

“IT, SME’s performance and regional development: an empirical study from insular firms”

AUTHORS

Alidou Ouedraogo

ARTICLE INFO

Alidou Ouedraogo (2012). IT, SME’s performance and regional development: an empirical study from insular firms. *Problems and Perspectives in Management*, 10(4)

RELEASED ON

Saturday, 22 December 2012

JOURNAL

"Problems and Perspectives in Management"

FOUNDER

LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

0



NUMBER OF FIGURES

0



NUMBER OF TABLES

0

© The author(s) 2025. This publication is an open access article.

SECTION 2. Management in firms and organizations

Alidou Ouedraogo (Canada)

IT, SME's performance and regional development: an empirical study of insular firms

Abstract

The globalization of the economy and the internationalization of markets have brought an unprecedented development of the IT in SME's. Some researchers postulate that this new organizational form supported by IT may actually help reduce the gap between industrialized and developing countries and contribute to improve SME's performance. This research builds on this hypothesis and focuses on the contribution of IT upon the performance of the firm in developing countries. This paper examines most of the largest Reunionese firms and allows us to identify several interesting factors. The author specifically examined certain characteristics such as size, age, diversification of activities or lack of diversification, status as a subsidiary of a larger firm, degree of computerization and if electronic communications influence IT use. The paper also looks at certain factors that could illustrate the relationship between IT use and firm performance. Finally, the paper presents findings and discusses them in terms of the degree of utilization of IT by insular firms, the development of external relationships and the importance of developing IT investment to reduce transaction costs within Reunionese enterprises. From this research, there is an assumption that the use of IT may have an impact on the performance of insular firms and can enhance regional development of insular countries.

Keywords: IT, SME, ultra-peripheral territory, regional development, competitiveness.

JEL Classification: C22, C53.

Introduction

Globalization means, in the context of this paper, an unrestricted flow of merchandise, services, technology, investments and ideas. Also, it implies internationalization of corporate strategy in production, marketing and research (Ouedraogo, 2007a). In recent years, and especially since the mid-1990s, in some insular countries, firms and industry have had to confront the winds of global competition. Those firms selling into external markets are forced to compete with low-cost and sophisticated producers, and are selling to increasingly discerning customers (Peng, 2006). These developments pose new challenges for insular countries industry, which needs to master the ability to compete with the world's leading suppliers.

Consequently, globalization is characterized by two phenomena that are a little bit contrary: on the one hand, it leads to a fragmentation of firms but, on the other hand, it stimulates a bonding or consolidation process of industrial production activities (Abecassis-Moedas and Grenier, 2007). This consolidation process of reorganizing industrial activity is stimulated by the development of information technologies (IT). These technologies play a strategic role at the micro, meso and macro levels and are defined as technologies that combine electronic data processing and telecommunications that provide data collection, processing, transformation, storage and transfer to recipients. In a world of increasing glob-

alization, any SME interested in continued growth relies on IT to improve performance (Baudchon and Brossard, 2001).

For this reason, researchers have become increasingly interested in examining the role and use of IT in territorial development (Belussi, 2005; Galliano and Roux, 2003). For many of them, IT plays an important role in spatial dynamics such as local and regional development (Moreau, Vermot-Desroches and Delisle, 2002), urban and rural localization (Galliano and Roux, 2003) and cluster activity (Suire, 2003). More specifically, numerous papers demonstrate that IT develops more rapidly when geographic, social or cultural proximity exists between partners (Belussi, 2005; Gottardi, 2003). These results may seem paradoxical when firms in a region such as Réunion Island are isolated from a certain number of their stakeholders. This research paper tries to shed some light on this apparent paradox by privileging the degree to which IT is used by Réunion Island firms. The first part of this research will examine the characteristics linked to the degree of computerization and the use of electronic communications implemented by these firms. Then, we shall look at the links that exist between IT and firm performance.

We'll begin by reviewing existing literature on IT, SME and local development and continue by examining the link between IT and competitiveness. The methodology used to coordinate these elements of knowledge and the rationale for indicators that we have chosen will then be explained. We will then propose different elements of response to the ques-

tions we examined. A brief conclusion will follow, illustrating the limits and contributions of this paper.

1. Theoretical background

1.1. IT and regional development. Globalization and unparalleled growth in markets and competition have pushed small to medium-sized businesses (SME) to depend on IT for survival. By adopting IT, they bring a new perspective to local development (Moreau, Vermot-Desroches and Delisle, 2002).

Because of IT, a small firm can survive by adapting to new rules of the game in which flexibility and quick response are key elements (Orlikowski and Robey, 1991). The widespread use of IT by the SME sector, and particularly the technologies available through Internet, are seen as a positive condition of growth and competition (Orlikowski 1992; Cases and Rouquette, 2000). For this reason, the contribution of IT to a firm's success is an area that numerous researchers have expressed interest in. Existing literature shows that one category of researchers examined the level of IT available to firms (Baudchon and Brossard, 2001). Here, researchers tried to understand IT development within a firm. Results demonstrate that a firm's computerization progresses very rapidly. However, computerization also brings an organizational evolution that many firms have difficulty recognizing and adapting to, leading to a lack of competition. This demonstrates that firms must truly appropriate IT use to their fullest extent. This is the belief held by a second group of researchers and, in fact, they suggest that the link between broadcast and a firm's performance depends on the degree of appropriation of IT by firms (Cases and Rouquette, 2000). These researchers argue that the broadcast dimension of IT must be complemented by a component of inherent appropriation mechanisms for firms where technology is viewed as a tool and a method of mobilization (means) rather than, initially, a structural element (an end). In this perspective, corporate performance cannot be attained without combining a spectrum of organizational processes, socialization and elaboration of inherent abilities that allows firms to improve and reinforce current activities (Benghozi and Cohendet, 1999). Cases and Rouquette (2000) demonstrate for example, that French accounting firms are not only highly computerized but have also factored in the required organizational modifications. In order to be efficient, both the qualitative and quantitative aspects of performance measurement must be measured.

