

KIT

Knowledge, Innovation, Territory

Applied Research 2013/1/13

Draft Final Scientific Report – Volume 3
Knowledge acquisition case studies reports
Version 24/02/2012

This report presents the draft final results of an Applied Research Project conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

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A. The viticulture sector in Arezzo, Italy¹

A.1. Introduction and description of the case study area

Arezzo is one of the ten provinces of Toscana and accounts for slightly more of 10% of the regional employment with a GDP per capita level slightly above the regional (and the national) average and a GDP per capita growth in line with the regional average. Arezzo's economy is centred on three main manufacturing sectors, namely textile, clothing and knitwear, leather goods, and, more important especially in terms of export volumes, gold jewellery. Importantly, this is the province with the highest export propensity in Toscana, which is driven not only by its leading sectors but also by other ones such as beverages, among which wine export is the most important segment (UnionCamere and Istituto Tagliacarne, 2009).

Interestingly, recent analyses on the effects of the current global economic crisis show that, in comparison with the other provinces in Toscana, Arezzo's economy has been negatively affected by its sectoral mix although some sectors proved to be more competitive than in other provinces, among which agriculture (UnionCamere, 2011). The agriculture sector, however, accounts for 2% of added value and 4% of employment in the province, the local economy showing a higher percentage of added value and employment in manufacturing and services (more than 1500 million of euro and 6000 employees respectively; UnionCamere, 2009 and 2010). Importantly, the agriculture sector includes the viticulture segment (although the two should not be equated), which accounts for a fraction of employment only. Nevertheless, it is important to remark that while capturing slightly more than 10% of agricultural land, viticulture shows a larger share of added value and export propensity and entails some of the most knowledge-intensive activities.

In fact, the viticulture sector has undergone dramatic technological discontinuities and processes of structural change in the last two decades that affected both demand and supply conditions.

On the demand side, the changes in wine consumption habits and tastes have brought a sharp contraction of sales volumes and a shift from bulk to premium wines, especially in European countries, thus making branding and marketing efforts as well as distribution channels crucial to preserve profit margins and market shares.

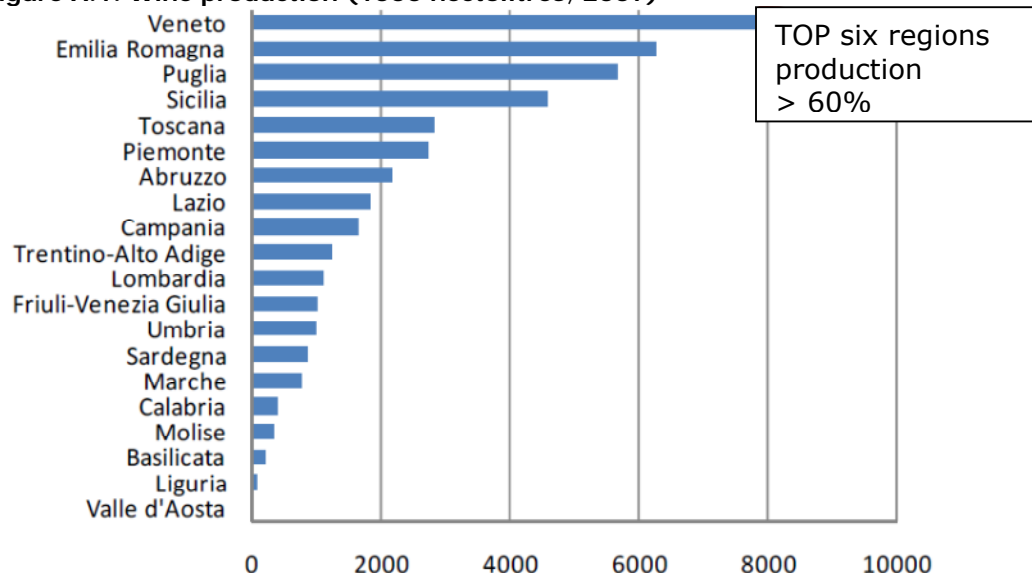
On the supply side, a process of technological modernization has pervasively diffused worldwide bringing to a relatively rapid adoption of scientific practices and approach in a traditional sector such as wine making. The speed of the shift from traditional to emerging business models and practices has significantly affected the survival chances of farms (Cusmano et al., 2010).

In this rapidly changing competitive context, where frontrunners countries, such as the US and Australia, as well as rapidly growing latecomers, such as South Africa, Chile, Argentina, New Zealand and also China, are increasingly gaining global market shares, Europe is still the geographic region with the highest intensity of wine production and the area where most of the international exchanges take place. Italy has in 2011 overcome France as a wine producer and together with France and Spain holds more than 45% of the world production (as of 2007). Italy also shows the highest export propensity and has been able to keep the share of world exports stable (about 18% of total world exports) in the last decade (UnionCamere and Istituto Tagliacarne, 2009).

Wine production is rather diffused in Italy, still with some specific concentrations in a few regions, namely Veneto, Trentino Alto Adige, Emilia Romagna, Puglia, Sicilia, Toscana and Piemonte (Figure A.1)

¹ This case study report has been written by Camilla Lenzi, BEST – Politecnico di Milano.

Figure A.1. Wine production (1000 hectolitres; 2007)



Source: LEL (Laboratorio di Economia Locale) elaborations on ISTAT data

The two latter in particular are of interest as they hold the largest share (in Italy) of appellation wines such as DOCG (Denominazione di Origine Controllata e Garantita), DOC (Denominazione di Origine Controllata) and IGT (Identificazione Geografica Tipica) as Table A.1 below shows.

Table A.1. Appellation wines per region (2008)

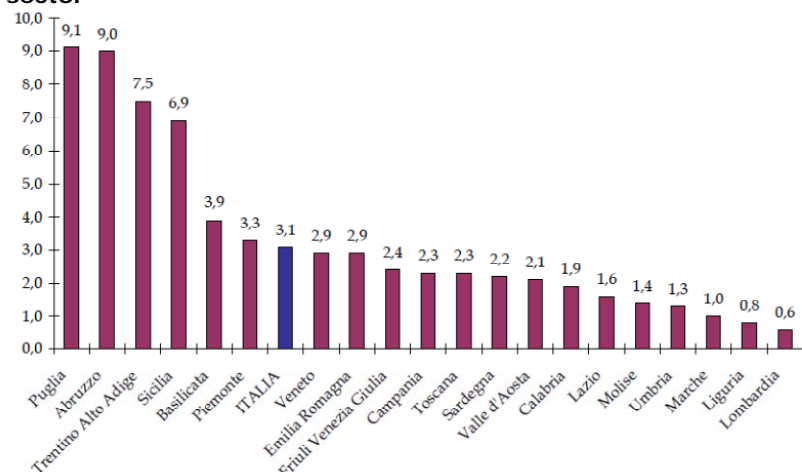
	DOCG	DOC	IGT	Totale
Abruzzo	1	4	10	15
Basilicata	-	3	2	5
Calabria	-	12	13	25
Campania	3	17	9	29
Emilia Romagna	1	20	10	31
Friuli Venezia Giulia	2	9	3	14
Lazio	1	26	4	31
Liguria	-	8	3	11
Lombardia	4	15	15	34
Marche	2	15	1	18
Molise	-	3	2	5
Piemonte	12	44	-	56
Puglia	-	26	6	32
Sardegna	1	19	15	35
Sicilia	1	22	6	29
Toscana	7	36	6	49
Trentino	-	8	4	12
Umbria	2	11	6	19
Valle d'Aosta	-	1	-	1
Veneto	4	25	10	39
Italia	41	324	125	490

Source: Istituto Tagliacarne elaborations on MIPAAF (Ministero delle Politiche Agricole, Alimentari e Forestali) and UnionCamere data

However, although the six top producing regions mentioned above have a relative importance in the national viticulture sector, at the regional level only southern ones seem highly specialized in this sector as compared with the national share whereas, for example, Toscana, Emilia Romagna and Veneto do not look specialized. Figure A.2 below shows the ranking of Italian regions according to the weight of the regional viticulture sector on the national viticulture sector with respect to the weight of the regional

economy on the national economy. This figure, thus, reflects the existence in these latter regions of a more structured and variegated industrial system articulated not only around the viticulture sector.

Figure A.2. Ranking of Italian regions according to their specialisation in the viticulture sector



Source: Istituto G. Tagliacarne elaborations on Infocamere data

In Toscana, the provinces of Florence and Siena are the largest producers, followed next by Grosseto and Arezzo ranked third and fourth, respectively. Despite its relatively more limited tradition in viticulture with respect to Firenze, Siena and Grosseto, this area hosts a not negligible number of wine producers and shows a rather strong orientation to the production of wines in the premium and, more in general, in the higher value segments, as attested by the share of lands dedicated to the production of DOC and especially DOCG grapes (UnionCamere and Istituto Tagliacarne, 2009).

The case of the viticulture sector in the province of Arezzo is of interest because it enables to study the process of knowledge acquisition, technical change and renovation and innovation adoption and generation in a territorial context that has shown a less prominent vocation in the viticulture sector but still some competitiveness even in a time of economic crises. This study is also of interest because of the key role played by dedicated local institutions that have launched two key projects to initiate a radical structural modernization process in the sector, as it will be discussed next in the report.

To identify the firms to be included in the analysis, the list of wine producers that are members of the Federation "Strada del vino – Terre di Arezzo" was firstly consulted. This Federation encompasses not only wine producers but also restaurants, farmhouses, wine-bars, and traditional products estates. Membership fees are little and most of the wine producers of the province are affiliated to the Federation. After extensive interaction and consultation with key informants, namely staff at the Federation, staff at the Agriculture Department of Arezzo Province, chief agronomists working in Toscana, a short list of 12 firms was developed. The short list was designed to maximize the variety in the typologies of firms to be interviewed in terms of size (e.g. hectares of land and employees), production techniques (e.g. organic farming), geographical coverage. The province of Arezzo in fact spreads over five different geo-morphological areas each characterized by different *terroir* (i.e. soil, climatic and farming conditions contributing to unique wines specificities). Importantly, the selected firms were reported as relatively more knowledge-intensive and conducting, albeit at different intensity, experimental activities. In the end, 9 out 12 firms were reached and 16 interviews were conducted.

Data were collected via semi-structured face-to-face interviews conducted at the firm premises lasting on average two hours. Information were integrated and supported by additional documentation collected through desk research, website search, company documents when available, and finally validated by respondents. Additionally, interviews

with staff of the Agriculture Department of Arezzo Province, staff of the Federation and key informants allowed to describe the broader economic context conditions and public initiatives undertaken to support knowledge and innovation acquisition and creation in the province with specific reference to the wine production sector.

Table A.2 summarizes key information about the interviewees and their relative organization. Most the firms are family-run businesses and of micro or small size, both in terms of employees and hectares, confirming the highly fragmented nature of farming in Italy. This is one of the key elements preventing the access to large-scale retail and distribution networks because of the high standards in terms of continuity, size and stability of orders required. Only two firms have multi-location vineyards. The number of employees, however, can largely increase in peak season. All of them are professional farms selling own branded wines and hobby farmers, grape growers, traders, wholesalers have not been considered for the present analysis. Although the year of foundation is often prior to 2000, around that year most of the firms experienced a major organizational and managerial change frequently due to the transition from one generation to the following.

Most of the firms has developed over time a differentiated offer of several activities related to wine production and farming, such as agri-tourism, restoration, vegetables and animal food product processing, in some cases with direct selling. Still, the wine production is the core business of the firms interviewed. Multi-functionality however is perceived as a necessity to face competition by finding new market opportunities and by increasing competitiveness.

The focus on quality products and in some cases organic farming also reflects a strategy to have access to global markets, by obtaining certification and traceability as proof of products value.

This however requires an increasing level of professionalism both in technical as well as in managerial skills and competences and the openness to the introduction of new techniques and practices to keep abreast of the increasing quality standards required in international markets and to introduce cost-efficient production processes in order to keep prices stable as much as possible. Addressing niche markets is a natural complement of this strategy, especially attractive in a context of changing demand patterns, habits and consumers tastes according to which wine is perceived as part of a broader experience and variety, uniqueness and local identity of agricultural products are considered as key elements in the gourmet culture fast developing and diffusing in recent times (Cusmano et al., 2010).

Similarly, opinions are convergent about the importance not only of a deep knowledge and understanding of oeno-agronomic aspects of wine making but also of craft-like mastery in all stages of wine production, ranging from the vineyard to the cellar.

Interestingly, most of the owners have previous working experience, sometimes also in unrelated sectors, that are reported to be anyhow as an important locus for learning about business, organizational and managerial practices that have been next implemented in the wine making business.

Table A.2: Key information about the interviewees and their relative organization

Firm	Year of foundation	Employees	Turnover (1000 euro)	Patents	Interviewees' position in the firm
A	1973	4	700	No	Owners
B	1993	60	na	No	PR & Press Officer
C	2000	1	70	1	Owner and chief oenologist
D	1998	9	na	No	Owner
E	1990	3	na	No	Owner
F	1948	18	1000	No	Chief agronomist
G	1961	40	5000	No	Chief agronomist
H	1966	>600	110000	Not renewed	Chief agronomist
I	1929	5	500	No	Owner

A.2. Firm profiles and innovative activity

The interviewed firms are all active in the same sector, i.e. wine production. All but Firm G, grow their own grapes, process them, and bottle their own branded wines at the local level. Nevertheless, vinification, bottling, branding and marketing are all done at the local level. Only Firm H has multiple locations worldwide; the others have all their vineyards in the province (at best in other provinces in Toscana, such as Firms F and I). Wines are usually classified on the basis of the a six-point scale, ranging from basic, popular premium, premium, super premium, ultra premium and icon (Heijbroek, 2003). Most of interviewed firms addresses the segments from the premium upwards, and, in general, over time there has been a shift from the production of bulk wine to quality and bottled wine. As mentioned above, most of the firms has a diversified business model. Multi-functionality is reported in fact as crucial to provide some revenues stability in a highly seasonal business such as agriculture. Importantly, all firms have developed products that have received awards, prizes and are been frequently listed in guides and sectoral journals in several years. Producing good quality wines is in fact considered as a sort of admission ticket to international markets.

The selected firms have all a highly knowledge-intensive profile. However, only firm H has an internal R&D unit with a fully-dedicated team composed of four people; more in general, firm H is the only Italian firm active in the viticulture sector having (recently) designed a dedicated R&D unit. Also, this is the only firm that was able to clearly identify the share of R&D expenditures on turnover (which was indicated to be about 0,3%).

Notwithstanding, all firms have adopted in recent times several measures to increase efficiency, improve the quality of wines, adopt new technologies, introduce innovations, both in the viticulture and in the vinification stages of the production chain. Firm A for example reported of a process of digitalisation introduced in the firm that enabled to reorganise the distribution of different cultures in different parts of the land to make land use more efficient and the management and observation of cultures faster. Firm E reports of the renovation of cellar and the acquisition of new machineries.

Importantly, all firms show a considerable experimental attitude and experimentation is reported to be crucial for improving the final products. Experimental activities are continuous (almost daily) and are increasingly conducted with a scientific approach. Experimentation involves several activities ranging from the observation of the performance of the new machineries and equipment (i.e. embodied technology) being acquired especially for modernising cellars (e.g. steel tanks for fermentation, *barriques*, etc.), and, more and more over time, to considerable efforts in collecting data and analysing the results, as in the case of organoleptic tasting, assessment of new methods and techniques of pruning, irrigation, canopy management. More rarely, firms conduct advanced experimental activities such as the selection of grapes in old vineyards or of native yeast through in-vitro techniques (Cusmano et al., 2010). On the one hand, none of the interviewed firms showed an extremely passive experimental behaviour (i.e. experimentation is occasional or the firm's facilities, both vineyard and cellars, are made available to external research organisations with the aim of conducting experiments, and eventually share the results also with other firms). On the other hand, none of them has been involved in joint research projects with universities or laboratories in the last three years but Firm H. Only firm I, report to have a dedicated part of the vineyard which is conducted together and under the supervision of a public research organisation dedicated to research and experimentation in agriculture (with a specialisation in viticulture) located in the province.

Intellectual property rights protection is not a common practice. Firm C reported to have applied for a patent related to the production processes used in the cellar. Firm H, despite being of a far greater size and holding a dominant position in the market, currently holds some patents. However, most of the time the inventions that could be patented are developed jointly with other firms active in other sectors (e.g. electronics, automation, automotive) that are left with the opportunity and the related duties of applying for a patent. Trademarks are more diffused although not very common. Overall, the perception of the relevance of intellectual property rights is limited.

Overall, the area shows a rather knowledge intensive profile. Although resources dedicated to formal research activities are scarce, as attested by the difficulties in the identification of the percentage of R&D spending on turnover or employment/working hours dedicated to R&D activities as well as by the limited propensity to patenting, knowledge intensity is far from negligible. In fact, experimentation is diffused and common practice and has generated over time a pervasive and cumulative learning process at the local level.

Key findings:

- The area shows a relatively high knowledge intensive profile attested by local firms' engagement and commitment to experimental activities and their capacity to bring on the market new wines awarded prizes even in international competitions.
- Knowledge is rarely related to R&D activities and embedded in patents but is primarily linked to learning processes, technical capabilities, mastery of craft practices.

A.3. Types of knowledge and expertise required for local innovation

The knowledge deployed in the vineyard and in the cellar is mostly a balanced mix of applied knowledge based on technical materials and documentation and knowledge based on practice, on job training and experience. Interestingly, all respondents indicated that the activities conducted in the vineyard are increasingly more important as compared with activities in the cellar in order to come out with a good and pretty unique wine. Accordingly, the increasing care required by the management and control of the vineyard implies that wine making is more and more viewed as a craft business albeit pervasively and drastically upgraded, renovated and modernised via huge investments in new technologies and agronomic and oenological practices adoption. Similarly, Firm H reports that the design and development of new machineries and equipments needed for large scale vineyards management is constantly fine-tuned to replicate craft and manual practices in an electronic and mechanised way. In cases technical documentation is not sufficient, the detection of specific problems is a key step to next identify the best partners to solve them.

The use of scientific materials is rather limited, consistently with the little engagement into relationships with universities and research institutes, an aspect that will be further discussed next.

Lastly, the knowledge coming from consumers and user-producer interaction is limited. Interestingly, wine tasting is a relatively recent diffused practice, especially in Italy, generally perceived as part of a broader gourmet culture and experience. There is a rather widely convergent opinion among respondents about the overall detrimental effect of wine guides and oenologists acting as opinion leader in the sector in orienting final consumers tastes and influencing sales volumes and trends. Probably, this is also related to the small size and production volumes of the firms interviewed that make them at disadvantage in reaching larger distribution networks and consequently more exposed to the evaluations reported in wine journals and guides with large diffusion among final consumers.

The area has been, at least at the early stages of the modernisation process of the wine sector, relatively dependent on sources of such types of knowledge external² to the area, as it will be discussed in the next section. The importance of external knowledge thus qualifies this case study area as a case of knowledge acquisition. Importantly, this is a case of best practices in knowledge acquisition since external knowledge has been rapidly absorbed at the local level by creatively adapting it to local needs and by initiating a process of learning centred within local firms. This aspect as well will be further discussed in the next section.

² In this report, internal stands for internal to the firm, local for internal to the region under investigation (i.e. the province of Arezzo) and external for external to the region of investigation.

Key findings:

The type of knowledge and expertise required are:

- of applied and specific nature whereas the use of scientific and basic knowledge is limited
- linked to a craft mastery of agronomic and oenological practices.

A.4. Channels for knowledge and innovation acquisition

The process of renovation of the wine industry in the province of Arezzo is characterised by the push effect given by two major projects, promoted and led by local institutions at the beginning of 2000, that significantly affected the next stages of the local sector development. Both of them benefitted from the lead of agronomists and oenologists with international reputation and considerable experience. The teams in charge of conducting such research projects were external to the province. The first project was about the zoning of the province area aimed not only at identifying the most suitable areas for specific productions but mostly to raise awareness of the local environmental resources available, largely still not fully exploited, and to provide guidance on how to make the best use of. The outcome of this project was a textbook including guidelines for farmers about several stages of the production process ranging from planting to ordinary management of the vineyard to better exploit local resources and to raise awareness of local potentials. The second project was about the production techniques of Vin Santo, a typical wine of Toscana. A selection of firms of the province participated to the project and two of them were interviewed, namely firm A and G. This project as well had as an outcome the publication of the results of the analysis undertaken over several years (in the period 2003-2007).

These two projects together with several promotional initiatives undertaken by the Agriculture Department of Arezzo (such as tasting, attendance to national and international sectoral fairs, co-joint events with sommeliers' and chefs' national and local associations) had the effect of raising awareness of the potentials of local wine industry and stimulated efforts in increasing quality levels and in penetrating additional and more distant markets, beyond the local one. These strategies required additional investments in upgrading production techniques by acquiring new machineries and managerial and organizational practices as well as in expanding the information set. To this end, several companies firstly relied upon the consultancy services provided by specialised knowledge workers, namely agronomists and oenologists with international reputation and experience, frequently external the area. These professionals holding university level technical qualification, have a scientific understanding and knowledge of the wine making process and can make firms experimenting alternative methods and productions and promote technical change. The so-called 'flying winemakers' were and still are a key carrier of national and international transfer of tacit and codified knowledge and enable accessing frontier knowledge external not only to firm but also to the region (Giuliani and Bell, 2005). Oenologists are oftentimes consultant, partly due to the limited size of the firms, partly because frequently the owner himself takes charge of the cellar. Some of the interviewed firms, however, report that the importance of external consultant oenologists have decreased over time. Most of respondents in fact maintains that a wine's quality far largely depends on the work done in the vineyard rather than in the cellar. Key decisions on the work to be done in the vineyard are mostly made by the owner or internal staff, such the chief agronomists. Over time therefore, there has been a progressive shift from external sources of knowledge and competencies to internal sources of knowledge and competencies. Still, most of the firms have a reference (likely, external) oenologist although this is reported to be to a large extent a marketing strategy to better place own products on the market and to better orient wine guides so to receive positive evaluations and, ultimately, to expand the final market.

The initial reliance upon external knowledge sources was largely related to the atomistic structure and the limited size of firms in the local market which constrained, if not prevented, the accumulation of rapidly evolving and frontier knowledge within local firms,

especially in a time of major and radical discontinuities in the information set to be used and deployed in the wine making business.

The role of business associations is important not only at the local but especially at the national level and ensures a source of continuous update on current production trends and techniques and learning from competitors. Participation to the annual or the even more frequent meetings of such associations is an important opportunity to monitor the frontier of the sector and competitors behaviour.

Interestingly, personal contacts and informal networks at the local and inter-regional level are considered the most important source of knowledge. Blind-tastings, dinners, hunting are among the most important occasions to exchange opinions and information on production techniques, wines characteristics, new practices to be introduced in the vineyard and in the cellar. These events are organised on a regular basis and, typically, involve different albeit not overlapping networks of professionals, such as agronomists, oenologists, the owners themselves. Their importance is judged even greater than attendance to seminars and workshops with professionals and scientists or participation to fairs and other sectoral (and more structured) events being promoted by business associations, public institutions or other research organizations. Their importance is also, on average, judged greater than visits to other companies and learning processes from competitors, which are nevertheless reported as crucial occasions to be confronted with to keep abreast of the state of the art in the sector. Still, visits frequently follow personal rather than business channels.

As to the relationship with universities and other research organizations, only Firm H reports to have continuous and repeated interactions with national and foreign universities, the latter being facilitated by the multiple location structure of the firm. The others complained about the distance from local and regional research organizations, difficulties in communication, differences in research targets and the research timing required, the 'ivory tower' nature of most universities, especially the local ones (e.g. Siena and Florence), the closure of the regional agency dedicated to the promotion of innovation and development in agriculture. This was in fact an important actor at the crossing between private firms, public institutions and research organisations and had in the past an influential role in terms of dissemination of information, updates, novelties in the sector, training events, new research projects development. This agency in fact provided technical training, oenology courses for producers, the organization of visits abroad (e.g. Bordeaux). Only Firm I reported to have continuous interactions with the local branch of the national Council for research in Agriculture which is, since its foundation, specifically dedicated to research and experimentation in viticulture.

Overall, the area has been, at least at the early stages of the modernisation process of the wine sector, relatively dependent on the consultancy services of external knowledge workers such as star oenologists with international reputation and experience, frequently external the area. The two projects led by the Agriculture Department of the province were also led by external consultants (namely, university researchers). Importantly, external knowledge has been rapidly absorbed at the local level by creatively adapting it to local needs and by initiating a process of learning centred within local firms. In turn, this has supported a moderate growth of the sector (and of the local economy) and allowed to preserve some competitiveness in agriculture also in a time of economic downturn as discussed in section 1. The key territorial elements enabling this learning and upgrading process are discussed in the next section.

Key findings:

The channels for acquiring knowledge and innovation are mainly external to the region, notably:

- flying winemakers (i.e. star oenologists)
- sectoral fairs and events organized locally as well as the national and international level
- informal business networks at the local as well as the national and international levels
- the two main research projects lead by the Department of Agriculture of the Province under the guidance of external research teams to the region

A.5. Local conditions to acquire external knowledge and innovation

The key element at the local level that enabled the renovation of the wine industry in the province roots first in the local institutions efforts in awareness raising of local potentials for this industry and second on the capacity of local actors to invest in upgrading and modernisation of technologies and practices not only to catch up with the frontier but also to be able to develop highly competitive products also in international markets and competitions. This latter element is the outcome of an entrepreneurial attitude and inheritance that characterise most of the owners of the interviewed firms (which as mentioned in section 1 frequently have previous working experience, also in quality of entrepreneur in unrelated sectors) which is further supported by a creative attitude in screening and a capacity to understand the current trends in the market and technologies and to adapt it to the local context and capacities. These two elements are crucial to understand the progressive shift from a strategy of competencies and capabilities absorption primarily mediated by the consultancy services of external oenologists followed next by an increasing internal capacity (to the firm) of mastering specific knowledge and stages of the production process.

Importantly, however, this process is largely firm-centred and there are limited opportunities for knowledge and competencies sharing among local firms. Overall, firms show a rather atomistic attitude. Cooperation with other firms is scarce and fragmented, even in the form of vineyards and cellars visits, especially in smaller firms. Weak agronomic and oenological practice, limited experimental attitude and structure, on the one hand, and the lack of trust, on the other, are among the most important elements explaining such a finding. Also, the mismatch between types of products, production techniques and the general perception of producing unique and un-replicable products are mentioned among the most relevant impeding factors limiting research cooperation opportunities at the local, regional and national level. Some firms report that there is no need of cooperating at all and the limited number of attempts made at launching cooperative initiatives generated more costs in terms of coordination and management than benefits in terms of cost reduction or access to new information. More intense cooperation initiatives would be appreciated however there is much resistance in putting efforts and investments in this direction. Consistently with findings discussed in Section 4, the (negligible) existing cooperative efforts are reported to be in general mediated by personal rather than business channels.

Key findings:

<p>The local conditions to acquire external knowledge and innovation reside in:</p> <ul style="list-style-type: none">- the proactive role of the province and the promotion business network- the creativity of local entrepreneurs in understanding market trends and technical practices and to apply it to local context and business needs.

A.6. Knowledge and innovation acquisition policy assessment

The perception of policy initiatives taken at the local level is mixed. On the one hand, there is an enthusiastic opinion on the initiatives undertaken on the promotional side. On the other, the initiatives undertaken on modernisation, research, innovation and development of the sector are considered almost nil. In particular, the closure of the regional agency for innovation in agriculture is considered absolutely detrimental, both from the producers as well as from the local policy makers perspective.

