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Models of ICT Innovation

Ten cases of successful innovative ICT SMEs in France

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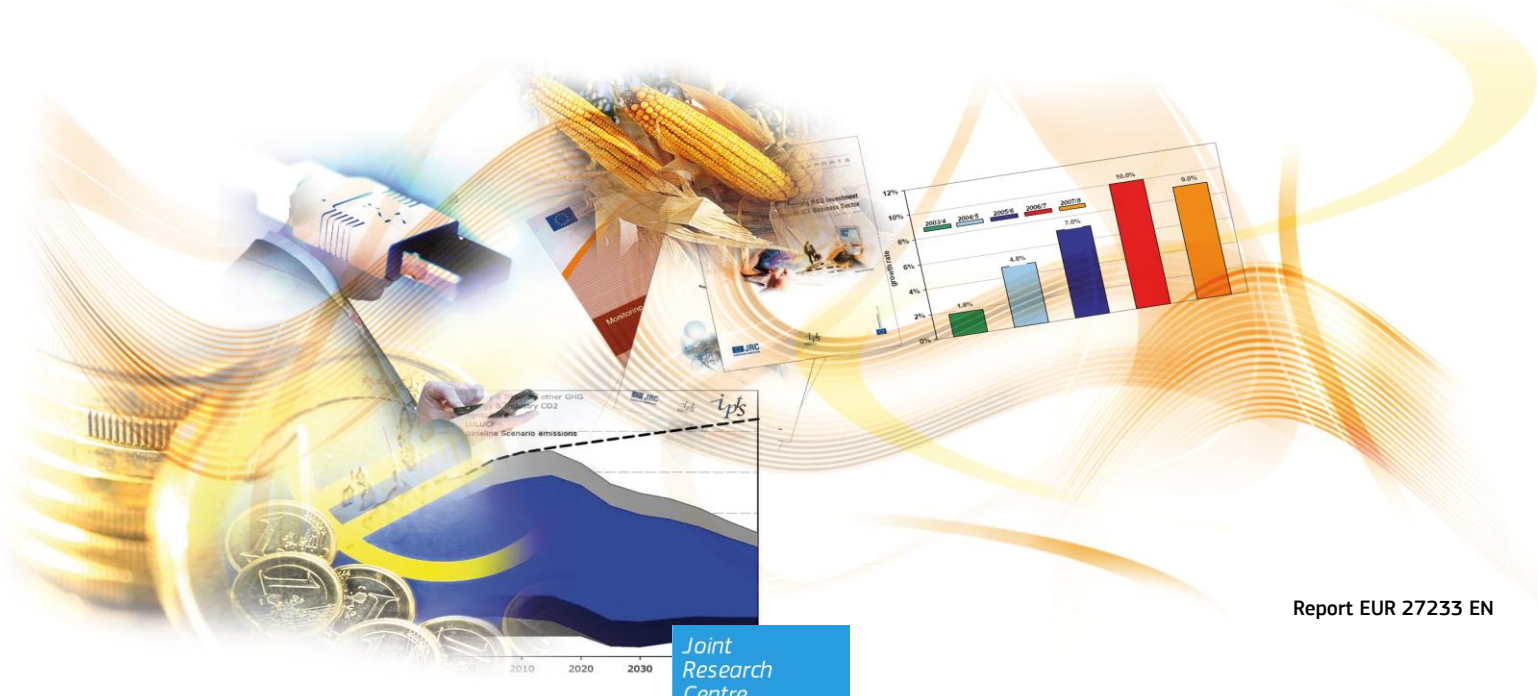

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Abstract
This report is the result of an exploratory study on innovation models, which looked for the commonalities and differences between ten small innovative and successful ICT companies in France. Specific attention was paid to documenting business strategies, purposes, means and drivers in very concrete terms. Chapter 2 regroups a large part of the information gathered under three main headings – technology, finances and markets. It illustrates each heading with the observations collected, and indicates what seem to be the key features of the innovation model. Chapter 3 broadens the perspective by pointing to various topics that contextualize the model of innovation. It questions the specific role of the observed companies in the overall ICT innovation ecosystem, and their relations to multinationals and the national and local innovation system. Chapter 4 summarizes findings and offers some conclusions.

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Preface

This report was prepared in the context of the three-year research project on *European Innovation Policies for the Digital Shift* (EURIPIDIS). This project was launched jointly in 2013 by JRC-IPTS and DG CONNECT of the European Commission in order to improve understanding of innovation in the ICT sector and of ICT-enabled innovation in the rest of the economy.[1]

The purpose of the EURIPIDIS project is to provide evidence-based support to the policies, instruments and measurement needs of DG CONNECT for enhancing ICT Innovation in Europe, mainly in the context of the Digital Single Market policy agenda and of the ICT priority of Horizon 2020. It focuses on the improvement of the transfer of best research ideas to the market.

EURIPIDIS aims are:

1. to better understand how ICT innovation works, at the level of actors such as firms, and also of the ICT "innovation system" in the EU;
2. to assess the EU's current ICT innovation performance, by attempting to measure ICT innovation in Europe and measuring the impact of existing policies and instruments (such as FP7 and Horizon 2020); and
3. to explore and suggest how policy makers could make ICT innovation in the EU work better.

This report offers a qualitative observation of ten innovative ICT SMEs in France. It aims to provide a better understanding of what aspects of their models of innovation allowed these companies to innovate, survive and prosper.

The concept of models of innovation refers to the way the innovators manage an invention from its conception through to its commercialization. Innovators make decisions on how to create the conditions for value making, within an overall context of high uncertainty due to the very nature of their innovative activity.

This study has focused on observing their behaviour and provides a structured insight into the main features of their models of innovation.

[1] For more information, see the project web site: http://is.jrc.ec.europa.eu/pages/ISG/EURIPIDIS/EURIPIDIS.index.html

Acknowledgements

The assertions made in this report are the sole responsibility of the author. They reflect his interpretation of the information communicated, but do not represent in any way the opinions of the people or the companies the author encountered.

The author would like to thank everybody who agreed to talk to him and broaden his views about ICT innovation from a company-level perspective, and who contributed stimulating ideas.

The author is especially grateful to those who helped him to translate his practical experience into a more structured document, even though it still has many limitations.

1. Introduction

This report offers a qualitative observation of ten innovative ICT SMEs in France. It aims to provide a better understanding of what models of innovation allow companies to innovate, survive and prosper.

The concept of "models of innovation" refers to the way the innovators (individuals or companies) manage an invention from its conception to its commercialization. Innovators make decisions on how to create the conditions for value making, within an overall context – an Innovation System – about which they often have limited knowledge.

The study tried to answer the following questions for each company:

- What were the main initial drivers for creating the company?
- What major obstacles or challenges has the company had to deal with?
- Who financed the company?
- How does the company access knowledge to stay innovative?
- How did the founders deal with their markets?
- How homogeneous or diverse were the solutions adopted?
- How have local, national or European instruments affected the companies?

All these questions aim to reveal the companies' "models of innovation".

Models of innovation are the ways and means innovators use to position themselves, their firms, and their activities within the local, national and international contexts that surround, support or constrain them. It is a micro-level approach to innovation as a process, from the firm's and the individual's perspective.

The academically and politically acknowledged concept of Innovation Systems[2] is different. It refers to "the supporting network of scientific and technical institutions, the infrastructure, and the social environment" (Freeman 1990, quoted by Carlsson, 2003). Therefore the study of innovation systems emphasizes and analyses the role of institutions and looks instead, one can say, at the meso level.

The companies in this study were selected from more than 100 French ICT companies that the author has got to know during the 25 years he dedicated to consultancy work. The author made his choice of 10 companies, complying as far as possible with the above-mentioned criteria ("innovative and successful ICT SMEs") and with suggestions made by IPTS and external experts from regional or national public agencies.

The age of the firms was not used as a criterion. As there is no real consensus in literature about what constitutes a 'young' company,[3] 'longevity'[4] was used, as a sign of success, to select companies, that had proven resilience, survival and growth. At the time of the study, 4 of the

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[2] For a thorough literature review, see: http://faculty.weatherhead.case.edu/carlsson/documents/InnovationSystemsSurveypaper6.pdf

[3] Regarding this notion of age, Eurostat sets a maximum of 5 years for its "young" companies in the case of gazelles. Those are the subset of high-growth enterprises which are up to five years old. The definition of gazelles is: All enterprises up to 5 years old with average annualised growth greater than 20% per annum, over a three year period, should be considered as gazelles. See at http://ec.europa.eu/eurostat/ramon/statmanuals/files/KS-RA-07-010-EN.pdf. Czarnitzki and Delanote (2012) use the European definition as specified in article 35 of the General Block Exemption Regulation (GBER) which determines Young Innovative Companies as having less than 250 employees, being less than 6 years old and spending at least 15% of its operating expenses on R&D. This definition is also used by Schneider and Veugelers (2010).

[4] From the Technical specifications: Success will be measured in terms of longevity and growth (Revenues, staff, profits).

companies observed were less than 10 years old, 2 less than 20 years old, and 4 less than 30 years old. This age criteria excluded de facto large companies and multinationals, such as incumbent telecom operators or IT equipment producers, for example.[5]

There is also no consensus on the term 'success' in the literature. The minimum criterion for a company to be considered successful in the study sample was that it had to have been active during the last 5 years with a significant growth in revenues.[6] The selected companies' turnovers range from 3 to 11 million euro for companies less than 10 years old, and from 18 to 40 million euro for the older ones.[7] Together, the ten companies provide 1,500 jobs and a turnover of around €170 million. Out of the 10 companies, 8 are or were high growth companies as defined by the OECD (average annual growth greater than 20%, over a three year period). Four of them have achieved impressive average yearly growth over the last five years of above 45%.

The author, on the basis of his expert knowledge and long professional experience, assessed the innovativeness of all the companies in the initial sample. The criterion is not very selective per se since almost all companies of the initial 100+ list claim to be innovative.[8] The level of R&D intensity (R&D expenditures / turn-over) was not considered in the selection, as this factor would be investigated for each case later in the project.

Finally, companies were chosen deliberately for their technological diversity in order to capture potential differences in behaviour. In two cases, pairs of companies were selected to allow for additional comparison within technological domains.

The following table provides the basic company-level data for year 2013.[9]

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5 This is true for France but could have been different in another country

6 All enterprises with average annualised growth greater than 20% per annum, over a three year period should be considered as high-growth enterprises. Growth can be measured by the number of employees or by turnover. (OECD see at: http://www.oecd.org/industry/business-stats/39974588.pdf).

7 Detailed data can be found in the annexes

8 Self-reporting and its assessment is not a fundamentally new issue as it accompanies also the emblematic Community Innovation Survey of EUROSTAT

9 Data is collected from company reports when available. For companies that do not publish results, the data from the site www.societe.com was used. It provide the results obtained by French companies, which are mandatorily published, but do not provide consolidated results. That is the case for Aquafadas, Ateme, Kreactive, Vitec, and Wiztivi. This underestimates specially the revenues of Vitec, for which consolidates revenues for 2013 are estimated at 30M€.

Company name	Technological domain	Creation date	Number of employees	Turnover	Turnover CAGR 2009-2013)	Sector (NACE)
Aquafadas	Software for digital publishing	2006	62	3,6 M€	46%	Software publishing 58.29
Astellia	Monitoring mobile networks	2000	350	36 M€	27%	Manufacture of communication equipment 26.3
Ateme	Video equipment	1991	110	20,6 M€	17%	Manufacture of communication equipment 26.3
Awox	Domestic network	2003	42	6,9M€	27%	Consumer electronics 26.4
Esker	Document management and delivery	1985	290	41,1 M€	11%	Software publishing 58.29
Intrasense	Medical imaging software	2004	70	4,1 M€	46%	Software publishing 58.29
Itesoft	Document management and delivery	1984	196	21,6 M€	2%	Software publishing 58.29
Kreactive	Education services	2004	40	3,3 M€	59%	Information Service Activities 63
Vitec	Video equipment	1988	175	25.,9 M €	10%	Manufacture of communication equipment 26.3
Wiztivi	Interactive digital TV	2007	50	4,7 M€	117%	Software publishing 58.29

This study is exploratory. It is based on brief case studies of ten ICT companies, covering a diverse range of ICT subsectors. It relies on the author's ex-ante deep knowledge of the companies, and is complemented by desk research and by direct contacts with each company, including interviews with the CEOs, and usually founders, of the companies. Specific attention was paid to documenting business strategies, purposes, means and drivers in very concrete terms.

The report is structured as follows.

- Chapter 2 regroups a large part of the information gathered under three main headings – technology, finances and markets. It illustrates each one with the observations collected, and indicates what seem to be the key features of the innovation model.
- Chapter 3 broadens the perspective by pointing at various topics that contextualize the model of innovation on the basis of the observation. It questions the specific role of the observed companies in the overall ICT innovation ecosystem, and their relations to Multinationals and the national and local Innovation System.
- Chapter 4 summarizes findings and offers some conclusions.
- A presentation of the 10 companies can be found in the annex, which includes for each company a description, a commented chronology, and a more detailed description of its specific innovation model.

2. A tentative model of innovation

2.1 Introduction

The data and information collected from the 10 case studies can be grouped around three main topics:

1. Access to technological knowledge
2. Access to finances
3. Access to market knowledge

In this report, 'access to technological knowledge' refers to knowledge in terms of technological competences and also market evolutions (such as standards) or competitors' capacities (such as new solutions emerging on the market).

'Access to finance' deals with access to financial resources, be they private or public.

'Access to market knowledge' encompasses market information. It aims to understand demand, and address it adequately. It is a matching exercise with the (potential) customer.

These three topics are the three essential resources an innovator (an individual or a team) tries to access, interpret and integrate in a coherent manner. They are also the three main uncertainties the innovator needs to address and "tame". These aspects are obviously interrelated: raising money may facilitate the access to knowledge developed internally or bought, as well as entering a new market.

This perceived need to integrate the three resources adds the issue of timing to the innovator's concerns. Timing affects all three factors and is an essential part of the innovator's coordination problem. As summarized by a company manager: *"A successful innovation needs good timing, customer acceptance, an enabling technology and acceptance of the financial market"*. This perspective introduces us to the uniqueness of innovators' activities: they need to gather resources, make decisions and convince other players about an as-yet unknown (innovative) product, service or process.

2.2 Access to technological knowledge

The following section analyzes in more detail the resources used at company level to obtain technological knowledge. Obviously, technological knowledge is crucial for technology companies, and also the origin of their existence. This point is sometimes neglected though it defines the difference between a tech and a non-tech company.

The initial technological knowledge is most often cited as the initial reason for setting up the company. Founders often have technical higher education ("engineers"), and an initial drive – frequently still alive years later – for developing their own ideas and solutions and pushing them onto the market.

But initial knowledge is certainly not enough. The knowledge required to start and maintain an innovative ICT company must be rapidly changed, updated and increased.

This is explained in relation to:

- The need for knowledge about new technologies and products to meet new demands.

  Example:
  In the video and TV sector, there is strong user demand to view content on any device. Another, more technical need is to be able to benefit from the development of cloud-based services and processes. This has significant consequences when developing digital video processing tools.

Vitec, for example, bought the Israeli company Octibase in order to be able to provide IPTV[10] dedicated products.

- The continuous technological progress in ICT, described by Moore's law, and also progress in several domains: software development, artificial intelligence, telecommunication efficiency (such as radio technologies) and others.

  Examples:
  Companies dealing with document management, such as Esker or Itesoft, have to continually add new algorithms which allow products to be more efficient, by basing them on text understanding and the use of new semantic tools. A telecom equipment company such as Astellia is permanently confronted with new standards: from GSM to 3G to 4G and, most recently, to 5G projects.

  There is also a general move towards software-based equipment, instead of dedicated hardware. Standard hardware, such as a PC, has more and more processing power and therefore algorithms that previously needed dedicated hardware may be implemented using software and standard hardware. This has several advantages for the customers: the use of standard hardware decreases the cost of investment (Capex: capital expenditures). It also makes the future evolution of the equipment easier: it is cheaper and faster to upgrade software than to change hardware, thus diminishing operating costs (Opex: operating expenditures) as well. This tendency was not in evidence directly in the 10 companies, but hardware companies such as Ateme have more and more to deal with software companies such as Elemental, which provide a software-based encoding system.

Therefore, initial technological knowledge, its maintenance, growth and update are behind many activities in each company. These include not only the use of in-house resources, but also a much larger set of methods for accessing external resources, or co-producing them. In this last case, a significant activity is the embedding of the company in a dense network of external relations.

