Information Practices in a Business Intelligence Environment: Findings from an Exploratory Study of French SMEs

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Abstract— **This paper presents the first results of a quantitative study that aimed to discover the way French SMEs in the northern part of the country perceive the Business intelligence process and their relation to the information-seeking and use process. The study has been conducted in close cooperation with the ARIST (Technological and Strategic Information Regional Agency) from the Regional Chamber of Commerce of the Nord Pas-de-Calais, France, from November 24 to December 18, 2009, on a sample of 3721 SMEs. Key findings refer to the perception SMEs have of their competitive environment, the importance given to information sources, the use SMEs make of information, and the implementation of Business intelligence structure.**

*Index Terms—***Business intelligence, Information practices, Information seeking, SMEs**

I.INTRODUCTION

BUSINESS intelligence (BI) is a hot topic in the competitive world today. Practitioners and scholars both point out the absolute necessity for the modern firms to be aware of their changing environment. But, despite its rising popularity, many authors have showed that BI practices are very different according to the size of the firms and not yet very popular in small and medium-sized enterprises (SMEs).

This paper presents the first results of a study that focused on the information practices of French small to medium-sized enterprises (SMEs) in the context of Business Intelligence (BI). The study has been conducted in 2009 and follows a previous study made in 2002 by one of the authors [1]. The paper outlines the first results of a quantitative study that aimed to discover the way SMEs perceive the BI process and their relation to information seeking. The paper is divided in six sections. After the Introduction (section one), section two presents the key concepts used in the paper and gives an overview of the literature on the same topic. Section three explains the methodology used for the study: how the data have been collected, the survey protocol and the hypotheses. Section four presents the key findings from the study and section five discusses the findings referring to the initial hypotheses. Lastly, section six concludes and gives some perspectives for next investigations.

II.CONTEXT OF THE STUDY

A.Key concepts

Studies in Business Intelligence (BI) are related to various disciplines, mainly economics, market studies, information science and, in some way, computer science. Consequently, researchers dealing with this topic use a diverse and polysemic terminology depending on their scientific origins. As Bouthillier defined in [2], in this paper, we use the term "business intelligence" to refer to "an information-gathering process involving the analysis of a company's external environment in order to remain competitive", including market and sales analysis, analysis of the customers behavior, and technical watch. The BI process includes several steps covering the entire information value chain of an information system. Choo [3] gives a general model of information management which consists of 6 steps: identification of information needs, information acquisition, information organization and storage, development of information products and services (packaging), information distribution, and information use.

From the Information science viewpoint, which is our approach, the whole process of BI may be considered as a particular type of "information seeking and use". In the literature, many expressions are used to refer to the step of "having access to information": information seeking, information searching, information gathering, information foraging, and even information acquiring. The number of different terms used to label the more or less same process of collecting information indicates the importance of this step. Because this paper is not the place to detail the differences between the terms, we just roughly stress attention on the fact that, very often, acquiring information in a BI context, and specially within the SMEs, doesn't' mean having an explicit procedure of collecting information. As we will see, sources of information may be formal or informal, external or internal,

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tacit or explicit… To be as neutral as possible, we then will use the term of "information seeking" as defined by Wilson [4]: *information-seeking* refers to purposive behavior involving users' interactions with any kind of information sources.

A second key concept we need to clarify is "information practices". For several reasons we explained below, we prefer this concept to "information behavior". While the concept of behavior is based on a psychologist viewpoint on information use, the concept of practice draws on a more sociological and contextual perspective. McKenzie [5] states that "a focus on practices rather than on behavior shifts the analysis from cognitive to social and is consistent with the study of information seekers within their social context". She suggests studying information use as a continuum of information practices, from actively seeking out a known source or planning a questioning strategy, to serendipitously being contacted by a previously unknown source or being given unasked-for advice. Bases on empirical studies conducted in the early 2000s, she developed a model of information practice which presents four modes: active seeking, active scanning, nondirected scanning and obtaining information by proxy. The main idea of the model is that people may use different modes of information practice depending on the context, the environment and the needs.

