through a weak Sociomateriality perspective

The analysis and discussion of semi-structured interviews, observations and documentary research helps us to understand and analyze the imbrications that exist between material and practices in an organization and to highlight the following contributions of our study:

Table -1: Contributions of our qualitative research through a weak Sociomateriality perspective

Axis	Data source	Summary of our contributions / Conclusions of our study
Study of imbrication between Material and Human agency	-Observations -Interviews with subsidiaries' Sales Directors and the Regional IT Manager	The practices resulting from the imbrication process encompass a human and material agency that interweave as a result of interactions between technology and human. Sociomaterial imbrications create and modify the practices of actors and the properties of technology over time to adapt the sales process to the needs of the organization.
Study of sociomateriality	-Interviews with Odex users (mainly Salespeople and the marketing team) -Observations	An organization's process is involved in the daily work practices, including selling practices, which in turn, also influence the development of other organizational processes and influence the material properties of the artifact that is part of the process.
Study of materiality	-Interviews with the Regional IT Manager -Documentary analysis (IS manuals and Booklets)	There are two types of materiality changes: one is a temporary change in the materiality of the IS for experimental purposes, the other is a more permanent change. According to our study, we could argue that the change in the materiality of an IS can be temporary if it has a single purpose and can be durable if it becomes a common practice.
Study of practices	-Observation of the work practices of a Salesman and a Clients Servicing representative -Interviews with Odex users (sales, technical, marketing, finance, clients servicing)	As multiple ways of imbrication between material and human occur in the organization, practices will change and become visible and analyzable. These practices can be considered as flexible structures that develop and modify to serve one or more processes in the organization and evolve over time to reflect the variability of the material features that make up these processes. Users of an IS emancipate themselves from the constraints imposed by a system by changing the practices and material properties of the system.

5. CONCLUSION

Although we are unable to integrate all the data and results into the limited space of this article, this research has allowed us to "feel" the complexity and at the same time the interest of integrating a technology within organizations and to confirm again that what we call a "social and material imbrication" is not as simple as it may seem and that the practices are often the result of a complicated interaction between the organization, the system and its users. The observations and the careful examination of all empirical data, particularly from the

perspective of weak sociomateriality, have allowed us to evaluate the implementation of a sales management process and practices of salespeople in the organization through an information system that is not simple, but which consists of many human and material interactions that are constantly imbricated and contribute to the life of the organization.

The theoretical perspective used in this research would benefit from being tested and refined in other organizations. Research undertaken by groups or

individuals with different perspectives and ideally not involved in the organizations subject to the empirical study would eliminate any question of methodological bias and provide additional empirical support for the robustness of this research.

A fundamental limitation of this research that can be investigated in the future is the type of technology being studied. It has been recognized that investigation of technologies that are less stable and easily modified by the user or investigation of technologies designed and used within the same organization (in-house technology development) can offer a significant advantage.

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APPENDIX

Table 2: Comparison of Weak Sociomateriality and Strong Sociomateriality for the study of Sociomateriality - (Leonardi, 2013, Table 2)

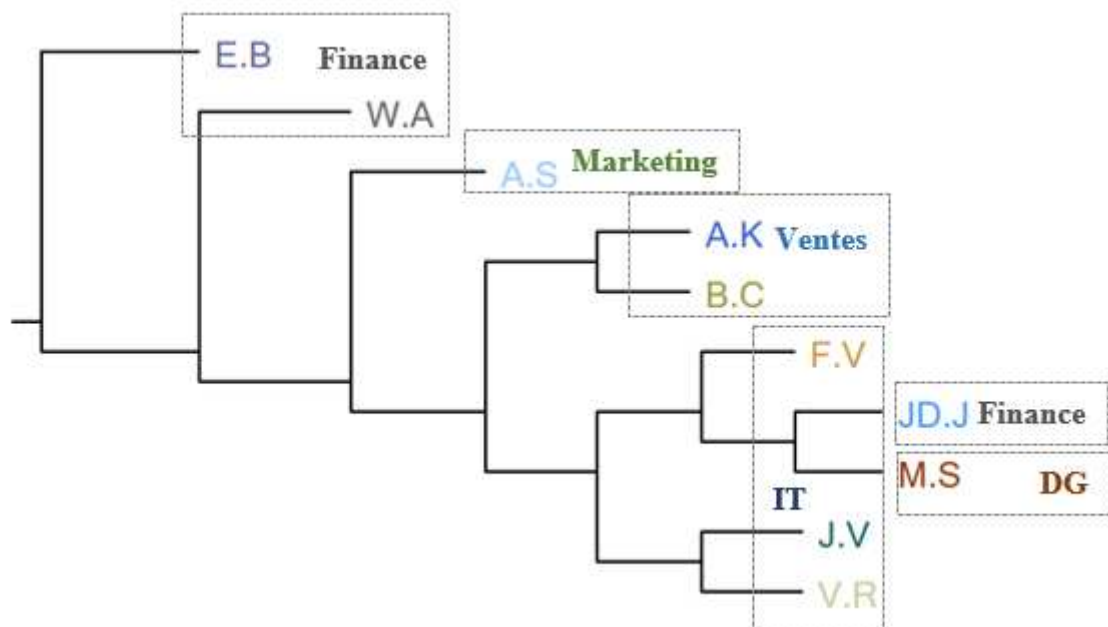
	Strong Sociomateriality Orlikowski perspective	Weak Sociomateriality Leonardi perspective
General Ontology	There is no social interaction that we can separate from materiality. There is only a merged "sociomateriality".	The social context and materiality are separated. Social and material become "sociomaterial" when humans interweave social and material agencies.
General epistemology	Analysts make arbitrary distinctions between what is "social" and what is "material" ("agential cuts") when they look at a unified whole ("sociomaterial")	Analysts determine how and why social and material interweave to become the "sociomaterial" and persist over time.
What is "Materiality" ?	There is no materiality. There is only sociomateriality.	The arrangement of the physical and/or digital materials of an artifact in particular forms, that persists through time and space
What is "Social" ?	There is no social. There is only sociomateriality.	Abstract concepts such as norms, rules, communication patterns, etc.
What is "Sociomateriality" ?	The inherent inseparability between the material and the social.	The constitution of particular sets of activities that combine materiality with institutions, norms, speeches, and all other phenomena defined as "social".
What is "Practice"	A sociomaterial achievement.	The space in which social and material agencies become constitutively indissociable through the process of imbrication.
Methodological analysis units	The Sociomaterial practice.	Social and material agencies.
Important ideas for Methodology	Identify the implications of sociomaterial practices for organizational processes (e.g., identification, negotiation, etc.)	Identify how social and material become sociomaterial and what implications this has for the organization (e. g. communication networks, centralization, etc.)
Potential conceptual contributions	Demonstrate how all organizational processes are sociomaterial and how recognizing this fact can improve their theorization. Demonstrate that the organization appears in practice and that this practice is neither social nor material but both.	To show how organizations and technologies have become what they are and why we think they should be like that. Move technology to a constituent role in the organization and organizational processes while showing how the organization adjusts technology.