Logisticians also ask the same questions: "The question is how information management can become a competitive advantage for logistics" says Gratadour

(2000) for example and logisticians answer by underlining the importance of reorganizing this function within a firm and around it (development of new activities, new agents or partners) as being necessary conditions for expected performance gains. Briefly, we submit that authors agree that the widespread use of IT in French SME is evolving rapidly but that lack of appropriation hinders the achievement of superior performances such as those that exist in the USA (Baudchon and Brossard, 2001). On the other hand, we know that transactions between clients and suppliers (especially business to business) have evolved rapidly during the last 10 years, thanks to electronic networks and that files and their logistics are now the areas where the most significant changes are occurring. Thus, hypothesis 1 suggests the following.

Hypothesis 1: The profile of Reunion Island firms is linked to their degree of computerization.

Corporate performance or competitiveness is not always identifiable at the corporate level itself but rather in the evolution and sharing of added value between the actors of the same file as a whole (Caby and Jaeger, 1997, 1998a, 1998b, 2000). The following hypothesis is, therefore, stated as follows.

Hypothesis 2: The way Reunion Island firms use IT is more adept at dealing with isolation and distance.

If IT development within firms is linked to better performance, could we conclude that there exists a relationship between IT use and productivity? This question is at the heart of an important debate among researchers in the field. We do not wish to take sides in the debate but rather to illustrate the different perspectives researchers have.

1.2. IT and competitiveness. The effects of computerization on firms are numerous. However, economists and managers alike have cautioned for several decades not to expect immediate and visible growth in productivity linked only to the introduction of new computerized and communication tools by firms. Greenan and Mangematin (1999) state: "Logically, investments in innovative technologies, especially in information technology, should have led to productivity gains. However, when statistical data didn't show this, thought was given to the manner in which technical progress is formalized in traditional growth theories and in measurement tools used in empirical approaches". They then investigated this assumption more closely by examining management research papers and Lorino's finding (1989) that: "Passive renewal of techniques that impact industry as well as services did not lead to expected levels of performances in firms". Then, citing Skinner (1988), they indicate that this "para-

dox of productivity” involves, for managers, not only “the efficiency of decision-making within firms” but also “the traditional use of management tools that underscore decision making”.

However, a BIPE study questions this famous paradox: “Simulation of a didactic nature done by BIPE with the Diva model shows that, if some sectors and some jobs can effectively be challenged by new technology, overall results are largely positive given the combination of demand – production of equipment and services arising from IT – and two effects on offer, productivity gains and competition and, creation of new products and services that would not have existed without these technologies”. The authors then add that “research by Karsenty indicates that elasticity in IT production is 0.2” which, through a drop in prices, “improves competition between firms... This improvement in competition should lead to an improvement of 4.1% in GDP within the next ten years...”.

On the other hand, Baudchon and Brossard (2001) in a comparative study of the IT sector in the US and France, develop convincing arguments regarding the positive effects of IT on productivity. In the US, results show that “productivity gains in work schedule and global productivity are clear and can be substantially explained by the widespread use of IT.” The authors suggest that “the absence of aggregate data in France can be mostly explained by delays in distribution and unfavorable business conditions in the 1990’s”. However, an econometric study of productivity in 51 sectors of the manufacturing industry provides a ray of hope: results show that IT has a positive impact which appears quite robust and seems strong enough to withstand capital incentive and pressure on capacity, as well as the introduction of variables related to working conditions and to workers professional qualifications.

In fact, scholars agree on the following elements:

1. On a macroeconomic scale, IT has a positive impact on employment: we must necessarily conclude that productivity levels on a global scale are minimal or non-existing (if they were otherwise, number of available jobs would have dropped). These positive effects on employment are linked to offer and demand effects and the regular introduction of new products and services.
2. The positive effects of IT on global competitiveness differ according to the sectors of activity; and productivity and competitiveness gains in firms are linked to experience and didactic (learning) effects. They, therefore, depend more on how IT are used in firms and how they reor-

ganize their activities rather than on direct spending for computerization, telecommunications and equipment.

The analyses presented in this research paper reflect this but, first, we must make a distinction between productivity and competitiveness. Productivity gains are measured either by fewer production costs when compared to a firm’s results or by an increase in results with the same production costs or, eventually, by both factors. In our study, we will argue that productivity gains are possible when firms better equipped in IT are also firms that reduce their labor costs while increasing sales. Hypothesis 3 is the following.

Hypothesis 3: Reunion Island firms that use IT intensively increase their competitiveness.

A firm’s competitiveness is linked to its capacity to successfully challenge competition. Of course, several factors are involved but we have chosen the best indicators that successfully define the competitive effects with regards to IT. We shall see that this still open to debate: can we, based on a few IT indicators in our survey sample, identify the firms’ characteristics with regards to competitiveness?