Still, promotional activities played a not negligible role albeit indirect. First of all, the efforts of public actions aimed at raising awareness of local potentials have been successful and the number of producers increased together with the quality of their wines. Second, the initiatives undertaken have contributed, although in a less visible way, to enlarge local producers market potentials by branding the different producers under a common label. This is actually the mission of the Wine Road, whose aim is to be a promotional device to marketing local wines and other agricultural products and, in turn, support the local economy. The Wine Road is part of a larger Federation, articulated at the national as well as at the local level, according to a thematic approach to tourism active since 2001. Toscana has currently 21 of such roads, among which the one in the Arezzo's province. Importantly, the ultimate goal of such 'roads' is to promote the participation to events in Italy and abroad under the same brand with the specific aim of awareness raising and training operators by sharing objectives at different levels. Whereas local producers do not always fully agree with this strategy and would prefer independence not only on production but also on promotion, and do not always fully perceive its long term benefits, they do acknowledge that in absence of this joint branding efforts led by the province's institutions, access to additional and more distant markets would have been more difficult if not impossible. The limited size of single firm prevents the opportunity of direct and independent distribution strategies (e.g. most of these firms, for example, do not have dedicated sales manager, which is frequently the owner, nor commercial agents). This bottleneck has been partly overcome by the local institutions' lead of promotional activities under a common brand.

Importantly, the exposure to external markets (e.g. participation to national and international fairs, even abroad) had the indirect effect of supporting learning mechanisms about new practices, methods, experiences that could be next replicated while adapted to local needs to improve efficiency and products. The promotional initiatives undertaken allowed to open local actors perspectives and set of knowledge not only on the market potentials, but also on the most advanced techniques. Again, without the support and sponsorship of local institutions, these steps would have been slower if not impossible because of the limited financial resources made available by small producers for similar activities.

Therefore, there is a general positive assessment of what done by the local administration to support the sector. Differently, there are less positive feedbacks about the regional and national policy initiatives. As to the former and already remarked above, the most common comment is about the closure of the regional agency for innovation in agriculture which is considered absolutely detrimental. The negative consequences of such a decision are magnified by the limited relationships maintained by local producers with other actors and research bodies, which are oftentimes left to personal initiatives on the basis of personal contacts and attitude rather than institutionalised and formalised in practices and mechanisms accessible to all producers. Universities and other research organisations are perceived as extremely far from what are the practical and daily needs of producers and difficult to be involved in the firm's practice. As to the latter, they are reported to be completely almost missing.

Lastly, one direction in which the initiatives at the local level could be improved is reported to be on the provision of activities and services such as technical demonstration to farmers, direct consultancy, use of common production equipment and machinery, which might be expensive for the single producer but that could be used by several ones under the coordination and supervision of a local body (e.g. extension agency). However, efforts to launch such initiatives have been undertaken without much success such as in

the case of the shared oenologist among producers which received strong resistance and in the end was dismissed.

Key findings:

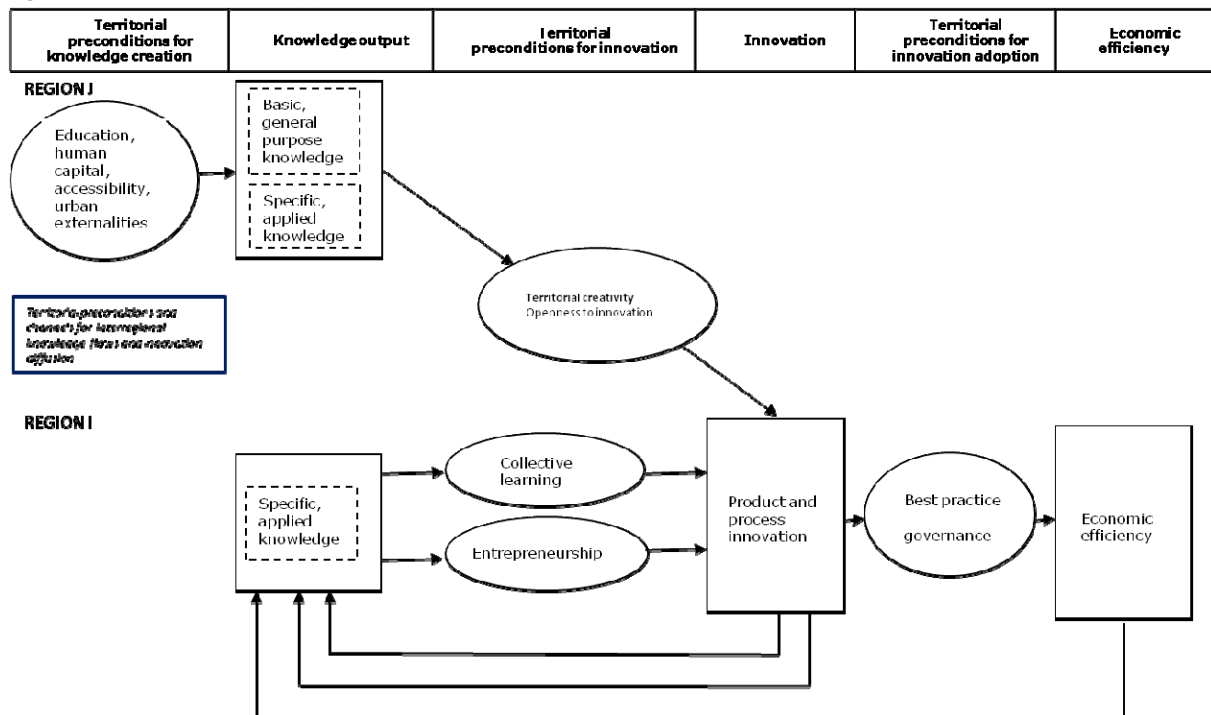
- The knowledge spillovers innovation policies have:
- received an overall positive assessment
 - made large efforts and turned to be effective in the promotion of local products
 - experienced a decreasing effort on the side of the production and technological rejuvenation of the sector
 - experienced a decreasing commitment of regional and national institution of research

A.7. Conclusions

This document has summarised the findings of the qualitative analysis carried out in the wine industry in the province of Arezzo in Toscana.

All in all, these findings suggest that this case could be associated to a creative knowledge and innovation adoption pattern, i.e. pattern 2 conceptually and empirically identified in Chapter 2, Volume 1 of the Scientific report and reported in Figure A.3.

Figure A.3. A creative application pattern



Source: KIT Draft final report

The modernisation and increasing professionalization of the wine industry are clearly evident also in the province of Arezzo case. In this case, the increase in the knowledge intensity of the industry required to access a larger pool of knowledge in order to keep competitiveness and market shares; this initially implied to involve external actors to the province, as it was in the case of the two major projects of zoning and on vin santo mentioned in Section 4. The consultancy services of star oenologists were also an important source of external knowledge. Knowledge in this case could be associated more to tacit knowledge embedded in key knowledge workers and professionals rather than codified knowledge as available in textbook and patents; it can be more likely associated to the notion of competences and capabilities rather than to knowledge developed in scientific basic and even applied research. The capacity to access this

knowledge and to successfully absorb and adapt it to local specificities has been moderated by two important elements: the creativity and entrepreneurial attitude of local producers. Most of the interviews in fact report of previous working experiences, even abroad and, in some cases, also in quality of entrepreneur, as an important incubator of practices and experiences that have been next successfully adapted and exploited in the wine business. This attests of the role of knowledge and competencies inheritance from previous, even unrelated, working experiences. Over time, this has led to the accumulation of endogenous competencies that may in the future self-sustain the local business needs and bring to an upgrade and a shift towards an endogenous knowledge and innovation pattern. Moving to this pattern however would require to initiate a set of actions aimed firstly at promoting the development of specific local knowledge creation preconditions presently missing, such as research organizations and education programmes specifically dedicated to viticulture. Also, policies should be aimed at promoting a networking culture so to endow local firms with relational capacity to faster access, exchange and absorb more general and scientific knowledge relevant to their specific applications which is not locally available nor internally developed.

The experience of Arezzo is also of great interest because of the role played by local institutions, and thus governance, in providing the initial drive towards a process of potentials awareness and new business opportunities discovery that had the second order effect of initiating learning processes and competencies accumulation building centred at the local level that in the end turned into superior innovative performance. Future policies should definitively support and reinforce this process of accumulation of specific endogenous competencies within local firms to preserve and, possibly, improve current economic performances.

A key bottleneck also emerges from respondents answers. On the one hand, efforts made at the institutional level have mainly concentrated on the promotional side. Despite with some relatively isolated cases, the opinion of the initiatives undertaken is very positive. On the other, interventions on the production side would be highly appreciated despite the limited initiatives proposed received very little favour and were in the end dismissed. The networking culture and attitude in fact still face large resistance. Efforts to build such a cooperative thinking and behaviour proved to be more successful on the promotional side, where individual benefits in terms of higher revenues and lower costs (e.g. fees for participating at international fairs) are clearer and of short-term nature, whereas they proved to be unsuccessful on the production side (e.g. shared oenologist). In this latter case, in fact, benefits from cooperation are of longer-term nature, relatively more unpredictable, require more commitment to joint projects and to share details on production techniques, equipment if not the vineyard. At the present stage, this is not even considered as necessary by some respondents. However, the limited size of most of producers is likely to shortly require some sort of cooperative initiative also on the production side in the light of the increasing competition in international markets coming from large producers. Lastly, in the light of the closure of the regional innovation agency for agriculture, respondents have shown the need of better interfaces to access external technology, knowledge and competencies and promote their transfer.

Key findings:

- Creativity (together with entrepreneurship) is a crucial enabler of the transfer, adoption and smart adaptation of external knowledge and competencies to local business needs
- The local governance can be a driver to initiate processes of structural change and deep rejuvenation, modernisation and innovation in traditional sectors by supporting processes of local accumulation of competencies and knowledge.

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B. The ICT sector in Lombardy³

B.1. Introduction and description of the case study area

Lombardy is a highly diversified, rich, and productive region located in the northern part of Italy. The region has been consistently scoring among the the most productive Italian NUTS2 areas, and covers alone 16% of the Country population, while at the same producing 22% of its GDP and accounting for 19.4% of its total investment.⁴ The region also ranks consistently among the top 10% EU27 areas in terms of Total Factor Productivity,⁵ although since 2003, when the region peaked to reach the 93rd percentile in the productivity distribution, this values has slightly declined.

The regional industrial fabric is made up of Small and Medium Enterprises; the average firm dimension (calculated as the total number of employees over the total number of local units⁶) is equal to 4.15, 16% higher than the Italian average, 4% higher than the average value recorded for the Italian *Nord Ovest* NUTS1 region, yet lower (by 36%) than the average EU15 level.⁷

The region covers also a relevant share of the total Italian and European manufacturing; in particular, 3.5% of the whole EU27 workforce employed in manufacturing is located in Lombardy. The region enjoys a traditional specialization in precision mechanical instruments, which partly led to the present interest in its ICT production and deployment performance. Table B.1 shows that the 7 NACE 2 sectors most closely related to ICT production represent a factor of relevant specialization for Lombardy both with respect to the Country, as well as with respect to the EU27. The evolution of the system notwithstanding, half such NACE 2 industries (manufacturing of office machinery and computers, computer and related activities, and post and telecommunications) also present a pattern of increasing specialization for the region.

Lombardy is therefore a stronghold for the European economy, while at the same time representing a major driver of ICT adoption (because of a thick market effect) as well as a non negligible producer of ICT-related innovations.

Table B.1. Number of persons employed in the ICT sector (selected subclasses) in Lombardy (Year 2006)

Sector	Lombardy	% of NW Italy	% of Italy	% of EU27	Growth 2000-2006
DE22 - Publishing, printing, reproduction of recorded media	50,755	73.13%	30.85%	3.64%	-0.99%
DL30 - Manufacture of office machinery and computers	3,346	46.08%	22.80%	2.25%	1.76%
DL31 - Manufacture of electrical machinery and apparatus n.e.c.	57,880	71.72%	31.41%	3.69%	-5.05%
DL32 - Manufacture of radio, television and communication equipment and apparatus	24,090	74.54%	29.98%	3.06%	-4.84%
DL33 - Manufacture of medical, precision and optical instruments, watches and clocks	30,937	66.94%	23.48%	4.48%	-0.55%
K72 - Computer and related activities	98,708	70.38%	26.82%	3.76%	2.71%
I64 - Posts and telecommunications	48,220	61.79%	17.95%	1.60%	0.62%

Source: EUROSTAT, *Structural Business Statistics*.

³ This case study report has been written by Andrea Caragliu, BEST – Politecnico di Milano.

⁴ Source: EUROSTAT 2009 data.

⁵ This statistics is obtained as a residual to a standard Cobb-Douglas production function of the form $Y_t = A(K_t^\alpha L_t^\beta)$. For a review of the concept, see Syverson (2011).

⁶ Data cover the year 2008, and have been retrieved on EUROSTAT on July 22nd, 2011.

⁷ Data for Lombardy and Italy from EUROSTAT; comparison with the average EU values based on EC (2010).

In this report evidence is presented on six organizations, whose choice is based on the maximum coverage of the market for ICTs in Italy. In fact, five of the six organizations selected cover about 2.15% of the total market for ICTs in Italy.⁸ As the market itself is indeed rather fractioned, this represents the bulk of the country's production. Most organizations are located in the city of Milan (90 research centres focusing on ICTs out of the 212 surveyed by *Questio*, the regional R&D and Technology Transfer Centers data base,⁹ viz. 42% of the grand total, are in fact located within the municipality's boundaries). The share of R&D centres engaged in ICT-related activities located in Milan reaches 70% if calculated on the basis of the recent definition of Milan's metropolitan area provided in the ESPON FOCI project.¹⁰

Table B.2. Summary information on the selected firms.

Organization	Year of Foundation	Part of a group	Listed on the stock market	Number of employees	Turnover	R&D% on turnover ¹¹	Patents
Organization A	1979	Yes	Yes	1,900	250 mil. €	10%	>50
Organization B	1999	No	No	11	<1 mil. €	-	N/A
Organization C	1908	Yes	Yes	1,200	350 mil. €	10/15%	390
Organization D	2000	Yes	Yes	2,900	310 mil.	50%	N/A
Organization E	1989	Yes	Yes	60	40 mil. €	12%	N/A
Organization F	1996	Yes	Yes	3,044	340 mil. €	N/A	N/A

The market context for ICTs is rather challenging. Competition from emerging countries both in terms of production as well as with respect to usage (which in turn drives the creation of standards for applications, software, etc.) has been steadily increasing in recent years, whereas most of its growth, the economic crisis notwithstanding, comes precisely from Asian competitors (Figure B.1.a). On the Italian market, a relative slowdown of the information technology component has been matched by a moderate growth of the telecommunications market (Figure B.1.b).

This report is structured as follows. In Section B.2 draws a profile of the innovative activities of the surveyed organizations. In Section B.3 the type of knowledge and expertise required by the firms to innovate is described. Section B.4 analyses the local and external channels used by the reviewed organizations for the acquisition of knowledge from outside. In Section B.5 a description of local conditions to acquire such external knowledge is presented. Section B.6 offers an overview of innovation policies from the perspective of the interviewed firms. Finally, Section B.7 concludes.

⁸ This figure is calculated as the ratio of the total turnover in Million Euros from the six interviewed organizations over the total sales in Million Euros of national and international ICTs companies on the Italian market (source of this last figure: Rapporto Assinform 2011).

⁹ For more information on *Questio*, see Capello and Caragliu (2009) and Verganti et al. (2004). The data base of all R&D centres in Lombardy is available at the URL www.questio.it.

¹⁰ See ESPON (2010).

¹¹ See Section B.2 for details on how these estimates are obtained.

Figure B.1. World market value of the ICTs industry by macro-area and total sales on the Italian market by sub-industry, 2008-2010.

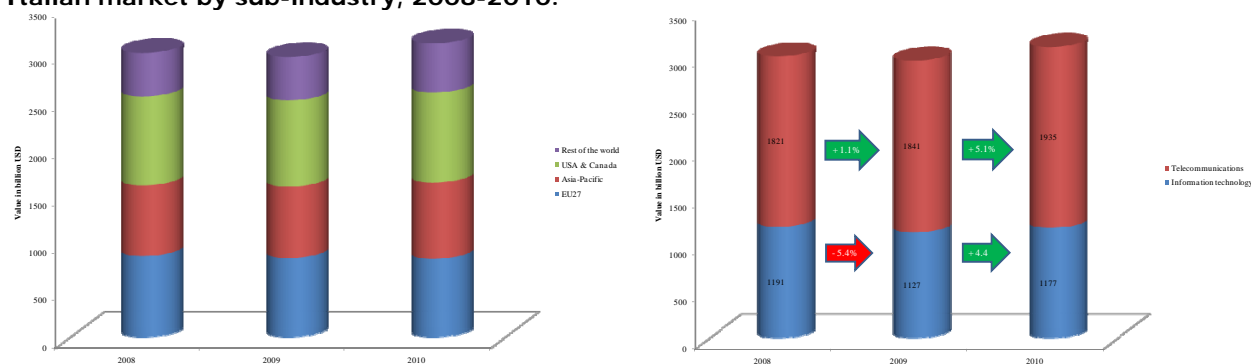


Figure B.1.a. World market value of the ICT industry by macro-area
Source: Rapporto Assinform 2011.

Figure B.1.b. total sales on the Italian market by sub-industry

2. Firm profiles and innovative activity

Innovative activities in the ICT sector present a rather different nature with respect to innovation in manufacturing. In particular, differences emerge with respect to the case studies on the automotive industries in Piedmont and Bratislava, and the ICTs in Oxford. In fact, it is oftentimes difficult to identify in ICT companies' balance sheets the exact figure committed to R&D. In the absence of a consistent knowledge margin granting competitive advantage against international competitors, Italian ICT companies dug a niche in the market, mainly acting towards the generation of innovative products using scientific and technical knowledge stemming mostly from large US multinationals of the industry (among them, Microsoft, Oracle, Google, Facebook, Apple). As such, the competitive advantages of the surveyed companies lies mainly in two factors:

- A very short time-to-market;
- A good knowledge of the local market needs.

Therefore, organizations as a whole carry out R&D activities as the core of their business, without however in most cases owning Vannevar Bush-like offices with white-dressed researchers engaging in continuous efforts to move the technological frontier. Research is based instead on a more horizontal activity, penetrating daily work in every corner.

The firms in this sample can be described as being mostly medium enterprises being born around the 2000-2001 ICTs bubble, and being currently listed in the Italian digital stock exchange (Nuovo Mercato). An interesting point pertains the industrial structure of these companies. Generally, they are organized in single units, independent firms belonging to the head company, each focusing on a specific line of product (e.g. supply chain management software, system integration, avionic system engineering). Because of the rapidly changing environment of this industry, new subsectors (e.g.: the relatively recent emergence of the internet of things and the cloud computing technology) swiftly substitute old ones. A huge challenge faces firms in such industry; in the case of the surveyed firms, the board of directors picks up opportunities embodied in small emerging companies, owning some decisive competitive edge on new technologies, but having so far failed to grow to large market dimensions. Such small companies are bought and integrated in the group structure, therefore widening the knowledge portfolio belonging to the head company.

The companies interviewed are also characterized by a wide coverage of the type and qualities of the ICT firms active in the region. They span from medium-size companies focusing on software development, to former multinationals currently being subsidiaries of a large telecommunication company, to a medium-size formerly traditional company, successfully converted to software applications and diversifying horizontally as well as vertically to different market niches. Finally, officials from a research centre analyzing

market trends specific of the ICT industry on the Italian and international markets, and officials from the Lombardy Regional Board, in charge of shaping policies for R&D, have also been interviewed. These additional interviews added a wealth of information on the extent of the market itself, its likely future trends and its inner mechanisms of price formation and technology adoption.

Key findings:

- Basic, GPT knowledge needed to innovate is mostly originated outside the region;
- ICTS firms in Lombardy mainly produce incremental innovations;
- Competitiveness stems mainly from a very short time-to-market and a good knowledge of the local market needs.

B.3. Types of knowledge and expertise required for local innovation

The knowledge required by the firms being interviewed is mainly of a technical and scientific type, mostly originating in the US (baseline software codes; technical platforms). The business model of these firms is to actively search for the knowledge base where it originates, by energetically exploiting entrepreneurial skills in identifying potential new market niches, and un- (or under-) exploited general purpose technologies (henceforth, GPT). Such knowledge, at least until the end of 1980s-early 1990s, in particular with Olivetti, was once available within the boundaries of Italian companies, but short-sighted industrial policies and a relative slowdown in ICT-based R&D activities around the second half of the 1980s decade pushed Italian ICT companies to accumulate a gap towards US competitors, which hasn't been filled ever since. Today, the companies being surveyed for this report that bridging the knowledge gap with large US multinationals uphill the ICT innovation pattern would probably be beyond reach.

This finding configures an interesting story for this industry in Lombardy. Qualitative evidence on the present case study suggests that critical factors hampering the effectiveness and competitiveness of the ICT producing companies in Lombardy in the 1980s include an insufficient attention to, or not fully successful, R&D activity,¹² which caused a technological gap in US ICT manufacturing;¹³ and a myopic industrial policy, which dropped a major source of public demand for Olivetti Personal Computers by excluding Olivetti from public offers determined, along with firm-specific policies, the progressive decline of the PC branch of the company.

The expertise at the basis of the ICT-related firms surveyed in this case study is based on web-surfing abilities and mutual cross-fertilization for catching up with new ideas, trends, market needs etc. the creative workforce of most of these firms is continuously engaged in online discussions forums, web searches aiming at identifying new technologies, social networks, possible applications for new or emerging technologies (e.g. the internet of things), and apply it to its current, or possible future, portfolio of customers. This implies a very fast job turnover and hiring policies targeting a young and innovative workforce.

The qualitative findings described in the present report configure an innovation pattern based on the crucial relevance of knowledge acquisition. The region-industry thrives on its capability to actively – and creatively – look for external sources of knowledge, which represent the basis for incremental innovations. The sources of such knowledge (see Section 4 below) are mainly located in the US (and marginally, in Germany); however, this has not always been the case.

¹² At the height of its commercial success, Olivetti devoted less than half of the (percentage) resources devoted to R&D activity invested by its main competitor, the US MNC IBM. Besides, an insufficient penetration of the US market, given the failure of the alliance with AT&T; a limited attention to software; and the scientifically-sound, but commercially unsuccessful, research carried out at AT&T's Bell Labs, which were the main source for new knowledge for Olivetti, ultimately drove Olivetti out of the PC market.

¹³ Indeed Olivetti had managed for a while to face-to-face compete with the US ICT giants. In 1984 its personal computer M24 sold its 1,000,000th copy, making Olivetti the European leader in PC manufacturing. In 1988, its personal computer sales made Olivetti the second largest PC manufacturing company worldwide after IBM. For additional information (in Italian) on the economic history of Olivetti, see Di Toro (2010).

In fact, in the 1980s this industry owned a relevant stock of GPTs, with a fabric of large ICTs firms and R&D labs, reaching therefore the critical mass needed to produce new knowledge in the field. A likely passage from an endogenous pattern of innovation (pattern 1) to a an adoptive innovation pattern (pattern 2) in the KIT theoretical framework is therefore suggested by these qualitative findings. This result is particularly striking: whereas Lombardy worsened its situation over the years, in the case of the automotive industry in the Bratislava region, where hints of a passage from an imitative territorial innovation pattern (pattern 3) to a knowledge acquisition pattern emerge.

Key findings:

- The type of knowledge required is of technical and scientific type, mostly originating in the US;
- Knowledge acquisition leads to local incremental innovation, with expertise in active and creative search of under-exploited new technologies suitable for local market needs.

B.4. Channels for knowledge and innovation acquisition

According to the conceptual framework developed within the KIT project, channels for knowledge acquisition have been classified as follows:

1. Internal channels: channels of knowledge acquisition internal to the firm/company/organization;
2. Local channels: channels of knowledge acquisition external to the firm/company/organization, but internal to the region being analyzed;
3. External channels: channels of knowledge acquisition external to the firm/company/organization, and external to the region being analyzed.

The following paragraphs are organized accordingly.

B.4.1. Local channels

Local channels are not enormously relevant in the present case study. In some of the surveyed firms, innovations come from within (e.g.: one of the companies promotes yearly an internal competition for new products viable to be produced and marketed; the winner is then subject to positive publicity as the contest winner, and gets company funds to run her business idea).

In addition, most entertain good relations with technical universities. Oftentimes, although mostly in the past, joint research projects had been set up with local universities and/or the European Union. However, a relative slowdown in this process is probably due to a perceived (by the firms) gap between the ivory tower replete with scientific, theoretical knowledge, typical of the academic world, with the hyper-applied, concrete technologies-seeking and profit-oriented companies.

Finally, a good share of new products comes from interacting with local customers, in a typically demand-driven approach. All companies, not only those being originally founded in Lombardy, but also those being born in other areas of the North-Western part of Italy and relocating to the Milan area for reasons of market access, claim that one of the most important reasons for being located in or around Milan encompass a market potential effect. Consistent demand for ICT products and services feeds the everyday business of these companies; and such stable demand in turn prompts the emergence of solutions which eventually foster the generation of innovative products.

A particular mention is due to organization A, which came to technology-intensive ICTs through a lengthy but steady pattern of technological change, from business management and quality software to the current wide range of products, covering the four business lines of HR software solutions, security, business software solutions, and automation. In this case, local channels include a close relationship not only with local technical universities, but also with the technical high school located in the head company town's headquarters. Traditionally, this school provided (and still does) the bulk of undergraduate recruits for Organization A. According to the officials interviewed, however, this mutually beneficial relation with technical high schools could be improved

by fostering the emergence of more technically-oriented curricula, capable of forming recruits ready to work and with a better attitude towards practical problem solving.

B.4.2. External channels

External channels are definitely relevant for these companies: the bulk of technical knowledge needed to innovate comes from North America. Because of the consistent competitive advantage acquired by the ICT giants in Silicon valley, most of the scientific and technical base needed to innovate, as well as the technical platforms adopted, are originated in the Californian cluster described in Saxenian (1994). Officials and people responsible for the companies' strategy are used to attend ICT fairs both in the US as well as in Europe in active search for potential applications of new knowledge being currently produced. Two of the interviewed companies also take active role in contributing to the downhill development of baseline software codes, technological platforms etc. originally generated by the likes of Apple, Oracle, Intel, and Microsoft.

Three companies, finally, mentioned Germany as an interesting, although marginal, source of external baseline knowledge because of the presence of SAP developers.

Overall, the inherent characteristics of the market for ICTs make the development of territorial diffusion processes over time rather hectic, and increasingly so. It suffices to say that a business which has been booming in the 1980s in Italy, viz. that of private televisions, is under severe stress because of the increased competition from alternative content and entertainment providers, communicating via the web.¹⁴

The present case study portrays Lombardy at a point in time, moving from a pattern "1" to a pattern "2" of innovation, with the GPT needed to innovate being originated from outside. While this passage may be in principle reversed, interviewees agreed that going back to a pattern "1" situation may be extremely costly and lengthy. A dependence on outside knowledge to innovate, also according to the organizations reviewed for this report, indeed decreases the average rate of profit for firms operating in this industry.

- Local sources of knowledge are relatively negligibly important;
- Knowledge acquisition from the US is crucial to the companies' survival, with the exception of one organization (organization A);
- Skills and knowledge in new technologies are brought inside the industry-region by buyouts of preexisting companies, managed by external and specialized managers.

B.5. Local conditions to acquire external knowledge and innovation

The source of inspiration for new products is mostly *not* local: it mainly stems from internet-based technologies developed outside the region, country and most often the EU. The continuous buzz on the internet definitely shapes the perception of market needs and potentials for research affiliates within the interviewed companies. Continuously online, these firms actively look for market opportunities inevitably destined to close in the short-run. As such, the continuous search for an edge in terms of time-to-market is a crucial condition to acquire external knowledge useful to innovate.

