

# The Brest Region ICT cluster study

**MUTEIS**

**May 2003**

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## CONTENTS

<b>CONTENTS.....</b>	<b>2</b>
<b>LIST OF GRAPH.....</b>	<b>3</b>
<b>LIST OF TABLES .....</b>	<b>3</b>
<b>1 INTRODUCTION .....</b>	<b>4</b>
<b>2 PROFILE OF THE REGION AND ECONOMY .....</b>	<b>4</b>
2.1 POPULATION .....	5
2.2 ECONOMIC DEVELOPMENT.....	6
2.3 ECONOMIC STRUCTURE .....	6
<b>3 DESCRIPTION OF ICT CLUSTER.....</b>	<b>11</b>
3.1 SIZE AND COMPOSITION OF ICT SECTOR .....	11
3.2 KEY COMPANIES IN THE CLUSTER.....	13
3.3 LOCAL ICT EDUCATION AND RESEARCH INFRASTRUCTURE.....	13
3.4 LOCATIONAL DEVELOPMENT OF THE ICT CLUSTER.....	15
3.5 PUBLIC POLICIES CONCERNING THE ICT CLUSTER .....	15
<b>4 DYNAMICS AND STRATEGIC INTERACTIONS IN THE CLUSTER.....</b>	<b>16</b>
4.1 INTER-FIRM RELATIONS .....	16
4.2 CO-OPERATION BETWEEN FIRMS AND RESEARCH/EDUCATION.....	17
4.3 LINKAGES BETWEEN KNOWLEDGE INSTITUTE IN THE REGION.....	18
<b>5 CONFRONTATION WITH THE FRAMEWORK OF REFERENCE.....</b>	<b>19</b>
5.1 TESTS OF THE HYPOTHESIS CONCERNING CLUSTER SPECIFIC CONDITIONS .....	20
5.2 TESTS OF THE HYPOTHESIS CONCERNING ORGANISING CAPACITY .....	21
5.3 TESTS OF THE HYPOTHESIS CONCERNING GENERAL CONDITIONS .....	22
<b>6 POLICY RECOMMENDATIONS .....</b>	<b>22</b>
<b>REFERENCES.....</b>	<b>25</b>
<b>ANNEXE.....</b>	<b>26</b>

## LIST OF GRAPH

GRAPH 1 - BREST LOCATION .....	5
GRAPH 2 - THE POPULATION GROWTH IN THE BREST REGION, THE BRITTANY REGION AND IN FRANCE 1982-1999 (BASE YEAR 1982 AND SOURCE INSEE NATIONAL CENSUS 1999).....	5
GRAPH 3 - DISTRIBUTION OF EMPLOYEES IN BRITTANY REGION (SOURCE INSEE, NATIONAL CENSUS 1999) .....	7
GRAPH 4 - STRUCTURE OF THE LOCAL ECONOMY (SOURCE: INSEE, NATIONAL CENSUS 1999)..	7
GRAPH 5 - LQ COEFFICIENT FOR BRITTANY REGION .....	9
GRAPH 6 - BREST ICT CLUSTER .....	15
GRAPH 7 - BREST ICT CLUSTER THROUGH FRAMEWORK OF REFERENCE .....	19

## LIST OF TABLES

TABLE 1 - EMPLOYMENT BY URBAN AREA IN 1999 (SOURCE : NATIONAL CENSUS INSEE) .....	9
TABLE 2 - TOP 9 REGIONAL ICT FIRMS AND THEIR LOCATION .....	10
TABLE 3 - EVOLUTION OF ICT JOBS IN BRITTANY REGION SINCE THE NATIONAL CENSUS OF 1999 .....	11
TABLE 4 - TOP 10 FIRMS OF THE ICT CLUSTER .....	12
TABLE 5 - ICT GRADUATED AND RESEARCHERS FOR THE CLUSTER.....	14

## 1 INTRODUCTION

This report outlines the results of the MUTEIS ICT cluster study for the Brest region. Brest is a French peripheral city in Northwestern France. Nevertheless, the city is situated in the region of Brittany, historically known as 'a land of telecommunications'. As well as the national research and development centre of the historical operator France Telecom and the National Engineering School for Telecommunication, there are many other institutions located in the Region.

This study will present the characteristics of a peripheral ICT cluster at an initial phase of development. These results are based on interviews of local companies, research and educational institutes as well as local institutional authorities. Our group<sup>1</sup> has used the results of the national census established in 1999 for many of the statistics associated with recent literature about cluster dynamics.

The study is structured in the following way. The second section will present the main economic characteristics of Brittany as well as the importance of Brest for the regional and national economy. We have notably computed different LQ coefficients in order to identify the ICT cluster. The third section focuses on the Brest ICT cluster. We present the main actors, the size, the location and the policy of the local authority used to promote the development of the cluster. The fourth section concerns the analysis of the interactions between the actors and answers the question of their dimensions: strategic, social, formal, informal, local, global, ... ? The following section is the result of a more general analysis about the behaviour of the cluster: what is its performance? What is its attractivity? What are the strengthes and weaknesses of the cluster ? At last, we conclude in sixth section with policy recommendations regarding our own analysis and diagnostic in order to improve the perspective of development of the Brest ICT cluster.

## 2 PROFILE OF THE REGION AND ECONOMY

Brest is located in Northwestern France. It is the second largest city of Brittany region and from a national and European perspective, Brest and its agglomeration could be considered as a peripheral location.

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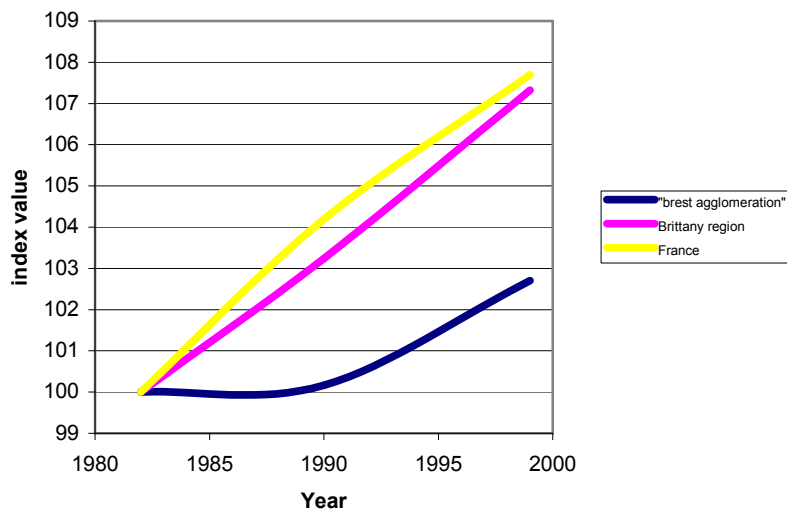
<sup>1</sup> By the way, I would like to thank Nicolas Jullien, Virginie Lethiais, Myriam le Goff-Pronost, Jean le Traon and Godefroy Dang'n'Guyen for their help during the first phase of this work.