2. Research methodology

Within the scope of a multiyear research project on firm competitiveness, a team of researchers from Réunion Island University, in cooperation with business leaders and local institutions, did a survey of the most important firms on Réunion.

2.1. Sample and survey questionnaire. Of the 598 firms with more than 20 employees on Réunion, surveyors selected a sample of 250 firms (SIRENE file) and 118 representatives of these firms met with researchers who administered a questionnaire containing 130 questions. These firms, therefore, represent 20% of this stratum. Efforts were made to select respondents with diversified activities and, in fact, the sample is slightly under-represented in the industrial sector and over-represented in the construction sector. The highly selected sample did not warrant any adjustments given that the activities of the firms interviewed did not always match their code in the SIRENE database. However, the firms, among the most important ones on Réunion Island, are really SMEs when compared to Metropolitan firms: 30% have 50 employees or less, the majority (60%) have 50 to 300 employees and only 10% have 300 employees or more.

The survey questionnaire was joint endeavor of researchers who combined their respective expertise within their own area of specialty: strategy, marketing, human resources management, information

systems, logistics and finance. Some regional economic experts were also asked to integrate the most pertinent and well-adapted concepts as applied to Réunion firms. Then, more than 100 questions on quantitative and qualitative data collection which encompassed several concepts and indicators of management science were developed for this survey.

Questionnaires were administered to CEOs or firm representatives through an interview process by a professor-researcher or a researcher, sometimes with a graduate student present. Each interview lasted approximately one hour and a half. The quality of the respondents provided first-hand pertinent data collection which was completed by summarized financial documents (balance sheets and operating accounts) either directly provided by the firms or taken from EURIDILE. Data collection and initial data processing (flat tabs and some multivariate breakdowns) were done by the Development Observatory of Réunion, an economic and social partner in this survey. More specific and refined data processing was done by researchers working in specialized fields.

2.2. Choice of variables. In this section of our paper, we examine the answers of the firms with regards to the degree of computerization and the reliance on electronic communications which were included in the survey section on information systems. It was impossible to include all the questions researchers had regarding information systems in the survey questionnaire as this would have led to an overly lengthy questionnaire – and a less efficient survey – but also because the pre-test phase had shown that only a few firm CEOs and representatives were familiar with the vocabulary of information systems. The degree of computerization of firms is characterized by the following indicators in the survey.

2.2.1. Annual expenditures in electronic data processing (EDP). We do not know however exactly where the investments were made. Material and software? Investments and/or only operations? EDP and/or telecommunications? Answers to these questions can only be obtained, therefore, by comparing one element to another.

2.2.2. Number of computer specialists in a firm. Several firms rely on external computer specialists and are more or less advanced with their information systems (see Rowe, 2002). They have achieved this without having to hire permanent computer specialists. However, we can hypothesize that if a firm has more than two computer specialists on staff, it is one of the more advanced firms with regards to ICT. However, the contrary is not necessarily

true. Firms which don't have permanent computer specialists as permanent staff rely on external providers; they can also rely heavily on ICT.

2.2.3. Applications used by a firm. This tells us more about a firm's use of an application rather than the equipment available because almost all firms are equipped with ICT. What is important is the availability of applications for either decision support or more complicated projects not related to accounting, pay systems or commercial follow-up.

2.2.4. Internet use by CEO/senior representative interviewed. Only seven people interviewed did not use Internet. In fact, the more a CEO/senior representative used Internet, the greater the firm's degree of computerization. The reverse is not true, however.

2.2.5. Firm has an Internet site. This indicator is straightforward and reliable.

2.2.6. Use of Internet site. Firms that manage purchase orders by Internet are more advanced but few of them do (13 firms for sales orders and 34 for supplier orders).

2.2.7. Person responsible for Internet. This indicator's reliability can be mitigated somewhat when a firm relies on an external provider.

The flaws of some of these indicators may imply less robust explanatory power.

During this exploratory process, we have tried to understand the significance of the data collected and, in particular, tried to determine relationships between the degree of computerization and the characteristics of behavior or use. Analyses of the hypotheses are more often available in dummy variables rather than numeric variables. For this reason, the majority of treatments presented use the chi-square test and correspondence analysis rather than regression and principle component analysis. Certain cluster analyses on numeric variables were done to control bias, to determine whether firms were differentiated and to refine the comprehension of the observations.

3. Results and findings

3.1. A degree of computerization that is easily typified. All firms in the survey have computerized equipment and several applications that are essential to operations with an average of more than three applications per firm. Almost all firms have Internet connexions: only 6% don't have Internet and 44% have websites. This illustrates that computer and Internet use is higher than in Metropolitan firms at the same date: a 2001 IDATE survey showed that 62% of firms with 10 to 499 employees were connected to Internet while only 24% had websites.

When we compare firms as to the size, Réunion firms are more advanced than the national average. Without any doubt, the hypothesis can be submitted that the geographic characteristics of the department are a contributing factor to these practices but it must also be noted that one-third of the firms questioned are subsidiaries of national or multinational groups.

It is difficult to translate this lead in terms of impact on the competitiveness of firms: several studies have been done on this subject and testify that it is impossible to obtain precise gains in productivity or profitability as they relate to a firm's IT investments. At best, we can suggest that if computerization is followed by internal organizational changes, significant gains ensue.