Secondly, the concept of information practice includes other dimensions of information processing such as producing, publishing, sharing, and recycling information. These various dimensions of information processing, including information seeking, searching and use, are embedded in work-related and non work-related contexts and cannot be anymore considered as separated from everyday social practices. The BI context is one of these work-related situations in which "information practices" are analyzed in this paper.

B. Overview

The domain of strategic scanning and business intelligence is one of the most challenging concerning the problem of information access, specifically for the decision makers. Different models scan the information processes, such as Francis Aguilar's strategic scanning process [6] or Richard Daft's chief scanning behavior [7]. Other models in information management, in particular the one suggested by Robert Taylor [8] then revisited by Howard Rosenbaum, quoted by [3], aim to articulate information seeking and decision making process. Three examples may illustrate this trend: Choo, Detlor and Turbull's environment scanning model [9], the informational ecology model of Thomas Davenport and Laurence Prusak [10] and the model of "Web information behaviors of organizational workers" proposed by Brian Detlor [11].

Specifically devoted to the study of SMEs, numerous studies have sought to give new and interesting perspectives on business intelligence and competitive intelligence in these enterprises, whether focusing on networking as in [12], environmental scanning [13] or competitive advantage [14],

[15].

Research on information needs, seeking and use in SMEs is part of a scientific and literary tradition with exploratory and experimental studies led worldwide.

Dua [16] analyzing Chinese SMEs came to the conclusion that managers mostly used personal sources of information. In South Bank London, Orminksi [17] showed a clear relationship existed between an enteprise's business strategy and its relationship to information use. Lybaert [18] focused on the association between information gathering and success in industrial SMEs in Belgium confirming the hypothesis according to which the more frequently entrepreneurs use information, the better their results and performance.

Studies have also been made in African SMEs. Nlayidzi Jorosi [19] analyzed the information needs and information seeking behaviors of SME managers in Bostwana. Among others key findings indicated that (i) SME managers used both personal and impersonal sources when seeking information, (ii) that information sources selection was largely determined by accessibility and ease of use, (iii) that SME managers devoted a significant amount of time to active information seeking, on an average of approximately five hours spent per week seeking information.

In Canada, an exploratory study of three organizations (varying in sizes from large to medium and small enterprises) explored the link between information culture and information use. Led by Choo, Bergeron, Detlor and Heaton [20], it showed information culture significantly affected information use outcomes and suggested managers might wish to consider taking the information pulse of their organizations in order to have a sense of the information attitudes and values that are important in their organizations.

To conclude this non exhaustive survey, a review of the French studies focusing on SMEs and information has to be mentioned. Various researchers have contributed to the analysis of the practices of BI in French SMEs among whom Lesca & Raymond [21], Colletis-Salles [22], Bulinge [23]. In a recent research work, Larivet [24] has led an empirical study on 100 SMEs showing, among other conclusions, that (i) information practices in SMEs structure themselves in relation to the level of influence they have on their environment, (ii) SMEs doing BI have a more collaborative approach to strategy and involve their employees more in information seeking, (iii) BI seems to be positively related to the manager's personal network and the organization of the circulation of information in the enterprise.

III. METHODOLOGY

A. Data collection

Although definitions differ from one country to another, in order to elaborate our sample, we resorted to the definition of a SME as given by the European Union in 2003 following the 2003/361/CE recommandation [25].

Consequently, in this study, *"the category of micro, small and medium-sized enteprises (SMEs) is made up of enteprises*

which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and / or an annual balance sheet total not exceeding EUR 43 million". (Article 2 – 2003/361/CE recommandation)

In the same way, an enteprise is here *" considered to be any entity engaged in an economic activity, irrespective of its legal form. This includes, in particular, self-employed persons and family businesses engaged in craft or other activites, and partnerships or associations regularly engaged in an economic activity"*. (Article 1 – 2003/361/CE recommandation).

Thanks to a close collaboration with the ARIST (Technological and Strategic Information Regional Agency) from the Regional Chamber of Commerce of the Nord Pas-de-Calais, France, a sample of 3721 SMEs, that satisfied with our definition, was identified.