**Graph 1 - Brest location**

## 2.1 POPULATION

The economic region of Brest, “Brest urban agglomeration” (CUB) gathers together 8 municipalities (Brest, Guipavas, Plougastel-Daoulas, Plouzané, Le Relecq-Kerhuon, Guilers and Gouesnou-Bohars). At the last 1999 national census, there were 156 217 inhabitants in Brest and 221 600 within the whole economic region. It is respectively 0.3% of the French population and 7.1% of the population of Brittany.



**Graph 2 - The population growth in the Brest Region, The Brittany region and in France 1982-1999 (base year 1982 and source INSEE national census 1999)**

As one can observe from the graph 2, over the last 20 years period, Brest agglomeration has suffered from a lack of attractiveness compared to that of Brittany and France. More specifically, there are two periods, the first one is the period 1980-1990 where population growth rate was

only 0.15%, means that the net sold of migration was almost zero and the second one concerns the last decade when the growth rate was 2.53%. If one observes a catching-up process (possibly partly thank to European structural fund), this one is still insufficient regarding the national rate of 3.36% for the same period. This profile of development must be analysed under the specific economic structure of the Brest agglomeration.

## 2.2 ECONOMIC DEVELOPMENT

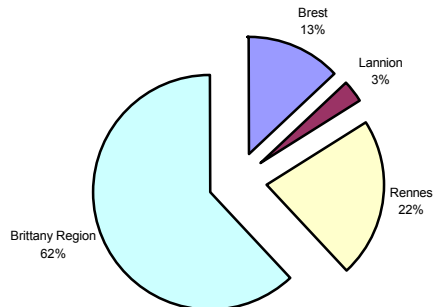
Historically, Brest is the French military port of the Atlantic zone, it concerns ship and maintenance building as well as naval educational activities. The first ship infrastructure was built here in 1683, and in the 19<sup>th</sup> century, almost 1200 ships were made. In 1851, almost 38% of workers were strictly dependent on the military activities and this sector contributes 21% to the national value added. Associated to this sector, a complementary iron and steel industry have been large employers but one can say, that both in terms of political power and financial power, Brest is highly dependent on the national government. This relative dependence was still true until the mid 20<sup>th</sup> century when the danger of strong regional specialization became risky. Since the 1960's, Brittany has benefited from a massive "national decentralization policy" and, associated with the pro-active behaviour of regional development agency, the CELIB, an electronics industry emerged in the region. The National Centre of the Telecommunication Study (CNET) is located in Lannion (100km from Brest) in 1962. From this date forward, many activities: public and private research and development, SMEs and TNCs related to electronic and telecommunications have been clustered in Brittany. The growth of employment is very high. In 1963 there were 920 employees in the sector; 3 200 in 1968 and 19 000 in 1988. The district has spill over closest agglomeration: Rennes to the east and Brest to the west. During this period, in 1977, a National Engineering School of Telecommunication (ENST- Bretagne) took place in Brest Agglomeration. This location have been one of the starting point of the development of the ICT cluster of Brest : "*technopole Brest Iroise*".

Many radical innovations have emerged from this polycentric historical ICT cluster: Transpac network, Minitel, Numéris network, optical fibers, the first numerical TV, TV flat-screen thanks to the development of integrated industrial structure and well-fitted educational infrastructure.

Today, partially due to the privatisation of the historical operator France Telecom, the research and development activities, initially concentrated inside the CNET tend now to be concentrated in ICT cluster of Rennes, thus, Lannion has suffered a partial de-location and overspecialization in the optical fibers crisis sector. If Rennes, is less affected with the conjunctural shocks because of its size and a more diversified path development, the ICT cluster of Brest is currently looking for its own path-development to attract activities but also to prevent the gravitational power of Rennes.

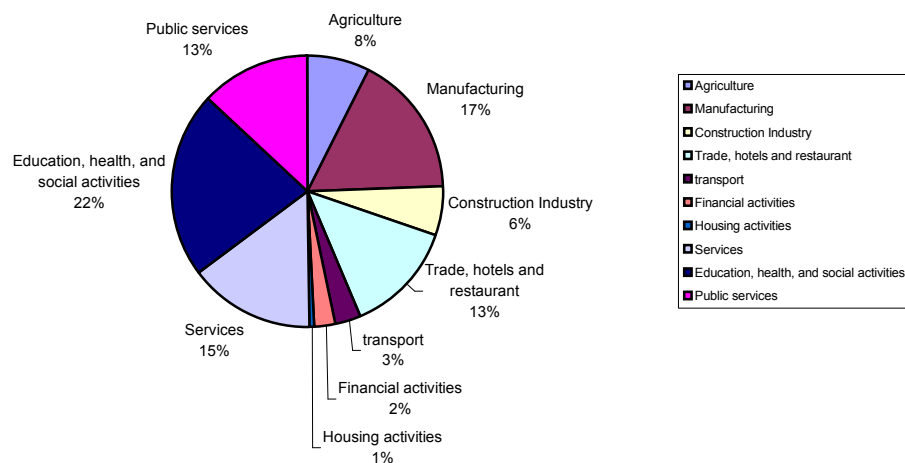
## 2.3 ECONOMIC STRUCTURE

There are 1 115 252 employees in the Brittany region for the 1999 year (source INSEE, national census 1999). The distribution is represented with figure 3.



**Graph 3 - Distribution of Employees in Brittany region**  
(source INSEE, national census 1999)

More specifically and focusing on Brest economic structure, graph 4 presents the distribution of employment by sector. We can observe the relative importance of the tertiary sector as well as education and health activities. Brittany, moreover, is the first tourist destination in France, and one finds this effect with the importance of the related sector of trade, hotel, restaurant. Let's look now at the ICT sector.



**Graph 4 - Structure of the Local Economy**  
(source: INSEE, national census 1999)

One part of the ICT activities dealing with service activities, the other one with the manufacturing sector. According to the OECD usual definition of ICT sector, we have only focused on the strict ICT activities, it means, hardware, software and services related to telecommunications and computing sector. In 1999, 34 525 employees belonged to these activities, 3.1% of the total of regional job market, whereas ICT sector represented only 2.4% of total national job market. Then, as the  $LQ=1.29>1$ , we can conclude to a specialization of Brittany regional concerning the ICT sector. In this way, we have compute different LQ coefficient for the sub-region, or cluster.

The LQ is the Location Quotient and it measures the sectoral specialisation for a region relative to reference area. It computes as:

$$LQ = \frac{\left( \frac{E_{ITCsector}^{cluster\ j}}{\sum_{sector} E_{sector}^{cluster\ j}} \right)}{\left( \frac{E_{ITCsector}^{brit.region}}{\sum_{sector} E_{sector}^{brit.region}} \right)}$$

Where  $E$  is the number of employees.