However, the ECER survey provides a precise image of the most important parameters of computerization (staff, expenditures, applications) and of Internet (main uses, existence and mission of websites).

In our sample, computer specialists on staff are relatively few: only 126.5 employees for 118 firms, an average of slightly more than one per firm. The presence and number of computer specialists increases with the size of the firm (T1: dependence is very significant; $\text{Chi}^2 = 29.48$, $\text{ddl} = 9$, $1 - p = 99.95\%$) which is not surprising but there are exceptions and many other factors come into play.

The findings are the same regarding expenditures: on average, investments are more than 100,000 Euros a year, with a significant root-mean-square deviation, a dispersion that reflects approximately the firm's size, but not fully, not at all ($r = 0,459\dots$) (see Table 1).

Table 1. Number of computer specialists and staff size

Staff size (4 cl.) / Number of comp. spec. (4 cl.)	7 of 49	50 of 99	100 of 700	1200, 1400	Total
None	26	21	13	0	60
1 or more	5	10	13	0	28
2	5	4	5	1	15
3 and more	0	2	12	1	15
Total	36	37	43	2	118

Computer utilization is frequent (on average, more than 3 applications by firm), and although most use "classical" applications (accounting, pay systems, commercial follow-up) some firms are more advanced than others. The same finding applies for projects: some firms retro-fit while others introduce updates to already complex information and communication systems. It must be said that R&D applications are quite modest, both for actual use and planned use (T2). Almost all firms use Internet and

several applications but they vary case by case and are quite dissimilar. In our survey, 44% have websites (or use the website of the business to which they are affiliated), which explains, in part, the greater proportion of sites than within Metropolitan firms of a comparable size (see IDATE survey above).

3.1.1. *Characteristics of firms with websites compared to those who don't.* Firms on Réunion Island who have websites are:

1. The most important with regards to work force (T3: $\text{Chi}^2 = 11.70$, $\text{ddl} = 3$, $1 - p = 99.15\%$).
2. Firm activity is linked closely to industry and services – tourism and hotel industry in particular – rather than construction and retailing (T4: dependence is significant; $\text{Chi}^2 = 19.48$, $\text{ddl} = 8$, $1 - p = 98.75\%$). However, size also plays a role here: firms in construction and retailing are of a modest size compared to the sample average.
3. Firms are diversified: the more distinct their activities, the more they have websites. Therefore, between the existence of a website and the importance of the main activity in sales, dependence is very significant (T5: $\text{Chi}^2 = 14.01$, $\text{ddl} = 3$, $1 - p = 99.71\%$).
4. Firms have been in activity for longer periods (T6: $\text{Chi}^2 = 9.49$, $\text{ddl} = 3$, $1 - p = 97.66\%$) which suggests that a learning curve could play a role.
5. Firms have more clients and are, therefore, less dependent on them (T7: dependence is significant; $\text{Chi}^2 = 9.55$, $\text{ddl} = 4$, $1 - p = 95.12\%$).
6. Firms are in more often in partnership with other firms (T8: dependence is significant; $\text{Chi}^2 = 5.71$, $\text{ddl} = 1$, $1 - p = 98.32\%$).

Before summarizing the characteristics of Réunion firms with websites compared to those who don't have them, we shall examine the relationship between having a website or not and the degree to which a firm is computerized. When we look at the elements from this view point, interesting elements emerge.

Of course, firms with websites invest more in computerization than those who don't have a website, (T9: dependence is significant; $\text{Chi}^2 = 10.48$, $\text{ddl} = 4$, $1 - p = 96.70\%$). Here again, the size of a firm plays a role. However, bigger firms that spend more on computerization and on websites express greater dissatisfaction with their information systems (T10: dependence is very significant; $\text{Chi}^2 = 21.53$, $\text{ddl} = 6$, $1 - p = 99.85\%$). Why? Do these firms have more experience in computerization or is it that their expectations regarding computerization are more important than other firms? Our results converge with those of another study (Jaeger et al., 1997). Of course, it may be that seeing as they have invested more in information systems their expectations are

higher in this regard. Nonetheless, it is an indication of a greater maturity regarding information systems.

The relationship between the number of computer specialists in a firm and the presence or absence of a website is more complex: the link between having a website and the number of computer specialists in a firm is quite weak (T11: $\text{Chi}^2 = 5.94$, $\text{ddl} = 3$, $1 - p = 88.53\%$) but the explanation is the use of external providers (T12: dependence is very significant; $\text{Chi}^2 = 16.09$, $\text{ddl} = 4$, $1 - p = 99.71\%$). Firms with websites rely on either in-house computer specialists, if they have one on staff or on external providers.