2.2.1 Capitalizing on in-house technological knowledge

The technological competence of the founders

Most of our companies have resulted from the founder's decision to start a business based on emerging technologies. These founders initially came from engineering schools. Their professional experience varies, from practically none as they have just completed their studies to considerable industrial expertise accumulated over time. In both cases, they want (or are obliged) to start some new activity.

Most of these founders are not "serial entrepreneurs". They are still managing the company they created years ago: some of them still keep financial control over the company (ownership). The interviews reflect their strong personal commitment to the success of their company. None of them mentioned selling their companies and a strong personal relationship (identification) appears to exist between them and their companies.[11]

Examples:

- Esker was founded in 1985 by two engineers to develop innovative software products, in relation to the emergence of the PC and unified operating systems (Unix). The aim was to create a software editing company. The first product (terminal emulator on PC) was a worldwide success.

[10] IPTV (Internet Protocol TV): a technology that makes it possible to provide TV services over managed Internet.

[11] Another striking anecdotal aspect is that in many cases, the selected companies were created by 2 individuals, not only one.

- Awox was founded in 2003 by a team with experience, that has been previous managing (as CEO and R&D directors) Smartcode Technologies (1994), one of the first companies for Internet software which later became Palm Computing Europe. The basic idea was to provide software for connected home equipment.
- Two engineers founded Ateme in 1991 after a few years of professional life. They wanted to develop innovative software, and were fond of technology. By offering advanced services, they managed to obtain a significant portfolio of IP on digital compression.
- Intrasense was created in 2004 to develop tools for integrating and analyzing medical imaging data from different imaging devices in a unified work environment. The founder of the company discovered the technology in the US and then completed a PhD in France on digital imaging for analysis of liver cancer, with the collaboration of very motivated physicians.
- Two engineers founded Aquafadas in 2006 to develop innovative editing software. Their second product was a success.

The only exception in the sample is Astellia. This company was created in 2000 as a spin-off from France Telecom, with a long privileged relationship (now ended) with Orange R&D.[12]

Thus it appears that tech companies in their early stages rely on the technological knowledge of their founder(s). Technology is part of their DNA and its creation could apparently not be generated by an imported resource, simply grabbed on the market.

Incorporating skilled staff from the labour market

A second source of technological knowledge comes with success, hence growth and staff recruitment. Contrary to pessimistic expectations, the issue of finding talented people was rarely been mentioned as a problem. Taking into account the average size and growth rates of the interviewed companies, and their high technological level, the hypothesis of low recruitment levels or low expectations can be discarded. In France skilled ICT staff seem to be available. The Paris and Ile-de-France regions are often mentioned exceptions, mostly in terms of staff costs. These views echo similar observations made in other research projects about France.[13]

Developing core in-house R&D

All the observed companies claim to run an in-house R&D department, which should not come as a surprise in companies belonging to the hi-tech sector. They have a variable, but generally high-level of R&D. Many of them have one main research center, where most of the in-house R&D and innovation is done.

For the companies which provided figures for R&D expenses, the percentage of R&D expenses compared to revenues ranged from 10% (Esker) to 39% (Awox).

For the companies which provided figures for the number of R&D employees, the percentage of R&D employees to the total number of employees ranges from 33 percent to more than 50 percent. Companies with more than 50% employees in R&D include Vitec, Aquafadas and Intrasense.

We have no figures for R&D by Kreactive and Wiztivi. For Wiztivi, one of the youngest and smallest companies in the selection, developers are part time researchers, depending on their work loads. As their customers are mainly large R&D labs, we can consider that these researchers contribute to a significant R&D effort. For Kreactive, the level of R&D should also be significant.

Some companies mentioned explicitly the need to be technologically “one or two years in advance”, in order to be ready if a new market demand appears. Very advanced technological knowledge is,

[12] France Telecom changed its name in Orange, its mobile brand in 2013.

[13] See for example the EIPE experts interviews reports: http://is.jrc.ec.europa.eu/pages/ISG/EIPE.html

and will continue to be, a strategic resource that helps companies to survive and find success on the market.

Examples:

- Vitec and Ateme need to keep up with new developments in digital compression, which are often pushed by consumer equipment manufacturers. The speed (and success) of the move from analog TV to digital TV, to High Definition, to 3D (stereoscopic) and to UHD is difficult to predict.
- Wiztivi develops new standards and technologies to allow the development of interactive TV and video on all terminals available.
- Awox develops advanced products for the connected home, and needs to be innovative in order to compete with giant companies such as Samsung or Google

2.2.2 Access to external knowledge

Many different ways of obtaining technological knowledge from outside the company were observed. Successful ICT companies develop proactively a technology watch function, which includes a variety of ways of capturing relevant opportunities in a rapidly changing technological sector. The term 'open innovation' is not necessarily quoted, but the behaviour and motivations of these companies often remind us of an environment of this kind.

Firm acquisition

The acquisition of other firms in the same or in a complementary domain is always an option.

Examples:

- Esker bought an US company which sells fax servers, and became a world leader in that domain.
- Vitec, in order to master the growing IPTV technology market, bought the Israeli company Optibase (at least its IPTV part), and kept part of Optibase's research team in Israel. IPTV technology distributes digital TV through managed Internet networks. It therefore has a lot in common with digital broadcast, but also significant technical differences, and a need for specific research and continuous innovation. Optibase, founded in 1990, was an IPTV specialist, which became fully owned by Vitec in 2010. The company is still doing research and manufacturing in Israel. This move allowed Vitec to increase the size of its offer, covering more of the video digital domain, and to increase the number of its potential customers, while also increasing its development and marketing capabilities.

In both cases, the acquisition enabled the companies to address new markets, with a large number of technical and commercial connections.

Technology acquisition from other firms or research centres

External technologies can be bought and become the property of the company. This option is considered when the company wants to concentrate on its key competencies (estimated to be critical for the market) and also complement them with new technologies in order to expand or consolidate their market.

This move often means that the company has to move from being a pure developer to becoming an integrator. The term 'integrator' may be misleading. In numerous industries, integrators are companies which answer the need of a specific customer by buying and assembling the best building blocks available on the market. The integrator in this study develops technology internally, integrates into it some externally developed technology, and produces the final product to be sold on the market.

This move from technology provider to integrator deserves attention. Two main factors drive this evolution.

First, technological knowledge is a key characteristic of all the founders. They are all highly educated people, mostly engineers. New companies usually rely on their internal knowledge as they generally do not have enough funds to buy knowledge from outside. This has a natural side effect: new companies usually sell one type of product or technology to other companies, which are able to provide the technological complement to the final customer. In order to grow, companies may need to integrate several technologies. Many of the examples selected became integrators, when they had acquired sufficient resources.

Second, all the surveyed companies claim they are facing rapid (and accelerating) technological changes, emergence of new markets and usages, and new demands from users. Most of the companies have responded by keeping the same product lines and at the same time addressing progressively adjacent or new markets. This allows them to grow, and fulfil new customer demands.

This constraint and the resulting strategy may compel the companies to keep and develop their basic know-how, while extending it to new adjacent markets. This extension to new technology and new markets is often associated with a move from being pure technology developers, which is feasible when companies develop one product based on one technology, to technology integrators, This move limits internal technological development to what is considered critical. It also gives more importance to the consumer's requests and expectations, as these become more complex and sophisticated. It leads to an increase in the tendency to "learn from the consumer". Market knowledge becomes essential.

Examples:

- From 2009, Astellia (monitoring mobile networks) has been developing a methodology to source needed new technologies, select the most fitting, buy and integrate them. The evolution of Astellia was strongly motivated by its need to master numerous evolving technologies. This mastery has enabled it to extend its offer to all parts of the network and answer customers' demands more rapidly.
- Ateme concentrates on the heart of its business: developing the best in class encoders. In order to achieve this, it bought audio technology from Fraunhofer that was needed but not critical.[14] Thus, the company, to keep its technological advantage, is becoming more and more an integrator.

Technology watch through participation in standardization consortia

Participation in industrial consortia developing (de facto) standards is a key element in several companies' strategies. This participation has both a financial and a human cost, as usually the most experienced researchers are the contributors to the consortia. But it also has several positive impacts, giving the companies:

- A precise knowledge of the technological level and strategies of the main international players,
- Worldwide visibility, not only to potential competitors, but also consumers,
- The possibility to influence the standard decisions from the inside, thus obtaining a technological advantage,
- Anticipated knowledge of emerging standards, allowing them to adapt more rapidly to the market.

Participating in standardization consortia is a strategic choice, not made by all the companies. Some prefer to work on the successive drafts published by the standardization organism and not invest too heavily in this type of (costly) activity.

[14] Buying technology from public research centres allows benefitting from R&D tax reduction.

Among the most active examples in our sample:

- Awox made a key strategic choice to become a main player in standard development by supporting DLNA (Digital Living Network Alliance),[15] an international private consortium founded in June 2004. Awox invested heavily in R&D activities in this domain and succeeded in becoming a major player. Awox is currently recognized worldwide as a technical leader for DLNA standards and implementation. This has allowed the company to develop building blocks for large electronic companies, and more recently to develop advanced products for the connected home. It is also involved in HbbTV.[16]
- Ateme is very active in standardization committees and in industry forums (DVB, IABM, SMPTE). Ateme is also present in HEVC.[17]
- Aquafadas is active with Idealliance[18] and Wiztivi with HbbTV.

Cooperative R&D Programmes

International cooperative programmes

Most companies never participated in public R&D international programmes and even less in the European ones (EU Framework programme or Eureka). The key reasons for not using these programmes include the absence of timeliness of such programmes, their administrative burden, the managers' lack of knowledge of the existing instruments (during some interviews, existing mechanisms had to be explained, as they were totally unknown to the managers), the difficulty to find and obtain the right partners, and the expected ratio cost/benefit of gaining access.

Finding relevant information is seen as an expensive task (as it uses a scarce resource, i.e. the best experts of the company), always followed by even more expensive work producing an acceptable proposal. In addition, attempts to obtain funding had failed in various cases.

Cooperative programmes are seen as a waste of time and money, not compensated by the funding offered. Cooperation with other international companies may be necessary but doing this through direct contacts is seen as easier.

Consultancy companies offer services as intermediaries, but they are not seen as efficient. Information days for the Framework programme do not raise significant interest.

In the sample, Vitec is the main exception. It is the only company that has successfully used international cooperative programmes. By chance or design, it had a staff member who was well acquainted with the mechanisms and benefited from good contacts with qualified people

Some quotes:
"We don't go to the Information Days, unless the domain is totally new".
"An Information Day is not the place where projects can be built".
"It is too difficult to find the good projects".

Examples:

- Intrasense: their only European proposal was made in 2006 (FP6) and was rejected. A possible explanation is the poor support they received in making the proposal. Note that the company largely practices direct international research and development cooperation.

[15] http://www.dlna.org/

[16] https://www.hbbtv.org/ Hybrid Broadcast Broadband TV or "HbbTV", is a major new pan-European initiative aimed at harmonizing the broadcast and broadband delivery of entertainment to the end consumer through connected TVs and set-top boxes.

[17] High Efficiency Video Coding (HEVC) is the current joint video coding standardization project of the ITU-T Video Coding Experts Group and ISO/IEC Moving Picture Experts Group

[18] http://www.idealliance.org

- Awox's proposal in FP7 was accepted, but not funded.[19]
- Wiztivi contributes to standard consortium, but up until now, it has not tried to participate in European projects The company is currently trying to participate with the support of a consulting company.
- Awox has a very high level of international cooperation, which is mainly due to its very active participation in an international industrial consortium.

This situation seems to have evolved over the last few years. Interviews with companies show that at least some of them feel the need for more international cooperation. They want to understand better the nature and (probably more importantly) the rate of change of the technologies they are working with. This interest arises from the increasing complexity of new technologies, the need to master more domains and understand the market evolution through collaborative exchanges.

Examples

- Astellia intends to join its first European project in 2015. This decision may be related to the fact that the technological complexity of customer needs is increasing, and that cooperative innovation is a potential answer.

National cooperative programmes

At the national level, the two main funding mechanisms are FUI and ANR. FUI[20] (Fonds Unique Interministériel) is more development-oriented and ANR[21] (Agence Nationale de la Recherche) more research-oriented. Bpifrance may provide support to SMEs for building the cooperation.

The same issues appear as in international cooperation. Companies, which position themselves globally, do not mention national cooperation as a major factor. As with international cooperation, lately there is a possible tendency towards more cooperation.

Examples:

- Ateme, which was up until now very reluctant to cooperate, has entered a cooperative project 4EVER (for Enhanced Video ExpeRience). 4Ever is supported by two Poles of Competitiveness,[22] and funded by Bpifrance, European Structural Funds and the Brittany region.
- Itesoft entered a large cooperative programme in 2010 with Sagemcom.

Relationship with universities and research centres

For the observed companies comments, universities are neither great sources of knowledge nor are they strong players in the innovation domain. None of the 10 companies has a significant relationship with any university. Relationships with public research centres are slightly better, but always mentioned as difficult. This observation echoes similar observations by Nesta.[23]

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[19] Detailed information is not available. The project might have received a good evaluation, passing the requested thresholds, but without being accepted for funding.

[20] FUI Funds Unique Interministériel is more development oriented (http://competitivite.gouv.fr/les-appels-a-projets-de-r-d-fui/les-appels-a-projets-de-r-d-du-fui-380.html) and ANR more research oriented (www.agence-nationale-recherche.fr/)

[21] www.agence-nationale-recherche.fr/

[22] http://competitivite.gouv.fr/

[23] Nesta Working Paper N° 14/01 "'Increasing the vital 6 per cent': designing effective public policy to support high growth firms". This documents states : ""there is a strong belief within public policy that universities play a strong role in generating HGF (High Growth Firms). Similarly universities are seen as knowledge generator of IP, which is then licensed by new start-up." The NESTA paper states that this belief is ill founded, and that drivers for innovation are suppliers, customers and end-users.

The attempts to cooperate with universities are generally described as disappointing, for several reasons, which include:

- Companies and universities work to different time scales for specific projects: six months is quite a long time for an SME. Industry has widely adopted new programming methodologies such as Agile programming, which allows for much shorter software cycles, by facilitating quick experiments. This has led to software cycles of months not years. This industrial acceleration does not fit well with the usual timing in universities.
  Example: In 2010, Esker moved to Agile technology to develop software.

- Universities have a different purpose: company relationships with universities and research labs are seen as difficult, since they rarely agree to address industrialization aspects. Proof of concept is sufficient to make a good publication, which is the main goal for a researcher. For industry, however, the key issue is to prove a concept's practical applicability.

  Example: A representative from one of the ten companies illustrates this by saying that the research lab view is often unfortunately the following: "The method works fine with 1,000 objects, I don't care if it will work with 1 million objects", and the lab is then not willing to continue the cooperation up to the industrial proof of concept.

Some other quotes:
"Working with Universities has always been a failure; rhythms were too different. Several attempts were made with selected researchers, and it was always impossible to synchronize."
"Cooperation with Universities have always led to failure: researcher not available, timing not compatible with industry"

It is interesting to observe that most company founders were trained in robust research and national education institutions. Though the universities and other higher education institutions have played a major role in generating entrepreneurs with a vision about new technologies, this link seems to fail or fade out.

There was no example of public research licensing to be found in the companies. There are a significant number of other cases in France, known to the author through his professional activity, where the start-up founder has wanted to license research results, usually developed previously by himself inside a research centre. The royalties requested by the research lab vary depending on the institution's strategy (University, research centre, engineering school) from low to significant, which can then compromise the economic development of any company.

These problems have been recognized in France, and led to the recent creation of SATT (see the following box).

Sociétés d'Accélération du Transfert de Technologies

In France, the SATT ("Sociétés d'Accélération du Transfert de Technologies") was recently created. A SATT brings together private companies with 100% public funding, which have a major goal: simplify, accelerate and facilitate the transfer of technology and knowledge from academic institutions to industry. SATTs are regional independent institutions, which may have different strategies.[24] Currently 14 SATTs are operating. €856 million have been devoted to SATT creation in the context of the "Programme d'investissement d'avenir (PIA)" decided in 2010. Their activity may include managing or protecting IP for the companies or funding the development of prototypes. Their range of activities varies depending on local policies and is still evolving.