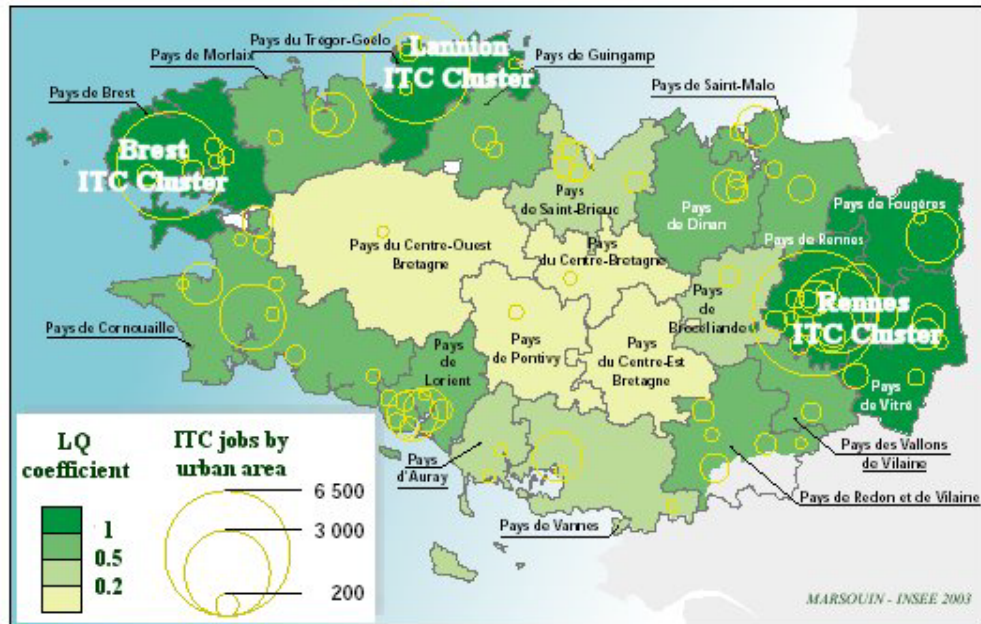
Obviously, if  $LQ>1$ , the ICT sector is over-represented in the region  $j$ ; we can conclude that there is a relative specialisation in this area.

If  $LQ<1$ , the ICT is under-represented and cluster  $j$  is less specialised than the Brittany region in the ICT sector.

At least, when  $LQ=1$ , cluster  $j$  is equally specialised than the Brittany region in the ICT sector.

Graph 5 presents the LQ coefficient for three main ICT poles in the region. All three are superior to 1. Thus we can conclude that Rennes, Lannion and finally Brest are specialised in the ICT sector.





Graph 5 - LQ coefficient for Brittany region

	Jobs in ICT sector	Shares (%) in the total jobs of area	LQ
Rennes	10 016	5.0	1,61
Brest	5 334	3.7	1,19
Lannion	5 313	14.3	4,61
Total number of jobs in region	34 525	3.1	

Table 1 - Employment by urban area in 1999  
(source : national census INSEE)

The LQ score for Lannion Cluster can be explained by the historical presence of the national research and development center of France Telecom (1800 employees) and Alcatel the mobile phone manufacturing company (1500 employees)<sup>2</sup>. But since 2001 year, and as previously stated, this cluster suffers massively from a specialization in optical fiber technology and the increase of local unemployment as well as a decreased in attractivity.

The number of employees in Rennes, as the leader in the region role, can be explained by the presence of more international and biggest company. Many others, there are Canon or STMicroelectronics but the main specificity of this cluster is the over-concentration of ICT services (for example: CAP GEMINI ERNST YOUNG or TEAMLOG) : 50% of regional ICT services and consultancy activities are located in Rennes. Table 2 presents the top 9 regional firms, the number of employees and their locations.

<sup>2</sup> Both figure at the end of the year 2001.

Name of the firms	Location	NACE <sup>3</sup> Sector	Employees (end 2001)
France Telecom R&D	Lannion Cluster	Telecommunication	1800
Alcatel Cit	Lannion Cluster	Manufacturing of TV and radio transmitters and apparatus for line telephone and line telegraph	1500
Thales Airborne Systems	Brest Cluster	Manufacturing of instruments and appliances for measuring, checking, testing, navigating and	1000
Alcatel Business Systems	Brest Cluster	Manufacturing of TV and radio transmitters and apparatus for line telephone and line telegraph	900
SAGEM	Rennes Cluster	Manufacturing of TV and radio transmitters and apparatus for line telephone and line telegraph	800
CANON Bretagne	Rennes Cluster	Manufacturing of office machinery, computers and other information processing equipment	800
Mitsubishi Electric Telecom Europe	Rennes Cluster	Manufacturing of TV and radio transmitters and apparatus for line telephone and line telegraph	700
StMicroelectronics	Rennes Cluster	Manufacturing of electronic valves and tubes and other electronic components	500
Equant	Rennes Cluster	Data base activities	500

**Table 2 - Top 9 regional ICT firms and their location**

Before studying more closely the ICT cluster of Brest, we might say few words about the economic perspective and how the international downturn has affected the production activities.

<sup>3</sup> See annexe for the NACE categories.

During the period 1997-2001, the rate of new ICT firms is 16% in Brittany, whereas for many other sector (including ICT), the rate of new firms was only 5.8% for the period. This high rate of entrepreneurship attracts many ICT and knowledge workers and non-initial Brittany resident occupies 17.5% (6 033/34 525) of regional ICT jobs. Nevertheless, after the 2001, international downturn has stopped this growth rate and as we might it in table 3, these figures are both results of decision of firms to stop their activities (Mitsubishi in Rennes cluster for example) and taking into account the distrust of investors, an important decrease of the rate of entrepreneurship

	March 99-00	March 00-01	March 01-02	March 99-02
ICT sector	+3.3%	+12.2%	-3.1%	+12.3%

**Table 3 - Evolution of ICT jobs in Brittany region since the national census of 1999**

### 3 DESCRIPTION OF ICT CLUSTER

This section will present the ICT cluster of Brest agglomeration which is called “*technopole Brest Iroise*”. We will present the main ICT actors and the composition of the cluster in a first section. Paragraph 3.2 gives a description of the key companies in the cluster followed by a portrayal of the local ICT education and research infrastructure in paragraph 3.3. In the last section, we also describe the local knowledge infrastructure and public policies concerning the ICT cluster development.

#### 3.1 SIZE AND COMPOSITION OF ICT SECTOR

At the beginning of 2003, there were 6 233 people working within the cluster. Almost 3 000 of them were ICT private jobs and distributed among over 68 firms. Almost 40 firms are located inside incubators.

The ICT cluster consists of different kinds of activities: research facilities on advanced telecommunications, marine science and technology but also few service companies. One of the characteristics of the cluster is the relative small size of the companies (<500 employees) except for 2 firms, one of them is an historically key company (see below). To get a better understanding of this point, we can observe the top 10 firms of the cluster in the table 4.