New knowledge from local sources comes not within the firm's boundaries through the labour market, but more through the acquisition of other firms. This is particularly relevant for organizations E and F, which rapidly and steadily grew in terms both of stock market value, as well as of knowledge base, with the acquisitions of external companies owning the type of knowledge needed to enter specific niches of the market. Organization F, in particular, maximizes this strategy by hiring external CEOs specific for the companies being acquired and with an expertise in the technological field in which

¹⁴ This technological shift has been duly reflected in stock values. Since Sep 4, 2006, through Sep 5, 2011, Mediaset S.p.A. the largest private television company in Italy and one of the largest in Europe, lost about 75% of its total market value on the Italian Stock Exchange. Market prices retrieved on Yahoo Finance (<http://it.finance.yahoo.com/echarts?s=MS.MI#symbol=ms.mi;range=5y;compare=;indicator=volume;charttype=area;crosshair=on;ohlcvvalues=0;logscale=off;source=>) on Sep. 6, 2011.

the bought-out company is specialized. This grants the head company control of the subsidiary, without losing the competitive edge typical of hyper-specialized technology-intensive SMEs.

Finally, few local social connections characterize most of the interviewed firms: qualitative results indicate that the ICT system in Lombardy does not constitute a *system*, given the relatively weak linkages among local firms and between firms and local universities or local institutions in general. On the policy side,¹⁵ the companies find little support from public authorities in terms of demand and regulation. Market-wise, it seems that Italian companies enjoy a relative gap in the speed and pervasiveness of ICT deployment.

In particular, only medium-to-large companies grasp the potential productivity-enhancing benefits stemming from adopting ICTs in everyday life. Because the Italian industrial fabric is oriented towards SMEs, this provides a major hurdle for the companies interviewed. In other words, these firms tend to sell products to large companies, being already customers and aware of the potential income-stimulating effects of ICT adoption, while they find it extremely difficult to enlarge their customer portfolio in the left tail of the firm size distribution.

In this respect, the relatively less disadvantaged situation of the Lombardy industrial fabric (see Section 1 for further details) provides a further incentive for Italian ICT companies to co-locate in the region. A strategy for international market diversification could probably reduce this gap, while at the same time requiring consistent investments for the companies, in order to grow beyond current dimensions.

Key findings:

- The source of inspiration for new products is mostly *not* local: it mainly stems from internet-based technologies developed outside the region, country and most often the EU;
- New knowledge from local sources comes within the firm's boundaries mainly through the acquisition of other firms;
- The ICT system in Lombardy does not constitute a *system*, since there are very weak linkages among firms, with local universities and local institutions.

B.6. Knowledge and innovation acquisition policy assessment

The quality of governance has in general been poorly evaluated by most interviewed actors. Few or no incentives, both economic as well as regulatory, have been set up in the region and in the Country as a whole. This gap includes also the missing reception of the EU Digital Agenda by the Country, meant to lay down a bridge on the digital divide affecting Italian regions with respect to top performers. Lombardy, although being by far the most advanced Italian region in terms of ICT adoption, still lags behind several EU27 regions in terms of ICT deployment. On average, in the four years 2006-2009, only 33% of Lombardy households owned a broadband internet connection, compared, among others, with the 84% to be found in Stockholm, the 79% recorded in the Danish capital region, and the 73% of Zuid-Holland, the Dutch region where Amsterdam, Den Haag and Utrecht are located.

The two biggest shortcomings from the policy side have been quite clearly underlined by the interviewees: the market is in general mostly non-receptive to new technologies, and the Public Administration does not act towards stimulating ICT deployment and consumption. On the first side, a general flaw of the Italian manufacturing fabric (see Section B.1) is the on average small size of the firms, of which Lombardy is not fully exempt. While in terms of performance this may not be detrimental even in the long run (see for instance figures in Sanderson, 2011), it is certainly matched by a relatively insufficient rate of adoption of information technologies. Most interviewees complain

¹⁵ See Section B.6 below for further details.

about the insufficient perception of the potential productivity enhances associated with ICT adoption.¹⁶

In larger companies, instead, people responsible for decisions about production strategies trust ICT companies to add a wide array of solutions to enhance the productivity of individual workers. One organization, for instance, tells of an innovative software developed by a large Italian defense MNC to be run on Apple's iPad and used for multimedia quality checks on different production lines, which has been emerging from the interaction between the needs of the customer and the problem solving skill of the company official.

From the policy side, instead, along with a reluctant adoption of the EU's digital agenda (with local projects being currently discussed in Milan and the Lombardy Regional Board about the adoption of *local* digital Agenda), recent attempts have been made to engineer schemes for ICT-related R&D projects. The regional board, in particular, put in practice two projects:

1. **Regional innovation vouchers:** in 2005, the Lombardy regional board set up schemes allowing expenses for different typologies of services, with differentiated amounts of funding and co-financing, in particular:
 - a. A technical feasibility voucher aiming at enhancing technical aspects of an innovation (5,000€, with a 25% co-financing from the companies involved being requested);
 - b. A patenting voucher geared towards protecting innovations developed by SMEs (7,000€ each, covering 100% of the expenditure).

Vouchers were given to all SMEs that applied, provided they presented a sound project proposal. Such vouchers could be spent in research centres, universities and public or private Knowledge-Intensive Business Services (KIBS). Patenting vouchers were the more requested ones, covering 57% of total applications.

2. **Meta-districts:** A second interesting project engineered by the Regional Board involves the definition of five "Meta-Districts" – i.e., areas of specialization for Lombardy companies, with ICTs being used as the fabric linking such companies, although spatially dispersed across the region, and therefore allowing the emergence of a cluster-like typology of production in the absence of real spatial proximity (and with the aim to stimulate the emergence of *social* and *cultural* proximity). The five Meta-Districts involve companies focusing on three industries in which the region has been traditionally specialized, namely fashion, design, and ICTs, as well as in two emerging industries (biotech and new materials). By means of this project, the Regional Board aims at:

- a. Fostering the aggregation among regional SMEs;
- b. Enhancing collaborations among companies and the R&D system;
- c. Increasing collaborative attitudes and knowledge exchange among firms;
- d. Promoting cross-fertilization across industries.

While the effectiveness of both these measures is probably hampered by the small sums being distributed, they do point towards a concrete attention to the issues associated with innovative activities in SMEs.¹⁷

These measures would, however, need a more careful evaluation of their scope and final goal. In fact, such measures are based on the *a priori* that cooperative behavior fosters knowledge exchange, which would ultimately increase innovation rates. In this case, they would be best targeting a reverse passage for the industry-region, from a pattern "2" to a pattern "1" of innovation. However, since the current nature of the business in

¹⁶ The literature finds instead consistent productivity increases associated with ICT adoption; for a review of this strand, see Jorgenson et al. (2008).

¹⁷ Empirical results on the real effectiveness of these measures have not yet been disclosed. Interviewed regional officials, however, claim that preliminary analyses point towards a relative impact on the capability of SMEs to cooperate with the aim to innovate.

Lombardy's ICT industry is based on a pattern "2", with basic GPT knowledge being mostly originated from outside, such policies may well act against their official goal and freeze the situation in its current state.

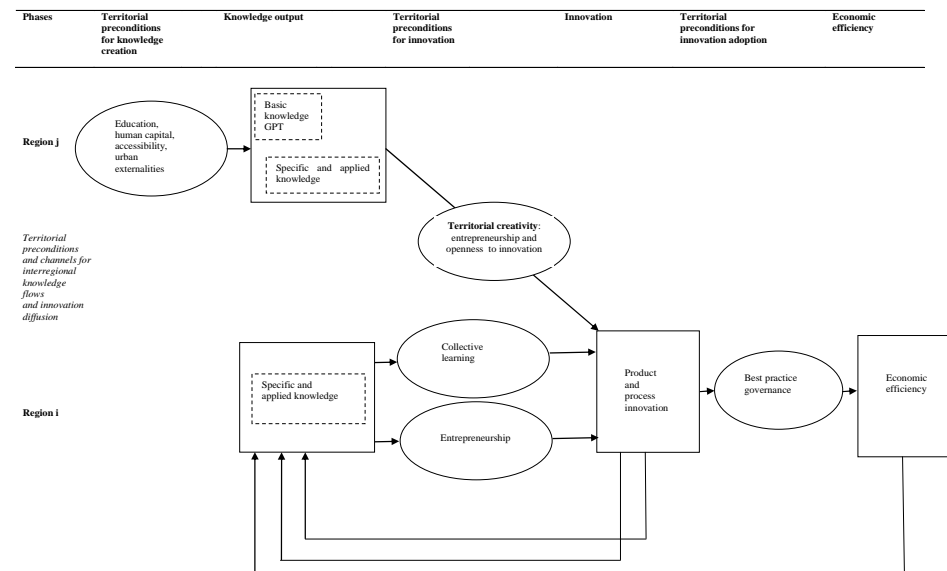
Key findings:

- The Italian market is in general mostly non-receptive to new technologies;
- The Public Administration does not act towards stimulating ICT deployment and consumption;
- Recent attempts by the Regional Board to provide incentives to R&D cooperation have been made, with insufficient evidence on their effectiveness and their long-run effects.

B.7. Conclusions

The results of interviewing different types of actors belonging to the ICT production system in Lombardy allow the identification of a typology "2" of innovation pattern in the KIT jargon, viz. a pattern in which knowledge for co-invention is absorbed from outside and employed in order to innovate. In particular, this pattern differentiates from the findings of the knowledge adoption case study on the Arezzo province, in that the knowledge base uphill the innovative activity in the ICT industry in Lombardy seems to be simply insufficient and needs to be imported from outside the region (and in particular from large US MNCs). This configures a sub-typology of pattern 2, Smart technological application, as described in Chapter 2, volume 1 of the Scietific report, whereas firms look pro-actively for possible sources of knowledge to co-invent and additionally increase the technological value added of the final good. This pattern is shown in Figure B.2.

Figure B.2. A creative application pattern.



Source: KIT Draft final report

In the absence – or insufficient endowment – of the scientific and technical knowledge needed to innovate, qualitative findings of this case study point towards proving the theoretical a priori described in the KIT Interim Report. In fact, creativity, entrepreneurship, and openness to innovation grant local ICT companies the competitive edge allowing their existence on the market. Actively looking for possibly under-exploited stocks – or bits – of knowledge on external markets is a crucial step for such companies and what ultimately allows their innovative activity. One organization actually claimed their *raison d’être* lies in their capability to “ground-discharge” the innovative potential associated to new knowledge and not fully exploited by the originating company. This in part reconnects with the literature on the knowledge spillover (filter) theory of entrepreneurship by Acs, Audretsch and co-authors.¹⁸

One additional insight from this case study provides preliminary evidence on the conditions to shift across patterns of innovation over time. In fact, previous evidence suggested the ICT industry in North-Western Italy could be portrayed more as knowledge creator pattern of innovation, with networks (see also the case study on the electronics and optics sector in Tuscany), at least until the late 1980s-early 1990s. However, myopic industrial policies, insufficient attention to R&D (with the consequent ageing of the knowledge stock accumulated in the region), and positive technological shocks affecting external competitors probably squandered the wealth of knowledge accumulated in the region, probably causing a shift towards a situation of external knowledge acquisition, creatively used to innovate at the local level.¹⁹

Threats from a changing technological paradigm are also lingering ahead of the surveyed companies. This has been pointed out not only from the research centre analyzing the market for ICTs, but also from ICT-producing companies. Most recognize that such technological change already (and negatively) affected traditional ICT-producing MNCs: recent figures, for instance, demonstrate the huge shift of consumer trends from traditional personal computers to tablets. Consequently, companies with the scientific and technical base needed for producing quality PCs or laptops may soon be out of the market if not capable of catching up with the (partially different) skills needed to produce tablets on the technological frontier. Also, the mode of software production is rapidly changing. A different philosophy, based on open innovation, induces faster and faster incremental innovations on software codes, routines etc., while at the same time subtracting the full intellectual property (source of profits in a traditional industrial view) from firms. Coping with these challenges will with all likelihood change the picture of this industry, not only at the local level, within the next 5 to 10 years; and this massive restructuring will also have consistent spatial impacts, affecting the distribution of intellectual and job resources among European regions.

Key findings:

- Creativity and active entrepreneurship grants ICTs industry in Lombardy competitiveness;
- Innovation is mainly of incremental nature, with GPT originating in the US;
- A shift in time from a region where in this sector an internal knowledge creation pattern of innovation is developed at least until the late 1980s-early 1990s to a region where knowledge is externally acquired and creatively used to innovate at the local level at the beginning of the 1990s;
- Causes of the change in the territorial pattern of innovation in Lombardy are myopic industrial policies, insufficient attention to R&D by local firms and policy makers (with the consequent ageing of the knowledge stock accumulated in the region), and positive technological shocks affecting external competitors.
- Recent policy attempts to reverse this trend would need further analysis in terms of effectiveness.

¹⁸ See for instance Audretsch and Lehmann (2005).

¹⁹ Whether this is good or bad will be analyzed in WP 2.3.2 in the KIT project.

B.7. References

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C. The automotive industry in the Bratislava Region ²⁰

C.1. Sector and firms profile and innovative activity

C.1.1. The automotive sector in western Slovakia

The automotive industry is the largest private investor in R&D in the EU. According to the Scoreboard, the categories 'automobiles and parts' and 'commercial vehicles and trucks,' produced an annual investment of €32.8 billion in 2008. The actual number is even higher, as this category does not include all automotive supplying sectors. The many patents registered by the industry underline the sectors' innovative stance as well. In 2008, almost 6,300 patents were registered by the European automotive industry (iri.jrc.ec.europa.eu/research/scoreboard_2009.htm).

Slovakia has become one of the leading car producers in Central Europe, mainly owing to the presence of three world-class automotive companies: Volkswagen Slovakia, Bratislava, PSA Peugeot Citroën Slovakia, and Trnava and Kia Motors Slovakia, Žilina. Slovakia's development into one of the world's most important automotive hubs began in the early 1990s, when Volkswagen decided to establish a factory for car production near Bratislava. Since then, Volkswagen has become the country's largest industrial concern and its leading exporter (accounting for about 19% of total export revenues in 2004). In May 2007, the company passed an important milestone in the number of Volkswagen cars produced. Since the start of production, it has produced more than 2 million cars in Slovakia (www.sario.sk). Volkswagen's entry into the Slovak market has also attracted other companies and, as well as, contributed to immense growth in the car components industry. This has increased the value of its output from 621.4 million euro in 1998 to 9008.8 million in 2009 (statistical Office of the Slovak Republic), with a peak of 13.682 million euro in 2008. Exports from Slovakia's automotive industry reached 17.8 billion euro in 2008 (35.79% of all Slovak exports). These figures decreased during the economic crisis of 2009 and 2010, but still remains the most important export sector.

One advantage of the Slovak automotive industry is that it is well diversified consisting of three different types of car producers and three different groups of car sub-suppliers, all of which are successfully interconnected. While Volkswagen assembles top-end cars, PSA Peugeot-Citroën produces middle-class cars and Kia Motors lower-class models. Moreover, car component producers (with the exception of those short-notice producers located in parks next to the car plants) often supply their products to several carmakers abroad as well as sell to other industries.

Automotive part production plants have increased the value of their production more than tenfold within the last decade. In 2008, the supply of components exceeded 6 billion euro, which is more than the amount of turnover of all three car production plants combined.

Table C.1. Top companies in Bratislava and surrounding region in automotive

Name	Revenues in th. EURO	Number of workers	FDI presence	Comp. position in Slovakia
Volkswagen Slovakia	5,373,929	8,719	yes	1
PSA Slovakia	1,641,147	3,408	yes	3
Johnson Controls	481,365	1,648	yes	5
SAS Automotive	284,520	n/a	yes	7
INA Skalica	282,981	3,330	yes	8
Sachs Trnava	138,921	1,407	yes	11

Source: TREND analyses

Foreign capital has a dominant position in the entire sector, not only in final production phase (PSA, KIA and VW), but also in the sector of their sub-suppliers. The amount of domestic businesses is very low. In many sub-suppliers' businesses, production for other sectors also takes place. Therefore no exact figures are available. However, about up-to

²⁰ This case study report has been written by Miroslav Šipikal, University of Economics in Bratislava.

90 - 95% of the sector consists of firms with foreign capital interest. Joining the sub-suppliers' value chains in the sector is extremely problematic for domestic businesses. Therefore, all key decisions are executed out of the region in the head offices of the parent company. The sector is highly concentrated in the Bratislava region and surrounding regions, in which approximately 50% of all employees work and 60% of production in sector in Slovakia originates.

C.1.2. Individual innovation profiles of firms

The whole study is based on personal interviews with firms and supporting institutions in the region, which are mentioned below. Apart from these interviews, the sources of the study came from telephone calls, research from available literature, companies' websites (particularly from their annual reports) in the sector and official statistical sources. One part of the results was obtained from the knowledge acquired from publicly supported research projects in firms. Interviews were executed by means of a standardized questionnaire consisting of 34 questions. The following provides short profiles of the firms and institutions which were that took part in these interviews.

Company A – a subsidiary company of a multinational corporation. It is aimed at the production of clutches and torque converters. It employs 1,200 workers, has achieved sales of 110 million euro and is ranked among the top 10 firms in the sector. The entirety of the research is concentrated centrally in the parent company; despite that many innovations are created here, particularly regarding process innovations. There exists the system of innovatory movement which is specialized on incremental process innovations. The firm does not co-operate with the surrounding environment a great deal, usually only when the qualified labour force is being prepared. The research is done in the head office and where a scheme is provided on how the production subsidiaries must financially contribute to this research.

Company B – an organisation aimed at applied development within the frame of the automotive and engineering industry. It produces one to two industrial models per year and once every several years, it is submitted to the European Patent Office. The total sales of the company are 20 million euro. It employs approximately 350 employees and the share of export is 81%. Within the firm, a large part of the innovations is carried out as an order – a client approaches with a defined problem that needs to be solved. The firm executes its own research as well. It focuses on an internal selection system, which is based on sector trends exploration and the knowledge of internal workers. This development is then commercialised in various stages. In the automotive industry, the company is more familiarised with the cooperation of domestic suppliers.

Company C – a subsidiary company of a multinational corporation with a central office in U.S.A. It is an integrated global manufacturer of engineered structural metal components and assemblies. The firm has 650 employees. There is no specific information on expenditures on research available in the firm except for the fact that these activities are not classified (this concerns several firms which were subject to this case study). Product innovations are handled centrally in Germany, where some experts of the technological centre participate actively in these innovations. Concurrently, the head office intensively communicates with car production plants (clients) in particular, whereas other external firms are used less. The cooperation of the firm with the local environment is limited. Domestic suppliers represent a very small portion. More than 85% of the production heads to Volkswagen Slovakia. Important sources of innovations are also clients who are, however, from outside the Bratislava region. Customer centres which are also allocated in various regions are responsible for contact with clients. For example, the centre for Suzuki, which has factories in Hungary, resides in the Bratislava region. On the contrary, the customer centre for Volkswagen, which supplies the largest amount of production, resides in Germany.

Company D - the final producer of the automotive industry in Slovakia. It employs more than 9,000 employees and annual earnings present 5.1 billion euro in 2008, making it the largest automotive industry company in Slovakia. The share of export reaches 99.4 %.

The headquarters in Germany recently decided to invest 300 million euro in Bratislava, which is where it will produce new models. Its first car will roll out of the factory in 2011. Overall, production at the facility will increase to 400,000 cars a year.

Production innovations are handled by the head office. Any ideas related to innovations arising in Slovakia are automatically shifted to the head office. The firm has departments in Slovakia which are focused on process innovations. It mainly uses the programme "ideas management" in the frame of which the innovative activities of the employees, who implement innovation functions. These activities represent a savings of approximately 10 million euro per year. More than 6,000 small process innovations are implemented into this system per year. Innovative improvements belong to strategic targets of the factory. Comparisons with other concern's factories also exist.

They very rarely cooperate with external subjects, but most frequently with private knowledge-based services, so-called "workshops", which are managed meetings for the purpose of production process improvement. It could also be called „generator of potential innovations". They co-operate with the public sector principally when improving labour force quality.

Company F - a subsidiary company of multinational concern which has reached sales of 60 million euro and has 650 employees. The majority of production goes to export. The supplies for VW firm in Bratislava is the primary reason for allocation to this area, although, these supplies have been later expanded to other car factories and plants abroad. All research is primarily managed by the company head office, even though, progressively more and more competences are also ceded directly to the factory in Slovakia. This is due to progressive labour force improvement as well as knowledge acquisition directly from production. This shift may be observed more visibly especially after production cancellation in the company head office. The development of new products appeared without the possibility of examining some of the items in the production process, which the plant began to execute. In the last year, this plant has also introduced its own innovations with patent protection what before the domain of parent company had been. The firm also uses the system of innovatory movement for moderate improvement of the production processes.

Company G - a domestic sub-supplier for the automotive industry that employs 300 employees. Innovations are not handled in any special department, but by individual division management employees. Basic stimuli for innovation come mainly from clients. Regarding the institutions in the region, it co-operates mainly with secondary schools. Outside the region, the clients are of great importance. Technology producers and fairs belong to other knowledge sources. Innovations focus primarily on the improvement of production processes and production efficiency. The firm has used several supporting programmes focusing on purchase of technologies, which is a distinct contribution, without which it would have had problems with competitiveness.

Company H - a domestic sub-supplier for the automotive industry that is considered among the largest businesses with domestic capital in the sector with a few subsidiaries. One subsidiary interviewed employs 270 people and exports 70% of production. This company is preparing to launch the competence centre, in which the focus would be research in the field of automation processes and new materials for use in the automotive industry, where it also plans to co-operate with universities. Until now, the firm has been implementing innovations on the basis of management decisions, even though individuals have been dealing with, though not exclusively, innovations. Presently, allocation of employees to the centre has taken place. They will be responsible exclusively for innovations development. The firm's main sources of

knowledge are clients and experience gained from participation in international fairs, but the employees to a lesser extent.

Company J - a research and development organisation focused on the engineering industry. It has 25 employees. It was founded as spin-off with the University of Žilina. It is concerned mainly with integrated systems for improvement of production processes. It cooperates with several well-settled firms in the automotive industry, mostly foreign firms. The university plays very important role overall - by cooperating on research projects, as well as, on the training of the labour force. The company uses several supporting programmes that focus on the development of new products. It produces one patent at the international level per year. It also carries out research and development to the specifications of the client.

c.1.3. Supporting institutions

Automotive cluster, Western Slovakia - a supporting association aimed at the development of the cooperation of firms in the automotive industry. Its main objective is cooperation in the support and education activities of the firms. It has also joined many international projects directed at the development of companies' cooperation in research and strategic activities with aim to vitalize the sector's position in Central Europe. It also took part in the foundation of the laboratory for research of product processes and their efficiency.

Slovak Technical University in Bratislava - the most significant technical university in Slovakia. More than 15,000 students study here, out of them approximately 3,000 in the fields of study related to the automotive industry. It provides several specialized workplaces dealing with the automotive industry. It also conducts several national and international research projects financially supported by the EU; for example, the establishment of the excellence centre for development and application of diagnostic methods of the processing of metallic and non-metallic materials, the establishment of the laboratory of flexible production systems with robotized service for the environment of production with no drawings.

Slovak Innovation and Energetic Agency - a state innovative agency aimed at innovation support through clusters support. It also manages aid from structural funds aimed at innovation transfer and the support of research and development directly in businesses. For the last 3 years, it has supported 30 projects focused on the transfer of innovation and research in businesses at the cost of approximately 100 million euro.

Slovak Academy of Sciences, Institute of Materials and Machine Mechanics - a research institute dealing with new materials, registering several patents that can be used also in the automotive industry. The institute has several international research projects within the 7-frame programme of the EU, as well as, several research agreements with firms in the sector of the automotive industry. It is more about cooperation with the head offices of these firms abroad than cooperation with their subsidiaries in Slovakia.

Company K - a private commercial knowledge-based intensive services company, which employs approximately 20 people. It focuses mainly on consulting and education in the field of innovation implementation, innovation management support and the enhancement of the efficiency of production processes. One of its founders is a significant German research institute, with which it intensively cooperates. Concurrently, the firm is also linked with local university.

Key findings:

- The automotive sector is growing very rapidly - Its value in output is from 621 million euro in 1998 to 9.000 million euro in 2009;
- Up to 90% of the sector consists of firms with foreign capital;
- More and more companies have started to build innovation or technical centres.

C.2. Types of knowledge and expertise required for local innovation

The automotive industry sector is one of the pillar sectors in the region of Western Slovakia. Despite the economic crisis, it is the most efficient sector in Slovakia. The automotive industry is the sector most invested in, in the European Union. However, research is markedly concentrated in the head offices of the final automotive producers. Therefore, the proportions of investments in research in the Slovak Republic and the Bratislava region are negligible. Firms in the sector consider the term "innovation" in a broader sense than just research. Innovations are understood as a continuous renewal of products and processes that leads to economic success. From the point of the region, we may observe constant implementation of innovations, which are primarily not the result in regional research.

From this point of view, process innovations have dominant position and mostly internal information from the production process is used. The very employees of the company or specialized technical departments are the crucial bearers. Tacit knowledge from direct experience of production process is plays a key role by innovations. Firms, apart from a few exceptions, do not possess their own research or development departments. Throughout the course of time, we have seen the shift towards more institutionalisation of innovation processes in firms. All of them have a carefully worked-out system of production improvement and innovation implementation. Acquisition of knowledge directly from production process is representative of all firms, the key source of knowledge, mainly for process innovations. However, they differ in the perception of system meaning. More simply stated, it may be said that the more multinational the firm is, the more worked-out system it has, the more linked to strategic intention and business management. Foreign multinational firms have slightly better worked-out systems of gaining knowledge; principally from the point of view of the broader usage of motivation tools and complex measuring of achieved improvements and innovations due to this knowledge. Referring to the nature and goals of these factories, process innovations are especially most demanded by management, who realises their responsibility to the efficient production of allocated products. Therefore, the cooperation to acquire knowledge for this from external sources (companies or public sector institutions) of innovations concentrates mainly on process innovations. Although, through this cooperation, the development of product innovations of external firms is supported indirectly. A concrete example is the creation of software for better process management. For the car factory, this represents a process innovation, but from the viewpoint of the supplying firm, it is a product innovation.

To a very small extent, scientific knowledge is used, as well, and it is published as ground or applied research. The automotive industry is highly competitive and according to firms, the publication of some innovation already means rather the displaying of knowledge which is not new any more. If a firm is informed of anything from scientific papers, it means that someone is ahead of them and is ultimately, not acceptable. In addition, all the know-how that exists for specific innovation is not usually published. Such innovations would mean only catching up with the existing situation and this is not sustainable for the survival of the firm in this highly competitive sector.

Clients as a source of knowledge and innovations represent an important source of information. There are mostly production factories located in the region, which are not in direct contact with clients. This information, even if it can come from the region, is collected and evaluated either in the head office or within the "customer centres", which are located around Europe; analogous to assembly factories. Here, customers are rather a source for product innovations. In the sector, very close connections exist within the direct value chain of production.

Companies also need technical knowledge. The decision making on technological innovations is in hands of the head offices of factories that are outside of the region. Due to the distinctive dominant position of multinational firms in the sector, the technological equipment of factories reaches world parameters. The domestic labour force works with

the most modern technologies available, which allows for consequently better inventing of several process innovations.

The research departments of firms also represent a distinctive source of knowledge, but are of little occurrence in the region. Patents are rather a product of department operation than a source of inspiration for new innovations. Patents implemented by other companies are carefully monitored, though, and evaluated from the point of view of contribution for its own innovations.

Key findings:

- Companies need knowledge mostly from production processes;
- They do not use scientific knowledge (product innovation comes from parent companies)
- Research and development departments of the parent companies are the main source of product innovation;
- Due to the orientation of process innovation, patents are rarely used.