From the view point of activities, the relationships between sites and activities and the relationships between computer expenditures and activities are coherent. A comparison between the two analyses (T4 and T13: dependence is significant; $\text{Chi}^2 = 30.49$, $\text{ddl} = 16$, $1 - p = 98.44\%$) effectively demonstrates that firms that spend less (business service) are those that have fewer websites and that those that spend the most have more websites (hotel industry, restaurants, tourism, printing, press services, audiovisual) (see Table 2).

$$\text{Chi}^2 = 8,91 - \text{ddl} = 4 - p = 0,062.$$

Table 2. Web site and activities

Web site/Activities	Yes	No	Total
Industry	11	9	20
Construction	5	10	15
Sales and marketing	10	26	36
Services	15	15	30
Local government	11	6	17
Total	52	66	118

Firms are differentiated by the degree in which they are computerized. A first global approach in this dif-

ferentiation could be made on a classification based on the mobile center method. The choice of 5 variables (date of establishment, % of sales in A1, Internet site or not, number of computer specialists, number of salaried workers) provides an automatic classification in 4 classes. However, it must be noted that class 3 is unique: it is comprised of two firms in the medical-social field which have significantly more employees than the other firms in the sample (1,200 and 1,400 salaried workers respectively).

The classes created illustrate the main characteristics we have discussed so far: firms with a longer history and more employees also have, most often, more websites and computer specialists on staff (class 2) and inversely (class 4). However, the diversification of activities doesn't quite follow this pattern. From that point of view, classes 1 and 4 are the most differentiated: class 4 has firms with the following characteristics: one primary work source, younger staff, smaller scale, less websites and very few or no computer specialists on staff (see Table 3).

When a correspondence analysis is applied to the same variables (CA 2: 41.86% of the variance is explained by the two categories represented), two groups with specific profiles emerge:

1. Firms with the most employees (more than 250 salaried workers), that have been in business longer (more than 40 years) and are the most diversified, are also the ones with more websites and computer specialists.
2. At the other end of the scale, we find the smaller firms that have been in business for a shorter time (created since 1990) and are the least diversified but which don't have either websites or computer specialists.

Table 3. Characteristics of the four classes

Classes	Staff size	%	Date of establishment	% of sales of A1	Web site	Computer specialists	Number of employees
Class 1	38	32,2%	1977,66	68,50	0,53	1,21	127,79
Class 2	16	13,6%	1959,19	75,63	0,69	2,81	385,19
Class 3	2	1,7%	1953,50	43,50	1	2,50	1300,00
Class 4	60	50,8%	1981,75	77,55	0,32	0,49	46,32

When the 6th variable is introduced (CA 3), that of the payroll percentage invested in training (34.76% of the variance explained by the two categories represented), here again, a clear opposition is drawn between the most important users who invest a significant part of their payroll in training and firms that are less computerized and only invest a small percentage of their payroll in training (less than 1%). Thus, the first link showing a relationship between training and computerization appears.

On the whole, two types of firms emerge:

1. More diversified older firms with websites and computer specialists.
2. Younger and smaller firms that don't have websites or computer specialists.

3.2. Réunion firms, computerization and external relationships. 3.2.1. *Client-focused websites.*

Firms that have websites use them mainly as publicity and information tools for clients and, to a lesser extent, for service providers:

1. The main clients of firms with websites are individuals rather than other firms (T14: dependence is significant; $\text{Chi}^2 = 4.48$, $\text{ddl} = 1$, $1 - p = 96.57\%$).
2. Websites are used mainly to explain the firm and its products (more than 77% of responses, see T15).

Firms with websites have a higher percentage of products under their own label (T16: dependence is significant; $\text{Chi}^2 = 8.445$, $\text{ddl} = 2$, $1 - p = 98.53\%$), their commercial feed-back is swifter (T17: dependence is significant; $\text{Chi}^2 = 6.00$, $\text{ddl} = 2$, $1 - p = 95.03\%$) and they introduce new products more often (T18: dependence is significant; $\text{Chi}^2 = 7.25$, $\text{ddl} = 2$, $1 - p = 97.33\%$).

From this viewpoint, Réunion firms are similar to firms in the Metropolitan area. Firms that sell to individuals, whether directly or indirectly are most likely to have websites which are used mainly to promote the corporate identity and eventually encourage general public commercial transactions via the website. But Internet use is far from being limited just to site development.

3.2.2. Supplier oriented Internet use. Whether or not firms have websites, 94% of the firms studied use Internet (T19). Types of use are more oriented towards suppliers as clients and the professional sector (48%) rather than towards clients (30%).

A total of 34 firms used Internet to send orders to suppliers (T20) but only 13 registered client orders from an Internet site (see T15). There again, as is the case in the Metropolitan area and elsewhere (see Cabby & Jaeger, 1997), business to business transactions are more developed than business to client transactions. It is evident that because suppliers are located far away, isolation increases the number of electronic exchanges and the use of Internet for this purpose, even when it does not translate directly into supply orders. The most frequent uses are rather for technical and professional information, e-mails, etc. (see T19).

3.2.3. High logistics costs. Understanding why Réunion firms have significant logistics costs is basically simple: 30% of them have inbound logistics costs 60% more than their sales figures while 18% of them attain that percentage for outbound logistics. Total logistics costs represent more than 20% of the sales for 30% of the firms in the survey... It is, therefore, not only the island's isolation that constitutes a serious drawback to procurement but it also contributes to significant internal communications costs.

Correspondence analysis of websites, computer expenditures, number of computer specialists, share

of sales going towards procurement on Réunion, share of logistics costs in sales and types of clients (CA 4: 29.8% of the variance explained), always demonstrate major differences between highly computerized firms and those that are less computerized. They also show that the weight of logistics costs and the share of procurement on Réunion play a role but in a more complex manner than in the first case: less computerized firms are found at both extremes with regards to procurement on Réunion. It is the type of client that is the determinant here. Firms with individuals as clients import systematically but their logistics costs are relatively low (retailing).