Name of the firms	NACE <sup>4</sup> Sector	Employees (end 2001)
Thales Airborne System	Manufacturing of instruments and appliances for measuring, checking, testing, navigating	1000
Alcatel Business System	Manufacturing of TV and radio transmitters and apparatus for line telephone and line telegraph	900
Thales Underwater System	Manufacturing of instruments and appliances for measuring, checking, testing, navigating	400
Thomson Broadcast Systems – Nexstream	Manufacturing of TV and radio receivers; sound or video recording or reproducing apparatus	120
Answare	Business and management consulting activities	110
Thalès Microwave	Manufacturing of electronic valves and tubes and other electronic components	100
Atlantide	Business and management consulting activities	75
Syseca – Thales IS	Business and management consulting activities	70
Cap Gemini	Business and management consulting activities	70
Cabasse	Manufacturing of TV and radio transmitters and apparatus for line telephone and line telegraph	45

**Table 4 - Top 10 firms of the ICT cluster**

Almost 90% of private ICT jobs are concentrated inside this top 10 and, actually, as the cluster is massively composed of very small and small size firms, the establishment size-distribution is heavily biased towards these smaller firms. This singular demography, especially if we compare with the 2 others Brittany cluster where one can find some biggest ICT firms can be explained

<sup>4</sup> See annexe for the NACE categories.

with the relative youth of the cluster *per se* and the position of the cluster on a initial phase of development. These figures are not surprising if we consider that institutional cluster has only started at the beginning of 1990's, in consequence, a young and growing cluster is generally characterised by relatively high levels of new firm creation. However, the presence of historically key firms and many spin-offs remains another singularity of the Brest cluster.

### 3.2 KEY COMPANIES IN THE CLUSTER

As previously stated, Brest has a long military history in such a way that many industries were directly connected to military interests. Formerly Thomson - Csf, today Thales Airborne System, the key company of the cluster is still directly concerned with military program, actually, its core activity is defense and military electronics from airplane to submarine technology. This firm has promoted the emergence of many start-ups as well as spin offs. We will present successively, the local star firm, Thales Airborne System, but also a start-up activity Autocruise S.A. There is no strictly foreign company within the cluster.

#### *Thalès Airborne System (ex Thomson CSF) part of the Thales Group*

Thales was established in France more than a century ago. It is a global electronics company serving Aerospace, Defence, and Information Technology markets worldwide. With operations in more than 30 countries and 65 000 employees, in 2002, the Thales Group generated 11.1 billion euros in revenues. The group is considered as a proven partner for the global aerospace community, and defence industry. It is also a provider of professional IT solutions and services. Across all three business areas, which follow different business models but rely heavily on many of the same technologies and skills sets, synergy and teamwork translate into tangible benefits for their customers. Inside the Brest cluster, the Thales group has split off into three entities, Thales Information System which is dedicated to ICT services ; Thales Underwater System for the underwater technology and Thales Airborne System for the airborne electronic and technology. Thales Airborne System employs almost 1000 employees.

#### *Autocruise*

It is a Thales spin off and more particularly a joint venture between Thales and TRW, an American group. Its core activity concerns radar technology adapted to personal and professional vehicles. Autocruise provides adaptative cruise control systems or components (radar and control electronics) to vehicle manufacturers worldwide either directly or through a system integrator, component or module suppliers. It especially produces and commercialises 77GHz adaptative cruise control long-range radar. Created in 1998, Autocruise is a Joint Venture Company of TRW Automotive, an American group and Thales. Its R&D is subcontracted to its French mother companies. Radar related issues are dealt with by Thales, vehicle related issues by TRW Automotive. Autocruise employs around 80 people and has an annual production capacity of more than 240,000 units. Thales is currently disengaging from the Autocruise capital, and becoming a 100% American subsidiary.

### 3.3 LOCAL ICT EDUCATION AND RESEARCH INFRASTRUCTURE

According to the French system of formation, there are two kinds of structures within the cluster. The most relevant education and research for the ICT cluster are the Engineering

school<sup>5</sup> and some department from the local university (UBO). Both of these institutions offer a number of course studies in the field of ICT, including, electronic, networks, telecommunication, informatics, virtual reality, microwaves, radar, mobile technology, optical technology...

There are 5 Engineering schools<sup>6</sup>, including the National Engineering School of Telecommunication of Brittany, (ENST-B) for an annual flow of 550 over 790 ICT graduated<sup>7</sup> and post-graduated. The University numbered almost 18 000 students of which 3 300 are concerned with science, mathematics and technology. One finds almost 450 annual ICT post-graduate inside the different masters and post-graduate programs. Finally, inside the university, ENST-B and Local business school, one find a masters especially oriented to ICT business and management for an annual production of almost 100 graduated. Finally, one estimates the annual ICT graduated over the Brest cluster at around 1100 people.

Besides education, all these institutions are concerned with research activities. The public research concerning both engineering schools and universities, the private research is more confidential and concerns the top 10 firms in the cluster.

Inside the ENST-B, all the research fields are dedicated to ICT. One finds applied and fundamental research in optical technology, radio-communication, micro-waves, informatics, artificial intelligence, electronic and radar,...Inside the ENIB, one find two departments. The former is dedicated to virtual reality and industrial informatics, the latter concerns the optical and laser technology. The research activities of other engineering schools concerns mainly acoustic, sonar, signal technologies, and at last optoelectronic.

Within the university, one finds fundamental informatics research department, one department is dedicated to medical imaging, another one concerns laser and optical technology. Finally, a laboratory (LEST) associated with the French national research center (CNRS) devotes itself to electronic and signal theory for telecommunications.

The private research sector concerns mainly the top 10 firms of the cluster (Thales, Alcatel, Answare, ...). They have more development-oriented strategies that research-oriented ones. These are principally some informatics and optical applied development for telecommunications. These companies, with active engineering school cooperation, have promoted the emergence of start-up firms as, many others, Optogone (Optical technology for telecom), Turbo concept (TurboCode) or Virtualys (Real Virtuality solutions).

The following table summarises the student and researcher potential for the Brest ICT Cluster.

ICT Graduated /year	ICT researchers (estimated)
1100	550

**Table 5 - ICT graduated and researchers for the Cluster**

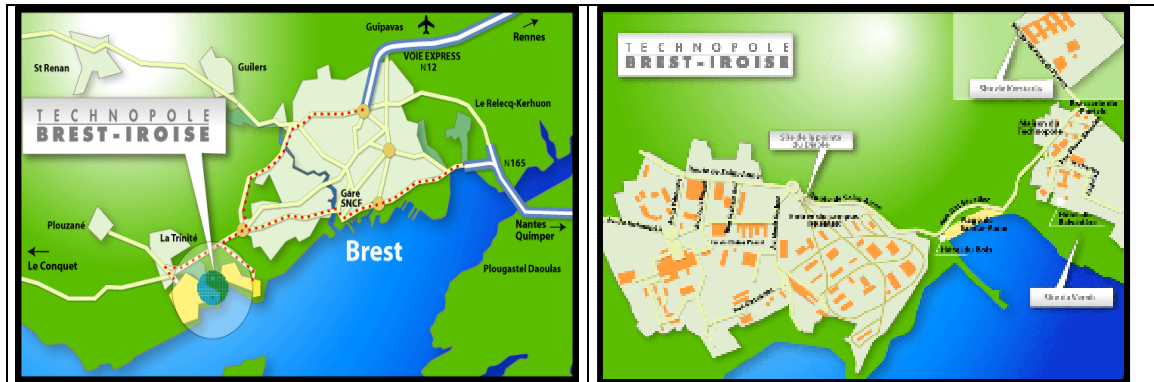
<sup>5</sup> Which french name is « grande école ».