Table 3: Semi-structured Interview Guide

1. Theme 1 - The question of the mutual influence between the structural properties of the organization and the IS 1.1 Between our initial interview (x year / month ago) and now, how did your organization (management, department) evolved? 1.2 Between our initial interview (x year / month ago) and now, how did the Odex IS evolved? 1.3 How the Odex system (its properties, use, interface...) and your organization (its structure, its practices...) have influenced each other over time? Could you give me an example (practical and relevant) of this influence?
2. Theme 2 - The question of human interpretation of technology 2.1 What are the challenges of the Odex system and to what extent, it can be considered a good sales information system? 2.2 Does Odex meet your needs and is it in line with your performance objectives? If not, why? Could you give me a specific example?
3. Theme 3 - The question of the materiality of the IS and the practices of the actors 3.1 What are the features/properties of the Odex system and how have they evolved between the first year of implementation and today? (Have a specific example). 3.2 Did Odex's properties had an influence on your daily practices and how did these practices evolve over time (in relation to the evolution of Odex's properties)? (Have a specific example). 3.3 How did the evolution of Odex's properties influenced the appearance (accentuation or deletion) of control, coordination and steering functions in your organization (management, department) (Have a concrete example)?
4. Theme 4 - The issue of organizational practices 4.1 Do you consider that the achievement of your work and objectives in the organization are slowed or facilitated by technology (the Odex IS) How? (Have an example). 4.2 By using Odex on a regular basis, have you been able to see that it can enable you to carry out practices (measuring indicators, changing practices...) that you didn't thought of when you first used this system? If so, which ones? (Have some examples).

Fig- 4: Processing of qualitative data under Nvivo 12– Some examples**a. Nodes created under Nvivo to handle the verbatims of the 42 semi-structured interviews**

Noeuds					
Nom	Sources	Références	Créé le	Créé par	
Fréquences des mots - différents types de SI		9	101	2/3/2018 5:41 PM	LO
Métier et Positionnement des interviewés		10	12	5/31/2017 4:45 PM	OL
P1. Influence mutuelle Propriétés structurelles de l'organisation -		10	10	5/31/2017 4:51 PM	OL
Situations avant ODEX		2	3	1/27/2018 4:21 PM	OL
P2. Ajustement des fonctions du SI dans l'organisation		10	45	5/31/2017 4:54 PM	OL
Autres Fonctions		4	4	5/31/2017 4:55 PM	OL
Fonction de Contrôle		10	10	5/31/2017 4:54 PM	OL
Fonction de Coordination		10	11	5/31/2017 4:55 PM	OL
Fonction de Pilotage		10	11	5/31/2017 4:55 PM	OL
Fonction prédominante		8	9	5/31/2017 5:31 PM	OL
P3. La matérialité du SI et des pratiques des acteurs		7	9	5/31/2017 4:50 PM	OL
Interprétation de la technologie par l'homme		9	11	5/31/2017 4:50 PM	OL
SI utilisés		10	13	5/31/2017 5:12 PM	OL

b. Data Sources grouped by word similarity and department under Nvivo

c. Frequency of words in interviews by department under Nvivo