C.3. Channels for knowledge and innovation acquisition

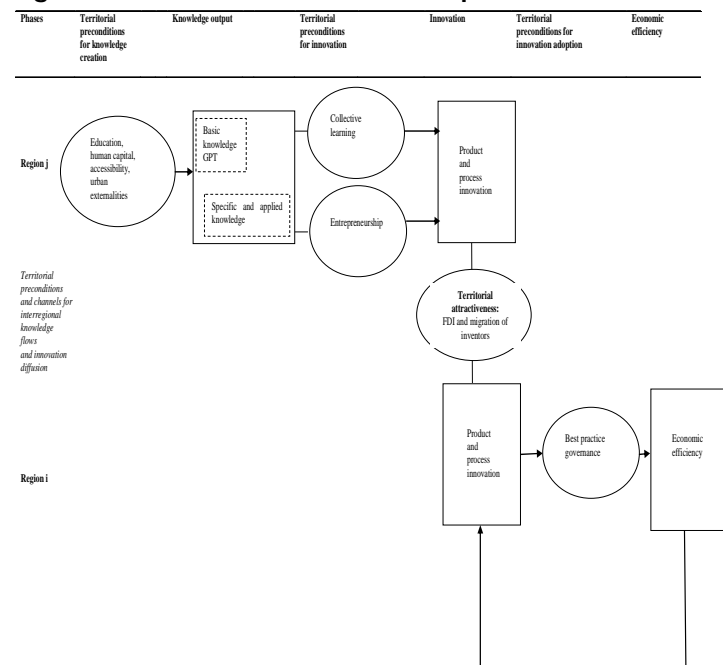
The system of innovation implementation is expressively marked by a high portion of FDI (foreign direct investments) in the sector. All key product knowledge and innovations, as well as decisions about their application are, therefore, executed outside of the Bratislava region. Parent firms make decisions on product series, as well as on essential processes or marketing innovations. In many companies, even basic technological settings are executed by the foreign workers of parent head offices. Regarding research, parent companies cooperate with institutions in their countries. They rarely use the institutions in the Bratislava region.

Subsequently, these innovations are shifted to subsidiaries in the region and their role entails the execution of these innovations with the most efficient production. However, it is necessary to mention that these channels for knowledge acquisition are mutual within multinational firms. There are more than 200 factories situated in Western Slovakia that every day acquire valuable knowledge from production process and furthermore, represent an important foundation for future processes and product innovations. As in the case of firms, here it could also be denoted as a certain specialization of the regions. Though the regions with head offices of these firms (mainly the developed regions in Germany concerning firms in the Bratislava region) are concentrated on product innovations and strong research, the Bratislava region is focused on the detailed command of product processes. This, consequently, leads the research to focus in this direction. In the automotive industry, not only production but also research firms in this region are, therefore, centred on tools, devices and software which have a direct relation to the possibility of efficiency or better logistics of production processes. They are also centred on product innovations concerning new materials regarding their production, i.e. to find out new materials from which the existing products would be produced easily, economically, more quickly or with lesser waste.

Usually, this is the reason why only a very small amount of registered patents exists there in the region, despite of relatively powerful innovation activity. It is not very useful for firms to deal with patent protection of process innovations, because many of them are closely interconnected with existing production devices or products, therefore the patent protection is to some extent useless. Likewise, they do not plan to trade or sell these work-outs to other companies, which would represent diversion from their present role. The added value of patents is so minimal that, on the contrary, there is the risk that in the case its release, the competition will become inspired by that patent. Firms sense that the enforcement of patent protection out of the EU zone is, also, very low. Lower patent rate is also influenced by the fact that a larger part of innovations results from the use of tacit knowledge in production processes, which are hardly transferable into patent protection.

To better understand the system of innovations implementation in the region, it is necessary to also shed some light on the time dynamics of this process. As mentioned earlier, the automotive industry in the region has recorded very dynamic growth in a relatively short period. Approximately 15 years ago, firms in this sector did not exist, and the amount of executed innovations was almost exclusively, situated in the firm VW Bratislava, due to progressive production expansion. Innovations came into the region because of technologies and product changes through foreign direct investments. Special supporting institutions focused on the automotive industry did not exist in the region. Within the used classification, this sector could be marked as a creative imitative pattern of innovation (see Chapter 2, Volume 1 of the Scientific report for a detailed description), depicted in Figure C.1 below. However, some suitable conditions for sector development exist here, e.g. primarily cheap and highly-qualified labour force, which creates presumptions for further flow of FDI. The accession of Slovakia into the European Union represents a distinctive stimulus for sector development. For production plants this signifies the opening of the entire EU market with no import and customs limitations.

Figure C.1: An imitative innovation pattern



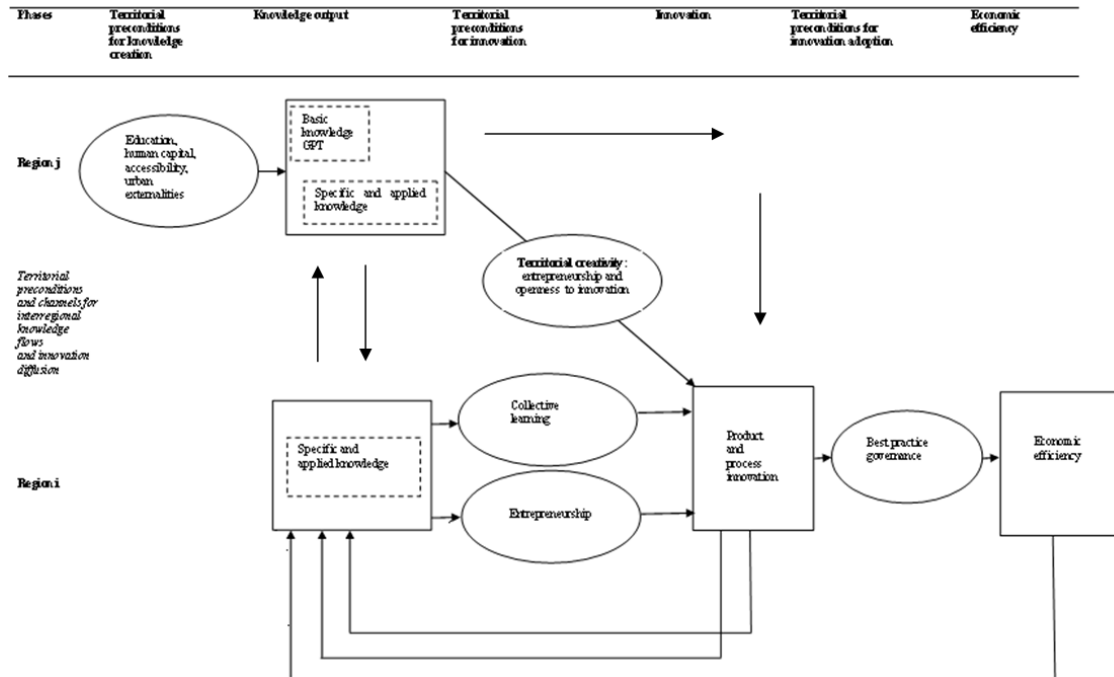
Source: KIT Draft final report

This situation was developed during the following years. As a result of the very convenient regional conditions, in which we can add the existence of qualified, relatively cheap as well as a productive labour force, a suitable business environment, distinctive investment stimuli and a good connection to the EU market, the volume of FDI in the sector markedly rose and thus, other channels of innovation implementation started to be mobilized in the region. It was caused mainly by five key factors:

1. The production in the region was cumulated in more than 200 companies in the sector, from where very important experience of labour force from the very production process arose. Due to the large amount of firms, there resulted a migration of labour force among companies and that led to the increase of their ability to contribute to changes in production process, which could then lead to savings and even to innovative solutions.

2. The strong position of the automotive sector in the economy started to lead to the activation of the public sector in education, also partially in research within this sector. Universities and schools started to cooperate more closely with firms and support the training of needed labour force. Special supporting institutions were founded, such as Autocluster or competence centres at universities focused on sector development support. Even though in the beginning, all innovations sprang from the head offices of companies, those companies within the region progressively started to be able to contribute to innovation processes in firms.
3. The next key factor is production reduction in parent countries. Due to convenient conditions, several firms started to shift production outside their head offices, where only research remained centred. However, the research needs experience from production process, as well as the devices used in production. Many solutions needed to be tested and simulated. Because of the shift of those devices from their parent country, firms were forced to transfer a part of their research activities to these production units. Such specialized units centred on the development of research and innovations in the Bratislava region started to arise. Simultaneously, persons from those units became members of research teams of multinational companies, therefore, their ability to create innovation solution has grown.
4. The fourth key factor is the progressive institutionalisation of innovation implementation. Distinct change for the shift from region towards the innovation formation did not only occur from the technological point of view. Regarding domestic firms, it represented the matter of the mental change of perception of innovations and their role in the process of undertaking's ability to be competitive. Due to undertaking's culture and emphasising on innovations, the view of the domestic labour force (as well as that of the domestic managers in businesses) on this field has changed. It transpired mainly into the progressive institutionalisation of innovation processes in businesses. Before, the role of innovations had been emphasised, nobody was responsible and no special units centred on research or innovations existed. Presently, the majority of businesses has distinctively formalized these processes. Institutionalisation is also indirectly connected with the implementation of various intra-firm standards and the acquisition of internationally recognized certificates (mainly certificates of quality in the automotive industry), which include the basic tools of constant ability of improving production processes, which were not habitually applied in businesses before.
5. The last key factor is the migration of labour force. A majority of the firms regularly sent employees from regional branches to head offices for training, world-wide training courses or allowed them to participate in new projects. That caused the increase of the ability of local labour force to understand the purpose and necessity of innovation as well as technological processes at new products development distinctively. A negative aspect of this change is that a part of this labour force then stays abroad permanently, but despite this, the part of the labour force that returns represents a distinctive contribution in innovation processes. Inter-regional migration probably plays a more important role in the process of shifting in the innovation pattern of the region than the migration within the region among individual firms.

Figure C.2: A creative application pattern



Source: KIT Draft final report, customized by the author

The result is an innovation scheme which could be marked as a creative application innovation pattern (Figure C.2; (see Chapter 2, Volume 1 of the Scientific report for a detailed description). Compared to the theoretical scheme, it is to be mentioned that the process of innovation and knowledge flow appears as bidirectional. While parent head offices supply valuable product changes and basic research knowledge, businesses in the region are concentrated mainly on process innovations. There still remains the distinctive influence of factors which have led to original the “territorial attractiveness” of the region. The region owns specific knowledge and conditions, which enable the usage of basic research information from other regions and their transformation into innovations, which in turn leads to economical competitiveness of the region.

The scheme introduced above nowadays represents the “average” model of sector functioning. Firms in the region that only imitate innovations or represent the production factory of parent company without any of its own abilities to use outside knowledge for innovations still exist. This concerns firms that were well-established in the region only a short time ago, or smaller domestic businesses centred on short production series; production and import of which are not even profitable for multinational companies. This does not cause such a heavy competitive pressure as in other sector segments.

On the other hand, there are activities which may be regarded as knowledge creation, not only knowledge acquisition. In a majority of such cases, it is matter of very talented individuals with tightly aimed specialization. It is related to patent protected solutions that were invented by those individuals. Such individuals are often employed in research institutes or at universities. These institutions are then often rather focused on cooperation with foreign businesses and institutions outside of the region. They participate in international research projects. However, there is no functional system of innovation formation and support in the region yet, which would be able to generate such knowledge on regular basis, such as in the regions of the European research area.

The interaction of the automotive sector with other sectors is yet to be mentioned. The automotive sector is very competitive with high investments in innovations that are performed with greater frequency than in other sectors. Therefore, a large part of

process innovations moves into other sectors through KIBS or through more universally oriented suppliers. With regard to the Bratislava region, it moves mainly into other branches of engineering and the electro-technical and chemical industry. By this means, the sector indirectly supports regional competitiveness.

Key findings:

- The sector has been moving from imitative to adoptive creative patterns of innovation;
- Main external channels of product innovation are parent companies;
- Main internal channels are employees and technical centres (mainly process innovation).

C.4. Local conditions to acquire external knowledge and innovation

The Bratislava region is the most economically developed region in Slovakia. Other advantages include a qualified workforce, the presence of several universities and a variety of financial institutions. The main industrial sectors include chemical, automotive, engineering, electro-technical and food-processing. However, services are a dominant part of economy, where a proportion of the tertiary sector reaches 75% in the region.

The Bratislava region is ranked among the most developed regions concerning GDP per PPS. In 2007, it reached 160% of the EU average (Eurostat). It became a quickly developing region, in comparison to the year 2000, when it reached only 100% of EU average. The automotive industry is concentrated not only in the Bratislava region, but also in Western Slovakia, both of which have a mutual border. According to GDP the latter belongs to the Convergence regions of EU support. On the contrary, this region is ranked among the least developed regions, reaching 66% of the EU GDP average. Notably, the proximity of both neighbouring regions was one of the specific reasons why the convenient conditions for automotive industry development in the region were created. The Bratislava region had a quality labour force and many supporting institutions, including the existence of a strong agglomeration of urbanization effects. Due not only to the labour force and lower living costs but also to the proximity of the Bratislava region, the region of Western Slovakia was enabled to create a critical volume of investments in the sector, which lead to a strong agglomeration of localization effects. In this region, the employment rate in the industry reaches up to 33% of the rate of total employment, which is triple when compared to the Bratislava region (Statistical Office of the Slovak Republic).

The biggest key advantage of the locality in the first phase of sector development may be considered human capital. The labour force plays a decisive role in the process of FDI flow and it is supported with proper environmental and investment stimuli. Human capital, nowadays, represents the key factor of knowledge and innovation formation in the region. The labour force is important due to the following:

- It has the ability to invent process innovations – quality of labour force influences its ability to understand production processes and to design their improvements;
- It influences the ability of innovations management – quality of medium management with sufficient knowledge in the field of innovation and production seems to be very important for the firm’s ability to innovate;
- It also has a distinct influence on the total absorbing ability of the region to perceive and implement innovations.

Due to high share and the importance of the automotive industry, the cooperation of firms in the region with other institutions in the region is limited. This cooperation is primarily aimed at the support of the labour force of the firm and is centred on education and labour force preparation. This dominant position has cooperation with secondary schools and universities. Businesses with domestic capital cooperate more, but there are not too many in the sector, as there are investments from abroad. Cooperation with

other supporting institutions, such as research centres or incubators is almost non-existent because they are not of good enough quality for the needs of this sector.

Cooperation with suppliers and clients is of much more importance. Due to the high concentration of firms in the region, some of these contacts take place at the level within regions, even though inter-regional relations still prevail. A majority of the firms implement innovations in close cooperation within the production chain. Therefore, this group may be marked as the most important, if related to specific types of firms and institutions in the local environment, which influence the innovation process of the firm.

Key findings:

- The most important precondition is quality and price of the labour force;
- The achievement of critical mass production, allowing creating specialized support institutions, plays an important role.

C.5. Knowledge and innovation acquisition policy assessment

The automotive industry is one of the sectors for which the aid from EU funds is quite limited. In addition, Bratislava is not included in the Convergence regions, which receive the highest EU support. Therefore, comparing all other sectors, direct aid is considerably limited and in most cases, it is limited to tax advantages. However, much support goes to public institutions such as clusters or universities. It is necessary to mention that innovation development in the region is realized to great extent by the supporting tools of regional policy, which are not oriented to research or development.

Particularly, in regard to the automotive industry, it is necessary to mention the support in form of investment stimuli from which this sector has been rapidly developed. Only three assembly firms, (PSA, VW a KIA) during their existence, acquired more than 720 million euro of aid. Other support was aimed for foreign suppliers, which followed those firms. This support was much more distinctive than in other industry branches and it was performed mainly in the form of tax holiday and subsidies for newly created work positions. This aid was, however, more focused on the support of the improvement of regional attractiveness than support towards innovation development.

Due to limited support, which may be used directly by companies in the sector, the interviewed companies highlight the improvement of the entire investment environment, as well as, labour force quality. Businesses, therefore, primarily prefer policy measures focusing on business bureaucracy decrease, education support and improvement of graduates' abilities for work.

Most of the support in the sector is determined on the national level. The local level participates in activities focused on the development of secondary education. Some businesses are beginning to feel that the lack of labour force is a resulting of strong sector density in the region. More intensive support of the technical fields of study is missing here. Generally, absence of local or regional support is, in the case of this sector, less important because the sector is a high priority for support on the national level.

In addition, low quality of research potential of the public sector belongs to the support deficiencies perceived by businesses. Logically, this quality cannot reach the private sector level that is increased by massive connection to foreign capital and big research centres in parent countries. Therefore, the progressive improvement of this potential is important for the region, at least in select specialized fields. The interconnection of the sector with significant research institutions abroad would be suitable. It would help the specialisation of the public sector comparably to the already specialized firms in the regions. This way, supporting institutions would manage to offer research potential for businesses in the region. The support policy should markedly support the participation of universities and research institutions in international research projects. Until now, it has been rather focused on supporting domestic research, but it does not force universities to progress sufficiently. In particular, the establishment of a strong foundation of the public sector is the basic precondition for further shifting of the region towards knowledge creation.

The more active interconnection of universities and companies and the improvement of labour force quality in the sector belong mainly to support tools that work well. As foreign investments are present in the sector to a particular extent, a suitable environment for their flow and preservation is also important, as it represents the best preconditions for implementation of innovations.

From the view of the regions' ability to create suitable environments, the support of external cooperation of universities and research centres from the Bratislava region with other research institution in countries with a high rate of research has become effective. Such cooperation projects have markedly improved the abilities of participating subjects, which has led to more active participation of such institutions in innovation processes within the region. Not many such cooperation projects were performed in the region, therefore, their total potential has still not been reached. Therefore, it is necessary to enforce public institutions in such activities, so that their potential can be sufficiently attractive to foreign companies for cooperation.

In conclusion, experiences show that **successfully functioning support tools in the region are the ones aimed at the key channel of innovation or knowledge flow in the region and are the ones with connected conditions leading to such channels.**

The support focusing on the moderate shift towards the endogenous knowledge creation also works successfully. If the region is situated in the phase of adoptive or imitative innovation pattern, the support which is centred on formation of territorial precondition for knowledge creation is not effective. The main reason for this is that there is no buyer of the created support system. It is evident that if firms are not able to manage innovations and have no sufficient abilities for use of basic research knowledge, there is no sense in actively supporting the formation of that knowledge. An example may have already been mentioned; public research centres which are not directly interconnected with the private sector.

In general, concerning the implementation of innovations, **system or cooperation measures that are concurrently aimed at more subjects** seem to be further more effective **than individual measures aimed at only one subject.** The main reason for this is that the innovation support for one subject represents only an innovation for that subject, not an innovation for the very region. Institutions aimed at the support of such projects do not have sufficiently qualified employees that would be able to differentiate the contribution of innovation. On the contrary, mutual projects represent distinctively higher probability of acquisition or creation of an innovation. This fact represents qualitative progress for the region. At the same time, important ties between businesses and universities (or other research institutions) are created. Support of these ties is also important for the improvement of the local abilities of public institutions to create new knowledge. A large part of the sector is formed by multinational companies that are not interested in cooperation with local institutions if not motivated by support programmes. Essentially, support of so-called specialized competence centres aimed at the research of specialized fields, whose condition is the participation of several institutions from the private, as well as, public sector, seems to work well.

In our opinion, this is also connected to the need for the achievement of a critical amount of investments for specialized research in public sector. This region could, in those fields, perform research on the multinational level and would become an equal partner to existing multinational companies in the region. In particular, the focus on process application and new materials in automotive industry seems to be suitable specialisation.

Particularly important is the active support of talented individuals, who may achieve capability for knowledge and innovation creation without a formed support system. This way, they could "open channels" for knowledge creation. In the Bratislava region, as well, several examples can be found where such individuals manage to invent patent solutions on the basis of which local competitive firms were then established. This support should be aimed mainly at the ability of schools to educate such individuals and

enable them the access to risk capital. The innovations created exactly in that way often represent the very first step, which can demonstrate to firms that innovations may be created in that environment. These individuals are often the centre of the entire innovation creation system. The relationship of this support to the risk capital in the region is just slightly developed.

Key findings:

- System or cooperation measures simultaneously aimed at more subjects seem to be by the implementation of innovations further more effective than individual measures aimed at one subject only;
- Better functioning support tools in the region focus on the key channel and with it connect conditions of innovation transfer or support aimed at a moderate shift towards endogenous knowledge creation.

D. The wood processing sector in Central Slovakia²¹

D.1. Sector profile and innovative activity

The wood processing industry in Europe does not belong to top sectors concerning investments in research and development. Despite this, its importance is mainly its ability to be developed in rural areas, therefore representing an important sector regarding regional policy.

The wood processing industry belongs to the traditional industrial sectors in the Central Slovak region. Although the region is one of the most undeveloped regions, enough labour force and the nature of the wood processing industry (the close proximity of raw material provided by the government and impossibility of transport to over-excessively long distances) enable high export efficiency in this sector, despite the relatively low rate of direct foreign investments and total maturity of the region. Therefore, self-employed persons and small- and medium-sized enterprises are even more active in the entire sector. Innovations are, though, more frequent in the most important businesses of the region. The SME segment innovates less frequently than more dominant businesses. A specialized university centred on the wood processing industry is located in the region.

The wood processing industry is the second most important industry in the region because it employs approximately 12% of workers of all industries. A proportion of the region in the wood processing sector within Slovakia represents about 60% in gross output and it has the same proportion in the amount of employees (Statistical Office of Slovak Republic). The sector has achieved a long-term growing tendency in the region. From 2000 to 2007, sector earnings have doubled. However, in 2009 – 2010, profitability and earnings decreased due to crisis. This crisis mainly influenced primary wood processors. Despite the crisis, no prominent factories collapsed, although a part of them had to accelerate the efficiency of their production factories. However, it was the crisis that facilitated the change in the perception of role of innovations in the production process.

Table D.1. Top companies in the wood processing industry in Central Slovakia (2009)

Name	Revenues in EUR	Number of workers	FDI presence	Comp. position in Slovakia
Mondi SCP	420 396	1486	yes	1
Lesy SR	195 733	3702	no	2
SCA hygiene products	158 509	2016	yes	4
SHP Harmanec	112 202	825	no	5
Metsa tissue	100 558	1070	yes	6
Kappa Sturovo	62 808	332	yes	8
Ekoltech Lucenec	33 377	788	no	12
Duropack Martin	26 429	198	yes	14

FDI presence in the sector is average, although, during the last few years, the amount of acquisitions of existing businesses has grown. Five foreign companies are ranked in the top ten biggest firms according to their earnings and in the top twenty, there are nine foreign companies. The majority has operated in the region for less than 5 years.

The wood processing sector is also exceptional because it has overcome the impossibility of starting materials transport from a distance of more than several hundred kilometres. In most cases, wood material supplies are inspected by the government. Therefore, for successful operation in the sector, local relations, as well, are important. This may represent one reason for a lower volume of FDI in the sector.

²¹ This case study report has been written by Miroslav Šipikal, University of Economics in Bratislava.

D.2. Firms profile and innovative activity

The whole study is based on personal interviews with firms and supporting institutions in the region, which are mentioned below. Apart from these interviews, the sources of the study came from telephone calls, research from available literature, companies' websites (particularly from their annual reports) in the sector and statistical sources. One part of the results was obtained from the knowledge acquired from publicly supported research projects in firms. Interviews were executed by means of a standardized questionnaire consisting of 34 questions. The following provides short profiles of the firms and institutions which were that took part in these interviews.

Company A – a holding company which has been expanded to several countries of Central and Eastern Europe. It is a domestic company that consists of 8 companies in 6 countries of Central and Eastern Europe. The company is, therefore, very active in this market and it represents the second biggest business in the wood processing industry in Slovakia. Earnings in 2010 reached the level of 115 million euro. The company invests 3 million euro in innovations every year. The number of employees of consolidated firms has reached 1,000. They do not have their own research department, but they have created an innovation team responsible for innovation suggestions. There are people from several different departments. Production is aimed at products made from paper. Innovations mainly include product innovations, the most dominant inspiration of which are buyers and process innovations through the producers of devices (innovation in the form of new devices) and employees (innovation on existing devices).

Company B – a foreign owned subsidiary of the Austrian parent company, used as a production base. It represents one of two production bases of the parent company, therefore it is quite independent in terms of investment and innovation activities. Revenues have reached 44 million euro and the company has more than 300 employees. It is located in Banská Bystrica. Production is centred on shuttering slabs. The firm belongs to the top 20 firms in the wood processing industry in Slovakia. Decisions on innovations are made locally. For bigger investments, the approval of the concern is needed. Innovations are mainly connected with production processes.

Company C – the fourth biggest company in the field of the wood processing industry in Slovakia and a member of a big multinational company. It employs 700 employees and exports approximately 90% of its production. Innovations from research are concentrated in the parent company, in which a special department is dedicated to innovations. This department is also responsible for the patent protection of existing innovations. The firm is very active in this field. In 2010, it prepared more than 60 patent applications. Its head office uses an open innovation system when it actively cooperates with institutions as well as persons who are able to provide missing knowledge from various regions. An open question (or problem to be solved) is addressed by up to 300 research groups, which are asked for their suggestions or research. The Slovak subsidiary has so far concentrated mainly on production, including mutual exchange of know-how with the parent company in possible innovations.

Company D - a joint venture of a German and Slovak firm, which employs 120 employees. 80% of earnings are due to export. Through a foreign partner, the company was initially able to create a production process. Moreover, because of new technologies and other changes it has increased labour productivity by more than 40%. Substantial change has also occurred in innovation perception. The firm had only "received" the innovations until after the joint venture. Then, the business culture changed, as well, and currently, the firm actively searches for possibilities for improvement of the production processes and products. The most significant sources for innovations are clients and the German parent firm. Regarding process innovations, the firm is very successful. It has already established a subsidiary company that produces machines with better parameters for the production process. Firms have also used EU sources to improve technological processes.

Company E – a firm with domestic capital, which is ranked among the top 20 firms in Slovakia. It employs 300 people and exports about 60% of its production. It does not have a research department or registered patent. Despite this, earnings rise and the firm is expanding steadily. The firm is oriented with the basic processing of wood material. Innovations are performed in cooperation with technologies producers and customer demands.

Company F– a young firm with domestic capital in the sector; it was granted the support for the purchase of new technologies. The firm does not have a system for innovations and EU support has brought technologies to the region which are, however, not innovative. Innovations are managed by the owner, although, without elaborated development conception. The fundamental source of innovations is the clients.

Company G - a domestic firm that has created a technological centre, which provides smaller firms with the access to production devices. The basic source of innovations is the experience of the owners and the information received from fairs and membership in foreign associations. It uses an innovative manner of innovation implementation and does not have its own department or specific person responsible for innovations.

D.2.1. Supporting institutions

The Association of Wood Processing - a national association aimed to support businesses in the sector. It is mainly active in the drafting of legislation and by conducting education activities of firms. It publishes its own magazine for businesses in the sector. Its activities are also performed in the area of support of specialized schools. It is a founder of the wood industry cluster in the region of Central Slovakia.

TU Zvolen – the only Slovak university that specializes in the wood processing industry. It participates in several less prominent international projects and performs several mutual activities with businesses, mainly by improving the educational level of the labour force. Approximately 1,500 students study specialise in the wood processing industry at the university.

Company H – a private commercial knowledge-based intensive services company that employs approximately 20 people. It focuses mainly on consulting and education in the field of innovation implementation, innovation management support and enhancement of the efficiency of production processes. One of its founders is a significant German research institute, with which it intensively cooperates. This approach enables it to work with more complicated technological innovations for which they do not have capacity for. At the same time, the firm is also linked with the local university.