<sup>6</sup> ENST-Bretagne, ENIB, ISEB, ENSIETA (mix military/civil school), Ecole Navale (military school).

<sup>7</sup> According to NACE typology.

### 3.4 LOCATIONAL DEVELOPMENT OF THE ICT CLUSTER

There are two locations for ICT firms in the Brest agglomeration. The primary one is the “technopole Brest Iroise” and graph 6 indicates its geography. The second one is in the city centre.



Graph 6 - Brest ICT cluster

The association “technopole brest iroise” as an economic development tool formerly began in the beginning of the 1990’s. The multinational and large group (Thales, Alcatel, ...) settled in the primary site for obvious reasons of large space and land availability. One finds several incubator structures, which are lodged some very young and young firms and we have noticed a real pro-active policy of housing building and development, but on the other hand, this primary site is relatively disconnected from the urban life and different amenities that often fit well with techies life and culture (Florida, 2002ab). The secondary site is more central (near the port) and is very recent. It concerns, today, very few companies.

It should be said that if the ambition of public authority is to create a rich and dynamic environment for multi-dimensional interactions in order to favour the emergence of new IT companies, we have observe today, that the cluster is relatively *ad-hoc*. There is a very poor attractivity (non-exogenous attractivity) but also very poor non-market interactions between firms and research/education centre. Many explanations can be proposed, and we will come back to them later in the fourth section. Before that, let us conclude the description of the cluster with the public policies concerning the ICT cluster.

### 3.5 PUBLIC POLICIES CONCERNING THE ICT CLUSTER

Several public institutions promote and support the development of the Cluster. They are not strictly speaking hierarchised and very often, we have observed a kind of confusion in terms of strategy in addition to a non-cooperative behaviour. To put it in another way, the multiplicity of public interlocutor associated with a non-well identified competencies act as a brake on the emergence and promotion of interactions between actors.

The first driving force of the Cluster is the association “technopole brest iroise”. It is a local agency directly connected with the local authority of Brest agglomeration. Its mission concerns the animation and the development of the cluster. Almost 10 people are involved in this agency. It appears that the current ambition is to promote the cluster abroad (exogenous development)

while its core activities, from our point of view, should be more focused on the dynamic of the cluster.

The economic development agency of the Brest agglomeration (CUB) is also involved in the promotion of the cluster. The strategy is more focused with international connections (Japan, the USA, China, Latin America...), especially in the direction of research and educational links promotion.

There is also the local Chamber of Commerce and Industry (CCI). Its role is to promote the territory and to help the setting-up of new firms. It is not specifically ICT sector oriented but not any than the other sectors.

From a macro perspective, there are two regional agencies that support more specific electronic and informatics industries such as AFEIT (<http://www.afeit.org>) and MEITO (<http://www.meito.com>). Both were born in the 1980's. The former is an association that brings together firms, research and education leaders as well as institutional authorities (technopole and CUB) whose principal role is to favour coordination between actors as well as matching supply with demand ITC competencies. The latter is a regionally council funded institution that promotes the ICT sectors across Brittany.

If many actors support, promote and tend to favour coordination between ICT activities as well as network promotion, this large financial means does not directly benefit firms nor entrepreneurship policy. From a micro perspective, these numerous interlocutors garble the operational competencies of each one and partially act as a brake on the promotion of dynamic interactions between ICT cluster's actors.

## **4 DYNAMICS AND STRATEGIC INTERACTIONS IN THE CLUSTER**

According to recent literature on cluster dynamics (Zimmermann, 2002, Suire, 2003b), above the sharing assumption that networks between firms, local authorities and research institutes can promote growth and innovation in a functional cluster, what matters is the structure and the topology of the interaction. Indeed, more than the existence of direct multi-dimensional interactions between actors, it is the collective form of these interactions that determine the performance of the cluster.

We can categorise interactions in a 2-dimension space. The first dimension concerns a distinction between informal or non-market interactions on one side and strategic and supply and demand relations or market interactions on the other. The second dimension deals with external/internal cluster interactions. Following a methodology in a previously work (Suire, 2003b), we are able to define a density of relation index as well as the local vs global nature of them for each company. The first point focus on the inter-firm relations (4.1), the interactions between firms and research/education institutes reviewed ion this point (4.2). Finally, we conclude with the linkage between knowledge institutes within the region (4.3). All these results are drawn from the interviews we have conducted.

### **4.1 INTER-FIRM RELATIONS**

Astonishingly, most of the actors of Brest ICT cluster do not know each other very well. One knows that informal networks and more specifically social networks support the diffusion of



information, good practices, job opportunities but also rumours and more generally any kind of exchange of tacit knowledge (Arthur, 1990, Saxenian, 1994). Then, if some actors agree that spatial proximity is a good thing to favour interaction, the other recognises that they do not know who their neighbours are and what their activities are. However, all the actors keep an active business intelligence strategy and have some social ties, but these interactions do not take place within the cluster. At the same time, we have observed a crucial lack of physical place (restaurant, bar...) where actors can meet each other. Many firms have noticed this problem and have sought for this kind of facility. Actually, it appears that some informal ties exist as soon as market interactions exist. Most of the time both interactions are superposed and we have noticed a strong singularity of the collective organization of the cluster. Interactions, both informal and economic are mainly bilateral but rarely evolutive.

Informal practices are not well diffused within the cluster. Most ties between companies are regular supply and demand relations. One ICT firm delivers products or services to another one (for example Thales provides R&D expertise to Autocruise as well as facility management). Inside this category, we made a distinction between two categories. Some firms have mainly local interactions, i.e., they interact with other firms within the cluster whereas other firms have very few commercial ties within the cluster but have mainly global links, i.e. outside of the clusters. Strategic cooperations concerning many firms but are very often bilateral. In addition, they rely mainly on historical development of the top 3 firms of the cluster (spin-offs from the key company Thales (Thales Information System and Autocruise for example) or from Alcatel and Answare from example)). These relations are most rarely dynamic and evolving and do not favour the fluidity and exchange of new ideas and practices. Finally, we have identified a positive correlation<sup>8</sup> between, the nature of the interaction (local vs global) and the market of the firms considered. The more internationalised the firms are, in terms of upstream and downstream activity the more the market and the consumers of these firms are themselves internationalised (Europe or world).