Out of the 3721 SMEs contacted, a number of 101 enterprises responded to the survey. This low response rate of 2.71% can partly be explained by the period chosen to send the survey (namely the end of the year) but also by the length of the survey and the owners and managers' lack of time to answer it.

The participating firms ranged in size from 1 to 200 employees and mainly belonged to 6 different industrial categories: (i) manufacture, (ii) sanitation (clear drinking water and adequate sewage disposal), (iii) civil engineering, (iv) wholesale, (v) information science and programming, (vi) specialized scientific and technical activities.

B.Survey protocol and Hypotheses

The methodology used in this research was based on a quantitative study that aimed at discovering the way SMEs perceived the BI process and more specifically what were their relation to information seeking and use.

Doing so, a questionnaire was finalized with the members of the ARIST and data were gathered by means of a mail survey, hosted on a server of the Regional Chamber of Commerce from the Nord Pas-de-Calais, France. The CEOs and managers of each firm being asked to complete it.

The questionnaire was available online from November 24 to December 18, 2009.

Overall, the study consisted of 5 main sections with specific research objectives: (i) enterprise identification, (ii) study of the enterprise environment, (iii) study of the enterprise information needs, (iv) study of the enterprise information practices, (v) enterprise perception of BI and means devoted to it.

Thirteen questions were asked. Participants accessed the survey remotely via the Web. For most part of the questions, items were presented as statements for which respondents either indicated their agreement using a scale of 1 to 4 or checked off yes/no answers. The survey also included a number of open-ended qualitative questions that asked for more detailed commentaries or responses.

Regarding data treatment and analysis, answers to the questions were entered automatically into a database. Each completed questionnaire formed a record in that database. The latter was subsequently cleaned and imported into Excel for statistical treatment.

Without denying that other potential research questions would also have been relevant, the study was chiefly restricted to the analysis of information practices and to SMEs relation with information seeking and the implementation of a BI structure. Thus our hypotheses were formulated as:

H1: Perception of the enterprise environment is positively related to information seeking.

H2: Information seeking is positively related to the implementation of a BI structure.

H3: Information seeking is positively related to the importance and value of information.

H4: Value of information is positively related to the diversification of sources of information.

H5: Value of information is positively related to the implementation of a BI structure.

IV.KEY FINDINGS

A.Enterprise environment

Part of the questions constituting the survey dealt with the perception SMEs had of their environment and their competitors.

The objective here was threefold: (i) determine the SMEs' professional network. Indeed, often considered as the first information providers, professional partners commonly represent the only sources of information for an enteprise; (ii) determine whether SMEs felt they had a good perception of their competitors and environment; (iii) determine whether SMEs regularly tried to identify the technological evolutions that could potentially threaten their development.

Concerning the first objective, evidence given by the answers enables us to notice that trade fairs and shows, unions, guild chambers as well as clubs represent the main professional network of our sample. SMEs will occasionally have relationships with private consultants or state services but nearly unanimously claim to have no exchange with research laboratories or European Programs and Institutions.

Regarding the second objective, 69.3% of the respondents consider they have a good perception of their enterprise environment when 27.72% say they do not.

Finally, 85.14% of the SMEs of the sample say they regularly try to identify the technological evolutions that could potentially threaten their development, when 12.87% say they do not. This result is all the more relevant as 57.42% of the respondents consider their customers to be volatile compared with 39.6% who consider they aren't.

Overall, findings in this section tend to show that SMEs have the feeling to have a good perception of their environment, with a sharp awareness of the need to watch it.

B.Typology of information sources

In the field of information needs, seeking and use, findings from this study show that 81.18% of the respondents consider

information to be a central asset for the enterprise. Generally speaking, SMEs grasp the importance of information regarding their growth and consider it a major issue.

In the same way, they confirm they make use of their personal and professional networks as sources of information which they regularly (for 20.79% of the respondents) or occasionally (for 56.43% of the respondents) consult.

In order to complete this result, we attempted to draw up a list of the sources of information that SMEs most frequently consulted and used. Ten different types of sources were suggested as shown below in Table 1.