Key findings:

- The sector may be considered as an example of progress and development without its own particular research;
- There are many small and medium enterprises in the sector;
- Innovation, not knowledge is required by the companies;
- The sector is not too competitive compare to for example automotive or ICT.

D.3. Types of knowledge and expertise required for local innovation

The sector of the wood processing industry dominates the imitative pattern of innovation. Firms are not leaders in the field of innovations. Public institutions such as universities or innovative centres do not belong to strong players in the field of basic or applied research. Because of the importance of transport costs, they may not only survive within this strategy, but manage to be developed. Also, due to the qualified and cheap labour force, they can expand and export to neighbouring countries. This sector may also be considered an example of progress and development without its own particular research,

relying on the transfer of innovations from other regions and in larger extent aiming at the ability of the region to apply acquired innovations. This strategy particularly helps the nature of the sector. Products of the wood processing industry are not particularly sophisticated and their innovations are not as frequent nor as radical as in several high-innovative sectors. Therefore, less knowledge or experience needs to be gathered by the region to remain competitive.

Firms use all types of knowledge available for their innovations, but to different degrees. Knowledge from scientific magazines is used minimally. The firms are often not very well informed about suitable types of periodicals for their needs. This results from the reality that firms tend to adopt already existing innovations which are directly applicable in the production process. Scientific articles usually do not contain complex solutions, but only some partial problem discussions or results. The firms do not have departments and persons able to exploit these partial solutions to integrate this knowledge into product processes.

A majority of the firms support the accumulation of knowledge and innovations acquired by employees from production process. Innovations resulting from this knowledge are not very frequent and their importance is rather minor. However, there is a case when such an idea was decided on to create a new prototype of a machine. This idea worked so well that the firm has established a subsidiary company which has started to produce such machines. Mainly tacit knowledge related to production processes are acquired by these means. This knowledge is essential for firms because their basic aim is to increase production efficiency. This knowledge (mainly during periods when the firm has no sufficient financial means for complete change of technologies) is crucial at achieving this goal.

The production sector's nature is visibly centred on improvement of the technological parameters of production. Firms mainly search for technological and technical knowledge, which is rarely based on patent protection. The sources of this knowledge are mainly the producers of technologies.

Knowledge acquired from clients is also very important. Primarily in the case of product ideas and changes, clients in particular are the most frequent source of inspiration. To a lesser extent, the same can be said about suppliers. Here, also pertains knowledge related to marketing activities (e.g. product design).

Key findings:

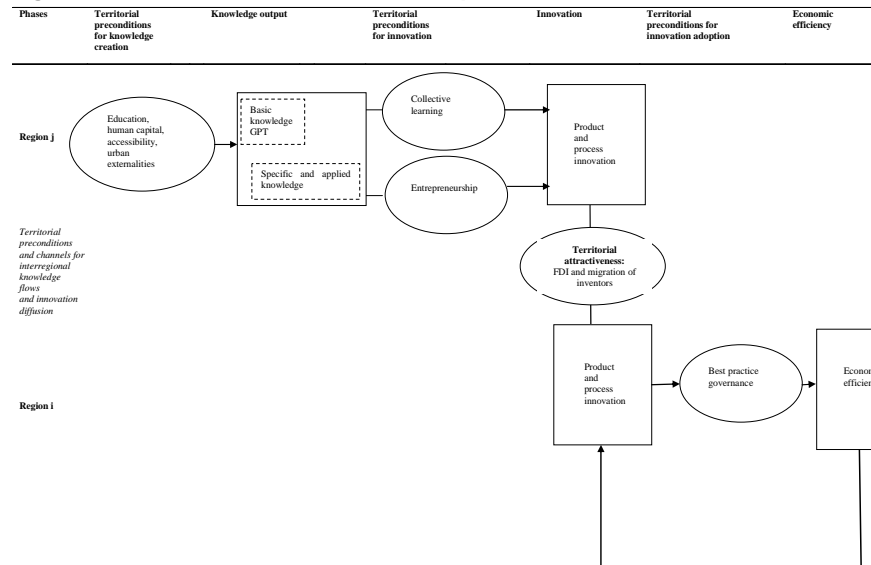
- | |
|--|
| <ul style="list-style-type: none">- The sector, for the most part, needs innovation, not knowledge;- And generally needs innovation to reduce production costs or increase effectiveness. |
|--|

D.4. Channels for knowledge and innovation acquisition

Firms in the wood processing sector belong to imitators. A basic scheme can be seen in Figure D.1 (see Chapter 2, Volume 1 of the Scientific report for a detailed description of this innovation pattern). Firms are not able to neither greatly use nor create basic or specific knowledge required for innovation implementation. Therefore, they mainly use existing innovations created in other regions. It is necessary to mention that this model represents the average (or prominent) behaviour of firms in the sector. A minority of the firms is able to also start their own innovation activities and implement new products by using available knowledge.

Firms use many possible ways to acquire available knowledge or innovations. The region does not pertain to the more developed regions, therefore, a large amount of innovations are acquired from other regions, principally developed regions of the EU. In regards to businesses with foreign participation, this acquisition concerns the regions in which these businesses have parent firms (often the northern regions of the EU). Acquired innovations can be divided into product and process innovations.

Figure D.1: An imitative innovation pattern



Source: KIT Draft Final report

The ability to acquire key information on up-to-date trends and labour force quality plays the most important role for successful technological (process) innovation ability of businesses in the regions. Key information is received mainly through two very frequent channels – wood processing machinery producers and memberships in international organisations, which enable networking and access to up-to-date knowledge. According to experience in the sector, membership in international organizations has a far more positive effect on businesses than membership in domestic organisations such as clusters or associations. In this case, producers of technological equipment and machinery represent the sector, which is more innovative than the wood processing industry itself. Therefore, they innovate very often and try to sell their innovative technologies to companies in the sector to improve their existing production processes or to completely implement new process procedures.

Businesses with foreign capital, mainly multinational companies, belong to a special category. The parent company is a crucial channel of innovation transfer, which makes decisions on process innovations and their transfer to a specific locality. Systems centred on continuous innovations improvement and providing support to businesses are also simultaneously implemented by these means.

Labour force quality to some extent influences the ability of businesses to work with this information. Employees play an important role here by using their experience via formalized systems of improvement movements and mainly via process innovations of existing technologies. The system of domestic firms is not too sophisticated thus producing effects with some exceptions that are not decisive for company profit. Part of this process also represents progressively obtaining various types of certificates required by clients that often bring standardized systems of constant improvement, in turn, providing possibilities for innovations implementation.

Products in the wood processing industry are not very complex. In reference to the furniture production industry, the majority of innovations are about the design and process of production. Concerning envelope production, a product is mainly innovated through the innovation of production process like introducing new materials, new technological procedures or faster production rather than through product change. If there is a change, the most frequent source of innovations is competition (global rather than local) and client, which corresponds to the imitative way of sector functioning in the region. Firms attempt to observe what begins to sell in big key markets, in which global players have a dominant position. Subsequently, firms try to implement similar products

to the region. A company that is first to be able to introduce these "novelties" to the local market gains the competitive advantage, therefore ensuring key distribution channels for this undertaking. Some of these innovations are created upon client requests, mainly global clients that request the same products used in developed countries. Firms have their own marketing and sales departments, which in this case represent a channel between the clients and the firm. These departments normally send the information to firm management and if management expresses a positive attitude, the process of innovation preparation will begin. This procedure however is not sufficiently systematized in a majority of firms.

In this sector, progressive development can be observed because of the sector, which despite the imitative innovation model is able to be competitive. An important shift is visible mainly in the field of innovations perception. In the past, firms perceived innovations as a "necessity" competitive struggle and not as the tool for acquiring strategic advantage. Basic expressions of this philosophy were "forced innovations". Firms were not active initiators of innovations but their passive receivers. Two basic channels of innovations transfer were visible there. The first channel was represented by machinery producers for the wood processing industry. They tightly communicated with firms in the sector and tried to persuade them to buy the machines enhanced by them. By this means, firms could imitate modern technologies without the need to actively search for them. The second channel represented existing clients who came forward with new requests, which "pushed" firms to implement new innovation; otherwise they would have lost clients. However, these approaches did not often offer a competitive advantage because businesses were being improved but only at the level of other businesses or an even lower level. In the last period, the change in approach was visible in several firms as they started to actively search for information and knowledge and plan innovations with better strategy. This indicates that they tried to implement innovations before they became urgent matters, therefore gaining an advantage over competitors. The higher rate of foreign investments in the region has also contributed to this, for which innovations are a standard element of developmental goals. Firms are more in number and active, in relation to knowledge acquisition from other regions and they have largely begun to use the services of specialized institutions in order to improve innovation activities. Notably, the support policy towards a broader application of this approach seems to be an important requirement for the possible shift of the sector to the ability to produce one's own knowledge as well as to move toward a more advanced innovation model.

Key findings:

- There is an imitative pattern of innovation in the sector;
- Main channels that are external to the region of innovations and knowledge are equipment or machinery producers;
- Main channels that are internal to the region are employees, especially for process innovation;
- Customers are also an important source, principally for product innovation.

D.5. Local conditions to acquire external knowledge and innovation

The Central Slovak region belongs to the less developed regions of the EU. Its GDP, according to PPS, reaches almost 53% of the EU average (Eurostat). Despite this, it belongs to developing regions due to the fact that in 2000 it only reached 38% of the EU average. The rate of the service sector is low in the region and foreign direct investment is also very low. The industry is the biggest employer, employing in total, 21% of the labour force. There is a high rate of unemployment in the region that is considerably differentiated within the region.

There is a need to mention that the wood processing industry belongs to traditional sectors in the region and has very long history. At the same time, it leads to a strong

dependency. A large part of the firms is established in locations where production capacities have existed for several tens of years. The region must therefore tackle the lock-in problem and pays very little attention to the creation of new market in main or related sectors. Also, foreign direct investments flow into businesses in the region, taking place on the basis of the acquisitions of the existing capacities of Slovak businesses. It diametrically differs from the automotive industry, where a major part of investments are "greenfield investments". On the other hand, this leads to the necessity for new markets and products, where specialized supporting institutions play an important positive role.

A relatively low rate of cooperation exists in the sector. Firms are often interconnected with the external environment rather than within the region. According to discussions with businesses, the following explanations could be identified:

- Regional cooperation is not necessary – firms currently acquire innovations primarily from sources situated out of the region. Therefore, it is more important for them to sustain these channels of innovation transfer than to develop local competition;
- Local competition prevails – in contrast to the automotive industry; decisive competitors are not global players but local companies. Therefore, the creation of competitive advantage is focused on whichever firm that is able to better imitate the newest global innovations in the sector.

This may be connected with a low rate of cooperation with more universal local institutions such as universities or research centres. A slightly higher rate of cooperation exists with Knowledge-Intensive Based Services which are aimed at supporting innovations transfer and education in the field of innovation management and transfer, which is primarily connected to the manner in which firms mainly innovate. At the same time, firms often have contacts or direct links to firms which provide the same services in other regions, where they also have access to the knowledge that businesses in the region overlook.

The region is therefore aimed at the creation of conditions that can help the existing system of innovations transfer the most. The key local advantage in this field may be considered to be human capital. There are a lot of specialized schools and faculty that concentrate on wood processing, which continuously bring in new qualified labour forces. The long term industry tradition also helps to keep a satisfactory level of qualified people in the region. The labour force plays a decisive role in the process of adopting knowledge and innovations. The importance of the labour force rests in the ability to identify and apply innovations located in the external environment.

Key findings:

- The key local advantage in this field may be considered human capital;
- A strong external link to acquire the newest innovations or knowledge available is the primary target of these companies.

D.6. Knowledge and innovation acquisition policy assessment

Supporting policy in the field of innovations is financed mainly with the support from sources of the European Union (due to the classification of the region as Convergence One). It represents, by far, the most important amount of financial sources aimed to support any development of the region, including innovation support. This support related to innovation is aimed at 4 basic fields:

- Technology transfer support – Firms may acquire a grant for the purchase of new technologies aimed at enhancing their competitiveness, where the emphasis would be placed on highly innovative technologies.
- Research support – There are several various measures. Support may be received for common creation (cooperation of the public and private sector) of competence centres, for the development and prototypes research of businesses, and the creation

of research and development centres at universities oriented with basic research without a direct connection to private companies.

- Education support – This mainly aims to enhance the existing labour force or adaptation of the unemployed through the completion of education courses and development strategies of human sources.
- Marketing activities support – This mainly provides support of exporting through the participation of firms at fairs and preparation of foreign-language marketing materials.

One negative aspect mentioned by firms was the generally complicated administration connected to the provision of aid, which in the case of smaller activities for participation at fairs reduced the total contribution of provided support. Firms in such cases mainly preferred an automatic claim with predetermined conditions.

Most of the support in the sector is performed at the national level. The local level is used only for activities directed at the development of secondary schools. Specific focus of suitable support, according to regional and local specifications, is restrained to a certain degree. There are no primarily defined regional preferences of support in the field of particular sectors, which leads to low support concentration in key sectors. There are almost no other forms of support apart from EU funds. There are partial possibilities of support (e.g. risk capital, small research grants adding up to 0.5 million euro) that target particular problems.

On the other hand, different types of these supporting policies are observed and used by many businesses. The most used type is direct support through the purchase of new technologies. In reality, this support harms the competitive environment because technologies purchased through these schemes do not account for the sector's new innovations, which are not present in other companies within the sector. Support of public innovation centres, which because of the prevalence of imitation strategies act as "cathedrals in the desert", is also very problematic. The centres do not have the "clients" for whom they could provide research. In the Banská Bystrica region, two similar support centres had to be prematurely closed.

Education support seems to be more efficient. KIBS, which is aimed at innovations development support, plays a very suitable role in this case. From a long-term point of view, support of the labour force and talented individuals seem to be particularly suitable for innovation support. Innovations in the region and sector are not created due to basic or applied research, but are created due to the inventions and ideas of some individuals. The support of the execution of such intentions may be the best method of practice. The quality of the labour force mainly in the field of process innovations plays an important role, even though not directly visible in innovation outputs. This is also one of the deciding factors which attract foreign direct investment. Supporting policy in this field is, however, primarily focused on the development of professional abilities in the labour force.

Particularly, there is a need to mention education support which focuses on the ability of firms to realize the meaning and importance of innovation processes and to, in turn demonstrate the methods of how a firm can, despite having less economical power, create innovations. Such education represents a necessary requirement for institutionalization of innovation processes within firms, which is one of the preconditions for the creation of capabilities that in theoretical basis is defined as „territorial creativity“. The support of this field seems to be efficient, as well as the support of start-up and new inventions, which could demonstrate new potential dimensions of sector development.

Support of cooperation among institutions is very disputable. Cooperation of firms with universities is at very low level. There is more cooperation from the specialized schools, but only on an individual basis. Cooperation at the level of the region, where the secondary schools are established, is also very low. Projects that concentrate on the support of cooperation have not provided the required results. The possible reasons are mentioned above. Universities are mostly concentrated on projects that enable the

purchase of devices for quality measuring, and then in turn, they cooperate with businesses. However, a capacity for more distinct research activities, which could be interesting for businesses, is missing. Work places that have joined international projects are the exception. Support of such projects seems to be important for the implementation of new innovations.

The support of marketing activities mainly leads to the support of export, although, it also covers the innovative ability of businesses, especially, if they are in the position of imitator. This support is successful and important to medium sized enterprises. Its advantage is the possibility to see the newest trends in the sector, which may be applicable in Slovakia.

Supporting tools, which the region lacks, but in which firms or supporting institutions are interested, can be summarized as follows:

- **Support of development of innovative culture.** It is necessary to support education not only concerning the proficiency but mainly the ability to manage innovations and implement innovative business culture. It also functions at commercial base, when firms in the sector realize the need of systematic work with innovations. Just after the achievement of positive change in innovation perception in small and medium sized enterprises it would be possible to effectively support the measures as support of clusters or common development projects. Without the creation of this culture in businesses, these measures were and will be useless because businesses are not interested in them, as several performed projects showed.
- **Support for opening of new markets.** The region lacks risk capital and active work by supporting institutions with new ideas and inventions, which in turn, could open new markets or expose existing market gaps. For the most part, such established businesses might change strong path dependency and create basic centres for the accumulation of experience of innovations, which could lead to the creation of specific regional preconditions for single innovation creation from acquired knowledge.

In general, **system or cooperation measures targeting one or more subjects** seem to make implementation of innovations even more effective **than individual measures targeting only one subject**. The main reason for this is that the innovations support for one subject represents only an innovation for that subject and it does not represent an innovation for the specific region. Institutions aimed at supporting such projects do not have adequately employees to differentiate the contribution of innovation. On the contrary, mutual projects represent a distinctively larger probability of acquisition or creation of an innovation, which represent qualitative progress in the region. At the same time, important ties are created between businesses and universities (or other research institutions). Support of these ties is important also for the improvement of the local abilities of public institutions to create new specialized knowledge. On the other hand, projects that focus only on the support of the public sector (e.g. research centres) often only lead to the creation of "cathedral in the desert". Centres established in this manner usually do not have consumers.

Key findings:

- Support to increase innovation culture seems to be one of the key targets for policies;
- System or cooperation measures aimed simultaneously at more subjects seem to make implementation of innovations even more effective than individual measures aimed at only one subject.

E. TV and digital media in Cardiff²²

E.1. Introduction and description of the case study area

TV and Digital Media sectors are classified in the UK under the overarching Creative Industries sector. Definitions of the Creative Industries sector varies, and most recent discussion in the UK is guided by definitions in an UK government Department for Culture, Media and Sport (DCMS) document published in 1998, which delineated a number of sub-sectors to be included within the term. TV and Digital Media (or New Media) figures prominently in all definitions, and in Wales the Welsh Government strategy for the Creative Industries, published in 2004, centred the initial focus of the strategy on film, television, new media and music (Welsh Government, 2004). The case study is based within this context, but as noted further below, the TV and Digital Media sector may also be placed within Creative Media as a sub-set of the overarching Creative Industries sector.

The UK government estimates that the creative industries accounted for 5.6% of total Gross Value Added (GVA) or £59.1bn for the UK in 2008. Within this overall contribution TV and Radio accounted for 0.3% of the total UK GVA (£3.2bn); Film, Video and Photography about another 0.3% (£2.7bn); and Digital and Entertainment media 0.02% (£200m)^{23, 24}. In 2010 the government estimates further that nearly 2.3 million people are employed in the creative industries as a whole across the UK, with nearly 200,000 employed in the three sectors identified above.

Both as a consequence of its economic contribution, but also because of its social, political and cultural influence, the Creative Industries sector commands substantial interest from government and from the private sector. In the UK it is centred on London, which acts as a major hub in both UK and global terms, but a number of smaller centres have developed across the UK, making it of interest to policy makers and industry in a number of different regions. Cardiff, while not one of the biggest, is a significant centre of activity. The creative industries and, hence, the TV and digital media sectors can also be considered as active forces for innovation (Chapain et al, 2010) and as such provides a strong case study to illustrate the processes considered in the KIT project.

We choose Cardiff as the region in which to base this case study because, in addition to reflecting UK policy and commercial interests in the creative industries and in particular in TV and Digital Media, Cardiff provides some additional local conditions that help to justify the choice. It is an interesting case by which to consider the effects of local policy structures (via the devolved Welsh Assembly), and the influence of specific local conditions affecting the development of the sector in the form of a minority culture and language. Such conditions provide a study of a fast changing industrial sector that is influenced by a range of factors including the commercial environment, technological change, social and cultural influences, and major government interest.

E.1.1. Geographical context

Cardiff is located in the East Wales area (NUTS 2 UKL2: East Wales). The East Wales NUTS 2 area extends along the whole of the eastern side of Wales, bordering England, and includes four NUTS 3 areas, namely Cardiff and Vale of Glamorgan; Monmouthshire and Newport; Powys; and Flintshire and Wrexham. This study is focussed on the city of Cardiff and its immediate environs.

²² This case study report has been written by Selyf Morgan, Cardiff University.

²³ This data originates from the *Annual Business Survey (ABS)*, of the UK Office for National Statistics (ONS)

²⁴ Publishing at 1% of total UK GVA (£10.1bn) and Software and Electronic Publishing at 2.5% of total UK GVA (£26.4bn) makes up the largest contribution to the total Creative Industries GVA contribution out of 13 sub-sectors in total.

The city of Cardiff has a coastal location, is host to an international airport (albeit with limited direct connections), and is some two hours from London by train. The immediate geographical context for Cardiff is the area of South East Wales, which includes the city of Newport, local authority regions in the south Wales valleys, and the Vale of Glamorgan²⁵. The Vale of Glamorgan is a largely rural area to the west of Cardiff, but a Cardiff city region is mooted to cover parts of the Vale of Glamorgan (including towns such as Barry) and former coal mining areas to the north of the city (the Valleys area) which are contained in the Cardiff Travel to Work area (see Table E.1 for population statistics).

Table E.1. Population of Cardiff, Newport and local authority areas in South East Wales (2010)

City and Local Authority regions	Population
Cardiff*	341,000
Newport*	141,000
Vale of Glamorgan	125,000
Caerphilly	173,000
Merthyr Tydfil	55,700
Torfaen	90,500
Rhondda Cynon Taff (local authority region)	234,300
Blaenau Gwent	68,400
Monmouthshire	88,100

*Source: UK Office for National Statistics (ONS): Mid 2010 population estimates *City authorities*

However, factors relevant to the case study are not confined to the city region, and the geographical context of Cardiff as a centre of the TV and digital media sector must take into account other parts of Wales that contain (smaller) concentrations of TV and digital media firms. The geographical context must also place Cardiff in relation to other significant centres for the sector across the UK, including Manchester, Edinburgh, Glasgow, adjacent regions of England in particular the city of Bristol, and London: the latter being by far the predominant centre.

E.1.2. Local economic context

The economy of South East Wales lags the UK, and had total Gross Value Added of £21.8 billion in 2008. This represents £16,700 per head, and is 81.4% of the UK average²⁶. However, there were wide variations in GVA per head across South East Wales, from 108.2 % of the UK average in Cardiff and the Vale of Glamorgan to 55.5% in Blaenau Gwent and Torfaen²⁷. The relatively high GVA per head for South East Wales largely reflects higher GVA per job than elsewhere in Wales, and in 2009 average earnings varied between 76.1 % of the UK average in Monmouthshire to 92.7 % in Cardiff and the Vale of Glamorgan (Welsh Government, 2011).

The distribution of employment in South East Wales across industrial sectors was similar to that for Wales as a whole in 2009, but there are wide variations in concentrations of sectors between different areas within the region, for example the share of production (manufacturing) ranged from 6% in Cardiff to 22% in Blaenau Gwent (see Table E.2)

²⁵ Parts of this area is included in the West Wales and Valleys NUTS 2 designation

²⁶ The average GVA for Wales as a whole was 74.1% of the UK average in 2008

²⁷ Note that the levels of GVA per head in these areas are affected by commuting patterns

Table E.2. Work place employment % share by industry in selected cities and towns SE Wales (2009)

Location	Public Administration, Defence, Education, Health & Other Services	Agriculture, forestry & fishing	Production	Construction	Wholesale, Retail, Transport, Hotels & Food	Finance & Business
Cardiff	37	0	6	5	24	27
Newport	36	0	13	5	26	19
Vale of Glamorgan	41	1	18	6	21	13
Caerphilly	36	1	20	7	22	15
Merthyr Tydfil	42	0	13	5	26	14
Blaenau Gwent	35	0	22	7	27	9
Rhondda Cynnon Taff	38	0	16	9	26	9
Torfaen	41	0	10	7	29	13
Monmouthshire	33	2	9	9	30	18
Wales	36	3	12	7	26	16
UK	32	1	10	7	26	24

Source: Labour Force Survey, Annual Business Inquiry and Welsh Agricultural Census as quoted in Welsh Government (2011)

E.2. TV and digital media sector: Firm profiles and innovative activity

E.2.1. Sector profile

As noted above the TV and digital media sector is included in discussion of the broader Cultural Industries Sector, but it may also be discussed (sometimes confusingly) in relation to the Creative Media Industries, which itself is a sub-set of the overarching Creative Industries sector. Skillset, which is the UK Sector Skills Council with responsibility for the Audio/ Visual sector, following the DCMS classification for the broader Creative Industries, include the following in their definition of the Creative Media Sector:

TV and Radio broadcasting and production; film production and distribution; Animation; Commercials; Corporate Video production; production facilities; Interactive media and games; photography, processing and retail; manufacturing of photographic equipment and materials; picture libraries; cinema exhibition; and publishing (Skillset, 2011).

Whichever way the sector is sub-divided, there is an intimate and pervasive relationship between the various components of the creative industries, and to this mix may be added the role and influence of the digital communications infrastructure and the broader digital economy (see for example Hargreaves, 2009).

The Creative Media Industries as defined by Skillset accounted for 6.4% of total UK output in 2010 (amounting to £77bn), with a 2% share in employment (~537,100 jobs). These figures make the UK sector the largest in Europe. The Welsh Creative Media sector is a relatively small but distinct part of the wider UK Creative Media sector, and around 20,300 people work in the sector in Wales (approximately 4% of the UK total: see Skillset, 2011). Included in this sector are Interactive Media (approximately 3,850 people), Television (3,500 people), Publishing (3,300 people) and Advertising (2,800 people)²⁸. A further 3,500 people are employed in Creative Media-specific occupations in other industries.

²⁸ Some health warning regarding this data must be acknowledged. Skillset point out that official statistics often does not include freelance workers, who are significant elements of some parts of the sector; and particularly for the sector in Wales, sample sizes may be too small to allow analysis at SIC 5 digit level (inhibiting the disaggregation of some sub-sectors). Official (Government) data can substantially underestimate the scale of employment within the Creative Media Industries in Wales, as is shown by Skillset's primary research.

Skillset estimates that there are 1,300 Creative Media companies in Wales (including some sole-traders) and a breakdown by broad sector can be found in Table 3. The majority (84%) of companies across the UK Creative Media Industries are small (fewer than 10 people) and just 2% of companies are defined as large in this context (100 people and more), and Skillset assumes a similar profile of company size in Wales. This assumption is corroborated by a Cardiff City Council study that found 24% of creative firms in Cardiff were sole-trader entities (Cardiff City Council, 2009).

The sector continues to be dominated by London, and the 4% of the UK workforce located in Wales suggests that Wales as a whole has a somewhat low per capita share given Wales' 5% share of the UK population. The relatively easy connection between Cardiff and London may have contributed to a drain of talent from Wales and a disincentive for companies to invest, however, proximity to London may also be regarded as an opportunity to gain new business and to maintain and nurture networking links. Policymakers have recognised the importance of the Creative Media sector in the cultural, social, as well as the economic life of Cardiff and of Wales in general. The Welsh Government has identified it as a strategic sector in its Economic Renewal Programme and has set up a number of bodies and programmes to support development (Welsh Government, 2010a), while Cardiff City Council has also identified the sector as one of its priority areas for support (see further below).

Table E.3. Creative Media Sector in Wales: Company Breakdown, 2011

Company breakdown Sector	Number of Companies
Television	50
Radio	50
Film ²²	< 25
Animation	< 10
Interactive Media	300
Content for Computer Games ²³	< 25
Other Content Creation (Corporate, Commercials and Pop Promos)	< 25
Facilities	100
Publishing	300
Photo Imaging	200
Advertising	250
Total	1,300

Source: Skillset, 2011 (all totals rounded to nearest 50)

E.2.2. Sectoral structures

As the process of technology convergence continues, boundaries between these sub-sectors are becoming blurred, however, it is instructive to consider characteristics specific to these sub-sectors that help to distinguish them, and to consider how they interact with each other in the Cardiff and Welsh context.