[24] http://www.satt.fr/que-sont-les-satt/

Learning through surveys of competitors

All companies carry out an ongoing survey of their competitors using the same technology, and of new technologies, which may compete with the existing ones. This is mostly done empirically, through Internet search (news, websites of the competitors, websites of standard organizations), participation in international conferences. It is difficult to assess the level and cost of this effort.

2.2.3 Technological knowledge: concluding remarks

This set of anecdotal evidence collected from the observation of 10 companies offers some points worth noting:

- As expected, technological knowledge is an important resource for these innovative SMEs. The founders' initial technological expertise has been a central factor in the creation of the company.
- Technological knowledge continues to be a central factor for survival and success. Keeping "more than up to date" with the technology is considered fundamental. It also reflects the needs of the business itself as it matures from technology provider to integrator.
- All the companies host a research department and are highly R&D intensive in comparison to non-tech SMEs.
- More importantly, all companies claim they have developed a variety of methods to acquire technological knowledge from outside the company: from informal techno-watch to formal participation in lengthy standardization processes, up to technology and firm acquisitions. These companies therefore carry out considerable networking activity, the methods and aims of which reflect the forms of open innovation.
- At the same time, the companies underline their lack of contacts – if not trust – in universities and research centres (due to issues with differentiated timing and objectives). They also seem to avoid entering EU R&D programmes (for reasons of administrative burden, lack of cost effectiveness, slowness, etc.). Such claims probably illustrate the distance between the everyday management of an innovative SME and the perceived accessibility of the system of innovation and its pillars: the universities and the public authorities.
- Finally, local clusters were never mentioned by any of the interviewees as a source of knowledge exchange.

2.3 Access to finance

In this chapter, we now address first the private and then the public funding tools that were mentioned by the interviewed companies. Of course, they are not mutually exclusive. Money from banks, from investors, from other companies and from public support is usually combined.[25]

2.3.1 Private funding

Early revenues through services provision

Several companies have started with a business model based on providing services. Providing services allows them to benefit from immediate sources of revenues, especially for young companies with strong expertise in a new development.

[25] We have not studied here the large number of small subsidies (funding proof of concept or preliminary market study…) or lending provided by local authorities, which facilitated the creation of the company and its first step, but did not go further. A document about the French situation is available at: http://frenchfunding.fr/le-parcours-du-financement/#.VC1yW0eXL9Q

Awox, Kreactive, Itesoft, Esker, Wiztivi and Ateme started by offering services. These services were mainly for developing advanced pieces of software or hardware for specific needs, and based on new technologies the founders had mastered. Based on the knowledge acquired, they were able to develop internally and sell algorithms or methods, and/or software and hardware.

Examples:

- Itesoft, created in 1988 was first called ITA (Informatique et Technologies Avancées). It aimed to develop advanced projects for unique customers. The first projects dealt with character recognition. These projects allowed the founders to identify needs and customers, especially large administrative organizations ((CNAMTS[26], URSSAF[27]).). A market study followed and led to the decision to develop and sell software dealing with document understanding, based on the knowledge acquired.

- Ateme, was founded in 1991, and was dedicated to encoding video It is an example of a move from services offering to IP selling and finally to product selling. (The name ATEME means "Assistance Technique et Etudes de Matériels Electroniques" - technical assistance and studies of electronic equipment). The company started by offering design services, which were ad-hoc developments fully developed by Ateme, with very positive results. Ateme was a growing and successful service company, which tried rapidly to develop and sell a product based on a previous development. This was a commercial failure, probably due to the absence of a specific market study. The company kept the ownership of the software/hardware components developed as services. In 2000, they owned a significant portfolio, based on components for which they kept the IP. They then started then a new business model selling IP to be used by their customers. Services activities contributed to the knowledge of the customer's needs. The move to IP developing and selling was not satisfying (no market visibility, no control over the use of the technology by customers, large players buying the technology just to fill a time gap). The company decided to develop its own brand and put its digital compression products on the market in 2007, which led to success after "suffering for a couple of years".

- Esker, was founded in 1985, as a software editing company. Initially, it provided software services and training. PCs and Unix were emerging at that time, dedicated terminals were widely used. The company sold services, based on a Unix dialect (SCO Unix) that could manage time-sharing systems (typically 5 to 10 terminals/PCs in a lab). The services revenues funded the product development, an emulator of a terminal on a PC, which was a worldwide success, with sales in Europe, US and Australia.

The company (a few people at the start) in each of these three examples owned a new technology competency on document understanding, digital encoding or PC Unix-based software. Providing services allowed for early revenues which served initially as the main source of funding, and also allowed the companies to better understand their customer's needs.

Ateme, which now sells hardware-based products, experienced what could have been "death valley" when it made the move from services to hardware products. Services provide immediate revenues, but revenues from the sales of products are only received a long time after product definition, development and commercialization. The complementary know-how needed is a second issue: how to (re)-define a business model, how to select the right product specifications, how to set up a marketing activity, then a manufacturing activity and finally a commercialization activity. The volume of issues raised implies a significant risk and broad competences are required to address them. The move from service to product implies a significant level of innovation, which is not only technical, but also business-related. This death valley crossing is quite visible in Ateme's results. There was a significant revenue drop in 2008 and 2009, related to the discontinuation of service

[26] CNAMTS Caisse nationale de l'assurance maladie des travailleurs salariés

[27] URSSAF Unions de recouvrement des cotisations de sécurité sociale et d'allocations familiales

offer, which was only partly compensated by the revenues associated with product sales. In 2010, however, Ateme resumed its growth.

Initial support from a large company, followed by venture capital

Engineers trying to develop new technologies within an existing company can launch a start-up with the support of that company (Intrapreneurship).

Examples:

- Wiztivi was created in 2007 by two people, who worked for a large group (Proservia). They convinced the CEO of the group to create an innovative company as a subsidiary of Proservia.[28] Wiztivi's main objective was to allow the TV viewers to have access to web sites on their TVs using only their regular remote control, through the use of software downloaded to their ADSL box. One of the arguments used to convince Proservia was that customers of WizTiVi would need services such as the building of specific web sites. Since then, the project has gone through several evolutions related to the demands of the key players: TV manufacturers, ISP and content providers. The first version included a unique Wiztivi portal, which distributed the connections to the various TV sites. This feature was refused by the ISPs. However, the work allowed Wiztivi to acquire unique knowledge in a complex domain by combining different major players, and new technologies as they evolved: emergence of connected TV sets, connected game consoles and connected boxes, emergence of widgets on the TV sets.

  In 2011, Proservia (acquired by Manpower Group) decided that its main activities were too far away from Wiztivi, and SFR development[29] (a venture capitalist fund) agreed to become the main shareholder, while leaving the company strategic freedom. Currently, the company advertises itself as the worldwide specialist in interactive user interfaces dedicated to set top boxes, TVs and other connected devices.

Early stage love money

"Love money" describes funding from people interested in supporting the project, for various reasons, the most common being that they are friends of the founders, or members of their family. Usually this kind of investor does not request financial return.

Example:

- Intrasense was supported by "love money". It was founded in 2004, and carries out digital imaging of pathologies, for example, cancers. The first investors (after initial creation) were two physicians who believed in the company's potential and wanted to contribute to the research against cancer. Funding also included early revenues from service provision. In this case, the service provision was not related to the company's current activity, but still provided an important source of revenues.

Unemployment benefit

Another funding method, not used in the ten cases selected, but observed frequently in companies created by former employees is to use their severance payment from the former company. In France, specific regulations allow the transfer of unemployment benefit into capital.[30] Though this

[28] The CEO of Proservia was at the beginning the CEO of Wiztivi

[29] SFR Development is a venture capitalist arm of the French telco operator SFR. See more at: http://groupenumericable.sfr.fr/reseau/open-innovation/les-societes-du-fonds-sfr-developpement

[30] http://www.pole-emploi.fr/candidat/les-aides-financieres-a-la-creation-d-entreprise-@/suarticle.jspz?id=27043

measure was not mentioned by the 10 companies considered, it has nonetheless often been used by recent start-ups.

Example:

- For Intrasense: being unemployed was mentioned by the founder as an important motivation to create Intrasense, but unemployment benefit was not available. Later, research tax credit and JEI status allowed him to accelerate R&D activities. Intrasense actively invested in research and development (more than €9 million since its creation) and developed from the start an international commercial strategy based on industrial (Original Equipment Manufacturers) and commercial partnerships (distributors).

Venture capital

Business angels usually fund recent start-ups at a low level (typically between €100,000 and €500,000). However, Venture Capital (VC) targets companies which have already proved they are working businesses, but which need cash to continue to grow.

Out of the ten companies, VCs funded six, with various levels of funding. They were mostly French organisations, such as Innovacom, which invested in Astellia and Awox. Innovacom is one of the few French VCs with international activities. It was a subsidiary of France Telecom (Orange), founded in 1988 to contribute to the development of innovative start-ups able to complete France Telecom's offer. It was bought by its managers in 2012. Orange still contributes to the new developments of Innovacom.

In all cases, the VCs intervention did not seem to imply a loss of control of the company by the founders, who are still fully managing their companies.

Examples:

- The founders of Awox (created 2003), who were previously managers of a large company, used their strong financial knowledge and contacts to raise funds. They carried out fund raising in 2004, 2006, 2009 and 2011. On some of these occasions, fund raising was related to subsidiary openings (2006 Singapore, 2009 USA). The level of funding was respectively 900k€, 1M€, 4M€ and 2M€. The first fund raising in 2004 benefitted from Awox being an innovative company (FCPI - Fonds Commun de Placement dans l'Innovation[31]): private investors were therefore able to claim a rebate on their revenues or their fortune.

- Astellia (created 2000, a spin off from France Télécom), was funded by VCs (Innovacom) related to France Telecom (now Orange), essentially to develop market and sales. In June 2013, founders and employees still own 32% of voting shares.

- Kreactive (created 2004) raised €3 million in 2013. This followed a major change in the company strategy in 2012, which aimed to offer "lifelong learning" through dedicated sites owned by the company under a framework combining advertising, monetizing, automatic inclusion of new contents and deep analysis of usages. The investors include French investors, Turenne Capital,[32] Alto Invest and business angels.

- Intrasense (created 2004) raised €4.4 million in 2008. Since its creation, Intrasense recorded a very high growth, but with almost permanent losses up to 2013.

- Wiztivi (created 2007) was supported for 3 years by Proservia (see above) and then was bought in 2010 by SFR Development. Since its creation, Wiztivi has recorded very high growth, but with continuous losses up to 2013. In 2013 EBITDA became positive, and 2014 will see the first profit.

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[31] http://www.mes-fcpi.fr/principes/principes.php

[32] According to its web site (http://www.turennecapital.com/en/) Turenne Capital is dedicated to being a long-term shareholder that provides expertise, advice and follow-up to directors in the developmental stages of their company.

- Vitec (created 1988) was partly funded by VCs, but the founders bought back their shares in 2005. The VCs were considered as having too short-term goals.

Initial public offering

An Initial Public Offering (IPO) is a usual way of raising private money. Half of the ten selected companies went for an IPO after they reached a significant development level.

Examples:

- Esker (created 1985) entered Euronext in 1997. Itesoft (created 1984) was introduced in February 2001 at Nouveau Marche de Paris (now Euronext[33]) by a financial consultancy. Astellia (2000) entered NYSE Alternext in 2007.
- Since this study began, two more companies have launched successful IPOs (in 2014): Awox and Ateme. They obtained €25 million and €13.3 million respectively. A specific goal of Awox was to develop its activity towards consumers, which is typically cash consuming.

The fund raisings had different goals depending on the company strategy, but usually they allowed the companies to launch or follow significant strategic move. With the exception of Astellia, all companies were more than 10 years old, and Astellia was a spin-off from France Telecom, which already had a significant internal history.

2.3.2 Public funding

There are many public schemes that support R&D and innovation in France and at European level. Describing them all is outside the scope of this paper.[34] This section concentrates on those that have been mentioned by the interviewees as having had an important impact.

They are:

- the Zero rate lending for R&D costs
- the Research Tax Credit
- the "Concours national d'aide à la création d'entreprises innovantes".

These alre not funding instruments in a regular sense, but they provide major support, and are used by almost all companies. We also describe briefly two additional support schemes: JEI and Jeremie.

Bpifrance is not directly in charge of all the actions mentioned below, but it is always a key player, providing expertise and funding.

Bpifrance

Bpifrance is a public investment bank and a trusted partner for entrepreneurs. It resulted from the merger of OSEO financing professions, the Strategic Investment Fund (FSI), the FSI Regions and CDC Entreprises (Caisse des Dépôts et Consignations) activities. Since the 1 January 2013, Bpifrance has been the main instrument of the French State for competitiveness and growth services for companies.

Bpifrance manages a large and rapidly evolving set of tools to support innovative companies, mainly SMEs. Its web site provides an overview of the existing support possibilities. A complete description may be found at the dedicated page of Bpifrance.[35]

With 2 200 employees, Bpifrance has three goals:
To accompany businesses in their growth;

[33] NYSE and Euronext merged in 2006.

[34] There exists a significant number of subventions for start-ups from local authorities or organizations, which facilitates the creation of a company. Level of funding is usually very low (around a few ten thousands Euros), quite efficient to facilitate the work before the creation (market feasibility, technical feasibility), but have less influence after the creation. For France, see for example: http://frenchfunding.fr/le-parcours-du-financement/#.VC1yWOeXL9Q

[35] www.bpifrance.fr

To prepare tomorrow's competitiveness;
To develop an ecosystem that favours entrepreneurship.

Bpifrance assists businesses of all sizes, primarily micro-businesses, SMEs, and mid-caps but also big firms that are considered strategic in terms of the national economy, territories or employment.

Bpifrance finances businesses from the seed phase to transfer to stock exchange listing, through loans, guarantees and equity.

Bpifrance, whose two equal shareholders are the French State and the Deposits and Consignment Fund (Caisse des Dépôts), acts in support of public policy established by the State and the Regions.

Source: http://www.nefi.eu/our-members/france-bpifrance/

Zero rate lending for R&D costs

The official name is "Aide pour le développement de l'innovation" (Support for innovation development) and includes zero rate lending and lending with no reimbursement if a project fails, the last option being less and less used.

The company needs to present a strongly innovative project to be eligible for this support.

Bpifrance manages, on behalf of the public authorities, the availability of zero rate lending for R&D costs. It includes delayed reimbursement beginning a couple of years later. This support covers up to 50% of the total development cost, excluding marketing and commercialization costs. It is an attractive tool, and indeed widely used, since it allows companies to develop products and only start repaying the loans when they collect their first revenues.

Bpifrance Zero rate lending of R&D costs was used by the majority of the interviewed companies, who all considered it to be a very helpful support. It was an important tool for developing new products and/or moving from services to products (the valley of death described earlier). Used in combination with service activities, the companies said it was a very powerful tool for development, and an alternative to bank lending or fund raising. Zero rate lending is largely used for successive projects. It allows the company to develop projects and start repaying the loan 3 years later, when its commercial results start to manifest themselves.

If the funded project fails, the funding does not have to be repaid. None of the interviewed companies has ever declared business failure, and has always paid back the loans received.

Almost all the companies used this support several times at various levels of funding, which may reach above €1 million (which implies more than €2 million development cost). Here are some examples:

- Astellia decided in 2012 to develop a complete new system architecture based on the latest technologies put together.
- Ateme decided around 2006 to develop a "best of class" encoder.
- Esker completed specific major developments for document understanding.
- Intrasense developed new medical imaging technology for specific medical issues
- Kreactive developed a new platform for designing, manufacturing and managing widgets for all types of terminals with new automated features and innovative services.
- Over the last ten years, Vitec has presented several projects, each for a new specific development and all successful.

Recently, this tool has benefitted from the support of the European Union,[36] as mentioned on Bpifrance's website. This support by the European Union and the European Investment Bank is dedicated to risk sharing. It offers banks "a guarantee on part of their new loans and leases to

[36] http://europa.eu/rapid/press-release_IP-11-1505_en.htm. See the press release "European Commission, EIB and EIF launch new scheme to help SME get loans for research and innovation" (5/12/2011).

innovative SMEs, allowing the banks to lend more and to do so at more attractive rates". It is interesting to note that this support (guarantee) was totally unknown to the interviewed companies.

The companies mentioned during the interviews that the tool's attractiveness diminishes under two possible circumstances: a very low lending rate offered by the banks[37] and a comfortable level of cash owned by the company.