As for the firms whose clients are administrations or other firms, low logistics costs are associated with procurement that is essentially local (construction).

Finally, a small group of firms that are highly computerized have logistics costs that are very high (up to 90% of sales) and exterior procurement of 15% to 70% of their sales figure.

3.3. Different types of external relationships. In fact, Réunion firms in our sample seem to use IT to reach consumers as is the case elsewhere but they also use it to lessen their isolation from suppliers by diversifying and opting for electronic transactions with suppliers. So, a firm's level of activity impacts on its level of computerization, its more frequent recourse to IT and the manner in which it obtains supplies.

Therefore, CA 5 (25.4% of the variance explained by the two categories represented) which looks at the correspondence of 6 variables (Internet sites A1 in sales, activities, class 5, main clients, 2 classes, % of purchases on Réunion, class 3, number of computer specialists, class 4) shows that:

1. The first group of firms characterized by a wider public orientation (western side of map); highly computerized; very little diversification; and, suppliers mainly off island (retailing).
2. The second group of firms of a more professional nature; one work activity; and, less computerized (building trades).
3. Industry and wholesale with activities of a professional nature, on the extremes of the two first groups (southern part of the map), represent the most diversified firms and the ones that export the most. More modest in size than the first group, they coincide with "medium range" computerization in terms of computer investments and having only one computer specialist on staff. Firms are rare in this group which complements the fact that they are not publicly oriented.

Significant logistics costs, percentage of procurement on Réunion and computer expenditures are not decisive criteria but play a role as variable dependents: it is through a firm's activities (lesser or greater degree of diversification) and a general public orientation or not that these criteria play a role in differentiating the profile of users that are more or less computerized.

3.4. IT and competition. We must exercise a good degree of caution here however. If we hypothesize that the most competitive firms in our sample are those which have been more resistant (the older ones) and are more developed (the bigger ones), we now know (see preceding analysis) that they are also the most computerized. But what this means isn't clear: are they better equipped because they are more competitive or are they more competitive because they are better equipped? We are not in a position to answer this question (see Greenan et al., 1999). However, without a doubt, a link exists here and we can shed some light on it by examining certain characteristics of the sample.

3.4.1. Websites, computerization and personnel. Having websites is not linked to the number of employees recruited (Chi^2 is not significant) but rather to the number of employees who leave the firm (T21: dependence is very significant; $\text{Chi}^2 = 10.97$, $ddl = 2$, $1 - p = 99.58\%$). On the other hand, computerization investments are linked both to recruitment and termination of employment (T 22: dependence is significant. $\text{Chi}^2 = 15.80$, $ddl = 8$, $1 - p = 95.47\%$ and T23: dependence is significant; $\text{Chi}^2 = 31.91$, $ddl = 16$, $1 - p = 98.97\%$).

These links must not be blindly understood as being only productivity related. Expenditure is linked to recruitment and size is also a factor: bigger firms hire more new employees and are subject to more termination of employment. To look at how size plays a role, two new variables can be calculated: percentages of arrivals and terminations and number of salaried workers. Having a website is (weakly) linked with termination (T24: dependence is not very significant; $\text{Chi}^2 = 5.04$, $ddl = 2$, $1 - p = 91.95\%$) but not with recruitment. The fact that a link exists between websites and departures and not between websites and recruitment indicates a certain effect linked to productivity which implies that factors other than ICT usage play a role.

It should also be noted that site existence is linked to a less frequent measuring of outputs: firms that have site only rarely measure the performance of their employees (T25: dependence is very significant; $\text{Chi}^2 = 13.36$, $ddl = 4$, $1 - p = 99.04\%$). However, no link can be found with quality measures or initia-

tive: from that point of view, firms in the sample aren't any different than the average firm, whether they have websites or not. A certain evolution in management thereby goes hand in hand with the existence of websites and, probably, with regards to a firm's activities.

3.4.2. Websites, computerization, management and a firm's results. Firms with websites also have more business plans (T26: dependence is very significant; $\text{Chi}^2 = 11.88$, $ddl = 2$, $1 - p = 99.74\%$) but a significant link did not appear between websites and increased sales projections or websites and growth in a firm's financial performance.

However, the three following correspondence analyses (CA) show a link between the degree of computerization and certain characteristics that contribute towards a firm's evolution if not always with regards to competition.

The first CA, more focused on a firm's degree of openness, looks at the links between 5 variables: websites, number of computer specialists, degree of diversification, business plan and partnerships (AFC 6: 35.2% of the variance is explained by the first two categories). From this point of view, diversification, partnerships and a business plan go hand in hand with more computer specialists and websites (western part). On the other hand, being a single activity firm, not having partners and not having a business plan are linked to lesser websites and computer specialists (eastern part).

The second CA examines the relationship between six variables: websites, main type of client, weight of the three most important clients, business plan, growth in the value of the firm, expectations of survey responders with regards to sales, (CA 7: 31.1% of the variance is explained by the two categories). This brings to light that the more firms are involved with the general public, the lesser the dependence on clients, the more often they have websites and more often do they anticipate an evolution in the value of their firm but not necessarily of its sales figures.