Television

The Television sub-sector in Wales is based on terrestrial broadcasters and independent production companies, with few people working in Cable and Satellite television. About a hundred companies are active in Wales, with around 2,500 people employed in independent TV production companies and about a thousand people working for three terrestrial broadcasters across Wales, namely BBC Wales, S4C and ITV Wales²⁹ (Skillset, 2011).

The three terrestrial broadcasting companies provide the free-to-air TV network systems in Wales. Other UK network channels are also available to Welsh consumers (including Channel 4 and Five), but none of those have production or other facilities in Wales. BBC Wales, S4C, and ITV Cymru Wales are based in Cardiff but only BBC Wales and ITV Wales have their own production capabilities. BBC Wales have been established in purpose built facilities since 1966 and are currently in the process of adding a 15,800 sq m 'Drama Village' complex to produce networked TV shows in the Cardiff Bay area of the

²⁹ BBC Wales: the Welsh arm of the British Broadcasting Corporation; S4C: the Welsh medium broadcaster; ITV Wales: the Welsh arm of the London based Independent Television Company

city. In 1984 ITV Wales opened a TV studio complex in the city, which is also used by a number of independent TV production and media companies.

The independent sector is made up of mainly small companies but there are some half a dozen, including Tinopolis, Boomerang +, Presentable, Rondo, Modern, and Green Bay who operate on an UK basis and beyond, and are able to provide content for UK TV network and international markets. Boomerang +, Presentable³⁰, Green Bay, and Modern are all based in Cardiff, while Rondo have offices in Cardiff and in North Wales, and Tinopolis is based in Llanelli in west Wales.

The Television sector in Wales is shaped by a mix of commercial and regulatory drivers, with strong government interest in the operation of both public service and commercial networks. In Wales both the BBC and S4C are public service broadcasters, while ITV is an independent commercial network. S4C is specific to Wales³¹ and is the only Welsh language public service broadcaster, broadcasting over 115 hours of programmes each week. It was established by the UK parliament's 1980/81 Broadcasting Acts, and first went on air in 1982. It acts as a commissioning body and since 2007 has had no in-house production capacity, sourcing its content from independent producers as well as the BBC and ITV Cymru Wales. Initially, S4C, like Channel 4, was funded from the Net Advertising Revenue of ITV which sold advertising space on Channel 4 and S4C. After the 1991 Act, S4C has been funded by a direct grant from the UK government, by advertising revenue, and by income from its commercialising activities (including publishing and merchandising) (Table E.4). However, in 2010 the UK government's Department for Culture Media and Sport (DCMS) announced that it was cutting 24% from its contribution over the following five years, and that oversight for the funding was to be transferred to the BBC.

The TV sector in Wales faces some immediate challenges and opportunities in its development. A major factor is the changing production and sourcing strategy of UK terrestrial broadcasters, including the BBC, ITV and Channel 4. The BBC has committed to increasing the share of its TV production outside London, including a commitment to increase the network expenditure in Wales to 5% of its total by 2016, and is in the process of enhancing its production facilities in Cardiff to which the production of a number of TV programmes, which will be transmitted on an UK-wide network basis, have been moved from elsewhere in the UK.

Table E.4: S4C Revenue by Source, 2009 and 2010

	2009 £m (Actual)	2010 £m (Estimate)
DCMS (UK government)	101.36	101.65
Programmes/ Airtime sales	3.15	2.35
Publishing/ Merchandising	0.31	0
Other Income	1.03	0.22
Total	104.94	104.22

Source: S4C, 2010; quoted in DTZ, 2010

ITV activity has been in somewhat of a decline, but this decline may be off-set to some extent by the UK-wide broadcaster Channel 4's aim to target commissions outside England (i.e. including Wales, Northern Ireland and Scotland), and to launch a dedicated development fund for Welsh independent producers (Channel 4, 2010). Other sources of opportunity and challenge is the convergence of media technologies including high definition, 3D, interactive, and online television; Video on Demand; the proliferation of digital TV channels; and the development of DVD, mobile and smartphone technology, all of which provide greater market opportunities. Digital distribution in general provides opportunities for creative firms, offering new channels to reach existing customers and to create new ones.

³⁰ Presentable is part of the London based Zodiak Media Group

³¹ S4C may now also be viewed on the internet worldwide and through cable networks in other parts of the UK, increasing their potential audience.

The presence of three large television broadcasters in Cardiff has attracted TV production firms to establish in the city, and the inception of S4C encouraged a distinctively Welsh medium sector to develop³². Whilst Welsh-medium independent producers developed largely in lieu of S4C, the UK government's 2003 Communication Act gave these (as well as English-medium) companies added impetus to consider other markets both within the UK and overseas. The Communications Act enabled production companies to retain ownership of their IP³³ and changed the terms of trade between the producers and the broadcasters or commissioning companies. The production companies are able to exploit the creative content of commissioned work and to generate revenues from the IP after it is broadcast. The routes for revenue generation include publication of accompanying books and other linked merchandise, the development of digital products, games, and diverse channels for advertising, and in exploiting the process of technology convergence (see further below). In developing such revenue channels the TV broadcasters and producers have to interact in ever more intimate ways with the broader digital media sector.

Film

As a distinct sub-sector film production in Wales is small. The sub-sector includes Production, Distribution and Exhibition, along with services for film, for example in Post Production. In 2011 it was estimated that some 250 people work in film production in Wales, which is about 2% of the UK total, and a further 750 people work in Cinema Exhibition (Skillset, 2011). However, there has been an increase in the number of feature films progressing to production in recent years. Seven films were in production or post-production in 2009-2010 and development funds were awarded to 16 feature films, and production funds awarded to 13 feature films. Established in 2006 and based in Cardiff, the Film Agency for Wales³⁴ has a remit to ensure that the economic, cultural and educational aspects of film are effectively represented in Wales, the UK and the world. It is funded by the Arts Council of Wales, The UK Film Council, and the Welsh Government (via Creative Wales).

Radio

The Radio sector includes public service radio, commercial stations and community and/or voluntary radio. Across Wales there are some 50 enterprises ranging from the BBC to small community radio stations employing some 750 people in total. The BBC runs two national services for Wales, one in the medium of English and the other in Welsh. Both BBC channels are headquartered in Cardiff, but the BBC also has radio studio facilities elsewhere in Wales. There are a number of commercial stations located around Wales with Red Dragon FM being located in Cardiff, and a number of independent TV producers also produce content for radio broadcast.

Developments in the UK Radio market offer challenges and opportunities in Wales. While there has been an increase in listening figures there has also been an increase in competition across the UK³⁵. Radio broadcasting technology is also changing, and the UK government's 'Digital Britain' report advocated a migration to digital technology (DAB radio) over the next five years (BIS, 2009). Along with an increase in DAB radio, more programme content is being delivered online, and this trend is expected to continue to increase.

³² Before the establishment of S4C, BBC Wales and the local ITV company produced some programmes through the medium of Welsh, but this was greatly expanded as S4C became operational.

³³ IP: Intellectual Property

³⁴ See Film Agency for Wales website: <http://www.filmagencywales.com/>

³⁵ See RAJAR (Radio Joint Audience Research Ltd) website: <http://www.rajar.co.uk/>

Animation

Animation is a strong sector within the UK and it is a sector that has a number of centres of activity outside London, for example in Manchester, Dundee, and Bristol as well as Cardiff. A number of animation studios are clustered around one part of Cardiff, namely the Cardiff Bay area, although a recent addition to the sector has opened a new animation studio³⁶ in Pontypridd, a town just to the north of Cardiff. The sector employs some 400 people in Wales with the estimated annual turnover being in the region of £7.5m (Skillset, 2011). The TV broadcaster S4C has been an important driver in developing the sector, but funding sources have since been diversified to include finance from outside Wales. Animation now supplies content to television, visual effects³⁷ (commonly referred to as Visual F/X or VFX) and the Games industry.

Interactive Media

The Interactive Media is a production discipline that may be found in a number of overlapping sub-sectors within the Creative Media sector and with the software and IT sectors. This convergence is spurred by content commissions that incorporates multi-platform demands. The sector includes specialist companies that develop web sites, applications, online content, offline multimedia, mobile applications and interactive television³⁸. About 3,850 people are estimated to work for some 300 companies located in Wales, which constitutes 11% of the UK workforce (Skillset, 2011).

E.2.3. Case Study Firms

In addition to the firms and other sectoral organisations described elsewhere in the study, four firms were examined in greater detail to illustrate processes of knowledge generation and acquisition, and processes of learning and innovation for this case study. Given the structure of the Creative Media sector in Cardiff and Wales in general the focus has been on independent TV and Animation production companies. The three TV companies included represent major programme sectors from sports, children, youth, music, documentary, and animation genres. A digital media company is described to illustrate how firms in this subsector may interact with TV production and other creative media companies in the context of increased technology convergence. Large network broadcasters have not been included given their role as commissioning agencies and ultimate marketplace. Table 5 provides a summary of some of the firms' characteristics.

Table E.5: Summary information on interviewed TV and Digital Media firms (2011)

Firm	Established	Sub-Sector	Turn over £m	R&D as % of turn over	Export as % of turn over	Employee No.*	Patents No. or IPR	New products /processes 2008-2011
A	1998	Web-based software developer	2.2	20	5	45	0	N/A
B	1994	TV content	16.29	5	N/A	173	0	138
C	2005	Animation	2	10	30	3 ft; 40 contract	N/A	15-20
D	2001	TV content (and film/radio)	N/A	N/A	N/A	12-15 ft; >40 contract	N/A	N/A

*Source: Author interviews and firm websites (Note: * Employee numbers are as ft: full time, freelance staff will be employed on contract basis; N/A: data not available)*

³⁶ Dinamo Studios opened in September, 2010: <http://www.dinamo.co.uk/>

³⁷ Commonly referred to as Visual F/X or VFX this includes the various processes by which imagery is created and/or manipulated outside the context of a live action shoot.

³⁸ All the terrestrial broadcasters produce and host online material, (particularly the BBC) and while much of this might be provided on an UK basis there is also provision for specifically Welsh based and Welsh language material.

Firm A is a privately owned web consultancy and software developers, which has been profitable every year since inception returning year on year growth averaging at 23%, with no external financing and no borrowings. The company maintains a client base in both private industry and in public sector organisations (such as the UK National Health System), ranging from companies that are listed on the London stock market, to international standards bodies, and organisations from across the UK public and heritage sectors. The company has developed products for media companies, particularly for content providers in TV, film and web-based media, that link across technology boundaries. However, apart from a supplier-client relationship based on specific product sales the company has no structured collaborative venture with any other media or web-based content provider. One of the company's main products is a web content management system that can deliver hundreds of thousands of documents and objects through a user-friendly interface. This management system may be customised to fit the requirements of the client organisation.

The location of the company was incidental in the sense that the founders, having attended Cardiff University as computer science students, had no compelling reason to move from the city on graduation. The company has since established a branch office in London to facilitate sales and marketing activities, to provide a base for meetings, and to help service customer and supplier relationships. The presence of other similar firms in Cardiff (or the region), which are mainly small or micro sized companies, was not significant to the location decision. Links between Firm A and other same-sector companies in the region are largely informal rather than being designed for collaboration or partnership.

Firm B was founded in 1994 and located in Cardiff following the establishment and development of the Welsh medium network broadcaster S4C, while the founders, graduates of Welsh universities, were biased to building the company in their home area. The presence of S4C was, however, the most important factor as it has remained the largest customer for the company's products to date. Firm B began as a specialist producer of youth TV programmes, and concentrated on a relatively narrow niche that included sports, extreme sports and music programmes. This strategy gave the company a good depth of experience and reputation but made them vulnerable to changing tastes and to the bargaining positions of broadcasters who commissioned programmes. In order to address this weakness the company started on a process of development in 2003/4 that broadened sector coverage by the acquisition of companies that were strong in other product areas, while retaining the strong brand and expertise in the original product area that had been built up over a period of ten years.

The acquisition strategy began with niche companies located in Cardiff and the rest of Wales that produced programme material primarily for the Welsh market. The company has since acquired other companies that produce for the wider UK and global markets, and this period of acquisition saw growth in the size of the company to the point that it became a public limited company (plc) and obtained a listing on the AIM stock market³⁹. The strategy has made it into one of the five largest regionally based independent⁴⁰ TV production companies in the UK in terms of turnover, number of broadcast hours, and products in the market (Firm B respondent). The acquisition strategy broadened the customer base but also broadened the skill base available to the company. In particular it was able to acquire new facilities such as its own studio and editing suites⁴¹. The Group infrastructure allows each acquired company to operate as independent creative divisions within the Group and to benefit from combined creative energy when required. The effective management of the new production resources of the company and the paid activity relating to these facilities comprises the majority of the group's profits. The

³⁹ Alternative Investment Market; a sub market of the London Stock Exchange

⁴⁰ 'Independent' meaning independent of the large network broadcasters

⁴¹ Previously small companies such as Firm B rented facilities from either large network broadcasters or specialist facilities companies.

acquisition process has made the company into a different proposition to the older generation of independent TV producers, and with increased capacity the company has been able to improve quality and volume.

Firm C's location decision was also strongly influenced by the establishment of S4C. As an animation company, the decision by S4C to strongly feature animation as part of its channel identity was crucial to Firm C's formation and location. The company is based on a previous company established in 1981 to produce a specific animation product, first broadcast by S4C, and which became that successful across the world. However, Firm C has reduced its dependence on S4C commissions in more recent times, partly as S4C's investment in animation has declined, but also partly as the reputation of Firm C and Wales as a centre for animation more generally has increased. The company has undergone another period of financial restructuring since this period, but has maintained its core production interest in animation and, in particular, animated children TV programmes.

Lastly, Firm D is an independent TV production company committed to making high-quality television programming across a wide range of genres, including documentary, specialist factual, arts, features and factual entertainment, with some drama production. Documentary production dominates with history, science, and current affairs being most prominent. The company is also involved with film-making and some radio work, but the main focus is to produce TV programmes for broadcasters in Wales, the UK and internationally. It supplies network broadcasters such as S4C, the BBC, Channel 4, ITV, and National Geographic, and was located in Cardiff on the basis of the presence of S4C and the personal histories of the founders. It has received venture capital investment from Finance Wales⁴² to support organic growth, which thus owns some of the company's shares.

Key findings:

- TV and Digital Media sector is part of the extensive Creative Industries Sector, which is a large and significant industrial sector within the overall UK economy
- There is an intimate and pervasive relationship between various components of the sector
- Television, Radio, Film, Animation, and Interactive media are subsectors of particular importance in Wales
- The Welsh TV industry is based around 3 network broadcasters and the presence of S4C encouraged the a diverse group of independent programme makers and producers
- Digital media companies in the region are micro or SME sized companies
- Integrating digital media components into TV programmes is increasingly important
- There has been a process of gradual merger and acquisition among independent TV programme makers and companies have grown in size and range of capabilities

E.3. Types of knowledge and expertise required for local innovation

Knowledge and expertise within the creative media sector is manifested in a wide range of skills, working practices, and development opportunities. Even within a relatively contained and well defined sector as web-content software development there are number of specialism that contribute to a firm's productive capacity⁴³. Most of the sub-sectors included within definitions of the creative industries, and particularly the creative

⁴² Finance Wales is a Venture Capital Fund set up by the Welsh Government

⁴³ Firm A, for example, list twelve job titles ranging from Developers, Project Managers, Internal IT functions, Testers, Customer Service Staff, Consultants, and Designers in addition to the normal administrative and sales functions within the company.

media sector require, in addition to creative talent, a high level of technical ability and competence in the use of technical equipment.

Across the TV and Digital Media sectors, whilst there may be differences in technology and working techniques, there are general and common characteristics that will become strengthened as the rate of technological convergence increases. New technology and the increasing use and influence of digital technologies have changed job roles within the sector, and have blurred previously clear boundaries between sub-sectors. Given the pace of technological development in the sector, it is impossible to define precisely the technological knowledge and skills that may be required in the future, but it is clear that successful firms rely on an ability to combine such knowledge with the capacity to produce content and to manage production and commercial functions, i.e. to demonstrate a robust innovative capacity.

The knowledge and expertise required by firms, therefore, extend from the creative skills required for content development; the technical abilities to use, adapt and develop relevant technology; and the business management and commercial skills that are employed in understanding the market (including ancillary exploitation such as books, DVDs etc) and in cultivating market presence and the industry relationships necessary to successfully deploy talent within the company. As noted above Firm B has grown both organically and by acquisition to the extent that they run their own studios and own editing facilities. In this case the company also requires the skills to manage those resources and to complement the management of the facilities with the creative and technical demands of production.

Content may be of less importance to many web-based new media companies where the functional demands of the software is defined by the company's clients. However, while the focus of these companies may be on software development more intimate interaction with content providers from TV and Film companies increases their expertise in designing products that add value to original content, and which becomes an integral part of the joint product between them and the original content providers.

'... (There are) plenty of new media companies that do websites – that is not the problem. The problem is (finding) people who can develop different ways of doing content ... (to) create the games (and) the apps to go on – that sort of element which (as) an in-house exclusive thing (we) would not be able to do.'

(Firm B respondent)

The employment structure within the creative media, and in particular the TV production sector is an important factor affecting the expertise contained in firms. A number of these companies maintain small core staff numbers on a permanent basis, and employ specialist freelance workers on a fixed term contract basis to satisfy the demands of particular projects.

'...because it's a creative industry it's very competitive. Ideas are at a premium, so there is competition for the ideas and for the people that get them, and for the people that can actually make them happen. But it can be quite difficult to retain certain of those people – those key ideas people who have their own minds. They want to remain independent of any single organisation and this creates the competition for that talent'

(Firm B respondent)

A firm has, therefore, to manage disparate talent and expertise that is mobile and, at the higher end of the quality range, expensive to hire.

Key findings:

- The sector employs a wide range of skills including creative talent, technical ability and competence in the use and adaptation of technology, business management and market understanding
- New technology and the increasing use and influence of digital technologies have changed job roles and blurred previously clear skill and job boundaries
- Within digital media functional demands of the software is defined by the company's clients but also need creative ways of making content
- The employment structure within the sector is important: firms in TV production in particular maintain small core staff numbers on a permanent basis, and employ specialist freelance workers

E.4. Channels for knowledge and innovation acquisition

E.4.1. Learning within and between companies

Even though there is significant clustering of TV and other creative media companies in Cardiff it has been noted that there can be some reluctance among TV firms (in particular) to form formal collaborations with local competitors, and this reluctance is in some part attributed to a need to protect IP (Chapain et al, 2010; De Laurentis, 2006). This reluctance is specific to those companies that compete on the basis of their ability to produce new content ideas, which is most relevant to the independent TV producers. However, given the intimate nature of the TV production sector in Cardiff, local social ties support the development of connections both within the sector in Wales and the UK as well as with potential international partners. Information about new opportunities and knowledge about new partners is shared to some extent between local firms, and such introductions help to reduce business risk.

'Formal collaboration between companies is difficult because we are competing against each other for broadcast commissions – we are competing for the same customers, but we do exchange knowledge – market knowledge and talent exchange is very important'
(Firm C respondent)

Freelance workers are an obvious source of potential knowledge diffusion, but they are often subject to non-disclosure agreements that constrain the diffusion of knowledge between companies. These constraints are accepted as normal within the industry given that a large number of production related staff work on a free-lance basis, and given that the majority of working processes and techniques are not company specific. What is of most value to companies are individuals who are capable of producing ideas for content that will be successful in a given market place.

'...people build up a track record in the industry by working for different companies, but there has to be a very clear demarcation in development between ideas that are belonging to our company and to other companies'
(Firm D respondent)

As intimated above cross-platform applications in the creative media sector are becoming progressively more important for product development, which requires companies to consider collaboration with specialists in other sub-sectors. This collaboration requires a joint approach between companies located in different sub-sectors and draws on a range of specialist skills and experience. Programme ideas must include as integral other platform applications (e.g. Twitter and Facebook) rather than being subsequent add-on elements. Integration across these platforms offers more added-value to the product through, for example, more viewer participation and brand loyalty.

Understanding the market is a crucial element in the knowledge and experience developed and retained by a firm. Production companies gain this knowledge in a number of ways, including formal collaborations in co-productions, in engaging in networking activities, and in developing a collaborative relationship with clients. In the case of TV

production the latter of these is highly important, where the producer has to understand what the commissioning company (normally a network broadcaster) is looking for, and they for their part reduce the costs and risks of commissioning by their engagement with potential suppliers. The broadcasters use privileged information about audience behaviour and reaction to particular programmes (e.g. from the Broadcasters Audience Research Board, BARB) and a trade in information and ideas takes place.

'..there is no point in creating something they don't want and they have certain information that a single company or a group of companies won't have - particularly about audience behaviour,so you need that collaboration with them to understand the audience – and because from their point of view they don't want people to be pitching blind anyway.'

(Firm B respondent)

The relationship between programme maker and broadcaster is, therefore, based on detailed information flows, and a part of the independent producer expertise is to keep abreast of the relevant information that will shape the ultimate product that they are marketing to their clients.

'....you really have to understand the broadcaster, you have to understand the nature of the market that they're operating in and their understanding of their own audience and their own schedule needs. So a lot of our work goes into taking that raw idea, the first moment of inspiration and tailoring it for the specific broadcaster. And the American broadcasters in particular will be able to tell you to the percentage point what the demographics of their audience are: how they're split gender-wise; what, to the month,(is) their median ages; and their strategy for holding on to that audience and expanding it'

(Firm D respondent)

Such a structured client-supplier relationship may not occur to the same extent for web-based companies, but interaction with clients relating to the functional demands on their products, and feedback on function and operation provides Firm A, for example, with essential product development information. Firm A maintains this level of interaction with clients across the world, and staff may work within client office locations to develop software applications, either in the UK or in other areas of the world. An understanding of the wider market is also gained through observing and learning from competitor experience from which an understanding of competitor strengths and weaknesses may be identified.

A survey of companies based in Cardiff in 2010 (Chapain et al, 2010) suggest that TV Production companies tend to be more focussed on local markets than their colleagues in Digital Media. This is largely due to historical development of TV production in Cardiff and the influence of the Welsh- medium market. However, companies are aware of the need to enlarge their horizons and to compete both in the broader UK market and internationally. Competition in international markets often entails collaboration with producers in other countries and is largely concerned with developing creative ideas for programme content. As far as collaboration leading to innovation more generally is concerned there appears to be less activity among TV production companies than between Digital Media companies in Cardiff (Chapain et al, 2010). Digital Media firms have been found to be more open to collaboration, to networking and to using external sources of innovation (see further below). However, since they provide services and, in some instances, collaborate on specific projects with TV production firms, they can also act as diffusers of knowledge across the sector.

Digital media companies may be inhibited by their limited breadth of knowledge and expertise to fully exploit the potential opportunities that are becoming available through the convergence of technologies. Outward looking TV production companies can offer greater experience and expertise in producing and managing content by which multiple streams of revenue may be developed, and it is through judicious alliance with specialists

in other platform technologies, such as web, VFX, and mobile applications that collaboration between companies can deliver the greatest benefits.

E.4.2. Industry Networks

More interaction and collaboration occurs between companies at a business level rather than around the development of new ideas and techniques. This kind of collaboration is facilitated by trade associations and other trade-associated organisations, particularly those involved in trade fairs. The TV sector in Wales is served by the trade association Teledwyr Annibynnol Cymru (TAC). TAC currently represents around 80 companies in total, including providers of audio visual services either as production companies or in a support capacity, and some 38 independent producers. As a trade association TAC offers an industrial relations service; business and legal advice; together with an information service. It is also a lobbying and representative body and acts in discussions with broadcasters, development agencies, government departments and various other bodies. Its UK-wide equivalent, the Producers Alliance for Cinema and TV (PACT), has some 17 Welsh members. Other trade-associated bodies are useful as sources and facilitators of interaction and collaboration between media companies, for example animation companies may work with the 'Cartoon' European network. Cartoon receives financial support from the MEDIA Programme of the European Union to run its activities, and its remit is to support the European animation industry through training and facilitating co-productions.

In 2007 a more general network aimed at the creative industries named NOCCI (Network of Creative and Cultural Industries) was formed in Cardiff, and was established deliberately to encourage informal and ad hoc interaction between 'likeminded creative people and entrepreneurs' and to discourage networking for the sole purpose of marketing and promoting particular companies⁴⁴. Within the digital media sector in Cardiff a prominent networking structure is the Cardiff Web Scene⁴⁵ which was established in 2007 and is open to all software firms and users in the area. This network has in turn led to the establishment of a Cardiff Ignite group⁴⁶ at which IT professionals and enthusiasts meet to network, exchange ideas and socialise, and is linked to the global Ignite network. Firm A also nurtures a similar community learning approach internally that allows free discussion on technology issues within the company. Staff members are encouraged to participate in discussion and in learning skills regardless of formal job roles. The company also hosts an open blog to encourage discussion between employees, the company and the global community of internet developers. The company prefers, in general, to think in terms of learning processes rather than in terms of training provision given its focus on innovation and the development of new ideas and technology, and this community and open learning process is the basis of this approach.

All companies in the sector value trade conferences and fairs highly. TV and animation companies, for example attend specialist technical conferences in the USA and Holland, and market related meetings at trade fairs such as Cannes. In addition to the potential for striking co-production deals attendance at the trade fairs provide the opportunity to cultivate new relationships and lessens the company's dependence on local markets. Digital media companies also makes extensive use of industry conferences and trade shows to instigate and maintain new relationships with other organisations, and Firm A's approach is highly structured. The company's employees are tasked to attend and to gather information, knowledge and inspiration for new ideas and potential product or process development in the company. The company evaluates the benefit of sending people to these conferences on the basis of an explicit process. Conference attendees report back in stages from initial reaction (an evaluation survey immediately after the

⁴⁴ The NOCCI network operated as social events for those involved in the creative industries and similar events were run by the NOCCI founders in other cities across the UK. It has since been discontinued but has been succeeded by similar other (web-based) networks in other regions and that serve the whole of the UK.

⁴⁵ See <http://www.cardiffwebscene.com/>

⁴⁶ See <http://ignite.oreilly.com/>

event) to later more considered evaluation of the value and applicability of the conference (and/ or training event) contents and interactions. The latter stage is based on a one-one internal interview a few months after the event to establish benefits and the links to key priorities and business strategy.

Key findings:

- The TV sector in Cardiff exhibits extensive informal interaction but there is reluctance to form formal collaborations with local competitors due in part to a need to protect IP
- Much collaboration in the TV sector is at the business level, facilitated by trade associations
- A need to understand the market encourages formal collaborations through co-productions and in collaborative relationship with clients
- Freelance workers act as diffusers of knowledge subject to non-disclosure agreements
- More widespread cross-platform applications encourage greater collaboration with specialists in differing sub-sectors
- Digital Media firms are open to collaboration, networking and using external sources of innovation
- TV production companies collaborating with digital media companies can offer experience and expertise in producing and managing content
- Industry conferences and trade shows are universally important for gathering knowledge and networking

E.5. Local conditions to acquire external knowledge and innovation

The clustering of TV and digital media companies in Cardiff, along with the presence of commissioning companies and TV broadcasters, together with the changes in regulation surrounding Intellectual Property (IP) has influenced growth and innovation in the sector. Notwithstanding a reluctance to collaborate in certain areas of work, as noted above, companies in the sector have benefitted from the presence of a core group in Cardiff and elsewhere in Wales⁴⁷. A current policy initiative (see also below) being developed by the Welsh Government, which may enhance support for the sector and reinforce the clustering effect within the sector in Cardiff, is the Media Capital project. This project entails the establishment of a digital content business park, which would promote integrated development of digital media and content activity in a single location. The proposal would see the BBC Wales headquarters moving from its current 40 year old location in northern Cardiff to a Welsh Government owned site in a regeneration area at the city docks, close to where the BBC has already built a new TV production facility. This proposal envisages a strong cluster of TV and digital content facilities and organisations in an area of the city that already hosts a number of independent TV producers, and where a spontaneously developed cluster of digital media companies are already located.