Research Tax Credit

The Research Tax Credit (RTC)[38] allows companies, whatever their nationalities, to reclaim a percentage of R&D expenses made in France. The rules for these claims have evolved over time, but still offer very significant support for many companies.[39] RTC is used to attract foreign investors.[40]

The French Ministry of Finance funds the Research Tax Credit. There are specific and detailed rules on what is considered to be R&D.

Research Tax Credit is based on a tax credit of 30% on R&D expenditure up to €100 million, and of 5% above this threshold. According to AFII (Agence Française pour les Investissements Internationaux - Invest in France Agency), it is the "most used funding mechanism in Europe". It benefits more than 2,000 foreign companies operating in France. 64% of French companies said they also benefit from it, according to AFII.

The scope of SME spending eligible for the research tax credit has been extended as of 2013 to cover innovation expenses arising from designing prototypes, as well as pilot plants for new products. These expenses are now included in the research tax credit base, at a rate of 20% (up to €400,000 a year).

France's research tax credit is also an incentive for research partnerships, as all expenditure contracted out to public sector bodies is double-counted, thereby effectively doubling the research tax credit (up to €12 million).

The research tax credit can be combined with the "innovative new companies" scheme (jeunes entreprises innovantes – JEIs, see under), which provides for reduced taxes (corporate tax and local taxes) and social security contributions over an eight-year period.

Research Tax Credit (Credit Impôt Recherche – CRI) is not limited to tax credit: it may also lead to the reimbursement of R&D expenditures for those companies which do not pay taxes on their revenues.

According to a study led by Ernst & Young-France Digital, 77% of start-ups used the RTC in 2013. All 10 companies in our sample also did so.

Quoting some statements of the interviewees:

- "Research Tax reduction allows us to employ more research engineers"

- "The Research Tax Credit is very efficient, but it should not be made difficult by long and complex control systems (as happened in 2013)."

[37] One may wonder why companies prefer bank lending even at a low rate to zero rate lending from Bpifrance. One possible explanation is that Bpifrance support implies some administrative work, in order to describe and explain the project, which takes time from the company's best people.

[38] http://www.invest-in-france.org/Medias/Publications/153/France-research-tax-credit-2013.pdf

[39] For more details see "Guide du CIR 2014" http://www.bpifrance.fr/Toutes-nos-solutions/Rescrit-direct-du-Credit-d-impot-recherche

[40] http://www.france.fr/en/working-and-succeeding-france/research-tax-credit.html

Prices as a support tool

Since 1999, Bpifrance[41] has been managing an annual competition named "Concours national d'aide à la création d'entreprises innovantes". It aims to support the best projects for creating an innovative company, and accepts two categories of project:

- "creation-development": winners of this competition may obtain up to 60% of their innovation programme (up to €450,000) if their company is to be launched shortly.
- "emergence": up to €45,000 can be obtained for validation, whether technical, economic or legal before planning the company creation.

This competition is rather popular: more than a thousand candidates participate each year. Among the four companies created after 2000 in our sample, two were candidates and winners. They both underline the significant impacts of their success: the funding obtained is in itself important, but it also provides credibility, makes fund raising easier, facilitates cooperation development and improves personal confidence. It is seen as especially needed at the critical time of creation.

Example:

- In 2004, Intrasense won the award "emergence". The award attracted other motivated people, facilitated very efficient support from the local incubator, and created a "visibility effect", attracting new contacts.

The public competitions have a non-financing private equivalent worth mentioning, as they were brought up in the companies' interviews. Awards and "firsts" are another way to exhibit innovation successes. Such competitions have a commercial value, appreciated by the companies and used to prove the quality of their innovation, product or service. Large organizations or conferences, and private large companies[42] distribute these awards, for example the National Association of Broadcasters Technology Innovation Award or the IBC Innovation Award.

Example:

- Ateme stresses the fact that, in 2014, it was the first company to provide 4K encoders to the first commercial 4K channel (in Korea). This company received the "Growth Excellence Leadership Award, Broadcast and DTT Video Encoder, Global, 2014 from Frost&Sullivan.

Jeune Entreprise Innovante -"JEI status

The status of JEI (Jeune Entreprise Innovante) allows companies to obtain significant tax reductions during the first 8 years of their existence.[43]

This status was created in 2004, in order to facilitate the creation of companies doing innovative work. These companies should be SMEs less than 8 years old and spend a minimum of 15% of their expenses on R&D (the same method of computation for R&D expenses is used as for the Research Tax Credit). According to French "Ministère de l'Enseignement Supérieur et de la Recherche", 3,000 companies were recognized as JEI in 2013, with a total tax deduction of €108 million. These deductions are applied to social taxes, such as on salaries.

All new companies are interested in applying for JEI label. All the interviewed companies founded after 2000 requested and obtained it. All of them commented that the impact, in terms of financial support, is significant.

Financial public support from the European Commission

JEREMIE[44] - Joint European Resources for Micro to Medium Enterprises, is an example of public support from the European Commission, developed in cooperation with the European Investment

[41] http://www.bpifrance.fr/

[42] Companies like Oracle or SAP provides mainly awards for innovation complementing their own products

[43] http://www.enseignementsup-recherche.gouv.fr/cid5738/le-statut-de-la-jeune-entreprise-innovante-jei.html

Fund. EU countries can use part of their European structural fund allocations to improve access to finance for SMEs, going through instruments such as venture capital, loan or guarantee funds.

Usually, this mechanism is not well understood or known by companies (funds are provided through local authorities).

Example
Awox : Jeremie funding made up part of the funds Awox raised in 2011, through Jeremie-LR, a local VC, funded equally by European Structural Funds and the Region Languedoc Roussillon.

It is quite difficult to assess the impact of Jeremie, as it comes together with other support schemes, but the professional experience of the author tends to confirm that it constitutes an important support for innovative start-ups.

2.3.3 Access to finances: concluding remarks

The author's experience, based on a much larger sample of companies, shows that a significant cause for companies to close down is not technical failure, but the difficulty of raising enough funding for continuous growth. Disappearance does not mean necessarily market or technical failure, but a lack of capacity to raise funds at the right moment. Raising funds is especially difficult for companies which have limited, but real growth with relatively good future expectations for continuous slow growth.

Compared to the vast range of solutions that have been developed for accessing technological knowledge, those for accessing financial resources look scarce and dispersed.

The majority of the interviewed companies relied mostly on their own revenues and R&D public support to fund their commercial and technical development. We must keep in mind that we have selected successful companies. Many others disappeared, some of which were bought by larger companies, which makes it difficult to estimate their success or failure.

Public funding seems efficient for the support of start-ups and new companies, and largely focused on R&D. The two most-used tools by all companies are Research Tax and the Zero rate lending for innovation. These are simple tools, available at local level, well known by the managers of SMEs, and quite efficiently managed. A general statement could be that the companies see public funding of R&D as satisfactory. The high level of R&D public support in France probably contributes to a specific result: a significant number of start-up and of older companies, even if they decide to base themselves in the US or to address primarily the US market, keep (and develop) their R&D in France.[45] R&D public support is open to all companies which carry out their R&D in France, with a limited amount for large companies (none among the interviewed companies were concerned by this limitation).

Private funding is more complex and quite differentiated depending on the stage of development. There is a first (low) level of private funding at the initial stages of the company. Companies may try IPOs after about 10 years, during which time both profitability and growth should be built up. IPOs have been used successfully, but may take place only after a significant level of company development, and often to support a major strategic move, such as an international effort. In the meantime, the companies interviewed say that Venture Capital is difficult to obtain. Several stressed that US investors are more likely to take risks than investors based in France and that there was a lack of private investment to support their international (and/or risky) development.

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[44] See: http://ec.europa.eu/regional_policy/thefunds/doc/instruments/jeremie/20111019_jeremie_state_of_%20play.pdf

[45] This is not the case for any of the 10 companies in this study, but a significant number of other French companies selected this option. It is the case for US company like Envivio or Besport, whose founders are French. Other examples include Criteo, which entered Nasdaq in 2013, Scality (software for servers) or Talend. A journalistic presentation is to be found in the newspaper "Le Monde" of 23 July 2014

Aquafadas, for example, was a growing company, which needed funding to accelerate its growth, and failed to raise the funds it needed. The company was bought by a large group, but was allowed to continue its independent growth (which explains why the company was kept in the sample).

Of course, in the sample, there is no counterfactual proof that any of these companies would have grown dramatically if they had accessed much larger amounts of money, but we could expect that their growth would have been faster, both through acquisitions and internal development.

2.4 Access to market knowledge

The market is a major uncertainty for innovative companies developing new products and services. They are in a very different position from companies which sell existing products at known prices on existing markets and have known competitors.

Hence, access to market knowledge plays a major role, and a key success factor is timing the introduction of new products right. If mastering the technology is a key preliminary condition, understanding the current ratio price/usage, relating current potential needs with innovative technologies and evaluating current user acceptance is mentioned by all CEOs as critical.

Most interviewees insist on the fact that customers or users are the most useful providers of knowledge, since they are able to define how and when a new technology may be sold to them. A key lesson seems to be that being the first with a technology does not necessarily mean a commercial success: it must be combined with appropriate knowledge of timing, such as when the user will accept/buy it, at what price, in what context and so on.

As a consequence, the customer needs to become the main party with whom these companies really must exchange information and knowledge. Technological knowledge is a necessity, but market understanding is the key to success.

The uncertainty becomes even greater since the market is naturally international.

All this was frequently echoed in the interviews: innovation, in order to be successful, needs to combine understanding of the customer, mastering the enabling technology, and managing the timing to match both. Understanding the customer allows the company to provide an "acceptable (technological) answer to existing and anticipated needs".

Some quotes from interviews

"My key guides are the customers and their needs".
"We are driven by marketing, then we develop internally".
"Ideas come from us, the market helps to define them".
"All research projects are internally defined and selected based on market analysis."

2.4.1 Early product failure

For start up companies, with managers who are mainly technically oriented, market learning is often acquired the hard way, by initial commercial failure of products, putting the company through hard times.

Examples:

- Aquafadas tried first to develop and sell software for generating automatic video storytelling. It was a commercial failure, and meant a difficult year for the company, but the second product (a super slideshow using video) was a success and allowed the company to regain its equilibrium.
- Ateme developed significantly and successfully by selling services. Its first attempt to sell a product, however, was a failure. It seems that the launch was made without enough market

research. The service activity allowed the company to survive and not to suffer excessively from this failure.

- Awox started developing a terminal named Media CTRL, a remote control which could manage the interaction between TV and PC. This was either sold directly by the company or used by larger companies and potentially incorporated in digital TV set. This kind of product was not successful. The company adopted a strategy of long-term partnership with large companies (Texas Instruments, Philips, Legrand and others).

The other interviewed companies did not suffer initially from this type of problem for different reasons, one of them being the fact that they already provided services, which gave them a relatively good knowledge of the users.

Examples:

- Astellia as a spin off from France telecom was well aware of user needs from other telecom operators, who were its customers
- Some companies were successful with their first product: e.g. Esker, Intrasense or Vitec.
- Itesoft decided to move from providing services to providing a product, basing its decision on a detailed market study (the company was called Informatique et Technologies Avancées (ITA). It changed its name to Itesoft to advertise the change.

2.4.2 Collaborating with the customer

A rich diversity of customer relations to avoid linear R&D

All interviewed companies have developed a variety of configurations to allow customers to express themselves from the very early stages, and importantly to build trust:

- Permanent direct contacts,
- Taking advantage of standardization consortium,
- Collaborative research including customers,
- Development methods allowing customer implication,
- Acknowledgement of customers' expertise and inputs.

This variety illustrates the huge efforts innovative companies must make to ensure the validity of their innovation on the market. None of them, beyond the first failed trials, follows an illusory linear path to R&D and innovation.

Of course, these methods are not mutually exclusive. Each company combines them, based on their strategy. Here are some examples:

Taking advantage of standardization consortium

Being a player in an international consortium, allows that company to contribute to the consortium's activity, which includes defining interfaces, developing validation tests and interoperability tests. On the one hand, this allows the participating company to be recognized as a significant player, to possibly enter into specific cooperation tasks, and on the other hand to understand precisely the needs and constraints of the “engaged/educated customer”. International standardization consortia do not limit themselves to technology by any means. They also define and continually develop “commercial requirements” for future technologies, and identify “use cases”.

Examples:

- Awox activity in the international consortium DLNA has been already described in the technical knowledge section. Participation in a consortium of this kind implies close contacts with technically-involved potential consumers. Other members of the consortium were Philips and Samsung, among many others involved in the “Digital Living Network”. DLNA

organized, as did several other consortia, “plugtests” or “plugfests”, which put together developers worldwide for interoperability and debug tests.

- Aquafadas considers its participation in international standardization groups, such as Idealliance[46] as very important for development.
- Ateme is a member of DVB.[47] (Digital Video Broadcasting), which is well-known for its technical specifications for digital video. It has also developed a commercial module, where the commercial issues around a DVB work item are discussed. The consensus arising out of this discussion is put together in a set of "Commercial Requirements" governing each and every DVB specification.

Collaborative research including customers

VITEC specializes in the development and industrialization of advanced digital video solutions in the MPEG field for OEMs and integrators. The company aims to respond fully to customer-specific needs in all sectors that use video: health, administration, broadcast, Telco, education, transportation, entertainment and military. Its sales are mainly to OEMs and integrators in the various domains addressed. This is coupled with a very high level of R&D, in order to provide advanced solutions for a wide range of applications. A very efficient approach to providing technologies to domains not familiar with it is to develop collaborative research projects (Eureka, PCRD, national) with potential customers in this specific domain.

Permanent direct contacts

Permanent direct contacts are an often-used method to keep in touch with main customers’ needs. It impacts market choices, and also R&D priorities.

Examples:

- Vitec’s main customers are specialized integrators and OEMs. Research and market choices are based on direct contacts with them and the anticipation of their future demands, associated to a very good technical knowledge. Contacts may be made at conferences and exhibitions, but also in a more systematic way.

  Note that this does not mean that advanced research should not be done. Vitec developed stereoscopic 3D technology, which was the buzz four years ago but finally turned out to be a failure in the broadcast domain. However, it was a success in the medical domain.
- Intrasense develops tools under the brand Myrian® for integrating and analyzing medical imaging data from different imaging devices in a unified work environment. The company deals primarily with issues related to cancers.

  The company created networks with leading research laboratories and industrial partners, and also a network of distribution partners selected on the basis of their capacity to roll out Myrian® solutions in different conditions of use and according to the strictest quality criteria. Partners are continually trained and are supported on a daily basis by Intrasense teams.

[46] www.idealliance.org Idealliance, a not-for-profit association, is aimed at identifying best practices for efficient end-to-end digital media workflows — from content creation through distribution. It runs committees, educational conferences, online training, and certification programmes, trying to provide its members the forum for the exchange of information that results in the creation of the media production industry’s most valued standards.

[47] www.dvb.org DVB consortium (Digital Video Broadcasting) includes 4 main modules. The technical one is only one among the four modules. The three others are commercial, IPR module and communication modules. The commercial module and the technical module are together the driving force. The commercial module provides commercial requirements, and validates each technical specification against these commercial requirements.

Development methods allowing customer implication

An example of systematized customer implication is the use of new innovative design methods. Innovative methods in design began to appear 20 years ago, for example Design thinking takes the the user's experience as a guide. The methodology relies on cycles where users are involved from the start and developers only discuss the feasibility of the features. Applying this methodology was strongly facilitated by new technological developments in programming, especially the Agile programming methodology and its various versions, which facilitates adaptive development, early delivery and continuous improvement, and continuous customer involvement.

Example of design thinking cycle:
A short (and repeated as much as needed) cycle:

Learn	what is the goal?
Define	what are the hard points?
Innovate	brainstorming
Build	not a prototype, but a light illustrating software
Validate by users	

In this process developers are only involved to discuss the feasibility.

Examples:

- Esker Software is a company whose main activity is to help organizations improve the processing and exchange of business information via cloud-based document process automation solutions. The company can replace any business process that runs on documents with one integrated collaborative platform, provided as "software as a service" (SaaS). The company has maintained continuous growth through a very efficient selection of new products, and adoption of new methodologies. Up until 2010, the process decision was based both on internal research and customer implication. In 2010, the company introduced a new "Agile based" development methodology[48] using the above mentioned method.