A third CA looks at the relationship between seven variables: websites, number of computer specialists, business plan, growth in the value of the firm, expectations of survey responders with regards to sales, partnerships and types of clients (CA 8: 27.1% of the variance is explained). Once again, firms more involved with the general public believe that the value of their firm has increased and have business plans even though they don't foresee growth in the sales figures. They also have more computer specialists on staff and more websites.

In general and given the data collected, business plans and growth in the value of firms through ac-

tivities mainly general public oriented seem to go hand in hand with increased IT use. We can, therefore, presume that the specificity of Réunion firms with regards to IT use is strongly linked to their isolation from main procurement sources although this is not the only factor that comes into play. To be competitive in their sectors, they must rely on IT.

4. Discussion

4.1. IT and SME'S performance: towards a regional development? *4.1.1. Reunion firms degree of IT use and performance.* First of all, a firm's characteristics influence its use of IT and its efforts towards more IT integration: age and size of the firms and diversification of activities or little diversification, for example. A firm's age is a definitive influence and this finding is in line with several research papers on firm computerization that unanimously conclude that a significant learning and experience curve with regards to computerization exists: the sooner a firm begins introducing computerizing, IT is used more often and to a greater advantage, regardless of the fact that material, software and networks evolve rapidly (Jaeger and Caby, 1997). The variable of size is the second influence although there are exceptions: two firms in this sample had less than 30 employees and were strong IT users. In these cases, service and interface activities account for usage. On the other hand, when larger firms (size wise) use IT more (generally), we don't know how this link works. Did computerization support that firm's growth and its continued success? Or, on the contrary, did its size provide it with the necessary tools to introduce computerization more rapidly? Research by Nathalie Greenan supports the second hypothesis.

Secondly, what about the influence of relationships between suppliers and clients? The hypothesis of the previous analysis is that, if there is an influence, it would come into play, here again, because of a firm's most important activities. However, given the sample's modest size, this hypothesis will not be developed further. It must be noted however, that firms most dependent on their clients either because of concentration or because their large clientele fluctuates a lot are in the group that uses IT less. It must also be noted that firms that export products use IT more. As to the variable "weight of logistics costs", here again there is a strong link between firms that use less IT but have important logistics costs. However, we cannot establish causality one way or the

other. The firms that use more IT also have fewer logistics costs. Are economies of scale the reason or has there been rationalization because of IT?

4.2. IT use and Reunion Island firms' competitiveness. Finally, what about competitiveness? Here again, only conservative hypotheses can be proposed. At best, it can be established that the oldest and most important firms are, by definition, the ones that have survived the longest and the ones that are more IT oriented. We would need to cross-tabulate aggregate indicators with the financial results of firms to obtain a clearer picture.

Therefore, although our results don't demonstrate the "subtle steps towards performance" (Boutary and Monnoyer, 2003) of Réunion firms – a subject that could be examined in another qualitative study – results show that a mix of characteristics with regards to equipment and IT use are needed in order to have affect competitiveness or simply, performance.

Conclusion and future research

This research paper investigates the use of IT in an ultra-peripheral territory of the Economic Union, Réunion Island. This region, located approximately 10,000 km from Metropolitan France, is very isolated geographically but operates under the same institutions as other French regions. Its 750,000 citizens represent a specific and very small market for firms that operate in this region of the Indian Ocean. Necessarily, firm development derives from close relationships with Europe, including procurement services that originate there. It is easy to understand how IT plays a lead role in the economic development of the island. In fact, the economy of Réunion Island is largely impacted by its level of exchanges with continental France, located 9,000 km away. Internet technology, including email, allows for interactive exchanges regardless of distances and time zones and represents an added cost advantage compared to telephone costs between North and South. These results suggest that the intensive use of IT by Réunion firms contribute to regional development of Réunion Island (Ouedraogo, 2007c). However, results do not allow us to establish a causal relation between IT use and the competitiveness of firms involved in this survey. Further Europe ultra peripheral region must be required to support the findings. Moreover, monitor and measure development of IT and innovation within insular firms and across many Europe ultra peripheral countries could be interesting.

References

1. Abecassis-Moedas, C., Grenier, C. (2007). Un modèle étendu de la structuration entre TIC and organisation au sein des districts industriels, *Revue Française de Gestion*, 3 (172).
2. Amabile, S., Gadille, M., Meissonier, R. (2000). Information, organisation, décision: étude empirique sur les apports de NTIC dans les PME Internautes, *S.I.M.*, 1.