In conclusion, one can say, that both formal and informal interaction, are mainly bilateral and stable. Nevertheless, different firms are positively engaged in local innovation network. If the pair-wise interactions are a strong factor of inertia in term of innovative and disruptive practice, the main observation concerns the lack of identification of different actors within the cluster. To put in another way, there is strong asymmetrical information among many players.

Both physical places as well as socialising events are very scarce. One knows that evolutive and dynamic relationships rely on trust and that the latter is facilitated with physical proximity. For example, two new housing facilities are currently being built within the cluster. The Real Virtuality European Centre (CERV) will open in January 2004 and a few firms of the cluster (Virtualys for example) as well as research activities will be housed in this new building. The construction of the "ITC village" has just started and it will gathers together education and research activities. These initiatives will facilitate technology transfer from research to industrial application and the emergence of a new relationship between actors within the cluster.

## 4.2 CO-OPERATION BETWEEN FIRMS AND RESEARCH/EDUCATION

The CERV is the last action to support and promote interactions between research and ICT firms but interviews have shown that many relations exist between both education actors

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<sup>8</sup> which is not statistically significant because of the low number (12) of firms inside our sample.

(engineering school and university) and firms for the cluster. These institutions have reason to maintain good relations with firms and *vice versa*. The graduate students from engineering school are potential employees for ICT firms and undergraduates are a crucial pool of ICT trainees for many firms in the cluster. ICT trainees, at the middle or at the end of the degree course, are an input for many firms and both universities and engineering schools provide some trainee but for many educational institutions, one finds again a pair wise interaction.

Most of the firms we have interviewed are satisfied with the level of knowledge of ICT graduate students. However, students from engineering school are more solicited than university ones, probably because, the schools are by definition more active in cooperating with firms.

Nevertheless, there are some critical about the degree of practical skills that some students have. This is the reason why, on the one hand, firms tend to privilege some specific schools (with a well-identified specificity) and, on the other hand, some ICT professionals come into some course to teach some applied contents. Finally, at the upper level of PhD degree and research activity, many students do part time in ICT firms. An important threatens concerns the brain drain that is taking place in Brest.

If university recruits principally in a local area, another school such as the ENST-B for example recruits at the national level, in consequence, students are more or less culturally and socially stuck to the territory. Besides, there is an over production of ICT graduates compared to the annual needs of firms and the difficulty in finding jobs is the cause of regular migration from Brest to other regions. Finally, Brest is a peripheral region, the relative lack of amenities compared to great cities associated to a not always mild weather can be considered as strong negative externalities for some young graduates who are looking for a more dynamic social and urban life. Further investigation on the individual motivation of migration could be highlighted this last point.

Local authorities have to consider the existence of the ties between firms and education institutes as necessary conditions for a dynamic cluster. In this way, if different actions are already undertaken, there is a strong need to go further. If the local promotion and support entrepreneurship is present, for example, a new incubator from ENST-B opens its doors in the middle of June 2003, we have noticed, for the interactions between firms, an asymmetrical information between many educative institutions and firms. Probably, an effort has to be provided to decrease this asymmetry in order to improve the matching between supply and demand.

#### 4.3 LINKAGES BETWEEN KNOWLEDGE INSTITUTE IN THE REGION

If some federative programs bring together many regional actors in the ICT field, there is not a real cooperation between knowledge institute within the Brittany region, especially between the three clusters of Brest, Rennes and Lannion.

There is one active regional federative program, the G2RA, which gather together firms and research institutions around the sub marine acoustic technology. Otherwise, for the ICT cluster of Brest, university and engineering school seem to play a non-cooperative game. There are very few interactions between both types of institutions. There is, nevertheless, some epiphenomenon, for example, when local Brest authority decides recently (march 03) to promote the ICT studies in order to attract new students, an open doors day took place where it

was possible to meet researchers and teachers in different institutions. The future “ICT village” is another good example of partnership between university and engineering school. Besides, at a more macro level (Brittany region), there are no cooperations between university and engineering school on the different cluster, except the natural mobility of student for a specific post-graduate for example.

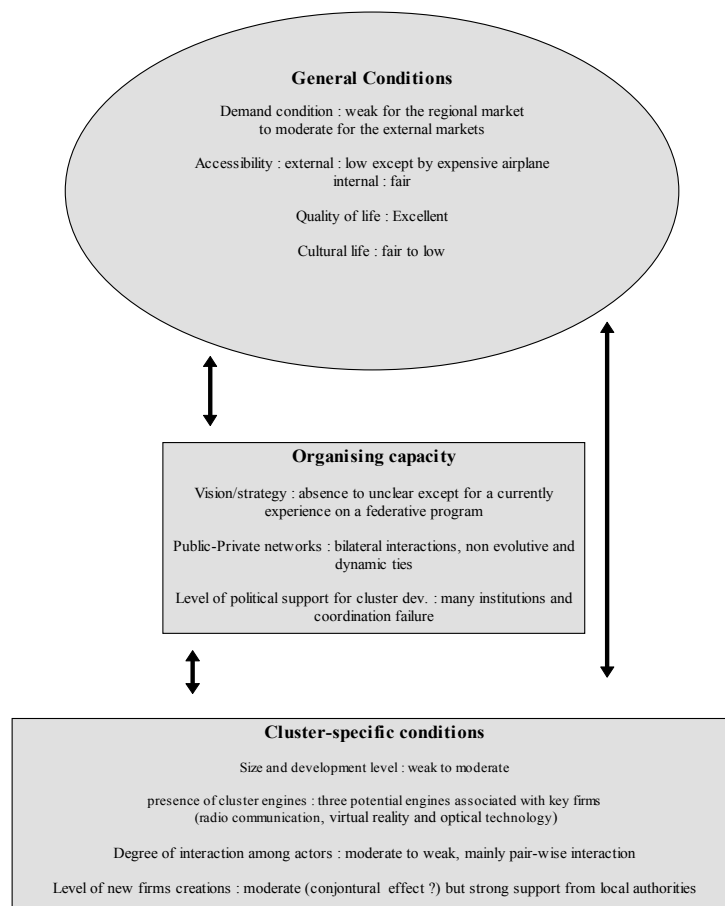
## 5 CONFRONTATION WITH THE FRAMEWORK OF REFERENCE

Having described the interactions between different actors within the cluster, we now have to investigate the nature and the performance of the cluster according to its characteristics and the framework of reference.

There are three hypotheses that we have to investigate:

- The success of ICT cluster depends on cluster specific conditions
- The success of ICT cluster depends on organising capacity
- The success of ICT cluster depends on general local spatial economic conditions

The following graph is a summary of our assessment and the results of the interviews of the actors of Brest ICT cluster.