Introducing innovative business models

Some companies adapted their methods to address a target market, without needing to do R&D. These methods affect the business model and the marketing-distribution methods. They can be seen as important building blocks of the innovation model, in particular because of their strong business drive.

Example:
A major change in software distribution started with the selling of "software as a service" (SaaS), where software is provided "on demand" by servers managed by the software provider. Esker adopted this practice early on. It originated in the 90's with ASP (Application Service Providers): the providers hosted the software and distributed them on line. Currently SaaS providers develop and manage their own software, and distribute them through Internet and the use of a web browser. The move to SaaS instead of software licensing has had a significant impact on Esker's business model and results, but has allowed it to provide a service that companies appreciate. Their software costs are based on actual usage, and they do not have to buy a license, thus their capital expenditures are reduced, and they have more precise control over operational expenses. The development of sales of software products using SaaS as a business model has been an innovative and successful move.

Furthermore, usage of the cloud modifies the relationship to the final customer, and modifies the business model. None of the interviewed companies mentioned it as critical, but Esker, Aquafadas and Ateme develop offers using the cloud.

[48] Agile software development includes a family of software development tools, aimed at developing high quality embedded software in markedly shorter times and at much lower costs than possible with traditional techniques. It is now widely used by both small and large companies.

2.4.3 Expanding market reach: Going global

Among the ten interviewed companies, nine sell to the international market. These companies have gone global and are growing. Kreactive is the only exception, with its growth mainly located in France.

The explanation might rely in the nature of their activity: producing encoders, test equipment for mobile networks or systems for networked homes or connected TVs for a national market does not make sense. Staying on a national market is a strong limitation to growth and carries the risk of the arrival of a foreign competitor. The technological features of these companies in some ways forces them to go global: this would not be the case if they were providing services or products with specific characteristics for national or local demand.

Examples:
This international reach is visible in the financial results and in the structure of the companies:

- Aquafadas earns 50% of its revenues outside France, and is trying to fight back to a previous share above 85%.
- Ateme makes less than 10% of its revenues in France, and is very active in industry international forums.
- Astellia makes less than 23% of its revenues in France, and owns offices all around the world.
- Awox was from the beginning an international company with its participation in the DLNA standard development.
- Esker earns 35% of its revenues in France and has subsidiaries in Europe, Asia and America.
- Intrasense created offices in Berlin, Istanbul, Kuala Lumpur, Moscow, São Paulo, Shanghai, Tokyo and the USA in 9 years. Asia and Russia represent 60% of its revenues.
- Itesoft concentrated its internationalization on Germany and UK.
- Vitec has subsidiaries in USA, Germany, Israel, United Kingdom and Russia.
- Wiztivi's customers are large Asian and European companies, but it did not open foreign subsidiaries and it remains in some ways a "national" company.

The globalization process did not start at the launch of each company for practical reasons, such as lack of funding for opening foreign subsidiaries, and the need to gain credibility beforehand. However, this process was intended from the start.

The strategy used to develop internationally differed:

- Buying UK and German companies mainly to obtain market shares.
- Buying foreign companies with a world market to obtain their knowledge in an adjacent domain.
- Creating offices through maximum cooperation with local players, therefore accessing the knowledge about local customers.
- Creating relationships through a high level of contribution to international standard consortia.

For most companies considered, not going global was simply not considered as an option. And going global raised the complexity of the customer relation exponentially.

Examples:

- Awox started almost immediately to contribute strongly to the international consortium DLNA (see above). It provides the company with contacts in the R&D centres of large international companies, which were their first customers.
- Ateme began from scratch to address the world market, which consists of a limited number of very large broadcasters with high level requests for technical quality. These customers

are very demanding, and are actively testing and comparing the new equipment. The way to success was based on quality, mainly rooted in in-house R&D.

- Astellia was a spin-off of France Telecom, which targeted the global Telco market. The technology already existed, and the money collected from VCs was mainly used for marketing. Astellia was created in 2000 and over the next 8 years it opened offices in New York, Singapore, Beirut, Rio, and Johannesburg.
- Esker Software, created in 1985, launched a software tool in 1990, which met with huge success. The subsidiary created in the US in 1991 was rapidly followed by subsidiaries in Germany, the UK, Italy and Spain, in 1997 in Australia and in 2005 in Singapore (JV with Lippo Group, an Indonesian conglomerate). In 1998-2000, the company bought several US companies, mainly to facilitate distribution and increase market size, but also to obtain new technologies (fax server).
- Vitec, created in 1988, started to sell products with good results, especially at export. The first significant success, an MPEG1 encoder, happened in 1992 and export began in 1993. Sales began through distributors, but went rapidly to value-added resellers or integrators. The company created subsidiaries in USA, Germany, Israel, China and the United Kingdom, but continued to rely on its network of international partners. The company bought the Israeli company Optibase (and some other companies), mainly to obtain a complementary technology.
- Intrasense created a distribution network covering around 20 countries, including BRICs, and has collaborators in Amsterdam, Berlin, Kuala-Lumpur, Moscow and Tokyo. Part of its success is due to close cooperation with local players, and its ability to adapt the technology to the specific working conditions of geographic regions (organization of tasks, clinical workflow, display format).

2.4.4 Some conclusions

Market knowledge, which might be seen as a "soft factor" (as compared to technology or finances), is vital. In the trajectory from invention to commercialization, a major challenge is to match adequately, in a timely and convincing way, the proposed technological solution with the expressed need of a customer and at a competitive price. This calls for acute market knowledge.

Collaborating with the customer is done through a diversity of channels and methods to allow a better understanding of the customers' needs and of their level of acceptance of new technologies.

When companies become more experience and establish relationships with at least some customers, more sophisticated methods may be used such as having customers in the design process, either internally or through a cooperative R&D effort. Participation in standardization bodies is another way to understand the needs of the customers.

Going global is in the DNA of most of these companies. Consequently, they extend their market knowledge fairly rapidly and are forced into capturing very quickly the necessary information to adapt and react relevantly to those new markets. At the international level, strategies vary depending on the structure of the market and the strategy of the company.

3. Beyond the model of innovation

As stated in the early pages of this report, the concept of "models of innovation" refers to the way the innovators (individuals or companies) manage inventions from conception to commercialization. Innovators make decisions on how to create the conditions for value making, within an overall context – the Innovation System – about which they may have patchy knowledge.

Looking at models of innovation is a micro-level approach. Nonetheless, observing companies also allows us to gather significant information about their perception of the context in a broader perspective, at meso level.

This chapter describes several of these observations briefly as they help position the model of innovation of these companies in the broader context within which they evolve. As with any qualitative exploratory study, these issues are food for further debate.

3.1 The case of Specialized Technology Suppliers (STS)

The study observed 10 companies, selected on a pragmatic basis as illustrations of innovative ICT SMEs in France. These companies have survived and grown in a competitive environment, and have consolidated into well-established global providers of innovative technological products and/or services.

To get to this position, they have cultivated technological excellence in their domain through a multiplicity of strategies. They have demonstrated they could grow by maintaining a balance between their own revenues and some limited access to external financial resources. Finally, they have built up their market knowledge over time and shown interest in establishing collaborative and trusted relationships with their customers.

The point we raise here is that this report is probably about one specific type of innovative ICT firm. These 10 SMEs have aspects in common worth unveiling, and we must also say that there are additional and *different* populations of innovative firms. The important conclusion is that innovative companies are diverse and need to be understood as such.

A first observation is that the ten companies all have a high level of R&D. They are therefore able to benefit from large tax credit. This level of R&D was not a criterion for the initial selection of the ten companies. Had it been a criterion, it would have left out of this study the innovative ICT firms with no R&D.[49]

A second observation is that these companies offer mainly or exclusively B2B services and products. Those that became B2C did so at a very late stage of their development. Only two companies among the ten interviewed companies move from a full B2B situation to a B2C model, or at least a mix of them:

- Awox has started to develop and commercialize consumer products. This (recent) move has proved so far to be successful in terms of growth and results. It may be considered as an example of an evolution towards a consumer electronics company.
- Kreactive provides services on Internet both to consumers (students) and editors (managing the existing content and monetizing it).

Third, the sample includes no companies which belong to or serve exclusively major industrial sectors, such as the automotive or aerospace. These sectors are highly structured industries with

[49] One could imagine companies developing innovative services, especially on Internet, using state of the art technology. A potential source of examples may be small companies developing on line services for mobile use.

well-defined types of players, from OEMs to suppliers of various levels. Here again, innovation may proceed from a very different model. For example, based on the empirical experience of the author, one would expect the existence of clusters to provide significant access to potential customers. Ad hoc standardization is an essential resource. The existence of a very structured system of relationships facilitates participation in collaborative research projects, and especially finding industrial partners, etc.

The above observations lead us to conclude that the ten companies may belong to a specific type of innovative company and that their model of innovation matches their specific profile and needs. Our assumption is that they are Specialized Technology Suppliers (STS).

Specialized Technology Suppliers (STS) may be defined as independent specialized hi-tech R&D-intensive companies that deliver their technology tailored to the demands of a variety of customer sectors across the economy. STS act mainly or only as B2B players. They deliver technology under different forms from IPs to products to development services.

While the overall STS concept covers many technologies and industries (material, chemical, mechanical), the discussion here is limited to companies developing *ICT* tools for any activity: administrative, industrial, or aimed at agriculture, health or food processing. In this context, these STS appear to be essential players for introducing new ICT into the economy across all sectors. They are engines of ICT as a General Purpose Technology.

If we consider the 10 companies, they started by using some of the most advanced features of specialized software and hardware and applied it to existing industries, or contributed to the emergence of new industries:

- Astellia developed innovative hardware and software tools to monitor mobile networks.
- Aquafadas developed set of software tools to manage digital edition.
- Ateme and Vitec developed software and hardware for video compression, using new algorithms made possible by new powerful hardware and software.
- Esker and Itesoft developed software and hardware for document processing, using technologies such as artificial intelligence and natural language analysis.
- Intrasense developed software for medical analysis of multiple and complex digital images of the body.
- Kreactive developed software and tools to manage widgets, then to translate schoolbooks or references into interactive online services.
- Awox developed software and hardware to create domestic audiovisual networks.
- WizTivi developed software which made the development of interactive, online TV possible.

3.2 Behaving within a broader ecosystem

3.2.1 Coexisting with multinationals (MNE)?

Multinationals as competitors

The 10 observed companies belong to 8 different technical domains, each of them populated by different MNEs.[50] The following lines offer a brief overview of these contexts and try to explain how the ten companies succeed in positioning themselves vis-à-vis MNEs.

[50] Definitions of MNE (multinational enterprise group, economy specific enterprise group, multinational group, etc.) provided by OECD (http://www.oecd.org/corporate/mne/48004323.pdf) or Eurostat do not allow us to clearly distinguish what makes a company 'multinational'. Most of our 10 SMEs have production and/or markets in several countries within and outside the EU. The criteria of size (large enterprises) are also left unclear. In this report, we therefore use our "common sense" and take large Telcos (FT, BT, Telefonica), or companies such as Apple, Samsung as MNEs. Our SMEs are hence not MNEs.

Digital publishing: Aquafadas

For digital publishing tools, only one MNE – Adobe - is well known, and it has a much wider scope than Aquafadas, which is more focused on books, newspaper, magazines, and comics.

Aquafadas was successful, but needed funding to continue growing. Its failure to raise money led to the decision to sell the company. The company was bought by an MNE (Kobo, owned by the Japanese giant, Rakusen). Kobo was only interested in the integration of the technology into its specific products, e-books and tablets, and allowed Aquafadas to continue to develop and sell their products to other companies in other application domains, including, more recently, corporate communication.

Digital compression: Vitec, Ateme

Digital compression equipment is traditionally developed and produced by small and specialized companies, whose operations are usually limited to the audiovisual equipment market. There are some possible explanations:

- The size of the market is limited, as compared to other industries (for example. the audiovisual equipment market is significantly smaller than telecom equipment market).
- In these markets, there is a need to manage high levels of technology and cope with very fast evolving technologies, which facilitates the emergence of start-ups.
- Suppliers must have very close relationships with customers, which are national and follow national demands and rules. The TV market is a national market.
- It is relatively easy for a customer to move from one supplier to another, since interface standards are well established.

This is not to say that MNEs will not try to enter the market. Indeed, Cisco, Ericsson, and Microsoft have entered the market, but are not dominant.

Digital imaging for medical applications: Intrasense

In this domain, there are a few very large players such as Philips and General Electric. The success of Intrasense cannot be explained by the absence of MNEs, as it has had to deal with competition from MNEs.

An important factor for its success was the combination of existing techniques (digital imaging) and the practical expertise of high level and highly motivated physicians. Another factor is the capacity of the company to listen,[51] and also its scientific quality (more than 100 publications). It was observed that physicians, highly involved in supporting their patients, were ready to spend time and money if they felt there was a significant chance of progress. Furthermore, the company entered various countries very quickly, using close cooperation with local partners. Capacity to network efficiently was a major factor in the company's success.

Monitoring mobile networks: Astellia

The domain of mobile network monitoring has seen significant growth in parallel with the growth of mobile market. There has also been a growing demand for quality measurement. The growing importance of SLA (Service Level Agreement) initiated by fixed line telcos in the 80's pushed the development of quality measurement tools. Large operators first developed their own measurement tools, but then relied more and more on external providers for this activity, which was not at the heart of their business.

The key players are MNEs such as Tektronix Communications (Danaher Group USA), JDS Uniphase (USA) and Anritsu (Japan), which are large manufacturers of test equipment and other types of equipment. Astellia is, on the contrary, dedicated to only one type of testing equipment.

[51] This contrasted with the behaviour of large companies and was the result of an explicit choice.

MNEs manufacturing telecom equipment already have products for monitoring, and, of course, close relationships with their customers, the telecom operators. However, telecom operators prefer to rely on independent and dedicated providers to check the quality of equipment/network, which do not use equipment provided by the MNEs being monitored. This leaves the market open to smaller companies, such as Astellia. Another reason is that Astellia is a spin-off of France Telecom, which was developing internally a high quality product, allowing the company to gain a significant market worldwide. The growing competition, associated with fast evolving technology, means that the company must keep up a strong level of R&D.

Digital management of documents: Esker and Itesoft

These two companies were created in the 80's. Their current business is processing electronic documents.

The market for document understanding is highly fragmented and not well defined. Itesoft claims to be the European leader with 5% of the total market. A significant level of R&D is needed to understand text, and new artificial intelligence technologies produce continual evolution in this field. There are no MNEs in this sector.

In this case, the reasons for fragmentation may include, apart from the technological constraints mentioned above which imply a high level of R&D expenses, the existence of national standards, habits and rules, and also the limited size of the market, which de-incentivizes the entry of MNEs.

On line learning: Kreactive

Customers in the e-learning market currently are mainly large companies (usually more than 5,000 employees). E-learning material has very specialized content, and relies on complex systems, such as LMS (Learning Management System). MOOC (Massive Open Online Course) which have appeared since 2012. However, business models for this market are still very uncertain.

Kreactive has considerable expertise in collecting, monetizing and diffusing content to all types of terminal. It owns a significant number of web sites aimed at children and students. The company decided to address the "Lifelong Learning" market, which is not very well understood or defined. There are no MNEs in this market.

Domestic networks: Awox

The domestic audiovisual network sector has been "a future success" for years. Awox was founded in 2003 by people who were convinced that "it was the moment", and believed in the need for standards to succeed in the market. Awox's creation (2003) was almost simultaneous with the launch of the DLNA consortium[52] (Digital Living Network Alliance), an international consortium founded in June 2004. Awox was from the start a key player in the DLNA consortium and the HbbTV consortium.[53]

Awox's revenues initially came from contracts R&D labs of MNEs such as Samsung and Philips, and from developing products sold by other companies under their own brand. This led to a permanent, but relatively slow growth. In 2013, Awox created a brand and began to sell its own product, presented as "smart home objects". This move has been very successful so far, but it implies that Awox must stay permanently ahead of competitors, especially MNEs, in terms of technology and design.

[52] http://www.dlna.org/

[53] https://www.hbbtv.org/ Hybrid Broadcast Broadband TV or "HbbTV", is a major new pan-European initiative aimed at harmonizing the broadcast and broadband delivery of entertainment to the end consumer through connected TVs and set-top boxes.

Connected TV and other audiovisual devices: WizTiVi

There have been a large number of successive failures in this sector. Several MNEs and other companies tried to develop connected TVs and failed (Microsoft, OpenTV, Thomson, Intel and many more).