TABLE 1
TYPICAL INFORMATION SOURCES FOR BI

Number	Sources
1	Professional journals and magazines
2	Discussion Groups, mailing lists, RSS
3	Free Newsletters
4	Paid Newsletters
5	Media reviews
6	Competitors' Web sites
7	Commercial databases
8	Technology and market surveys
9	Blogs and wikis
10	Trade fairs, conferences, exhibitions

For each of the sources, respondents had to indicate their frequency of use resorting to a scale of 1 to 4 (1 = Never; 4 = Very often).

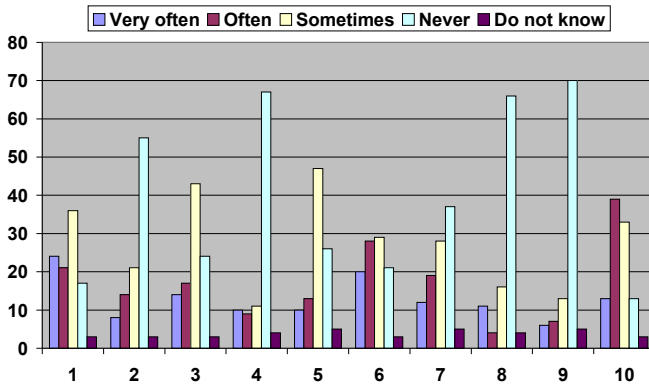Figure 1 summarizes survey responses to this question.

Fig. 1. Sources of information used by SMEs.

Considering the overall value given to information, we could have expected SMEs to use "very often" or at least "often" a large diversity of sources which would have met with their information needs and necessity to gather information.

Yet as can be noticed in Figure 1, results rather indicate that in terms of sources, SMEs mostly use what we could refer to as "traditional" types of sources as well as "free" sources but in a rather small proportion.

A close analysis of the data shows that when adding up answers of the "very often" and "often" categories, (i) free newsletters (30.69%), (ii) professional journals and magazines (44.55%), (iii) competitors' websites (47.5%) and (iv) trade fairs (51.48%) remain the most frequently used types of sources. Yet in comparison, nearly as many SMEs if not more only use these sources occasionally or never.

In the same way, clear-cut results show that a very large proportion of our SMEs do not give attention to sources linked to new media, such as: (i) blogs and wikis (69.30%) or (ii) discussion groups (54.45%), and sources which require financial cost such as paid newsletters (66.33%) or technology and market surveys (65.34%).

These findings appear to express that SMEs, even though they say information is a decisive element and recognize its value, do not frequently gather information neither mobilize a variety of sources. They rather use traditional and free or easily accessible sources but with moderation.

C. Importance of information

The second aspect we analyzed concerning information dealt with the importance SMEs attached to their sources of information.

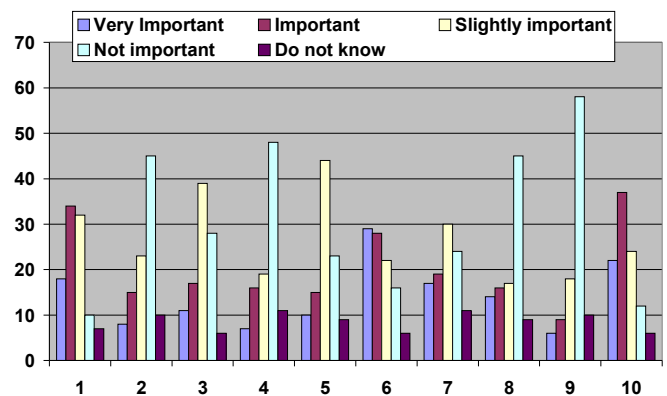Key findings pertaining to this question are presented below in Figure 2.

Fig. 2. Importance given by SMEs to information sources

Many of the results, if we make a comparison between Figure 1 and Figure 2, illustrate the subtle but meaningful differences in the SMEs' relationship with information.

Indeed, if generally speaking the lack of importance attached to the different sources matches with the lack of frequency of use of these sources, the ratio isn't the same.