**Graph 7 - Brest ICT cluster through framework of reference**

## 5.1 TESTS OF THE HYPOTHESIS CONCERNING CLUSTER SPECIFIC CONDITIONS

The peripheral situation of Brest agglomeration is clearly a disadvantage. Nevertheless and very curiously, we have noticed that if Brest is poorly attractive to French people (geographical position and capricious weather), this is not the case for the non French ICT workers, especially from the north of Europe. This is a counter-intuitive result with regards to traditional home bias effect (Figueiredo and alli, 2002).

### Home bias effect

We assume a relation between the attractiveness of a cluster and the visibility, i.e. an *ex ante* identification of regional characteristics by the firms. For example, as the national frontiers always play a role, the foreign and domestic firms are not sensitive in the same way to regional attractiveness. Actually, domestic investors will have quite different expectations about profitability depending on their knowledge with the respect to the pool of available sites. Particularly, when the domestic investor evaluates potential profits and compares the home environment with of all others sites, it is unlikely that there is equal information cost concerning the characteristics of the sites. This is mainly because investor has an accumulated stock of knowledge of home site's attributes. Thus, lower labour costs, higher agglomeration economies, or better accessibility to input and output markets in a given non-home area may be insufficient to counterbalance information and search cost associated with non-home location. To put it in a different way, one can say that extra-national or extra-regional mobility can be negatively correlated with home bias effect. The empirical study of Figueiredo and his colleagues valid this hypothesis. Actually, they find that non-Portugal investors favour areas that minimise the information cost, ie mainly areas that exhibit *economics of urbanisation* while this variable is not relevant for home investors. In contrast, *economics of localisation* attract both new home and new non-home manufacturing start-ups in Portugal, but this variable has also a higher impact on location decisions of non-home investors when compared with home (see Suire, Cariou, 2003 for further explanations). Finally, non-home investors are sensitive to strong economics of agglomerations.

Some interviews have clearly showed that the location in ICT cluster of Brest is non-optimal regarding their commercial strategy. Many of them have some commercial agencies located in nodal exchange Paris or the east of France. There is clearly a lack of business climate and we do not have "*find many things in the air*" within the cluster. Besides, Brest is suffering from the gravitational attractivity of the Rennes cluster and some firms, who are currently in a multi-site strategy are thinking about clustering in Rennes.

The relative lack of urban amenities and cultural attraction play a role in the annual migration of ICT graduated from Brest to France or Europe even if the majority of interviewees recognise that the more difficult is to attract not to sticky thanks to an exceptional quality of life (environmental conditions, sea, air, ...). These behaviours constrained the development of the cluster.

The theoretical framework suggests that the presence of one ore more ICT "local champions" is a necessary condition of a cluster's functioning. There are two historical firms within the

cluster, Thales and Alcatel. Both have generated some spin-offs and are nationally as well as internationally recognised ICT firms but the multi-dimensional interactions does not really exist. Relationship still to be mainly bilateral between spin-off and nursery firms. In this way, the collective organization of the Brest cluster tends to be between a “*state-anchored district*” and a “*hub-and-spoke industrial district*” in the typology of Markusen (1996). If a recent federative program (Research institute and ICT firms) around the “wireless local loop 40 Ghz” is a good way to stimulate some new relationship, we have to admit, that strategic as well as social interactions between actors are relatively weak. Many actors regret it.

We know that the relational density, commercial and informal is crucial to the support and diffusion of ideas, routines, good practices and finally to promote continuous innovation, further growth and development of the cluster. If we have observed very few interactions within the cluster, there exists a mixed will to support and stimulate them. On one side, there are a few regional innovation networks, some regional ICT activities coordinators, some regional ICT research coordination as MARSOUIN, and if we have not yet observed many interactions, many conditions are combined to favour their development. On the other side, there are a multiplicity of pro-active federative programs and probably a risky strategy for an under critical-mass cluster (see below).

Finally, concerning the creation and the role of start-ups in the cluster, we do not have exact figures, nevertheless we observed a real will to support entrepreneurship regarding the incubators that are located within the cluster, and also, the lending of buildings and facilities or more generally infrastructure policy.

## 5.2 TESTS OF THE HYPOTHESIS CONCERNING ORGANISING CAPACITY

Brittany has always been a French a “land of telecommunication”, but in Brest, the ICT does not seem to be a spearhead sector. What we have observed is that the words of the local authorities are not always translated into actions and many directions are considering today. Pell-mell, one finds underwater acoustic programs, a deep sea offshore, an integrated coastal management, a federative program around intelligent sensors, about the production-to-consumption traceability of temperature controlled products, a high speed mobility and convergence in data communications. It is not certain that the ICT actors will engage themselves in so many programs. There is a crucial lack of long-term strategy while it should be vital that all concerned share this vision. At the same time, many ICT firms have suggested their solutions to improve the collective organisation of the cluster. Some have suggested some sectorial animation, promoting of young start-ups, some cluster animation with two way information flow (from bottom-up to top-down and vice versa), others an *identification* of the competencies of different institutional actors, but almost all of the interviewees have regretted the lack of animation and the feelings of an unclear strategy development.

Concerning the partnership between private and public actors, it is scarce and often just concerns the same ICT firms. The promotion actions and marketing strategies are not collectively decided. For example, during our investigations, the local authorities did an active promotion of the cluster aimed at Chinese people in China, but, unfortunately, some of the cluster firms were not informed of this action. A clear strategy and sharing vision is crucial to building a stable foundation of the cluster and then becoming attractive. This recommendation is important especially because Brest is in a peripheral region with an under critical mass cluster. A reasonable specialization (emission of externalities of localisation), then the

diversification (emission of externalities of urbanization) appear to be a logical and rational path development for a cluster. Doing it in another way might be a risky internal as well as external strategy and could prevent the virtuous circle of agglomeration.

### 5.3 TESTS OF THE HYPOTHESIS CONCERNING GENERAL CONDITIONS

According to the framework, a strong regional demand is one of condition for a well-functioning cluster. Concerning the ITC Brest Cluster we have discriminate between individual demand and professional demand.

Individual demand of ITC products is a function of volume and age of the concerned population. Brest is in this respect far behind Rennes in term of dynamism and its capacity to attract a young and talented population. Nevertheless, if the volume of 20-40 year olds is not so great, there is a high proportion of less than 20 year olds who are strong ITC prescribers, in Brest. Concerning professional demand, the ITC service providers are great consumers of ITC technology, here again, Rennes is massively concerned. The key firms of the Brest cluster tend to get their supplies from outside the region. The bigger demand still the result of medium size companies strategies, in the sense that informatics, communications, electronics are some transversal and inter-sectorial needs.

The accessibility to Brest is not easy, especially by train (4h30 from Paris) or by road (almost 6h30). Many interviewees have mentioned that there are airplanes from Brest to Paris, the nearest international hub, many times a day, but the costs of business moving are very high for many firms. There is currently a hot debate to build a high-speed rail link from Le Mans to Rennes to disenclose Brest<sup>9</sup>. This peripheral location appears to be a serious brake to the location of international companies and most of them are located in the Rennes cluster (2h00 from Paris). However, this peripheral location can be an advantage for certain interviewees when they say that Brest is a good location for lower labour costs. Wages of ITC workers as well as the cost of living (low rent for example) but also congestion, are far below that the medium level of bigger cities.