However, the context has been modified by numerous evolutions, including increased high bandwidth access, the appearance of "connected" TV sets and other devices. However, there are still some major issues, one of which is putting together three very different types of players: consumer electronics equipment manufacturers such as Samsung, Internet Service Providers such as Orange or Numericable, and content providers (broadcasters) in order to address both technical and market problems. A connected TV manufactured by any CE manufacturer cannot operate without a network able to support the interactive features and a channel providing content for it. The non-existence of accepted standards contributes to the difficulty.

WizTiVi is able to offer a high level of technological knowledge in all the domains involved, a precise knowledge of the players involved and the ability to address them, without being a MNE and a potentially dangerous competitor.

Multinationals as customers

In fact, most of the companies observed were suppliers to MNEs.

A variety of situations was observed.

Astellia provides tools for surveying mobile networks to its customers, which are mainly MNEs that are active in only one sector - telecommunication services. These MNEs abandoned the huge internal R&D effort they were making a long time ago (before the worldwide move towards privatization) and are therefore neither willing to compete with dedicated hardware providers such as Astellia, nor to control them.

The customers of a company like Esker, which provides tools for managing all types of input and output documents, are potentially MNEs from all economic sectors. Again, customer MNEs have little interest in competing with their suppliers, since they would have to significantly increase their development efforts, with no clear market gain.

Supplier companies are mainly concerned about the sale of IP and licences to MNEs, because they have serious difficulties in obtaining a significant share of the value created by the final product. At least two companies, Awox and Ateme have dealt with this problem by moving to product development. Awox's products are aimed at the consumer market, and Ateme's products at the industrial market. Both have been very successful. A condition of success for developing new products is to preserve a time advantage over the MNEs.

In both cases, this decision was partly motivated by the predatory behaviour of MNEs. They often buy innovative technologies, but provide little in return, and at the same time develop these technologies internally at full speed, in order to control them.

Some observations

The above-mentioned cases lead us to hypothesise about the way ICT Specialized Technology Suppliers (STS) shape their model of innovation and behave within a broader industrial ecosystem where MNEs could threaten their survival. The baseline is that none of the 10 firms is directly competing with an MNE. This may be considered as a basic fact: a small company will not develop a product (launch an innovation) in direct competition with an MNE.[54]

[54] A problem arises when the MNE comes later into the market. In that case, the small company may move to another product, or accelerate the speed of innovation. This rule may have some exceptions when new

- MNEs do not occupy (by any means) all the market space.[55] STS select their markets carefully and develop the best possible knowledge about the markets they can address – and how – to avoid frontal collision with MNEs.
- Among the 10 companies selected, the few which have a direct relationship with an MNE were IP suppliers, and this situation was felt to be uncomfortable. A move from selling IP to selling products was an efficient strategy for at least two of them.
- Most markets addressed by these 10 companies are relatively small or emergent.
- Some of the addressed markets are fragmented markets with no or few large competitors.
- The game is different when technical or usage evolution leads to the creation of a new ecosystem, combining new large players, which are unable to master all the technologies needed. In the audiovisual equipment domain, we have witnessed the entrance of telecom players, providing cheaper transmission means and IT players, providing software adapted to manage the complexity. These circumstances create a new ecosystem where innovative SMEs need to find and keep a significant place. In these cases, companies like Awox and Wiztivi try to maintain a permanent technical lead.
- For specific products, industrial customers may not want to buy from MNEs. This is the case for monitoring mobile networks, where large players are competing (Huawei, Ericsson). As they are providing the equipment and managing it, those MNEs are at a competitive disadvantage when selling services to monitor their own products when used by a mobile operator.
- The risk of being bought by an MNE is real, especially if buying the company represents a competitive advantage for the MNE over its competitors. Another potential motivation of the MNE is to take control of a market expected to grow very rapidly. The MNE can also use efficient people from the company for its own development.
- In the ten observed cases, the founders/managers have kept control of their companies, which all show healthy growth.

3.2.2 Benefiting from the innovation system?

The acknowledged concept of Innovation Systems[56] refers to "the supporting network of scientific and technical institutions, the infrastructure, and the social environment" (Freeman 1990, quoted by Carlsson, 2003). Therefore the study of innovation systems emphasizes and analyses the role of institutions.

The observations in this study have paid little attention to this aspect, even though some of the collected information, directly or indirectly, offers indications about the relation of these firms to the system of innovation that surrounds them.

It appears that the innovation system, the full set of public tools aimed at supporting innovation and R&D, is often too complex and too costly to afford – in time, costs and learning curve - for a start-up or an SME.

In the case of the observed firms, information and probably implementation of support should have come from three main sources:

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products, while competing with existing ones, bring new innovative features, which make them different. That is not the case of the 10 companies.

[55] The existence of different levels of demand may contribute to it. Inside a country several categories of buyers exist with different key criteria for selecting equipment (cost, simplicity of use, number of features). There are also large differentiation in the demand from rich countries and developing countries. We may think here of the typical classification in 3 tiers of telcos or Internet operators.

[56] For a thorough literature review, see: http://faculty.weatherhead.case.edu/carlsson/documents/InnovationSystemsSurveypaper6.pdf

- The local public authorities such as incubators or local public support to development,
- Bpifrance (national support agency),
- International support provided by the European Commission.

This was not evident in most of the cases.

The functioning and evolution of the innovation system and of public support (even more to young and/or innovative companies) is seen as unpredictable and obscure, locally, nationally and at European level.

The (non)-use of public support in various areas, assumed to be of interest in the initial steps of the study, can be interpreted as the consequences of this situation.

Demand-side policy

Demand-side innovation policies include public procurement, regulation, standards, consumer policies and user-led innovation initiatives.

According to the OECD report[57] on demand-side innovation policies, "This interest in demand-side innovation policy has emerged as part of a greater awareness of the importance of feedback linkages between supply and demand in the innovation process. Demand-side innovation policies are part of an evolution from a linear model of innovation, usually focused on R&D, to a more broad-based approach that considers the full scope of the innovation cycle. This focus on the demand side also reflects a general perception that traditional supply-side policies – despite refinements in their design over recent decades – have not been able to bring innovation performance and productivity to desired levels."

Demand-side policies fit well with the strong tendency towards user-led innovation, which has been mentioned as key by several companies.

Two examples of comments on impacts are described here.

Example

- A manager from Esker, a company working on document understanding, mentioned the issue of regulation in relation to electronic signatures. It was pointed out that some countries have made electronic signatures mandatory, thus boosting the associated market, and also giving a significant competitive advantage to companies in these countries.
- For companies such as Awox or Wiztivi, public standards may have an important effect if they have worked on their elaboration. This work gives them the opportunity to be among the first companies to propose a product following the new standard, and to acquire and commercialize a strong expertise in a highly technical field. Awox made the choice to concentrate on the DLNA consortium. In both cases, the "standard" implied an industry-driven definition, leaving little room for policy action.

It is striking that no example of public procurement was observed.

Participation to cooperative research and innovation

Cooperative international research and innovation programmes include European programmes such as ESPRIT or the successive Framework Programmes. They also include international programmes, which are nationally funded such as Eureka, and especially in the ICT domain, Eureka clusters.

All companies were aware of the existence of European programmes such as ESPRIT or the various Framework Programmes, even if the difference with Eureka programmes was not always clear. They had very different opinions about these programmes. Some explicitly expressed complete rejection. Esker Software has never participated in a European research project. Others made the

[57] DEMAND-SIDE INNOVATION POLICIES – © OECD 2011.

same choice in the past (e.g. Ateme but it may apply for funding in the future), arguing these programmes were loaded with too many overheads which made them a waste of time and resources that could be better invested in "real" work.

A few companies (Awox, Intrasense) did try to participate in European projects, but their projects were rejected. Their assessment is that they just did not understand the rules, and possibly that they selected the wrong consultant to help them. Wiztivi managers were dissuaded by difficulties in finding the "right project".

One company, Vitec, has participated significantly in European projects (it had several successfully-funded projects in parallel). In this case, the presence of an employee who was both familiar with the process and with the people involved in other companies has been decisive.

A more recent move towards future participation has been observed. Notably, representatives from Astellia, Ateme and Wiztivi expressed an interest in participating in future European projects. There are several reasons for this move:

- The technological world is getting more complex, with the appearance and development of new technologies (big data, cloud), and the acceleration of some technical and market changes (move from 3G to 4G to 5G for mobile operators, move from High Definition to Ultra High Definition 4K than 8K).
- R&D projects that involve potential customers allow companies to define and understand precisely their needs. This helps companies to be first-movers and provide the right products. This fits perfectly with companies which have developed a core technology, and wish to apply it to several vertical domains.
- R&D projects may be a protection against surprises, such as a technology developing faster than expected.
- Collaborative research may help share and reduce the pressure of speed of technology evolution, and the uncertainty of technology adoption.

These arguments may also apply to national cooperative programmes. However, these do not allow access to European players.

European financing through local authorities

The European Commission is also providing specific financial support through national or regional support. The companies have only to discuss their financing needs with their local authorities, which make access to support much simpler.

Two examples were identified during the interviews.

The zero rate lending for R&D development benefits from the support of the European Union,[58] as mentioned on the web site of Bpifrance.[59] The support is based on an SME risk-sharing instrument, and offers banks "a guarantee on part of their new loans and leases to innovative SMEs, allowing the banks to lend more and to do so at more attractive rates". The interviewed companies, intensive users of the scheme, did not know that it was supported by the European Union and the European Investment Bank.

The second example deals with European Structural Funds.

Example: the European Structural Funds (FEDER Fonds Européen de Développement Régional) contributed to Awox fund raising in 2011, through Jeremie-LR, a local VC, funded equally by European Structural Funds and the Region Languedoc Roussillon.

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[58] http://europa.eu/rapid/press-release_IP-11-1505_en.htm

[59] http://www.bpifrance.fr/Toutes-nos-solutions/Pret-Innovation. See also: See the press release "European Commission, EIB and EIF launch new scheme to help SME get loans for research and innovation" (5/12/2011).

JEREMIE[60] - the Joint European Resources for Micro to Medium Enterprises, is an example of a public support from the European Commission. JEREMIE is an initiative of the European Commission developed together with the European Investment Fund. EU countries can use part of their European structural fund allocations to improve access to finance for SMEs, through instruments such as venture capital, loan or guarantee funds. This mechanism is usually not well understood or known by companies (funds are provided through local authorities), but a few of them mentioned they had benefitted from it though they could not assess the size or impact of that support.

Relationship with universities and research centres

As mentioned earlier, universities are not seen by our 10 companies as either important sources of knowledge or collaboration, or as strong players in the innovation domain. None of the companies has a significant relationship with any university. Relationships with public French research centres are slightly better, but always mentioned as difficult. Interviewees named better and worse research institutes in terms of cooperation and royalty sharing, implying this issue belongs to a research centre's own in-house policy. This observation echoes similar observations by Nesta.[61]

The attempts to cooperate with universities are generally described as disappointing because they:

- Work to a different time scale
- Have a different purpose

Based on the companies we met, we may say that universities and public research institutions play a major role in generating engineers with a vision about new technologies but do not seem (up to now) to be active actors in fostering, encouraging and accompanying entrepreneurship and growing innovative ICT companies.

Taxation regimes

Taxation is organized at the national level, and each country is (relatively) free to select tax credits related to R&D. Interviews have led to international comparisons, but with not enough data to attempt any conclusion. In France, research tax credit is an important feature for most of the companies we met. It was considered to be a highly satisfactorily scheme by all the companies we met, even though tax credit is mostly limited to R&D expenses.

Technology transfer

In the observed cases, technology transfer is practiced mainly through acquisitions of companies or technologies. Vitec bought the Israeli company Optibase and obtained its IPTV technology. Ateme bought knowledge from Fraunhofer Institute, knowledge which was not at the heart of the company's strategy.

Some observations

Looking at the cases, it is again possible to hypothesise about the way innovative ICT firms shape their models of innovation by consciously taking advantage of the surrounding innovation system, theoretically dedicated and designed to facilitate their growth and success.

As a baseline, all of the firms do benefit in one or another way from this support, but not in any structured or comprehensive way. A small and innovative company has no resources to access and

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[60] See: http://ec.europa.eu/regional_policy/thefunds/doc/instruments/jeremie/20111019_jeremie_state_of_%20play.pdf

[61] Nesta Working Paper N° 14/01 "Increasing the vital 6 per cent: designing effective public policy to support high growth firms". This documents states : "there is a strong belief within public policy that universities play a strong role in generating HGF (High Growth Firms). Similarly universities are seen as knowledge generators of IP, which is then licensed by new start-ups." The NESTA paper states that this belief is ill founded, and that drivers for innovation are suppliers, customers and end-users.

interpret a set of supportive instruments embedded in a changing and usually bureaucratic environment. It acts, fast, where it sees opportunities, having assessed the risks.

This may be especially true of European support instruments. Among all the knowledge needed by a company, it is easier, faster, and cheaper to know and understand a national system, when it is used by other nearby companies and managed by local people. MNEs, on the other hand, have a huge advantage as regards European support instruments.

The starting assumption of this study is that, at firm level, the construction of a winning model of innovation is the key to success, and perceived as such. Innovation systems come second, as a potential, but often too costly set of information and support instruments. To access these, intermediaries are necessary. Some companies may – by chance – have members of the staff qualified to do this. More often, they will use external consultants, well or ill informed.

The system of innovation, as a concept and as an institutional realty, is not central to the thinking and management decisions of the innovator. Our conclusion here is that innovators are not as aware of the institutional context as they are of their technological knowledge, of their financial resources and of their market (customers and competitors).

The innovative process - that of bringing innovations to the market - has more to do with the model of innovation developed by an innovator than with the system of innovation within which it develops.

4. Conclusions: a triangle of uncertainties

This report offers a qualitative observation of ten ICT innovative and successful SMEs in France, to provide the basis for a better understanding of the nature of the models of innovation that allowed these companies to innovate, survive and prosper.

The concept of "models of innovation" refers to the way the innovators (individuals or companies) manage inventions from their conception to their commercialization. Innovators make decisions on how to create the conditions for value making, within an overall context – in particular an Innovation System – about which they may have patchy knowledge, if any.

Though the ten observed companies have very different trajectories, markets, products, and growth rates, they also seem to share commonalities when it comes to their models of innovation.

As shown in the report, most of the observations on the 10 case studies are related to three main categories of access that can drive progress if adequately addressed by the innovating company:

1. Access to technological knowledge
2. Access to finances
3. Access to market knowledge

These dimensions make up a triangular model of innovation for each firm: they motivate many of the decisions and behaviours of the innovators (individuals or companies).

Additionally, timing is repeatedly mentioned as a transversal dimension. It is seen as a constraint, expressed as an issue of matching (to find the right timing), not necessarily of speed (being the faster[62]).

This model seems to convincingly encompass all the statements and behaviours collected in the observations. The innovation system is only called upon in addition, when easy to understand and use, in order to facilitate a solution to any of the three main dimensions.

The extensive anecdotal evidence collected from the observation of 10 companies offers points worth noting:

On Technological knowledge:

- Technological knowledge remains a central factor for ensuring survival and success. Keeping “more than up to date” with the technology is considered fundamental. It also reflects the needs of the business itself as it matures from technology provider to integrator.
- The founder's initial technological expertise is a central factor in the creation of the company.
- All these companies have research departments and are highly R&D intensive, which makes them unusual as compared to other SMEs.
- More importantly, all the companies claim to have developed a variety of methods for acquiring technological knowledge from outside the company: from informal techno-watch to formal participation in lengthy standardization processes, up to technology and firm acquisitions. These companies therefore carry out extensive networking activity, the methods and aims of which reflect forms of open innovation.
- At the same time, the companies underline their lack of contacts – if not trust – in universities and research centres (claiming issues of different time scales and also different objectives). In addition, they seem to avoid entering any of the EU R&D programmes (for reasons of administrative burden, cost effectiveness, slowness, etc.). These claims probably illustrate the distance between the everyday management of an innovative SME and the

[62] The notion of first mover did not appear, but it might still be very relevant.

perceived accessibility of the local system of innovation and its pillars: the university, the public authorities.

- All together many of our observations of the companies indicate open innovation behaviour on their part.