3. Askenazy, P., Gianelle, C. (2000). Le paradoxe de productivité: les changements organisationnels, facteur complémentaire à l'informatisation, *Economie and statistique, INSEE*, 219 (242), pp. 339-340.
4. Baudchon, H., Brossard, O. (2001). Croissance and Technologies de l'information en France and aux USA, *Revue de l'OFCE*, 76 (January).
5. Belussif F. (2005). Are industrial districts formed by networks without technologies? The diffusion of internet applications in three Italian clusters, *European Urban and Regional Studies*, 12 (3), pp. 247-268.
6. Benghozi, P.J., Cohendet, P. (1999). l'organisation de la production and de la décision face aux TIC, in Technologies de l'information, organisation and performances économiques, rapport du groupe de travail présidé par A. Rallet and E. Brousseau, *Commissariat général du Plan*.
7. Boutary, M., Monoyer, M.C. (2003). TIC and PME: Les subtilités du cheminement vers la Performance, communication au 8 Congrès de l'A.I.M., *Grenoble*, May 21-23.
8. Caby L., Jaeger C. (1997). Les usages des réseaux électroniques and la structuration des marchés: le cas de la pharmacie and de la publicité en France, *Réseaux: Les coûts de transaction*, 84 (July/August).
9. Caby L., Jaeger C., Steinfield, C., Kraut, R. (1998). Electronic Network Use and Coordination between Producers and Suppliers, Laurence, *Telecommunications Transformation: Technology, Strategy and Policy*, ed. E. Bohlin and S.L. Levin – IOS Press.
10. Caby, L., Greenan, N., Gueissaz, A., Rallet, A. (1999). Quelques propositions pour une modélisation, *Informatisation, Organisation and Performance*, pp. 131-169.
11. Cases, C., Rouquette, C. (2000). Informatisation and changements organisationnels: l'exemple des activités comptables, *Economie and Statistique*, pp. 339-340.
12. Crepon, B., Heckel, T. (2000). La contribution de l'informatisation à la croissance française: une mesure à partir des données individuelles d'entreprises, *Economie et Statistique*, 339 (340), pp. 93-115.
13. Foray, D., Mairesse, J. (1999). Innovation and performances, approches interdisciplinaires, Editions des Hautes études en Sciences Sociales.
14. De La Grange, T., Hoarau, M.-L., Torit S. (2004). Diffusion des TIC dans les entreprises and administrations réunionnaises, Observatoire du Développement de la Réunion.
15. Galliano, D., Roux, P. (2003). Les inégalités spatiales dans l'adoption des TIC: Le cas des firmes industrielles françaises, *Journées Changements organisationnels and Informatisation*, December 4 et 5, Paris.
16. Gollac, M., Greenan N., Hamon-Cholet, S. (2000). L'informatisation de "l'ancienne" économie: nouvelles machines, nouvelles organisations and nouveaux travailleurs, *Economie et Statistique*, pp. 339-340, INSEE.
17. Gottardi G. (2003). Why do the ICT and the Internet Find it Hard to Spread into Industrial Districts and Favour Knowledge Exchanges? in F. Belussi, G. Gottardi and E. Rullani.
18. Gratadour, J.R. (2000). La logistique, nouvelle frontière du commerce sur Internet. In: Médiation – Les nouveaux cahiers de l'IREPP-ACSEL-N 23, 04/2000 Institut de recherche and prospective postales and de l'association pour le commerce and les services en ligne.
19. Greenan, N., Mangematin, V. (1999). Autour du paradoxe de la productivité, *Innovations and Performances*, pp. 44-45.
20. Greenan, N. (1999). Technologies de l'information and de la communication, productivité and emploi: deux paradoxes, *Rapport du groupe de travail présidé par E. Brousseau et A. Rallet*, Commissariat Général du Plan.
21. GREGEOI, (2002). Etude de la Compétitivité des Entreprises Réunionnaises – GREGEOI – Université de la Réunion, November 2002.
22. Jaeger, C., Caby, L., Kraut, R., Steinfield C. (1997). Les impacts des réseaux de données sur les échanges inter and intra entreprises: une analyse comparative franco-américaine, CNET, DIH.
23. Jaeger, C., Caby, L. (1998). La relation fournisseur-client and les technologies de l'information and de la communication, *Réseaux*, 91: Les relations clients-fournisseurs à l'épreuve des réseaux, November 1998.
24. Jaeger, C., Caby, L., Abecassis, C. (2000). TIC and coordination modes: the case of the apparel industry in France and US, *Journal of Marketing Management*, 16.
25. Moreau, É., Vermont-Desroches, B., Delisle, S. (2003). Les effets des NTIC sur le développement local and régional: Évolution ou changements radicaux, XXVIII^e Colloque annuel de l'Association de science régionale de langue française, Trois-Rivières, Québec.
26. Orlikowski W., Robey D. (1991). Information technology and the structuring of organizations, *Information Systems Research*, 2 (2), pp. 143-169.
27. Orlikowski W. (1992). The duality of technology: rethinking the concept of technology in organizations, *Organization Science*, 3 (3), pp. 398-427.
28. Ouedraogo, A. (2007a). Strategic management in African firms: a local perspective, *Problems and Perspectives in Management*, 5 (1), pp. 81-94.
29. Ouedraogo, A. (2007c). Crisis management and corporate strategy in African's firms: Towards a contingency approach, *Journal of Contingencies and Crisis Management*, 15 (4), pp. 220-231.
30. Passeron, H. (1999). Les technologies de l'information and la croissance: les enseignements d'une simulation les 4 pages du SESSI, 116, Aout.
31. Peaucelle J.L. (1981). Les systèmes d'information: la représentation, PUF.
32. Peng, M.W. (2006). *Global strategy*, Cincinnati, OH: Thomson South-Western.

33. Rallet, A., Brousseau, E. (1999). Technologies de l'information, organisation and performances économiques, Rapport du groupe de travail présidé par...Commissariat général du Plan.
34. Reix, R., Rowe, F. (2002). La recherche en systèmes d'informations: de l'histoire au concept, in ROWE eds, Faire de la recherche en système d'information, Vuibert-FNEGE.
35. Suire R. (2003). Stratégies de localisation des firmes du secteur TIC: du cyber district au district lisière, *Revue Géographie, Economie, Société*, 5, pp. 379-397.