The Media Capital proposal is strongly supported by Cardiff City Council, and it is envisaged that a partnership between the TV and new media companies, the Welsh Government, the city council, and local universities to support the development will enhance the cluster effects already in evidence in the city. It is argued that without such a media centre Cardiff will fall behind other regional centres of the industry, such as Glasgow and Manchester, who already have developed such facilities. The Media Capital proposal also seeks to embed the BBC, the largest single employer in creative industries in Wales, more strongly into the local media cluster.

⁴⁷ There are small clusters of TV production and digital media companies elsewhere in Wales. These have strong links with companies and other organisations that are based in Cardiff and, given the relatively small distances involved, may be regarded as strongly related to the Cardiff cluster.

An ongoing tangible effect of the clustering effect of companies has been their ability to collaborate in supporting educational and training programmes in the region. Formal training and relevant courses are available in a number of Higher Education Institutions (HEI) in all parts of Wales across the spectrum of the creative industries. Training has become more co-ordinated since the formation of the Skillset Media Academy Wales⁴⁸, an organisation headquartered in Cardiff, and which is a centre for organising high-level media education and training, which is delivered at the participating institutions. It is the only Welsh member of the UK-wide Skillset Media Academy network. The Welsh academy is a partnership of four HEI in Wales led by the University of Wales, Newport and includes Swansea Metropolitan University, Aberystwyth University and the Cardiff School of Creative and Cultural Industries at the University of Glamorgan⁴⁹. It offers a range of media courses, and can include master-classes, short courses, collaborations and work placements with production companies, through which the academy can provide students access to professional equipment. The Academy works closely with a range of industry bodies as well as production companies that include network TV broadcasters, independent TV production companies, animation, and other media companies. A more specific Skillset Screen Academy includes many of the same HEI and this has secured EU convergence (European Social Fund) funding to provide professional development courses to the industry.

Each of the exemplar firms featured in this study have taken advantage of the opportunities provided by the provision at the local HEI's, and in most cases these relationships have been eased by personal connections between the founders of the companies and the universities, most having attended these institutions as students. The interaction is also producing graduates that are ready to take up positions in the industry on completion of their studies, and the schemes available act as direct and specialised training schemes for the companies involved. Producers from firms run seminars and discussion groups on a regular timetable for local university courses, and contribute to student assessment. The commercial advantage to the firms is to provide first sight of the best people, while receiving visits from active practitioners is advantageous to the university. Students may also take advantage of work placement opportunities as part of their degrees, which is made meaningful by their participation in producing real TV programmes.

Companies are also taking advantage of funding to act as industry partners for Knowledge Transfer Partnerships (KTP) (at Masters Degree level) and the Knowledge Economy Skills Scholarships (KESS) (PhD level). In the case of Firm B, research for the KTP scheme is producing a base of knowledge that will be exclusive to the sponsoring company, and part of the agreement stipulates that any commercially advantageous information may be retained by the company⁵⁰. Such an exclusive deal is not allowed for the KESS scheme and, in Firm B's case, research will produce a methodology for generating added interest ('buzz' or 'noise') directly related to a TV programme on social media fora. The research is co-ordinated with a similar project underway in Spain, and the aim is to produce an automated process that will generate the impacts desired and made generally available.

Firm A has also opened channels with Cardiff University, and is interested in becoming involved in student projects, in providing work placement opportunities, and in employing graduates. Links with universities is not limited to Cardiff but includes contacts with

⁴⁸ See: <http://www.mediaacademywales.org/index.php?id=5>

⁴⁹ In addition Cardiff University has a strong school of Journalism that incorporates training for television and radio, while Glyndwr University, in north east Wales hosts a new Centre for the Cultural Industries incorporating state-of-the-art TV and radio studios, 3D workshops, design studios, IT suites, Apple training suites and post-production audio and visual facilities, and Bangor University in north west Wales a school of Creative Studies and Media.

⁵⁰ Such research, had it been sponsored by one of the network broadcasters, would have had to be shared with all TV production companies.

schools and departments of computer science at other Welsh universities, and interaction with American institutions such as Harvard University and MIT. The US links were created following a call for student projects that address technical problems defined by the firm. The product of the interaction may be used on a commercial basis to facilitate further business development in the US.

The company is also exploring apprenticeship schemes that may have formal links with universities and other training providers, and is also open to employing people who have not (yet) embarked on HE courses in computer science. The emphasis is on identifying enthusiasm, technological competence and a passion for developing technology. While contacts with secondary schools have not been developed, the company will accept applications for employment from school leavers. The company recruits from across the UK and attracts Cardiff graduate designers who return with industry experience gained in London. A significant aspect of the experience gained by recruits and returners from London is a greater commercial awareness and understanding of how and where the company's products fit into the overall industry and with specific customer requirements.

Key findings:

- Companies can take advantage of the benefits of clustering in the region
- The Media Capital project seeks to focus development in a particular part of Cardiff to enhance clustering effects. Firms have collaborated closely with Higher Education Institutions to develop educational and training programmes relevant to the industry
- Links between firms in the digital media segment and universities are improving both in Wales and globally

E.6. Knowledge and innovation acquisition policy assessment

The importance of the creative industries in cultural, social and economic terms has become more explicitly understood at all levels of government throughout the UK over the last decade. New structures of government have been established but changes in technology, in revenue streams, and in the ability of enterprises to monetise channels of mass communication have ensured that these structures have been under constant debate and review. This is particularly the case with television broadcasting and new media technologies.

The activity of the Welsh Government in this area is strongly constrained by the policy frameworks that are being developed at the UK level. Much of the creative industries are regulated by Ofcom⁵¹ and the DCMS, and many of the issues relevant to the development of the sector remain the responsibility of the relevant UK government department and have not become devolved to the national administrations in Wales⁵², Scotland or Northern Ireland. Support provided by the Welsh Government has also to be designed in the context of the actions of non-governmental agencies at both the UK and Welsh levels. In the television sector, for example, funding for the BBC in Wales is controlled centrally in London, while S4C funding has also come primarily from the UK government. There is also a programme of support for creative industries through higher education provision, and the impact of the wider provision for cultural industries through bodies such as the Arts Council of Wales should be taken into account.

⁵¹ Ofcom was set up by the Broadcasting Act, 2003 with a remit that extends over a number of industrial sectors and processes. Its duties includes the promotion of competition and consumer protection, and it deals with licensing firms, research, codes of conduct, consumer complaints and regulation of the radio spectrum.

⁵² A review of local service delivery in 2006 recommended that the Welsh Government should, however, be actively concerned with the delivery of all services affecting the Welsh population regardless of whether these are formally include in devolved areas of competence or not (Beecham, 2006).

In order to offer an overarching framework of support in Wales the Welsh Government announced a Creative Industries Strategy in 2004 (Welsh Government, 2004), and commissioned a review of the strategy and its impact in 2009 (Hargreaves, 2009). More recently the Welsh Government has developed a strategy for the digital economy that highlights the crucial importance of developing the digital infrastructure and the skills with which to fully exploit the digital economy, and which emphasises the close interdependence of the Creative Industries and ICT (Welsh Government, 2010b)⁵³.

The Creative Industries Strategy set up three areas for intervention, which included the creation of a Creative Intellectual Property Fund (IP Fund); a more strategic approach to the provision of business support through the creation of a Creative Industries Strategic Hub; and better targeted training and education provision. All three areas have been criticised by stakeholders for misplaced focus and lack of overall coherent vision, with the training and education appearing to have achieved most success (Hargreaves, 2009). The Intellectual Property Fund was set up with a £7m investment budget in 2005 and aimed at supplying equity investment to films, TV, new media and music projects over a 3 year period. The fund was managed by Finance Wales in an attempt to fill gaps in funding projects. Reviews of the operation of the fund and its objectives in 2007 and 2009 judged that it compared well with similar funds in other countries and regions in the UK⁵⁴. The review also noted that the fund, whilst retaining commercial goals, had also identified wider objectives such as talent development and innovation as important in its funding decisions. By March 2010, the fund had been increased to £10m.

The approach for business support proposed by the 2004 Strategy was to set up a 'hub and spokes' framework, where the hub: a new agency nominated as Creative Business Wales (CBW), would be advised by a panel of experts. A set of creative industries sub-sector 'spokes' radiated from the hub, which were to be led by employers, and which would co-ordinate and enhance the delivery of support to firms in each area. CBW was revived in 2008 and now contains the Welsh Screen Commission and Media Antenna Wales (established in 2007 and EU funded). These organisations exist to help film and TV producers find locations and technical facilities in Wales, and to support TV and film projects in Wales with training and help for attending international marketing events mainly in animation and documentary respectively. Outside the CBW, Film Agency Wales (FAW: established in 2006) is funded by the Welsh Government, the Arts Council of Wales and the UK Film Council on an annual budget of £1.6m to develop and fund film projects in addition to what is provided through the IP fund. It is also engaged in education projects, advocacy and market analysis.

A new body was set up by the Welsh Government in early 2011 to provide direct advice to Ministers on the opportunities and needs of creative industries and named the Creative Industries Sector Panel. This is also led and constituted by people with established reputations in the creative industries sector, and the Chair will also sit on the Digital Wales Advisory Board in order to maintain an integrated approach to policy making across the sector. This Board is charged with providing ministers with advice on infrastructure, skills, competitiveness, public service delivery, and digital inclusion.

To date, policy support for new or digital media has been less than that for TV and film sectors. This relative neglect may be partly because digital media can include a multitude of activities and designations that include online content, interactive, new media, and web-based technologies, and development of support programmes for this sub-sector is hampered by low levels of knowledge about the extent of activity. The case discussed in this report, Firm A, notes that whilst it has received general business development support and advice from Welsh Government agencies, for example in developing a Human Resources (HR) strategy, it has not been in receipt of structured business

⁵³ However, a full mapping exercise for the Creative Industries sector in Wales was completed only in 2010.

⁵⁴ Notwithstanding some criticisms for favouring projects in the film sub-sector, and having neglected in particular, new media and music (Hargreaves, 2009).

development finance or venture capital from public sources (e.g. Finance Wales, or from the BIS at the UK level) and is not aware of any sector specific schemes for such support. Major digital media growth in the UK has occurred, particularly in the Games sub-sector, however, and while there may not be any major games studios located in the region, a number of small companies, specialising in software creation, consultancy, digital problem solving (including games), and provision of web-based services to the public sector do exist as noted above (also see Hargreaves, 2009).

One initiative to develop digital media companies that has in the past been supported by the Welsh Government has been the so called @Wales digital incubator. This organisation was based in Cardiff and offered on-site mentoring, IT innovation, business development and marketing support. The Welsh Government, however, decided following a review into its performance by the Creative Industries Sector Panel in early 2011, to close the incubator because it failed to provide expected levels of output and quoted an inconsistency between the role of the incubator and the Welsh Government's new approach to business support.

Key findings:

- The importance of the creative industries in cultural, social and economic terms has become more explicitly understood at all levels of government
- The activity of the Welsh Government is constrained by the policy frameworks at the UK level
- The Welsh Government has developed strategies for the Creative industries and the digital economy and an IP Fund to support innovative developments
- Digital Media is not as well supported by government action as the TV and allied sectors

E.7. Conclusions

New technologies, and new combinations of technology, are changing the TV and Digital Media sector in a rapid fashion, and firms in the sector are under constant pressure to adapt and to innovate in order to secure their survival. New technology also provides the opportunity for new combinations of skills and expertise, and new opportunities for creating business. The convergence of technologies from different sub-sectors is offering challenges and opportunities to TV (content) producers, digital technology companies, and software developers to learn to work together and to create products that will add greater value to their main outputs. In addition the sector is under constant scrutiny from regulators and policy makers, reflecting the economic, social and cultural importance of the industry. New and existing firms are challenged to respond creatively.

The case study for the TV and Digital Media sector centred in Cardiff describes a sector that is in a process of change and adaptation to the circumstances summarised above. Firms in Cardiff have enjoyed success and growth as the sector expanded since the establishment of S4C in the early 1980s, and since the Communications Act of 2003 allowed independent TV producers more incentives and opportunity to expand. Mergers and acquisitions have concentrated some of the strengths of the sector in Wales, but have also allowed companies to expand their horizons and markets. Policy makers in Wales have identified the sector as important and significant and have been active in devising support programmes to encourage further development, although development support for the digital media sub-sector lags behind that for the more 'traditional' media sectors and displays less understanding of the sector.

The sector in Cardiff has a pattern of development to date that may be characterised as a 'creative co-inventing application pattern'. This pattern is what is designated in the KIT project as Pattern 2 (Figure E.1; (see Chapter 2, Volume 1 of the Scientific report for a detailed description of this pattern). It is based on locally developed competencies,

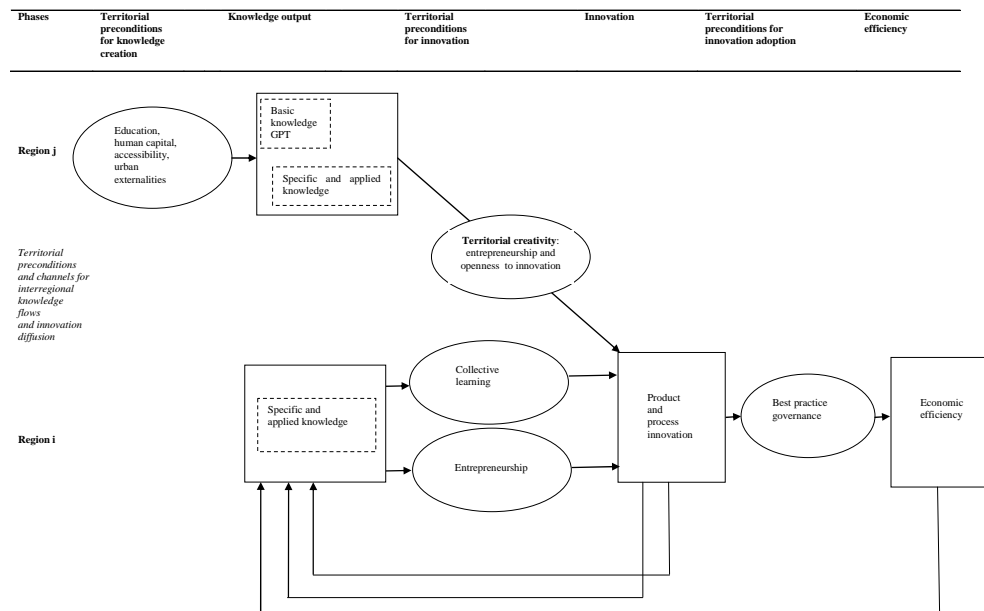
collective learning at a general level, and active processes of product and process innovation. Strong firm-level sector-specific knowledge is evident in Cardiff that allows firms in the region to innovate and to adapt basic knowledge that is produced and developed in other regions. Firms in the region are networked to sector organisations in other regions that enable exchange and knowledge acquisition to occur, and are also able to attract and fully utilise mobile (freelance) expert labour. The region also displays the capacity to generate expertise locally, and provides a strong basis of skills and talent.

Projects involving both public and private sector actors, such as the proposed Media Capital, offer the potential of capitalising on existing strengths and on the clustering of sector actors in the city. However, the sector is highly competitive and developments in a number of other regions, and globally will have direct bearing on the success of firms located in Cardiff.

Key findings:

- The convergence of technologies from different sub-sectors are offering challenges and opportunities to the TV and Digital Media Sectors
- The sector is in a process of change and adaptation to new technology and financial structures
- Mergers and acquisitions have concentrated strengths and have allowed companies to expand their horizons and markets.
- The sector resembles a 'creative co-inventing application pattern'

Figure E.1: A creative application pattern



Source: KIT Draft final report

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F. The Food sector in West Wales ⁵⁵

F.1. Introduction and description of the case study area

The British Food sector case study addresses the food sector in Carmarthenshire in south West Wales (NUTS UKL1: West Wales and the Valleys). The region has a large agricultural sector and both the local and the Welsh Government have promoted the connection between the agricultural attributes of the region and its food industry. The case study takes account of this linkage and focuses on those sectors that add value to the main agricultural products of the region, namely dairy and meat.

The region has few large food sector employers, with the majority being SME's or micro-sized businesses. Case study illustrations have, therefore, mainly engaged with small companies, and with artisanal food producers, but also make reference to larger entities. The sector in this region is a comparatively low-tech sector and companies included illustrate knowledge acquisition processes rather than knowledge creation. There are, however, examples of firms that employ more sophisticated technology and also perform their own primary research and development, and reference is made to these in order to contextualise the capacity of the region.

F.1.1. Geographical context

Carmarthenshire is located in south west Wales, part of the NUTS 2 area that covers west Wales and the former south Wales coalfield area known as the south Wales Valleys. The south west Wales⁵⁶ part of this NUTS 2 designation covers the local authorities of Carmarthenshire, Pembrokeshire, Swansea and Neath Port Talbot. The character of the region varies from a heavily industrialised east to a predominantly rural west. Neath Port Talbot contains a large integrated steel making plant, while the neighbouring city of Swansea is a centre of administrative, retail, health and educational services. Carmarthenshire and Pembrokeshire are predominantly rural although in each case there are localised areas of industrial development, notably around the town of Llanelli in Carmarthenshire and the oil and liquidised gas terminals and oil refineries of southern Pembrokeshire. Carmarthenshire has no large cities, with the major centres of population being Llanelli and surrounding villages (78,300), Carmarthen (15,244) and Ammanford (12,755) (Welsh Government, 2011). The distribution of population of each area is shown in Table F.1.

Table F.1: Population of local authority areas in South West Wales (2010)

City and Local Authority regions	Population
Carmarthenshire	180,700
Pembrokeshire	117,100
Swansea	232,500
Neath Port Talbot	137,400

Source: UK Office for National Statistics (ONS): Mid 2010 population estimates

F.1.2. Local economic context

The performance of the economy of south west Wales lags that for Wales and the UK. The region had total Gross Value Added of £12.2 billion in 2008, representing £13,900 per head, which is 74.1 % of Wales and just 67.5% of the UK average. There is some variation in GVA across the region from 77% of the UK average in Swansea to 60.3% in the combined area of Pembrokeshire, Carmarthenshire, and Ceredigion⁵⁷ (Welsh Government, 2011). The distribution of workplace employment also varies appreciably across the region. Swansea stands out as a centre of public administration, and Neath Port Talbot as a centre for production (manufacturing). Carmarthenshire and

⁵⁵ This case study report has been written by Selyf Morgan.

⁵⁶ As designated by the Welsh Government

⁵⁷ Note that for some statistical purposes the definition of the south west Wales area includes Ceredigion, a unitary authority adjacent to Carmarthenshire.

Pembrokeshire have high concentrations of construction jobs and in agriculture, forestry and fishing, while the wholesale, retail, transport, hotels and food industry designation is the second most important by % share of local industry.

Table F.2: Work place employment % share by industry in Local Authority areas in SW Wales (2009)

Location	Public Administration, Defence, Education, Health & Other Services	Agriculture, forestry & fishing	Production	Construction	Wholesale, Retail, Transport, Hotels & Food	Finance & Business
Carmarthenshire	34	9	9	10	26	12
Pembrokeshire	31	8	8	10	31	13
Swansea	42	1	5	6	26	20
Neath Port Talbot	34	1	23	7	24	12
Wales	36	3	12	7	26	16
UK	32	1	10	7	26	24

Source: Labour Force Survey, Annual Business Inquiry and Welsh Agricultural Census; quoted in Welsh Government (2011)

F.2. Food sector: Firms profile and innovative activity

F.2.1. Sector profile

The food sector profile in Carmarthenshire is similar to the overall profile for Wales, although it has some higher concentrations within the meat and dairy sectors. The food sector is an important component of the Welsh economy producing a turnover of £1.4bn in 2009 and a GVA of £1bn. It is also the largest manufacturing sector employer, employing an estimated 23,400 people or 14% of the total manufacturing workforce in 2008. The highest employment concentrations are in the eastern regions of the country e.g. Flintshire (3,000); Wrexham (2,500); Cardiff (2,300); and Newport (2,100), but Carmarthenshire, with some 1300 jobs in the sector, is the fourth highest area in terms of the number of workers in the sector. It has the highest concentration of workplaces, accounting for 11% of the total (i.e. 66 out of the 600 in total) (ONS, 2010).

Across Wales 30% of food businesses are small and medium enterprises (SMEs) (between 11 and 249 staff) with 40% of the workforce working for organisations of this size. In 2009 micro organisations of 10 people or less make up 68% of businesses. Many food and drink businesses in Wales are, therefore, associated with small, family run enterprises. These enterprises are associated with high quality production methods (Improve, 2010). Meat, Bakery and Dairy products are the three leading sub-sectors by employment numbers and these represent 6,800 employees (29%), 6,700 employees (29%) and 2,300 employees (10%) respectively⁵⁸.

In Carmarthenshire the food sector has been identified as a major growth sector by the local County Council (see further below) and as such has been supported and promoted as a significant strength of the area. Much of this strength is based on the agricultural profile of the region (see Table F.3 for all-Wales statistics), and much of the promotion work of the local county council's economic development department rests on the linkages between the agricultural character of the region and local food output.

⁵⁸ Labour and sector statistics derived from UK government Office of National Statistics sources from 2008 – 2010

Table F.3: Value of Welsh agricultural output, 2009 (forecast)

Category	Value (£ million)
Milk and Milk products	330
Sheep and Lambs	204
Finished Cattle	207
Store Cattle and Sheep sales	90
Poultry and Eggs	78
Finished Pigs	4
Total Cereal	15
Horticulture and potatoes	33
Capital formation in livestock	51
Other agricultural activities	121

(Source: *Welsh Agricultural Statistics, WAG 2009*; *Note Capital formation refers to investment in buildings, physical work undertaken by the farmer and the value of the physical increase in breeding livestock)

The region is one of the main milk producing areas in the UK⁵⁹ and, hence, a large part of the case study focus has been devoted to dairy producers. For Wales, the majority of milk production (80%) has been used in cheese making, and the majority (70-75%) processed in Wales (Welsh Government, 2007). However, many of the milk and cheese factories that existed in the south west region have been closed over the last twenty year period, leaving just two large scale dairy factories in the region. Smaller dairy factories have been established in the interim, with a number of these producers adding value by using organic milk, and producing a wider range of products including pasteurised liquid milk, flavoured milk drinks, yoghurt, cheese, and butter products, using both cow and goats' milk. By the summer of 2011 there were some thirteen dairy food producers in the region ranging in size from the two remaining large processors employing around 70 people each, to micro sized firms employing just three people. Milk that is not processed in the region is transported to other facilities in south Wales and to plants in England.

Carmarthenshire produces beef and sheep meat and while there is only one abattoir in the county, there are five more within the south west region, and plants producing processed meat products are also located in the region. Fish and fish products, which includes inshore fishing, a local shellfish industry and a seaweed speciality food⁶⁰ provides a small contribution in terms of the value of landed fish, but contributes significantly to local tourism and recreational activities (Welsh Government, 2008). Similarly horticultural production is a relatively small part of the local food production and processing sector.

Other food sector companies in the area include packaging, distribution, and food service firms, some of which are large companies and multinationals. Companies that provide support functions, such as food analysis laboratories, and some companies that are engaged in more specialist activity such as food flavouring production, spray drying food flavouring and colouring, and specialist gluten-free and vegetarian food manufacturers, are also located in region.

F.2.2. Case study firms

The food sector is often regarded as a low-tech sector, but the specialist food related activities referred to above employ advanced techniques, while some firms engage in original research and development (particularly in food flavouring). The case study will

⁵⁹ The Welsh Government financed (from RDP funds) Dairy Development Centre is located in the region. This centre aims to facilitate the development of the Welsh dairy industry through a proactive technology transfer service, the provision of milk and cheese market information to farmers, demonstrating best practice methods of milk production and through research and development work. The dairy industry across the UK contribute some 9% of the UK's food and drink manufacturing and processing industry's turnover, 6% of all UK exports and 13.6bn litres of milk is processed per annum.

⁶⁰ The seaweed product is named Laverbread (Bara Lawr in Welsh). In 2005, the shellfish sector produced ~£12million of production value spread across 11 businesses and employing 56 people in full and part-time employment (Welsh Government, 2008)

refer to some of these companies but concentrates on the major sectors that are present in the region, namely dairy and meat production. This focus reflects the region's status as a milk-producing area and the efforts being made by firms and support agencies to develop the food sector by emphasising local natural conditions as a major component of their marketing strategies, and making the link to local agriculture explicit.

Of the various food sector firms in the region six were examined in greater detail (Table F.4): three of these are artisanal cheese firms; two are (the remaining) large scale dairy processors; while the last is a marketing firm engaged in the production of branded Welsh meat, and which uses local provenance to market its product, linking local growing conditions directly to the quality profile of its product. Firms were interviewed following a common interview schedule developed for the KIT project, and policy makers and local support officers were also interviewed to ascertain how local policies and actions to support the sector were being delivered in practice.

Table F.4: Summary information on interviewed Food sector firms (2010)

Firm	Established	Sub-Sector	Turn over £,000	R&D as % of turn over	Export as % of turn over	Employee No.*	Patents No. or IPR	New products /processes 2008-2011
A	1982	Dairy	260	1	2	3	0	1
B	2006	Dairy	1000	3	1	9	0	10
C	1991	Dairy	110	1	0	6	0	7
D	2006*	Dairy	100,000	N/A	0	72	0	0
E	2007*	Dairy	24,000	0	40	71	0	1
F	2003	Meat	93	N/A	N/A	1	1	3

*Source: Author Interviews and firm websites (Notes: * These companies are located at sites that have been milk processing sites for a considerable number of years and operated by a number of other companies; N/A: Not available)*

Firm A is a micro sized firm that was a pioneer in the resurgence of artisanal cheese making in the area. The founders moved from the Netherlands and started making cheese on farm from a number of different recipes in 1982. Although some artisanal cheese making was already taking place at isolated locations in Wales, the degree of interest, and number of cheese makers, were low. However, the artisanal segment of the industry has increased significantly over the intervening three decades. Firm A has diversified into other products over the years since it was established and is currently developing a whisky distilling venture to be also located on the farm, utilising by-products from the cheese making process. The firm has also been active in various collaborative engagements with other small cheese makers in the area to promote their products by linking the natural conditions of the area to the qualities of their products. The current collaborative marketing venture includes Firm A, B and C along with two other similar firms in the area.

The founders of Firm B had also moved into the area from elsewhere for a mix of reasons that included personal family ties and desire to locate in this region. The founders were already very experienced in the dairy industry prior to starting the company and the firm was developed in response to opportunities that presented themselves in the locality. They perceived that a strong level of the support was available from the public sector, and recognised that a local concentration of food producers had accumulated, which was beneficial to start-up food producers in marketing and logistical terms. The firm has grown with a well defined focus on targeted marketing particularly to multiple retailers.

The founder of Firm C also had lengthy experience in the food sector before returning to the area to establish a cheese making venture on his farm. The cheese is currently being produced at business incubation units provided by a public sector funded Food Technology Centre, but the firm plans to move to purpose built facilities located at the

farm from which the main milk supply is sourced. The cheese product differs from traditional cheese types from the region in being flavoured yoghurt-cheeses. The founder of the firm is also involved in the re-opening of a dairy bottling plant in the locality, which is being established on the site of a former large milk processing and cheese making factory.

Firm D is a substantial component of an UK wide company⁶¹, within which it operates as a local subsidiary that produces (mainly) cheddar cheese for retailers' own brand labels but also for its own local brand. It is located at a site that was first built as a dairy processing plant in 1930. In the interim the site has been owned by a number of different companies engaged in the dairy industry and has produced evaporated milk, cheese, whey butter and whey powder. Facilities at the site has been continually improved, and include new condensing and drying plant, curd handling machinery, cold stores, and packing facilities, and improvements aimed at increasing efficiency by increasing the rate of milk processing. The present owners first secured a share of the creamery in 2002, forming a joint subsidiary with the previous owners, finally taking over fully in 2006. At the time a further investment of £2.6m was made to upgrade the plant and to install new cheese vats, which was followed by a £3m project (jointly funded with the Welsh Assembly Government) to install new more energy efficient whey processing equipment.