On access to financing:

- The difficulty of raising enough funding for continuous growth is, in the author's experience, a major reason for failure and disappearance. Disappearance does not originate necessarily in a business model or technical failure.
- A majority of the interviewed companies rely on their own revenues to fund their commercial and technical development at least in the first years. Raising money is always a difficult task.
- Financial resources, both public and private, appear scarce, dispersed, and not well suited.
- Public funding seems efficient for the support of start-ups and new companies, and largely focused on R&D. It can be said that generally companies see public funding of R&D as satisfying. Research tax credit and zero rate lending for R&D are widely used and much appreciated.
- Raising private funds is more difficult, especially raising funds for commercial and international development. Most of the private funding observed happened during the initial stages of the company, but getting funding thereafter for more ambitious growth seems almost impossible.
- IPOs were used successfully, but they can take place only after a significant level of company development has been reached. They are often used to support a major strategic move, such as an international venture.

On access to market knowledge:

- Understanding of the market can be acquired through collaborating with the customer.
- Collaboration can take place through a diversity of channels and sometimes methods to allow a better understanding of the needs and of the level of customer acceptance of new technologies.
- With time, this collaboration can become a codified method (design process,...), allowing for faster and more efficient processes.
- Standardization bodies are another way of exploring the needs of the customers. Most of the industry consortium work routinely with commercial requirements and use cases.
- Global market knowledge is essential very early on: it is part of the global DNA of these companies. It adds a layer of additional complexity to market knowledge management. Local presence and collaboration apparently help.

Contextual aspects probably also drive the above features of the model of innovation of the observed companies. Some of the study's observations indicate that these companies behave like Specialized Technology Suppliers, defined as independent specialized hi-tech R&D-intensive companies that tailor their technology to the demands of a variety of customer sectors across the economy. STS act mainly or only as B2B players. They deliver technology in different forms from IPs to products to development services. The move to B2C is difficult but may bring significant rewards if successful.

These companies probably behave independently, as compared for example, with technology suppliers that are strongly embedded in large industrial value chains dedicated to a major industry such as the automotive or aeronautics.

The study also showed the very relative independence of our companies from large multinationals, which are more customers than competitors. This is due to the specificity of our companies' products, services and markets.

Finally, while occupying a strategic role in the digitalization of the economy as a whole, due to their cross-sector adaptability, these companies seem little integrated in the processes, constraints and benefits of the local and national innovation systems.

Though these observations should be considered with caution,[63] they have some policy implications.

The very diversity of the companies acting as innovators in the economy, illustrated here by a group of Specialized Technology Suppliers, calls for some caution regarding a one-size-fits-all perspective about ICT innovation.

Most of the 10 companies have mastered the issues of access to technological knowledge rather well. The major role that in-house R&D continues to play deserves attention: the current policy focus on innovation and entrepreneurship, probably combined with some disappointment about the growth rate of R&D expenditures in EU during the crisis period, may distract policy attention from R&D. However, it remains crucial to these companies.

In addition, the open innovation strategies deployed by the companies confirm an outreaching trend. Here global reach may be seen as a challenge to (past) policy making.

Access to financing is still an issue in Europe. This finding does not come as a surprise.

One wonders about the financial fate of these companies though their global success cannot be challenged. Their survival and growth is to be admired. However their limited size could be related to the funding constraints to which they have been confronted since their creation.

A major uncertainty for innovators is how the market will react to their innovations. Without the market there is no innovation, but only invention. If innovation is central to the business model of these companies, commercialization is central to their growth. Our cases show that commercialization is by no means straightforward: the possibilities of failure are high and companies can expect to pass through 'the valley of death' when they have to adapt to what the market will really take up. Policy makers should not see this as only an issue of public procurement. It may be an issue of financing, of timing, of coaching or of global outreach. Many of the interviewees would also say it is a question of luck and serendipity.

In any case , the commercialization aspect looks little known or integrated in policy support instruments to new and to experienced entrepreneurs confronted with demand, competitors, pricing issues and global reach of products and services that are new to the market.

[63] As this is a qualitative study, it cannot support generalisation.

5. Annex: Company descriptions

Each company description is divided into 5 parts: a brief history, its current status, financial results, a more detailed chronology and a tentative of innovation model.

Obviously, these are simple summaries of the author's much broader set of notes.

Unless otherwise indicated, figures are for the year 2013.

5.1 Aquafadas

Company description

Aquafadas was launched in 2004, and its headquarters are in the south of France. The company develops software for digital publishing, tablets and smartphones, and creative software for animations in Flash® and HTML5, video creation and more. Aquafadas is the leader in the digital comics market with AveComics, used by French and international publishers to publish comics to tablets and smartphones. Products are sold worldwide in key markets such as the U.S., Japan, Germany, and the UK.

In 2012, the company failed to get funding for further growth and was acquired by the Canadian company Kobo, which belongs to the Japanese group Rakuten. Kobo used Aquafadas' features and tools for its own software, but then the company was allowed to continue its growth and access world research done by the Rakuten group.

Current status (2013)

10 years old

Offices in Montpellier, Paris and New York.

Employees: 62

R&D: 42

€4 million revenues and €40,000 net result

Financial Results

Aquafadas								
keuros	2006	2007	2008	2009	2010	2011	2012	2013
revenues	54	235		881	1799	1799		3630
net result	5	65		-321	26	-322		40
Employés	4	5		23	30	36		62
					Source : société.com			

Chronology

Aquafadas	Key time points	(Tentative) access to external resources
2004	Two people searched for innovative software to develop. First try: software to exploit family video and generate automatic story telling	
2005		Aide à la Creation d'Entreprises Innovantes 2005 (Concours OSEO) Awards Mac Innovators
2006	Company creation	
	First product stopped, market failure	

2007	Second product : super slideshow including video: commercial success	
	Publishing digital books	Research Program Book Digital 2.0, base 1.6 million euros, OSEO Anvar
2007-2009	Development aimed at publishing comic books: a technical success and commercial failure (not enough content available)	funded by CNC (35%)
2007-2010		Failure of cooperation with universities
2011	A full digital publishing system, "one of the most innovative systems for digital publishing". Digital books, magazines, comic books and corporate communication. "Create, publish, distribute and analyze"	
2012		International Digital Publishing Forum member. Co-animator of the group «ePUB fixed Layout»
2012	Cloud authoring tool	
2012	Bought by Canadian company Kobo (owned by the Japanese group Rakuten)	Sale following a failure to raise enough funding for growth
2013		Member of Idealliance to develop an innovative new standard format for digital magazine: Open EFT
2013	Company still free to continue its key activities	Important access to world research through Rakuten

Innovation model

Technological knowledge

internal survey, R&D, standardization group

Finance

R&D funding, sale of the company: failure to raise enough money for growth

Market knowledge

Failure of the first product, success of the second, market evolution towards adjacent markets

Specific

Creation	Two engineers wanting to innovate
Death Valley	Several difficult moments

5.2 Astellia

Company description

Astellia is a leading provider of service assurance solutions that helps mobile operators monitor and manage network QoS and customer experience. Founded in 2000, Astellia has experienced tremendous revenue growth to become one of the leading providers of service assurance solutions designed to optimize mobile network QoS and customer experience.

Astellia has been operating on a global scale for more than ten years, collaborating with over 200 mobile operators and equipment vendors worldwide. Astellia supports its customers in optimizing their network performance by assuring an end-to-end monitoring of their multi-technology networks.

Astellia is a pure player in 2G, 3G and 4G mobile network optimization, with a unique expertise in Radio Access Network (RAN) where most of the quality degradations come from.

Current status (2013)

14 years old

Offices in Paris, New-York, Singapore, Beirut, Rio, Johannesburg, New Delhi, Prague, Saint Petersburg (export 77%)

Employees: 290 (plus 50 independent workers working only for Astellia)

R&D: €68 million

Revenues: €47 million, net result €2 million

Financial results

Astellia										
k€	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
revenues	7530	12290	16500	20900	25000	25500	33400	34100	42100	47200
Net result	1420	2390	2220	2500	2900	2100	2512	-615	3027	2002
Employees	59	82	97	128	162	200	234	246	264	290
						Source société.com ; company reports				

Chronology

Astellia	Key time points	(Tentative) access to external resources
1997	Public Telco France Telecom (FT) R&D developed software for mobile traffic analysis Cigale. In another move, FT funded the company Edixia to develop hardware probes	
1998	Qositel: spin off from FT R&D continued the work on Cigale (2G 2,5G)	
1998	Edixia Telecom Technologies created the first remote massive capture probe (largely funded by France Telecom)	
2000	Qositel merged with Edixia Telecom to become Astellia, employing researchers from FT	Two major support actions: the company achieved the status of JEI (Jeune Entreprise Innovante) and the Research tax credit

	Developments funded by VC related to FT, mainly for marketing and sales	
2000-2009	Innovation went on permanently, following the technical evolution of mobile: GSM, GPRS, Edge, 3G, 3G+,... funded internally	Offices in New-York, Singapore, Beirut, Rio, Johannesburg
2005?	Last technological transfer from Orange Labs took place, when Orange stopped its activities in the domain	
2000-2009	An incremental innovation: evaluate technologies, select some and apply them. An empirical transition from internal development to buying development	
2009	The above informal process reached its limits. A formal sourcing methodology was developed (subcontracted to Cap Gemini). At the same time, the company went through a major change: from developer to integrator	Listed on the NYSE Alternext and Euronext Paris
2011	The "Strategic marketing and Innovation" action was launched (4G came faster than expected)	Offices in New Delhi, Prague, Saint Petersburg
2012		The company used zero rate lending to develop a completely new architecture, as the old one had become obsolete and non-competitive. OSEO supported the new product, Nova4G
2012	The world's complexity was increasing: big data and the cloud, and collaborative innovation was a (new) answer	
		Decision made to join a European project in 2015

Innovation Model

Technological knowledge

Orange Labs (spin off), internal R&D and later buying technology.

Finance

Research tax credit, revenues from sales, then an IPO.

Market knowledge

Quick international development.

Specific

Creation spin-off from France Télécom

5.3 Ateme

Company description

Founded in 1991, Ateme competes worldwide with large multinational companies in a very specific and highly technical market: encoders for first tier broadcasters - the most demanding market for encoders. The company has been carrying out commercial and support activities around the world since 2004-2007. It faces strong international competition from players such as Ericsson-Tandberg, Envivio, Elemental, NTT and Fujitsu.

Ateme announced it had 200 customers in over 60 countries.

The company has a policy of being seen as technological leader ("being the first"): it regularly publishes white papers, participates in international standardization, and presents the "technology firsts" it has achieved on its web site. Ateme is the winner of various "awards" from technical publications.

This relatively new domain (combining video, telecommunication and IT) is characterized by very fast technical evolution. Compression standards from MPEG2 to HEVC and video formats from SD to HD, UHD and more, are very important.

Current status (2013)

22 years old

93% of sales out of France

Offices in the US, China and South Korea

Employees: 125

Revenues: €21 million

Financial results

Ateme										
k€	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Revenues	10	10,2	12,6	14,4	10	10,1	16	12,9	17,9	20,6
Net result	0,04	-0,7	-1,8	-1,3	-4,1	-3,8	0,3	-1	379	-1593
Employees	131	133	147	151	106	88	77	75	78	
				Source societe.com before 2011, then company						

The decline in the results for 2008-2009 corresponds to the cancelling of profitable services activities, and in 2011 to the sale of security activities.

Chronology

Ateme	**Key Time Points**	**(Tentative) access to external resources**
1991	Two engineers who wanted to develop innovative software and were fond of technology, after a few years of professional life, created Ateme.	
1991-2000	A growing and successful service company, failure to develop products.	
2000	New business model: no firm visibility, no control of the real use of the IP, business model bringing in not enough revenues	
2000 - 2007	Unsatisfying results: no firm visibility, no control of the real use of the IP, business model not gathering enough	

	momentum.	
2006	Decision to develop own brand and products: suffered for a couple of years…	
2007	First products	
2004 - 2011	A continuous policy to master the heart of video compression aiming at the high-level market: broadcasters	Several zero rate borrowings from OSEO: all reimbursed. CIR (research tax credit) – very helpful.
2011 - 2014	Move for specific products to an integrator behaviour.	In order to address larger markets (VOD, catch-up TV), buying products and integrating them.
2012 - 2014	Considering European projects	HEVC: Contribution to the elaboration of the standard, French R&D project 4ever.

Innovation Model

Technological knowledge

Internal R&D (best in class)

Finance

Services, zero rate lending, tax credit, IPO 2014

Market knowledge

First services, then IP and finally own brand product, first tier broadcasters mainly

Specific

Creation Two engineers fond of technology

Death Valley Difficult move from IP to product sales

5.4 Awox

Company description

Previous managers of Smartcode Technologies (PDG and R&D director), then Palm Computing Europe, created Awox in 2003, following the closure of this company.

The basic idea was to provide software for home equipment, taking advantage of the growth of high-speed broadband access, digital networks and digital content. In 2003, when the company started, it was a new idea. This meant it had to work with very different companies: e.g. telcos, ISP, consumer electronics, equipment manufacturers.

Awox aims to supply products to the market for connected objects at home. Its activities include the design, manufacture and commercialization of objects, and the development and licensing of software dedicated to object connection. The company sold more than 129 million licenses in 2014 (52 million in 2013).

In 2013, it made a significant move to selling products under its own brand.

Current status (figures 2013)

10 years old

Subsidiaries in Singapore and Palo Alto

Employees: 42

Revenues: €7 million

R&D: €2.8 million

Figures

Awox										
k€	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Revenues	226	705	290	470	1170	2640	4128	4258	4699	6959
Net result	-75	74	-930	-1650	-1560	-2330	-1370	180	276	-230
Employees	4	13	16	na	20	23	na	36	42	42
						Source 2011-2013 company (before 2011 : societe.com)				

Chronology

Awox	Key time points	(Tentative) access to external resources
2003	Creation of Awox by previous managers of Smartcode Technologies (PDG and R&D director), then Palm Computing Europe. Goal of the company: connected home equipment based on standards	A decision by people with strong knowledge of large companies and investors
2004	Fund raising	supported by the OSEO label (Innovative company) €900,000
2006	creation of a subsidiary in Singapore, support of DLNA (Digital Living Network Alliance), an international consortium founded June 2004	Second fund raising - €1 million
2004-2008	Developing building blocks for large electronic companies	Cooperation with large groups Philips, Samsung, Orange
2008	Creation of a subsidiary in the US, Awox becomes Testbed Reference Device for DLNA	Third fund raising - €4 million

2011	Work on Hbbtv (Hybrid Broadcast Broadband TV or "HbbTV") a major pan-European initiative	Fourth fund raising - €2 million
		cofounder of MCC - Media Cloud Cluster - Languedoc Roussillon
2013	Major evolution: launch of products sold on the consumer market under its own brand.	
2014		Initial Public Offering on Euronext - €25 million raised

Innovation Model

Technological knowledge

internal, participation in a standardization consortium, cooperation with MNEs

Market knowledge

Standardization consortium, first customers MNEs

Finance

4 successive fund raising efforts were made, and an IPO carried out in 2014

Specific

Major strategic choice to contribute to a standardization consortium (DLNA)

Successful move to consumer products in 2013

large number of patents

Creation by previous managers of large international company

5.5 Esker Document Process Automation

Company description

Esker was founded in 1985 as a software service house. Its main activity now is to help organizations improve the processing and exchange of business information via cloud-based document process automation solutions. The company can replace any business process that runs on documents with one that integrates a collaborative platform, provided as SaaS.

The company has succeeded in maintaining continuous growth through a very efficient selection of new products, and adoption of new methodologies.