Brest suffers from a paradoxal attractivity: *from a slippery place to a sticky one*. Brest, home to the largest marina in Brittany is a port city open to the world. Its remarkable diversity is reflected in a list of key characteristics - beaches, creeks, valleys, lighthouses, islands, sea, gentleness, interplay of light, mosaic of blues and greys, waves, chapels, châteaux, granite calvary crosses, manor houses, megaliths, ...but few people know that before they come! In other words, Brest is suffering of an image deficit for many French people. The CUB (Brest agglomeration agency of economic development) began to realise this, and very recently, a CD-ROM with a video presentation of the Brest quality of life has been produced in order to present the site to ICT workers located outside Brittany and to communicate at exhibitions. Nevertheless, if the quality of life plays a crucial role in attracting and sticky ITC workers, some interviewees have noticed a deficit of cultural activities and infrastructure.

## 6 POLICY RECOMMENDATIONS

What can we say about the ITC Brest cluster perspectives?

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<sup>9</sup> In this case the time travel from Brest to Paris will be 3h30.

Based on the interviews and our own analysis, we can say that what we have observed is not counterintuitive regarding the behaviour of an evolutive social and complex interacting system as a well-functioned cluster should be. The basic elements, firms, research/education institutions and local authorities, before interacting all together in a richer manner, have to develop trust with one another, and for that, tend to favour dynamic and repeated bilateral interactions<sup>10</sup>. It is what we have observed within the cluster and it is the signal of a “normal” development process. However, a danger exists of a lock-in situation and a frozen situation if relational density does not increase. Network innovation, local base knowledge appears as soon as information and tacit knowledge diffuse easily within the cluster, in this sense, the recent “small world” theory (Watts, 1999) highlight the underlie interaction structure and collective organization that optimise the diffusion. Without go in further details<sup>11</sup>, one can say that an optimal collective organisation relies on a mix of strong local interaction (cohesion or cliquishness) and global interaction (accessibility), what does it means exactly for the collective organisation of the cluster?

A well-functioning cluster needs to be locally connected, and these ties must be dynamic and evolutive. It is a way of easily and quickly diffusing new ideas and good practices and, finally, supporting radical or incremental innovation. With a future ICT federative program, Brest is attempting to stimulate this local cohesion but a good way is also including new coherent elements in the system, ie. start-ups to recompose and support new interactions. Here again, Brest seems to be on the right track with affirmative support for entrepreneurship and an active incubator policy. However, a well-functioned cluster must also be connected with the outside and in this domain, the Brest cluster seems not so well-connected: except for the key companies and some others of the cluster, the connections with abroad are relatively scarce.

There is clearly a problem of accessibility to and from Brest but the cluster is also suffering from a hub and spoke architecture with an insufficient diffusion of information and tacit knowledge, from Thales or Alcatel, to the other actors of Cluster. The strictly pair wise interactions between these large firms and their spin-offs brake the evolution of the interactions and the local diffusion. More can be do to support the development of the cluster, passing a crucial tipping point and leaving a frozen situation.

As far as the behaviour of the local authority is concerned, the ICT ambitions are not clear. Several development programs are now engaged and depending on the level of institutional actor (Cluster with “technopole Brest Iroise, Agglomeration with “CUB” or Regional), the number of interlocutors are numerous, probably too much. A possible clarification is possible with a reinforcement of the prerogatives of the “technopole Brest Iroise” and a stronger communication and cluster policy. At last, a possible polycentric strategy with the other Brittany clusters could be considered in order to prevent a risk of an under-critical mass lock-in situation. Of course, there is a danger to an over-specialization, but an identification of complementarities between Lannion and Brest could be a good development strategy.

The capacity to attract ICT foreign companies or stimulate the delocation of a national company is not really the role of the “technopole Brest Iroise” association, on the other hand, the internal and external promotion of the cluster is. We recommend strongly improving the internal

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<sup>10</sup> It is a classical problem of game theory.

<sup>11</sup> See Suire (2003b) for that.

communication with a more active “*who is who*” policy. There is a directory, but it is too formal and probably inadequate for internal communication. One could stimulate informal meetings or events on the cluster. We recommend also external communication. As previously mentioned, Brest is suffering from an image deficit while many natural assets are present. Non-Brittany ICT workers must know that. Besides, Brest must not forget that amenities, cultural and nightlife are important for young well-educated. Currently, and some interviewees have remarked this, Brest is not quite pro-active in this way while city is not very well equipped.

The virtuous circle of agglomeration with positive feedback effect begins to occur when negative externalities of agglomeration are inferior to positive externalities of agglomeration. Today, and for the Brest ICT Cluster, the difference between both is insufficiently positive. The negative externalities are not really present in Brest (low congestion, low rent, ...), that is the reason why a local effort must be focused on the positive externalities (urban amenities, transport, ...) associated with a more affirmative ICT image.



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## **ANNEXE**

### **ICT BUSINESS SECTOR (NACE CATEGORIES)**

#### **1.A Hardware**

30 Manuf. of office machinery, computers and other information processing equipment  
313 Manuf. of insulated wire and cable  
321 Manuf. of electronic valves and tubes and other electronic components  
322 Manuf. of TV and radio transmitters and apparatus for line telephone and line telegraph  
725 Maintenance and repair of office, accounting and computing machinery

#### **1B. Hardware**

323 Manuf. of TV and radio receivers, sound or video recording or reproducing apparatus  
332 Manuf. of instruments and appliances for measuring, checking, testing, navigating and other purposes except industrial process controlling  
333 Manuf. of industrial process control equipment

#### **2. Telecommunications**

624 Telecommunications

#### **3. Software**

721 Hardware consultancy  
722 Software consultancy and supply  
723 Data processing  
724 Data base activities  
726 Other computer related activities

#### **4A. Content**

221 Publishing  
744 Advertising  
921 Motion picture and video activities  
922 Radio and television activities

924 News agency activities

#### **4B. Content**

2211 Publishing of books  
2212 Publishing of newspapers  
2213 Publishing of journals and periodicals  
2214 Publishing of sound recordings  
2215 Other publishing

74401 Advertising agency activities  
74402 Advertisement placement activities  
74409 Other advertising activities  
9211 Motion picture and video activities  
9212 Motion picture and video distribution  
9213 Motion picture projection

#### **5. Other services**

5143 Wholesale of electrical household appliances and radio and TV goods  
5165 Wholesale of other machinery for use in industry, trade and navigation  
7133 Renting of office machinery and equipment including computers  
7414 Business and management consulting activities

#### **6. Research and development**

731 Research and development on natural sciences, engineering and technology  
732 Research and development on social sciences