Similarly Firm E is a company that bought a site with a long history of milk processing. It is a multinational company headquartered in Canada, and has extensive interests in both north and south America. It has been pursuing an acquisition strategy to expand into other markets world- wide. The previous site owners had been producing similar product to the current owners, namely block and shredded mozzarella cheese, and had been operating the plant since 1988, having itself taken the site over from the original owners. The plant received various investments totalling over £10m during a twenty year period, some of which was part provided by EU Objective 1 scheme funding. The current operation continues to produce mozzarella cheese for the food service segment of the food sector (mainly for the pizza market) and exports some 30% of its produce to continental EU countries and a further 10% globally. Employee numbers contracted in 2007 largely because the company found it impossible to maintain optimal efficiencies following difficulty in regaining supplies of milk that were lost when some farmers ended their milk supply contracts following disputes with the previous site operators.

Firm F differs radically from Firms A-E, not only because it works within the meat sub-sector, but also because it is primarily a marketing-company that facilitates the delivery of a premium quality meat product. The firm is a joint venture in which the collaborators include a food wholesale and distribution company, a farmer's co-operative company from which some 65 farmers supply cattle, and an animal feed company. These three companies work together to develop a beef product that has high quality characteristics and marketed as fully traceable Welsh beef. Firm F utilises the reputation and natural characteristics of the producing area, with cattle required to have been born, reared, finished and processed in Wales, and stipulate rigorous feeding and nutritional regimes and animal welfare conditions⁶². Cattle and meat are also monitored and tested regularly to maintain standards and consistency with information on product performance delivered to the farmers.

⁶¹ Group turnover in 2010 was reported at £536m (company Annual Report)

⁶² For example, the company stipulates that the cattle are not transported any further than a maximum of 100 miles (167km) in order to reduce stress on the animals.

Key findings:

- While the food sector is diverse, major local strengths lie in dairy and meat production
- Firms have strong locational ties, including personal motivations and long historical association with the area
- The reputation of food promotion and the productive capacity of food and agriculture in the region are significant attractors to firms
- Investment has been made in production capacities, with some process innovation activity being carried out by all the firms
- Innovative activity is centred on mainly on organisational, marketing and incremental process improvement

F.3. Types of knowledge and expertise

The types of knowledge and expertise required by dairy sector firms in Carmarthenshire are generally focussed on practice based production knowledge, on the management of relatively low-tech production equipment, and on business management and marketing knowledge. The types of production skills and technical expertise necessarily differs between the artisanal, low volume, producers (e.g. Firms A-C) and firms (e.g. Firms D and E) that have large volume throughputs and greater environmental, waste and energy demands. Both small and large companies do not make radical innovations in product terms, but adapt generic production knowledge to the relevant scale of production and respond to evolving regulatory environment. In the case of the larger firms (D-E) new technology is always under consideration but investments in production plant at this scale are expensive and new technology is employed only when its introduction is optimal in the production and management cycle of the company. Health, hygiene, food safety and environmental knowledge is fundamentally the same across the industry and required by regulation, although greater production volumes places added responsibilities on firms.

The larger dairy firms (D and E) differentiate staff roles into operative and technical. While the production operators need to understand the process of cheese-making, both firms maintain technical staff⁶³ engaged in quality control, calibration of equipment, and procedures to support hygiene, health and safety. Technical staff requires food technology knowledge, and in each firm, run a small on-site analysis laboratory, whilst site engineers are responsible for plant maintenance and optimisation. For the smaller firms (A-E) production and 'technical' roles are combined and distributed among the small number of employees, and more use is made of external expertise, such as for quality and hygiene testing and analysis.

In the case of Firm F, relevant expertise includes livestock husbandry, feed composition, meat preparation, and meat presentation in addition to business management and marketing knowledge. It has also utilised scientific knowledge, sourced directly from a local university, which provides advice on an innovative and consistent feed quality system, and on the feed protocol to maintain the livestock protein balance for the last sixty days prior to slaughter. Because of the company's structure, however, this combination of knowledge is largely resident within the respective partners who collaborate in the functions of the firm, and the main roles of Firm F are to co-ordinate the activities of the three partners and to facilitate internal knowledge exchange. Successful management of this system gained the firm an EU Protected Geographical Indication (PGI) brand.

⁶³ Firm D has seven designated technical staff whilst Firm E employs four.

Many of the small dairy companies can often be termed lifestyle companies, and have shown little motivation to grow. Business motivation for these firms resides in the desire to create quality products and to utilise territorial characteristics to add value. In this respect they are supported by the promotional strategies of the local county council and the Welsh Government through its 'True Taste' branding of Welsh produce. Provenance becomes an important element in the marketing strategy of these firms, and an understanding of how to deploy this factor is important for small firms. However, some of the companies interviewed do have a growth oriented approach, and are able to adapt to market preferences, identify market opportunities and adapt production to the demands of the market. Knowledge of how to identify, access and use this kind of market oriented information becomes a crucial factor for those companies that are aiming to expand their market and diversify their outlets. These companies seek to go beyond the 'lifestyle business' stage and to marry standard technical competence with market competence and accreditation standards in order to access multiple regional markets.

'...90% of that (cheese market) goes through supermarkets, then really if you're going to have any sizeable share of that you're going to have to go into the supermarkets. The next logical step is if you look at [name of major multiple retailer] who has 38% of the Welsh market in retail, therefore you've got to be in [name of major multiple retailer] if you want to grow any sizeable business....it doesn't matter whether the best food scientist puts together the best food formulation and that product is fantastically packaged, if the marketing of that product or the positioning or the pricing, or the pure mindset of the family business possibly is not correct and aligned with the market it's not going to be a success.'

(Firm B)

Key findings:

- Dairy and meat firms may be considered as a low-tech sector, engaged primarily in production processes with little fundamental generic R&D activity being conducted in the region
- Considerable knowledge in the dairy sector is related to food technology, food safety, hygiene, health and safety and environmental protection.
- Production innovation is incremental and constrained by financial restrictions
- Marketing knowledge is of crucial importance for all firms, but is an area of weakness for many small dairy firms that have growth aspirations
- Marketing knowledge is paramount for growing the meat market, and used to inform production activity
- Organisational innovation is displayed in small firms as they become established and mature

F.4. Channels for knowledge and innovation acquisition

F.4.1. Internal channels

Within artisan firms (A-C) technical knowledge of food making processes is gained mainly through on-the-job training and experience. Product knowledge is acquired either through local or family recipes, or freely available information. Other small cheese company founders have brought product knowledge with them from previous experience and utilised this experience in establishing and developing new companies in the region. In the case of Firm B, experience consist of an accumulated 30 years in the food industry, primarily in management and marketing within the cheese division of a major dairy company, while for Firm C, experience was mainly in terms of food processing engineering and technology with a number of differing food (mainly dairy processing) companies in the UK.

'I haven't got food technology training but I have a vast knowledge of the process and what things need to do to change. It has developed over time. It is not based on the

chemistry of food; it is based on how food reacts to temperature, pressure and things like that. So it is all practical - based on what produces certain effects.'

(Firm C)

'...(and) having got the technology for cheeses that are difficult to make - we brought our technology with us, and we've done our own kind of thing for product development.....'

(Firm B)

The two larger firms (D, E) operate dairy plants on sites that have hosted dairy companies for a substantial number of years. In the case of Firm D there has been cheese making on the site since the 1930's and there is a considerable depth of local experience and understanding of the dairy industry in the area. The stability of the workforce suggests that practice-based local knowledge can be passed on by informal means.

F.4.2. Local channels

In addition to the accumulated experience of staff within the companies small scale cheese makers have been able to gain knowledge from mutual interaction. Much of this interaction is on an informal basis and, for example, firms will help each other with specific advice on production equipment and facilities (e.g. specialist dairy flooring), or assist in the logistics of attending trade fairs and shows by sharing transportation, fridges, and product delivery. The larger firms D and E have also been prepared to interact with local small producers, who are invited to visit their sites to discuss specific areas of interest, and to observe various processes working at larger scales.

Even with the increase in the number of cheese makers over the last ten years, most cheese makers in the region and across Wales know each other. There have also been a number of collaborative organisations as in, for example, the formation of a cheese marketing company, namely '*Cheeses from Wales*' through which a number of the artisanal (and commercial) companies from the region, and from across Wales, supplied cheese⁶⁴ to retail outlets. A successor and more locally based association has been set up, namely '*Teifi Valley Cheese*', to which five cheese makers have committed to jointly market their cheese and to market the region as a centre for artisanal cheese making. As part of the marketing exercise the association publicises a '*Cheese Trail*' that leads visitors through the area to visit each producer, and which has as a result received support from tourist agencies. Firms have also collaborated to exchange product, process and market related information. Whilst there is an element of competition between them as cheese makers, most of the cheese produced is of different types or different flavours, minimising scope for conflict. Knowledge exchange is mainly about specific elements of production processes, and for specific market introductions.

Small dairy sector companies in this region do not have access to specialist research and development capabilities, but are able to take advantage of a dedicated public sector food technology centre to test and develop, on a small scale, product or process adaptations and innovations. As noted above, knowledge of health and hygiene regulations may be obtained through formal training and certification, which may be provided by the technology centre or local Further Education Colleges.

The food technology centre, (the Horeb Food Centre), is financed by the Welsh Government and offers space, over a limited period, for new companies to engage in product development, product assessment, factory design, equipment sourcing, and small scale manufacturing. The centre can also offer assistance in designing quality management systems and auditing, and provides access to specialist training courses for

⁶⁴ '*Cheeses from Wales*' was formed in 2005, but was wound up in 2009.

the food industry. Companies may use the services of food technologists at the centre, but may also decide to use the facilities as an incubator space within which to launch the company or to develop a specific new product or process. Public analyst laboratories are available when product safety issues are pertinent, or where the firm needs a definitive analysis of the nutritional composition of a new product. The local council authority in the region has also built a dedicated Food Park that hosts food companies at different stages of development, and on which firms may interact and gain knowledge about operational areas.

For many of the small dairy companies in this region business management knowledge and expertise is gained through experience. As noted above, many companies have been founded by individuals with experience gained in other regions and this is brought to bear in developing the business, but companies are also able to take advantage of business support services provided by the local county council.

'We work with the food business support office of Carmarthenshire County Council. Carmarthenshire Council have been quite inspirational in their thinking of having a food park at Cross Hands, but also the fact that they are targeting tailored support into businesses that they believe are going to put a return into the public purse. So we actually have had a lot of support in particular with them'

(Firm B)

Companies have also utilised the knowledge gained by their staff from experience of working in other dairy sector companies. In the case of Firm B, for example, skilled specialists in food technology, food hygiene and, in particular, the technical aspects of dairy processing, who were previously employed in larger dairy companies that have shut down, have been employed locally.

The larger dairy companies engage more formally with other companies and Firm D, for example, has developed a relationship with a locally based animal feed and human food supplement maker who buy whey protein from the company. The two companies interact to maintain the quality characteristics of the product and have collaborated in optimising the operation of production plant (e.g. a Reverse Osmosis Plant). Firm D have also worked with specialist cleaning companies who convey best practice in plant cleaning and maintenance to the company. Firm E, however, while it does not collaborate with other cheese making firms (in the interests of confidentiality) do interact with other companies to learn about generic techniques such as energy efficiency measures (for example through an Environment Agency network), and about the maintenance and operation of the mechanical equipment that it employs.

Companies have also collaborated with universities in this region to develop new product. An illustration is the collaboration between cheese makers and the chemistry department at Swansea University, e.g. in developing a nano-filtration technique in researching whey characteristics. Both small and large dairy companies have participated in research contact with the university. In the case of Firm A the cheese maker is interested in the lactose content of whey, which may be turned into alcohol that will be the basis for a diversification⁶⁵ into a micro-distillery venture. The company is taking advantage of EU funding to encourage collaborative research with the university to finance the research.

In developing its meat product the partner organisations making up Firm F have consulted a local university to identify a method of improving meat texture and a method that would ensure a longer shelf life once the meat has matured. The cattle are grass fed for the majority of their rearing period and are tested to ascertain vitamin E levels before slaughter. Monitoring of participating farms is conducted regularly with, for examples, samples of fodder being analysed for vitamin E content. If required, feed

⁶⁵ Firm A has a history of diversification into business ventures related in different degrees to the farm and cheese making business, including collaboration with a Scottish whisky distillery in producing organic whisky.

supplement is then provided (prepared by the animal feed company) to raise the levels of vitamin E (naturally found in grass) to ensure that all farmers that supply meat to the company provide a consistent product⁶⁶. Market feedback is provided from the wholesale/ food distribution member of the collaborating group that interacts with customer and consumer sources.

Health, hygiene and food safety knowledge is generally obtained and certified from dedicated training courses in all cases. The larger firms also value the contacts they maintain with government agencies such as the Health and Safety Executive and the Environmental Agency, who may provide courses and seminars on topics related to regulations and improved techniques in the operation of production sites.

F.4.3. External channels

The use of sources of knowledge and expertise that are external to the region is most clearly evident in the case of the larger firms D and E. These firms engage with sources of knowledge within their respective corporate groups, thus specialists such as food science and food technologists are utilised to develop improvements in their product, or to develop new products that are created at a corporate level, on an UK basis in the case of Firm D and global in the case of Firm E. The parent company for Firm D supplies technical audits regularly to check on processes and to spread best practice and research from other plants, but also to pick up any local best practices that may be adopted elsewhere. It also maintains a small artisan cheese maker in Scotland that is used as a training resource for cheese-makers working at its mass production plants. In addition to interaction with Swansea University, Firm D has also been working with Cork University, from the Republic of Ireland, which is an acknowledged world leader in dairy processes⁶⁷. The parent company for Firm E also employs a training development section, based at its headquarters in Canada, that is available to its production sites, and this central facility also supply specialists in Mozzarella cheese production techniques who may conduct visits to make and oversee improvements in the processing⁶⁸.

As noted above, some of the small dairy companies (A-C) have become more adept at sourcing and utilising market data, particularly from multiple retail outlets, to target their production activity and to improve sales. Each of the companies in the study is also a member of a number of sector specific trade associations that supply general sector relevant information on production issues, market knowledge and regulatory changes.

Key findings:

- Dairy firms have a long history in the region and draw on a considerable local processing knowledge
- Much contemporary leading edge knowledge on production techniques is sourced from outside the region, which is subsequently adapted for local use
- Considerable informal interaction occurs between small dairy firms, centred on generic production, marketing and distribution
- Large firms collaborate with suppliers and customers to improve production techniques, and source relevant information and specialist knowledge and skills from corporate sources both in the UK and elsewhere
- Specialist research led knowledge is sourced from local universities and public sector sources within and out-with the region and is targeted at areas of immediate concern to the production activities

⁶⁶ The company has also been involved in a multi-national scientific research project on beef production and rearing techniques, namely ProSafe Beet Project.

⁶⁷ This collaboration with Cork University has been focussed on improving yield efficiencies in obtaining solids from liquid milk.

⁶⁸ These corporate specialists were also able to explain the process and teach local operatives, technical staff and management about the reasoning and techniques supporting their production processes.

F.5. Local conditions to acquire external knowledge and innovation

The food industry has a long history in the region, and has developed in close relation to the local agricultural sector. Such association is true for both the dairy and the meat industry, although added value meat products have not been as well exploited as the dairy industry. The history of the dairy industry in the area has produced an experienced, stable, and knowledgeable workforce where, for example, at the larger dairy plants generations of the same family staff members have worked, individuals have personal working histories of 30 years and more at the same plant, and low staff turnover means that some 50-60% of the work-force has been employed at the same site for extended periods of time. Such stable employment patterns are found throughout the industry, and firms can take advantage of this accumulated knowledge and experience of the plant and the industry, although a formal process to record such local and practice-based knowledge, or to systematically source and take up new ideas, is not in operation.

Local government recognises the value of the history and relationship of the food sector to the agricultural sector, and has made considerable efforts to support and develop the two sectors in alliance. The local county council in Carmarthenshire has appointed a food sector development officer, located at a Rural Business Centre, who collaborates with other manufacturing support officers at business incubator facilities. The county council has also developed dedicated locations for food sector companies, for small family-run, start-up companies, and larger multiple location firms, the largest of which is the Cross Hands Food Park. The Park, which is a joint development between the council and the Welsh Government, was established in 2005 and is the first designated centre of excellence for food technology in Wales. It has good transport links to markets in south Wales, the English midlands and London, and is placed on an arterial Euro Route between Ireland and continental Europe, which makes the location attractive to Irish firms for finishing, warehousing and transfer facilities.

The Food Park includes large industrial units, smaller business incubator units and development plots. All existing units were designed and built to food grade standards and range from incubator food production units to large production units. The park also houses support services such as food laboratories and public analysts that offer a range of analytical and advisory services related to food along with expertise on agricultural products, pharmaceuticals and environmental issues. It is managed to support start-up food companies, to provide progressively larger units as the companies develop, and to offer further opportunity for expansion on currently undeveloped land. Through the provision of its various services the Food Park aims to cultivate the sense of the park as a centre of expertise.

'..... it (Cross Hands Food Park) is very successful as it started with a huge meat company that was there, which gave critical mass to it. [name of distribution company] then joined it and really many of the companies who are renting the units there are quite large companies and were fairly focused in their direction.... when they go there they lend credibility to the site and critical mass to it being a food park.'
(Firm B respondent)

As described above, a number of the food businesses in the region are small, family owned companies, often located in the owners' home premises or in farm buildings. While the arrangement is suitable for those companies that do not have growth potential and motivation, it represents a potential obstacle to either expand, to transfer, or to sell businesses. Micro and small firms are, therefore, encouraged to move to the Food Park or to other purpose built premises on smaller business parks around the region. The Food Park also serves as a centre for informal networking between companies, and for informal collaboration on the basis of exchange of labour and services. A similar approach is utilised at the Food Technology Centre, where companies using starter units are able to stay at the facility for a maximum of five years only before moving. Firms B and C are examples of small cheese manufacturers that have used the centre as their

main production facilities to date but are both in the process of developing new purpose built locations that are more accessible to transport links, and provide savings in energy and transportation costs.

Key findings:

- The food industry has a long history in the area, and has been developed on the basis of an agricultural sector that supplies most of its raw materials
- The sector can draw on an experienced, stable, and knowledgeable workforce
- Central and local government recognise the value of the history and relationship of the food sector
- Local government has expended considerable efforts to support and develop the food sector and employs a dedicated food sector development officer
- Local government maintains a Rural Business centre, a dedicated Food Park, and contributes to a Food Technology Centre located in the region

F.6. Knowledge and innovation acquisition policy assessment

The food and drink industry is a high priority sector for the Welsh Government and features prominently in the Economic Renewal programme adopted in 2010 (Welsh Government, 2010a). Policy in this area has been developed in conjunction with other policy interests, particularly agricultural, economic development and environmental policy. The Wales Food Strategy, published in 2010, sought to place food policy in relation to other policies and to develop a coherent and comprehensive approach to food by integrating social, environmental and economic goals (Welsh Government, 2010b). In addition the Welsh Government has a range of policy support instruments that are based on the Rural Development Plan, Supply Chain Efficiency Scheme, and support for skill development within firms.

'We are committed to developing the Welsh food supply chain through market development, strengthening a positive food culture, and by promoting sustainability and efficiency. Under the Rural Development Plan, the Processing and Marketing Grant Scheme and Supply Chain Efficiency Scheme provide direct support to businesses in this sector.'

(Welsh Government, 2010a)

However, the Welsh Government's support⁶⁹ to food sector companies is in a process of change as budgetary cuts limit what may be provided. The main change has been a reduction in the provision of one-to-one consultation and support. While the previous approach had targeted individual firm requirements, for example in providing advice and guidance in relation to Processing and Marketing Grants (PMG) as part of the Rural Development Plan, current provision is on the basis of a so called 'one-to-many' provision. The new approach is conducted through the greater use of, for example, improved literature, seminars and breakfast meetings to highlight changes in regulation, provision of skills training, and other opportunities for support. With less money available there are consequently fewer opportunities and reasons for companies to approach the Welsh Government, and the Government has to be proactive in developing support programmes, and to integrate what they are able to offer with what other agencies provide.

An example of greater collaboration between public sector agencies is provided by the sector specific training supported via government funded skills councils. In Wales five councils relevant to the food sector collaborate on training improvements, including the Food Manufacturing Skills, LANTRA (land management), the Hospitality Sector and Skill Smart (retail skills) councils. In addition a public and private sector joint project, named

⁶⁹ Support is organised through the Welsh Government's Food, Fisheries and Market Development Division. (FFMD)

Project Eden, that aims to improve skills across the dairy industry on an UK level is being co-ordinated and run at Reaseheath College in England. Students attending the course are able to work on projects that are of direct benefit to industrial partners at industry sites, and Firm D currently participates in this scheme and hosts a number of students⁷⁰.

Carmarthenshire County Council has also been actively developing its support measures for the food sector, which it identifies as one of the most important sectors in the region. Its dedicated business development officer gives free of charge assistance in support of grant applications, for market information, branding, business developments, and staffing. Whilst some of the processing and marketing grants are not currently available, EU regional selective assistance and investment grants may be accessed by enterprises in the region and, for example, small grants of up to £10,000 as a 40% contribution to project costs is available from an EU fund that the council administers. The business development officer also supports marketing activities in various ways, for example by assisting in attendance at trade shows, including the annual 'International Food Exhibition' and the 'Speciality Fine Foods Fair' in London. The Council runs a trade stand in collaboration with the Welsh Government's food marketing support agency at the shows under the 'Carmarthenshire Food and Drink' brand, and allows food companies space on the stand for their own marketing activities.

The county council service is currently supporting over a hundred businesses at various stages of their development that range from sole trader firms to employers of twenty five to thirty people. While there is no barrier in terms of company size, support is concentrated at those firms who show good growth potential and are in need of some developmental support. The larger food sector companies included in the case study have been beneficiaries of financial support for specific improvement projects in the past, but have in the main grown too large to qualify or require further on-going support. Interaction between the larger firms and government agencies are currently focussed around responses to specific regulatory requirements such as the Carbon Reduction Commitment about which firms need clear guidance about the expectations of government.

As noted above the food sector is considered by the Welsh Government and the local authority as an important sector for the region. The county council as the main public sector agency active in developing the local economy and the food sector in particular has been an influence on the locational decisions of many of the firms in this region. The employment of a dedicated food development officer, the location of the Food Park and Food Technology Centre, as well as a Dairy Development Centre, and the organic farming centre (Organic Centre Wales) in the adjoining mid Wales region, also underline the concentration of expertise and support for developing food related businesses in the region.

Key findings:

- The food and drink industry is a high priority sector for both the Welsh Government and local government Support for the sector makes explicit links to the agricultural sector as well as to other sectors such as Tourism and Hospitality
- Policy aims to integrate public sector support across industrial sector boundaries.
- Practical support ranges from the provision of generic business and marketing advice, assistance to access development grants, and access to services provided by specialist food sector centres such as a Food Park and Technology Development Centre
- A dedicated Food Sector Development Officer co-ordinates local government support in this area
- Skills development is considered important both through public sector and private sector provision

⁷⁰ See http://www.reaseheath.ac.uk/wordpress/?page_id=2873

F.7 Conclusions

The food sector in west Wales is an important sector that employs significant numbers of people in a relatively low population area. Links between food processing and agricultural industries are close and, along with those to other sectors such as hospitality and tourism, are emphasized by policy-makers to justify commitment to these sectors. Food sector firms have a long and established presence in the region, with dairy and meat production and processing being particularly significant. Dairy and Meat have, therefore, been the main focus of this study and conclusions are related primarily with reference to these sub-sectors.

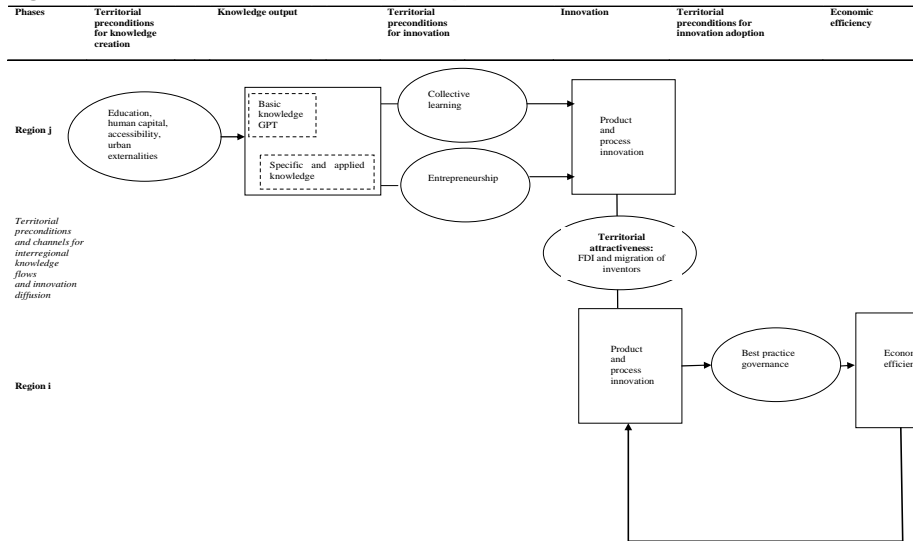
The historical basis to the dairy and meat sub-sectors provides a reservoir of knowledge and understanding of the requirements of the industry, and the capability to support production, processing and distribution activity. These activities are generally considered as low-tech activities, and companies illustrate knowledge acquisition processes rather than knowledge creation. Whilst there are examples of some food-related research activity in local universities, and of some companies that are active in utilising knowledge from such research to diversify their businesses, the region in general does not host dedicated knowledge generation activity. There remains, however, the capacity and potential to develop links between current food sector firms and other companies that may be able to use the agricultural and food processing sectors as providers of raw materials. Examples of such links are already present in the region and include food flavouring, animal feed and human food supplement firms, and the use of by-products from food and agricultural production as the basis for alcohol and fuel production. Further development of this potential requires investment to develop local capacities.

To date, knowledge is largely imported into the region and adapted to local capabilities. Innovative activity, however, may be identified in terms of process development at small scale firms and in terms of marketing and organisational processes. The characterisation of the dairy and meat segments of the food sector in this region suggests that the pattern may be described predominantly as an imitative pattern of innovation, as described in the KIT Interim Report and represented by Figure 1 below. Firms, with the active support of public sector agencies, have been able to imitate and adapt acquired knowledge to innovate and to develop production and business processes that may be new to the firm and the region. The study, therefore, demonstrates what has been described by the KIT project as an 'imitative innovation pattern' (see Chapter 2, Volume 1 of the Scientific report for a detailed description of this pattern).

Key findings:

- The food sector is an important sector employing significant numbers of people in a low population area
- There are important links between food processing, agriculture, hospitality and tourism
- The food sector has a long and established presence in the region
- The sector employs low-tech approaches, and companies illustrate knowledge acquisition processes rather than knowledge creation
- There is capacity and potential to develop links between current food sector firms and other companies
- Knowledge is largely imported into the region and adapted to local capabilities
- The sector predominantly displays an imitative pattern of innovation

Figure F.1: An imitative innovation pattern



Source: KIT Draft Final report

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The ESPON 2013 Programme is part-financed by the European Regional Development Fund, the EU Member States and the Partner States Iceland, Liechtenstein, Norway and Switzerland. It shall support policy development in relation to the aim of territorial cohesion and a harmonious development of the European territory.

ISBN