Current status (figures 2013)

29 years old

Subsidiaries: Germany, UK, Italy, Spain, USA, Australia, Singapore, Malaysia, Canada

Employees: 307

Revenues: €41.1 million, of which €14.5 million in France (35%)

R&D: €4.1 million

Financial results

Esker										
k€	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
CA	22641	22917			26593	27481	32704	36278	40260	41116
résultat	-2205	-1636			-1112	1157	1474	2640	3001	3188
Personnel (fin de l'année)			230	245	271	245	258	271	281	307
						Source : company				

Chronology

ESKER Software	**Key time points**	**(Tentative) access to external resources**
1985	Two young engineers create a software editing company based on their knowledge of the emergence of PC and Unix	
1990	Launch the first product, terminal emulator on PC (funded by services revenues), large success	
1997		Introduction to Nouveau Marché de la Bourse de Paris (now Euronext)
1998-2000	Buy several US companies (facilitate distribution, increase market and sales) by product: fax server unit	Research tax credit: starts and continues: efficient, except when controls become heavier (as in 2013)
2000-2005	Emergence of a new idea (internal discussions, customers): a piece of equipment connected to a company which automatically manages outputs -and later input- of fax, e-mail, SMS, post mail: a continuous development process still going on: OCR, machine learning, IA techniques, etc.	
2001	First product for large companies was a success: Deliveryware	
2005	Addressing SMEs: offer Flydoc (unique at that time) as a SaaS	
2005-now	Continuous improvements for document understanding. Name changed to "Esker Document Process Automation"	2006-2008: two requests for zero rate lending for specific developments, one was successful and the loan was paid back, the other was abandoned (market change) and the loan was returned immediately.
2010	Major change in process: move to Agile methodology (Salesforce started in 2008) very well accepted by employees and successful (allowed them to answer customer requests faster)	Regret : There is no support for process innovation
2013	A new major change in process: design thinking (made popular by Apple)	

Innovation Model

Technological knowledge

the founders, internal, bought

Finance

Internal revenues, zero rate lending for R&D, then IPO

Market knowledge

Close relationship to the customers

Specific

Creation by two engineers: services and immediately products

innovation in process and design

The company is strongly against the software patent: it creates an uncertainty for innovators, and creates risks in potentially adjacent patents. It slows the development process.

5.6 Intrasense

Company description

The company was created in 2004 by Stephen Chemouny to develop tools for integrating and analyzing medical imaging data from different imaging devices in a unified work environment. It can be adapted to every modality, every organ and every pathology. It can be used on a workstation PC or on a server for interpretation of results and post processing. A unique product name - Myrian - covers a range of specialized products.

Since 2006, it has probably been one of the fastest growing companies.

The key source of innovation has been a network of physicians, who collaborated and spent an enormous amount of time on it. The capacity of the company members to listen and to innovate accordingly was a major success factor. The company also creates networks with leading research laboratories and industrial partners.

Intrasense has developed a network of distribution partners selected on the basis of their capacity to roll out Myrian® solutions in different conditions of use and according to the strictest quality criteria. Ongoing training is offered to partners, who are supported on a daily basis by Intrasense teams.

Current status (figures 2013)

9 years old

Offices: Berlin – Istanbul – Kuala Lumpur – Moscow – São Paulo – Shanghai – Tokyo - USA

Asia and Russia represents 60% of revenues

Employees: 57

Revenues: €4.1 million

R&D: 50% of the employees (more than 100 scientific publications)

Financial results

Intrasense										
k€	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
CA	91		92	597	1270	910	1022	2544	4102	4153
Résultat net	-13		-218	-438	170	-950	-1596	-1619	-553	-1838
Employés			20		23	33	41	41	49	57
					Source : company					

Chronology

Intrasense	Key time points	(Tentative) access to external resources
1995	Stephen Chemouny works in the US on digital imaging and finds the subject new and interesting	
1997-2001	He did a PhD on automatic analysis of liver radios for cancer analysis	No support from computer labs: no interest, funded by agricultural labs!
2001-2003	Fails to get a job	

2004	Decides to launch the company based on the two awards mentioned right	Obtains the award as an emerging company (money and fame), and gets very efficient support from the local incubator. The award attracted other motivated people
		Love money from two physicians
	Complementary revenues from alimentary activities	CIR (Research Tax Credit) and JEI (Jeune Entreprise Innovante) funding allowed the company to double or triple its R&D effort
2005	Obtains Class IIa medical device CE label	
2006	Sales begin of the Myrian product line	Use of VIE (Volontariat International en Entreprises) was very efficient in foreign countries
2006	strategic choices made to orient company towards **pathology** (in particular cancer) and **technology,** and its **commercial** position (intense local adaptation, international coverage)	proposal to FP6: rejected (supposed cause: poor support in making the proposal)
2006		creation of an informal network of doctors working on cancer, very successful (the competitor GE was not listening to French doctors)
2007		FDA certification
2008	Product line broken down on a per organ basis	€4.4 million raised
2006-2014	'Develop Myrian' launched, a multimodality platform for medical imaging, permanent high level of R&D investment	
2009	Partnership with Toshiba Europe	
2010	Subsidiary in Shanghai	
2011	Subsidiaries in Malaysia, Germany and Brazil	
2012	Subsidiary in Japan	Introduction to NYSE Alternext
2013	Subsidiary in the US	
2014		€4 million raised

Innovation Model

Technological knowledge

Internal research in close collaboration with a network of physicians and companies from several countries, including BRICs

Finance

Raising money twice

Market knowledge

Use of VIE[64] for international network of distribution partners

Specific

Creation by a person interested in the subject

A very efficient creation of international networks.

[64] http://www.ubifrance.fr/formule-vie/vie-en-bref.html

5.7 Itesoft

Company description

Itesoft offers software solutions for digitizing, automatically processing and managing all its customers' incoming documents: letters, forms, invoices, and payments. Its main offer, Freemind, targets large companies or organizations. It integrates fully into companies' Information Systems (ERP, CRM).

Itesoft is one of the leaders in this rather fragmented and ill-defined market in France and in Europe.

Current status (figures 2013)

25 years old

Offices: Germany, the UK

Employees: 196

Revenues: €21.6 million

R&D: 60 employees

Figures

Itesoft										
k€	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Revenues	18291	16779	16478	17398	19431	20298	20210	21727	21664	21600
Net result	-140	219	-592	-1602	943	720	571	532	646	460
Employees	142	141	149	158	160	182	182	200		196
						Source Company				

Chronology

Itesoft	Key time points	(Tentative) access to external resources
1988	ITA (Informatique et Technologies Avancées) created to develop advanced software projects	
1989	First project developed for automatic reading of documents using artificial intelligence techniques	Anvar subvention and Zero rate lending
	Since development of first project, continuous research has been carried out on the recognition of typewritten and handwritten characters	
1994	Following a market study, decision made to develop and sell a software package. ITA becomes Itesoft and a software editor: creation of a dedicated department with R&D activities	
1998-...		Partnership with research labs, several zero rate lendings from OSEO, always leading to successful results and fully paid back
2001	HRH Business Technology bought and renamed Itesoft, UK	Listed in Euronext Paris Nouveau Marché
2002	FormsConsult Software GmbH bought and renamed Itesoft Germany	

2010	A large cooperative project (5 years) launched: Document on Demand, i.e. a large set of new functionalities for document analysis, targeting TPE and small SMEs (less than 25 people)	Funded by OSEO, includes a large number of research institutes and Sagemcom
2010	Yooz launched to access the PME market by providing SaaS services	

Innovation Model

Technological knowledge

internal R&D, customers

Finance

IPO, zero rate lending for R&D

Market knowledge

Addressing large companies, buying subsidiaries (the UK, Germany)

Specific

A service company for advanced projects

Rapid move from services to products

5.8 Kreactive

Company description

The company Kreactive was created in 2004 to provide services for RSS and widgets. In 2007, the decision was made to develop a platform for designing, manufacturing and managing widgets for all types of terminal. This platform included an advertising agency and audience measurements.

In 2011, it was decided to completely change the direction of the company and move to "lifelong learning". This move was based on the existence of numerous sites for students and pupils, with significant audience but low technical level and low monetization. Buying these sites and providing them with a unique and advanced framework was a first step, then advertising and monetizing them allowed the company to automatically include new contents and carry out deep analysis of usages.

The current offer, branded Digischool, allows owners of knowledge to transform it into applications available on all terminals, making it easily monetized and managed. The work is done by a team of experts who index and annotate content in each country, with a set of computerized tools. Digischool is mainly dedicated to supporting young people during their studies.

The company aimed from the start to offer this product in 10 countries: United States, England, Germany, France, Spain, Brazil, Russia, China, India and Morocco.

The "historical" offer is still provided by the company (development of applications), but the goal is to get revenues from advertising and content distribution. Existing content may be bought or new content developed, possibly by funding teachers.

Current status (figures 2013)

6 years old

Offices: Lyon

Employees: 43

Revenues: €2 million

Figures

Kreactive										
k€	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Revenues		131	242	100	260	350	1114	2003	2013	2232
Net result		67	44	-103	-116	-73	97	-168	-313	518
Employees								32	33	43
					Source Societe.com					

Chronology

Kreactive	Key time points	(Tentative) access to external resources
	Anthony Kuntz, an employee in a SSII, becomes convinced of the future of RSS streams	
2004	He established the company Kreactive, offering consultancy on RSS and widgets	

2007	It was decided to develop a platform for designing, manufacturing and managing widgets for all types of terminals	
2008	the platform included an advertising agency	OSEO zero rate lending
2010	A new platform was developed with new automated features and innovative services	OSEO zero rate lending permitted this development
end 2011	Media Etudiant (Efficaweb) was bought.	Anthony Kuntz set up an association with Thierry Debarnot, owner of Media Etudiant, a company with several sites for students with large audiences and a low technical levels
2012	The company selected a new brand name: **Digischool** aimed at "lifelong learning"	
2011-2013	Small sites dedicated to learning were bought	
2013	A unique framework was built for all owned sites combining advertising, monetizing, automatic inclusion of new contents and deep analysis of usages	fund raising €3 million
2014	several partnerships for educational sites	

Innovation Model

Technological knowledge

Internal knowledge and R&D

Finance

Zero rate lending for R&D, Fund raising much later

Market knowledge

From “pure agency” to B2C, a previous consulting activity, a great capacity to address new opportunities

Specific

An extreme ability to move and adapt, associated with a high technological level

The selected business model is part of the innovation: selecting specialists and paying them to provide content, which will be entered in the company platform then distributed.

5.9 Vitec

Company description

Founded in 1988 by Philippe Wetzel, VITEC specializes in the development and industrialization of advanced digital video solutions in the MPEG field for OEMs and integrators. Since 1988, VITEC Multimedia has been devoted to the development of MPEG encoding and decoding solutions and the creation of innovative concepts intended for digital video applications. Since 1990, VITEC has focused its efforts on digital video and conforming to ISO standards such as MPEG.

The company aims to respond fully to customer-specific needs, in all sectors using video: health, administration, broadcast, Telco, education, transportation, entertainment and military. Its sales are mainly to OEMs and integrators in the various domains listed above. This is coupled with a very high level of R&D, which provides advanced solutions for a wide range of applications.

Current status (figures 2013)

Note: the figures below are estimates, and include foreign subsidiaries, whereas the table in the section headed "Financial results" does not include foreign subsidiaries.

25 years old

Subsidiaries: France, USA, Germany, Israel, and the United Kingdom

Employees: 175 (worldwide)

R&D employees: 100 (worldwide)

Revenues: €30 million (worldwide)

Financial results

Vitec is a private company, which does not publish its results. The following data are provided by Societe.com, which considers only the results of the French branch (including exports). The consolidated data, taking into account subsidiaries in Israel, Germany and Russia are significantly higher.

Vitec										
k€	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Revenues	6630	11490	14630	18680	16190	13460	17496	24556	22613	19743
Net result	1000	2140	4060	5270	5060	3590	4372	3772	3259	2462
Effectifs	22	29	38	40	46	47	55	63	69	70
					Source : Société.com. Figures do not include foreign subsidiaries					

Chronology

VITEC	Key time points	(Tentative) access to external resources
1980's	Philippe Wetzel worked at Matra Espace and contributed to European programmes (RACE)	
1988	He created his own company offering digital imaging compression (no standard existing at that time)	
1988-1992	Electronic cards for videophone	
1992	First MPEG1 encoder on PC: international success	

1988-1998	Subsidies were a significant source of funding	RACE, then ESPRIT, Zero rate lending from OSEO : one project per year
1997	Opened the US subsidiary (followed by a couple of years with a negative financial balance)	
		More and more technology bought from Fraunhofer (not the core job, but mainly audio). Funding accepted for the CIR (Research Tax Credit). Fraunhofer has to find money from the companies, and then may obtain subsidies, which lead to very usable results. No equivalence in France
	The company is used to build consortium and/or to contribute to some.	CIR (Research Tax Credit) proved very useful: allowed the company to carry out more research
2010	Vitec acquired the Israeli company Optibase (and kept the brand)	Knowledge acquired in adjacent domains (IPTV), R&D continued in Israel
2010	Vitec acquired the military and security activity of ATEME	
2012	Hired an engineer from Thales, who showed to be highly networked and proved very successful in mounting European projects (6 successful attempts out of 8 in 2013)	

Innovation Model

Technological knowledge

internal R&D, R&D international programmes with potential customers for new development, buying companies for adjacent markets

Finance

Sales and zero rate lending the first ten years

Market knowledge

Major cooperation with customers (integrators and value added resellers)

Specific

Creation by an engineer experienced in both technology and European programmes

Strategy: provide the best technology available to all industrial sectors, with the notable exception of 1st tier broadcasters.

5.10 Wiztivi

Company description

WizTivi was founded in 2007 to develop and commercialize products and systems allowing an easy vision of Internet sites on TV set, with a significant level of quality. The company evolved rapidly to included multiscreen development in its activities.

Currently, the company presents itself as the worldwide specialist in interactive user interfaces dedicated to set-top boxes, connected TVs and other connected devices (STBs, game consoles, tablets, smart phones…). It develops multi-screen applications, provides an SDK (software development kit), and works with operators, TV channels, content providers and CE manufacturers. A key feature of the offer is the permanent search for best image quality and fluidity.

Another original aspect of its innovation is a “creative studio”. This design studio is equipped with all the tools needed to have the best operative quality for any application developed.

Up to now, Wiztivi works mainly through direct contracts with R&D labs of large international companies: Samsung, LG, Toshiba.

A significant part of Wiztivi's revenues come from the sale of IP and especially the SDK. The company announced it broke even in 2013.

A key strategic advantage is its knowledge of the ecosystem. The company's strength is its ability to initiate connections between these players. Most specific innovations have been made possible by finding a partner: for a customer (such as an ISP), the company finds a CE manufacturer and develops the technical aspects of the interface. Another key feature of Wiztivi is its contribution to the development of standards.

Current status (2013)

6 years old

Applications used in 17 countries and 4 continents

Employees: 50

R&D: developers are doing part time R&D

Revenues: €5.2 million (estimate)

Financial results

Wiztivi						
k€	2008	2009	2010	2011	2012	2013
Revenues	48	236	2 082	3 253	5 353	4 669
Net result	-16	-707	-707	-2 623	-384	-591
Employees						50

Chronology

Wiztivi	Key time points	(Tentative) access to external resources
	Starting point : an encounter between an R&D manager at France Telecom, then Proservia (selling R&D services on video processing) and a researcher on smart cards in Silicon Valley and an idea: Internet video content on TV should be provided in an easy and efficient way	Two researchers with significant technological expertise developed the project. They succeeded in convincing the owner of the group (an SSII) of the interest of the project, based on previous successful developments.
2006		Contacts made with ISPs: positive reactions
2007	Creation of Wiztivi as a subsidiary of Proservia	
2007-2009	Several evolutions took place, related to the demand of the key players. TV manufacturers, ISP and content providers	
2009	SFR was a customer, but Wiztivi was allowed to work for all players.	SFR development bought 3% of Wiztivi's capital
2009-2014	The company succeeded in putting together content owners, ISPs and TV set manufacturers, and provided the technical development needed.	Partnerships were built with Philips, Intel, Yahoo, SFR.
2010	SFR Development became the main shareholder instead of Proservia	
2009	Taking into account all connected devices	
2009	WTV creative studio, a team addressing UI/UX (User Interface/ User Experience) was created, which had the technical expertise and the up to date equipment	
2009-2014	Developments made for TV on demand, catch up TV, interactive TV, with en emphasis on image quality and fluidity	Strong contribution to HbbTV standard. Some funding by an FUI R&D project. No participation in European projects: too difficult to find a good project
2010-2014	Developing for Toshiba worldwide the UI and back-end for Toshiba Place	SFR Development bought the capital retained by Proservia
2013-2014		Tentative decision made to go for European projects through the support of a consulting company

Innovation Model

Technological knowledge

Internal, partnership with MNE, then participation in a standardization consortium, a new ecosystem implied combining knowledge from several domains

Finance

Initial support by a large company (SSII), 3 years later bought by a Venture Capitalist

Market knowledge

Customers are large Consumer Electronics companies and Telecoms.

Specific

Creation by two researchers with a specific interest, who succeeded in convincing a large company to support the project.

Their key skill was that they understood a new ecosystem, and were able to manage working relationships with key players, content owners, ISPs and TV set manufacturers, associated with the best available technological competences.

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