There is a clear indication here that SMEs, in absolute terms, attach more importance to information than they actually gather it.

If we add up answers from the "very important" and "important" categories, we observe that the percentages are higher when it comes to evaluating the importance of the sources namely, for example, 51.48% for professional journals and magazines as opposed to 44.55% when dealing with the frequency of use, 56.43% for competitors' websites as opposed to 47.5% for the frequency of use and 58.41% for trade fairs as opposed to 51.48% for the frequency of use.

Similarly, sources like paid newsletters or commercial databases, though it remains modest, also show a higher degree of importance attach to them than when focusing on their degree of frequency of use.

The observation of a gap between these two dimensions

strengthens the idea according to which SMEs, as a whole, value information and attach importance to it.

Not surprisingly, blogs, wikis and discussion groups still remain the lowest rated sources regarding their degree of importance. Results once again are clear-cut and could let us think, but this remains a hypothesis, that these sources are too complex to watch, evolving too quickly and particularly "noisy" in the informational sense of the word.

D.Information use

Finally, data revealed interesting results regarding the use SMEs made of information. Following four possible answers, respondents were asked to tell what they did with a piece of information when they judged the latter was important.

Of the firms responding: 71.28% answered they disseminated the piece of information to the colleagues of the enterprise; 58.41% said they looked for additional information; 37.62% indicated they shared it with partners who did not belong to the enterprise; finally 34.65% said they filed it for future use.

Here again, results tend to express SMEs have responses and established practices as regards the use of information. Yet paradoxically enough, they do not gather information as much as we could expect them to do, which leads us to wonder if the main obstacle doesn't result from a lack of means, a lack of skills and a lack of labor.

E.Implementation of a BI structure

Directly related to information practices, this study consequently sought to understand the perception SMEs had of business intelligence (BI) and the means they devoted to it.

Broadly speaking, the majority of the responding firms (56.43%) indicated they had not implemented a BI structure in their enterprises when, on the other hand, 31.68% said they had.

This first result could lead us to conclude that few tools, few specific persons and little means seem to be allocated to a BI activity in our sample. Further analysis of the data gives more elements to confirm this statement. Indeed, 48.51% of the respondents indicate no specific person is in charge of information seeking in their enterprises as opposed to 22.77% who positively answer to the question. Moreover, 62.37% say they do not use business intelligence tools as opposed to 24.75% who say they do.

Yet this analysis needs to be tempered for two reasons. In the first place, 38.61% of the SMEs point out that information seeking is part of the usual tasks their employees perform as opposed to 32.67% who say it is not the case. In the second place, and common to both questions, 28.71% of the respondents neither indicate a specific person is in charge of information seeking in the enterprise nor add this activity is part of the usual task their employees perform.

This shows that opinions and results here are not categorical. The lack of stand marks we are in an in-between situation which is meaningful. It reveals potentiality and practices which cannot be characterized as formally established but which yet exist.

A complement to this statement can be found in the respondents' answers regarding the number of days they said to be devoting to information seeking each month.

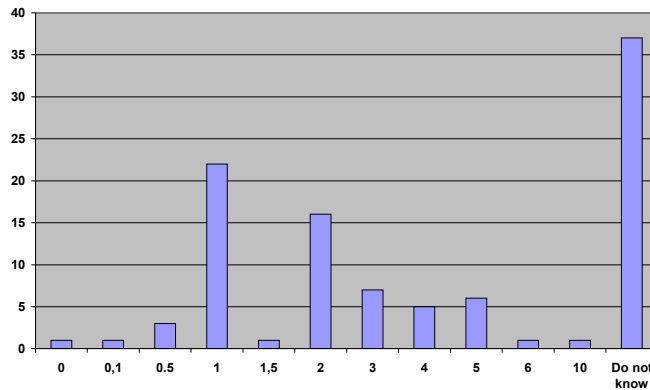Results pertaining to this question are detailed below in Figure 3.

Fig. 3. Time devoted to information seeking per month (expressed in days)

The number of days devoted to information seeking is presented on the abscissa. The number of SMEs concerned by the answer is presented on Y-coordinate. As can be noticed, only one SME indicates not to be devoting time to information seeking, 37 SMEs do not know and 63 SMEs declare to be devoting time to information seeking in a range from 0.1 day to 10 days. The most frequent answers given being 1 day per month for 21.78% of the respondents and 2 days per month for 15.48% of them.

Data confirm SMEs do have information seeking practices but in a moderate manner.

V.DISCUSSION

The purpose of this research was to analyze the way SMEs perceived the BI process and to study their relation to information.

Figure 4, presented below, corresponds to a first modeling of the items we examined.
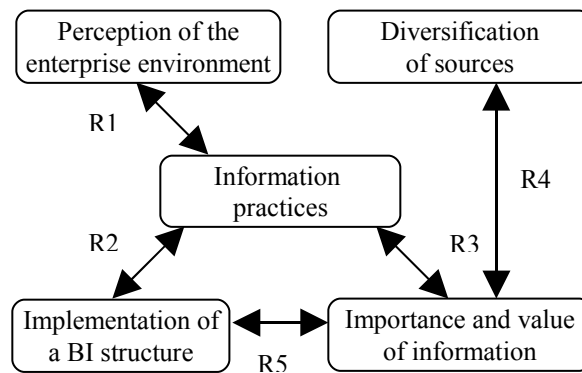

Fig. 4. Key Findings implications

Based on our initial hypotheses, the aim of this model is to give an overall picture of our findings and discuss the correlations that can be established between these items.

Considering our results, a first correlation can be established between the perception SMEs have of their environment and information practices. This correlation is referred to as R1 in Figure 4. Results in this study show that SMEs which have a good perception of their environment tend to seek for information and are well aware of the necessity to remain updated on the evolutions that directly concern their development.

Consistent with this idea, the majority of SMEs, in this study, indicate they value information and attach importance to it. Yet when focusing on the relationship between this degree of importance and information practices (R3 in Figure 4), we observe there is no real causal link between the two items. Data show information seeking remains a moderate activity. Aside from their professional networks, SMEs only consult a few sources frequently. The latter are not varied. This selection of sources can possibly be explained by factors of accessibility and ease of use. This tends to mark as well that diversification of sources and importance of value (R4 in Figure 4) are not, in the context of this research, immediately related.

Following our analysis, an interesting correlation can be established between information practices and the implementation of a BI structure (corresponding to R2 in Figure 4). Generally speaking, the respondents of our sample indicate they have not implemented a BI structure and do not use specific BI tools. Nevertheless, they point out information seeking is part of the usual task they perform, on a regular monthly basis. Similarly, a large majority of respondents add they disseminate, look for, share and recycle information when the latter is considered to be important or decisive. This is consistent with our definition of the concept of information practice which includes other dimensions of information processing such as producing, publishing, sharing, and recycling information. This also reinforces the idea according to which the importance of information is positively related to the implementation of a BI structure (R5 in Figure 4) and reinforces the link the importance of information and information practices (R3 in Figure 4).

VI. Conclusion and Perspectives

The results presented in this paper give new data concerning the way French SMEs from the North of France perceive the Business intelligence process and their relation to the information-seeking and use process even if some limits can be pointed out. First, the ratio of respondents is quite low and we need to be very cautious about the results. Secondly, the questionnaire available to the SMEs had to be shorter than initially expected in order no to discourage the managers who accepted to complete it and some answers need to be clarified. We now plan to realize some interviews to confirm some of the results. Thirdly, the findings need to be discussed in further details and to be compared to other similar studies even if the difference of methodologies for conducting the studies makes the comparison difficult. This future work is already initiated

and will be presented in a next article.

The study conducted by the authors of the paper takes place in a more general research program concerning the information practices in work-related situations and specifically in Business intelligence contexts. The theoretical framework of the research mainly refers to Information Science even if we consider issues coming from management science. Studying BI practices may indeed refer to different conceptual backgrounds that we will need to discuss in further details. The quick overview of the few key concepts presented in section 2 shows the importance to clarify the scientific approaches used by scholars. This theoretical issue will also be studied in future works.

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