IN-DEPTH ASSESSMENT OF THE SITUATION OF THE EUROPEAN FOOTWEAR SECTOR AND PROSPECTS FOR ITS FUTURE DEVELOPMENT

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Task 6: Research, Development and Innovation in the Footwear Sector

Final Report

prepared for

DG Enterprise & Industry

RPA

April 2012

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DG Enterprise & Industry, European Commission

by

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EXECUTIVE SUMMARY

The Role of R&D in the Footwear Sector

Research, development and innovation (RDI) have a strategic importance for the competitiveness of EU Industry. From the point of view of a firm, innovation is the implementation of a new solution aimed at enhancing its competitive position, its performance, or its know-how.

Footwear manufacturing has benefited from both process and product innovations. These include innovations made to the production line that improve the efficiency and effectiveness of footwear production and that of complementary services. There has also been significant investment into the development of new materials, components and technologies especially in the fields of specialist footwear such orthopaedic, protective and sports footwear.

The aim of this report is to consider the importance of research and innovation for the footwear industry in three regions of the EU. The objectives were:

- *to provide a retrospective analysis of what has taken place over the last 10-15 years;*
- *to identify best practices in transforming R&D outcomes into marketable products; and*
- *to assess future prospects for R&D in the footwear sector.*

To investigate these aspects we carried out case-studies, involving interviews with individual companies and industry associations in three regions. These are described in Box 1.

Box 1: The Case-Study Regions

*The main footwear clusters in **Lombardy** are Vigevano – just south of Milan - and Bassa Bresciana. Vigevano is a traditional cluster composed of footwear companies, component manufacturers and footwear machinery manufacturers. Research institutes, including CIMAC, the research institute of the Italian Footwear Association (ANCI), are also based in Vigevano. Bassa Bresciana is mainly a leather industry cluster. Not all industrial clusters in Lombardy have maintained their competitiveness, as the Vigevano district has been negatively impacted by the emergence of Eastern European and later Far-East Asian imports.*

***Southern Poland** comprising the neighbouring regions of Silesia and Malopolska is the main footwear area of Poland. In Silesia, the industry is concentrated around the cities of Czestochow and, Myszków while in Malopolska, the key areas are Kalwaria Zebrzydowska and Podhale. The Institute of Leather Industry (ILI) (based in Krakow) provides research, training and consulting services for footwear and footwear components.*

*Portugal's main footwear-producing region is in **Norte**, focused around the city of Porto. It contains 96% of all Portuguese footwear companies and employs 98% of people working in the footwear industry. It hosts the Footwear Technology Centre of Portugal (CTCP) and the headquarters of the Portuguese Footwear, Components and Leather Goods Manufacturers' Association (APICCAPS).*

Best Practices in Implementing R&D Outcomes

The importance of the research, development and innovation (RDI) was recognised as a key factor to sustainable and economic growth in each of three case study regions.

In all three case study regions, product-related developments (to develop new ones or to upgrade existing ones) were the main focus for footwear manufacturers, together with improved business models and marketing innovations.

Another important trend identified by some of the footwear companies interviewed was the acceleration of incorporating IT into footwear production. This includes the use of IT in the production process, to facilitate small production runs and to customise the products in a cost effective way, as well as in sales and logistics.

Footwear firms are also exploring different sales and marketing strategies and trying to approach international markets in a different ways, including internet sales, to maximise opportunities to sell their goods.

In Lombardy (Italy) and Norte (Portugal), RDI in the footwear sector was actively supported through collaborations amongst companies and other organisations.

In both regions, producers of shoe manufacturing machinery have focused on developing technological improvements that offer more flexibility to their customers in the process of shoe production and maintain high quality products. The close geographical proximity of machinery firms contributes to the spread of knowledge to footwear firms in each cluster. However, there is little direct information and knowledge exchange among the machine manufacturers in Lombardy.

In Norte, the research centre aims to bring together different organisations that can then work together on implementation. Its close relationships, not only with footwear companies but with the sectors that support them, including equipment manufacturers, enables it to do this. Companies in the region have also worked closely with their suppliers and customers to ensure that RDI meets the market needs of the industry.

In Southern Poland, there is a formal 'technology platform' for the leather industry which was established in 2006 to encourage technological development and co-operation between industry, institutes and academia with a focus on conducting research and implementation of the results. However, in practice, there appeared to be a very limited amount of partnering between companies and institutions with respect to RDI.

Conclusions

The key conclusions of the study are that:

- *most companies have undertaken some form of research, development and innovation in all of the regions examined, delivering a wide range of different innovative outcomes. In most cases, responsibility for RDI remains in the EU, even where companies have relocated production to third countries. However, we did find one example of a company setting up an RDI facility in China;*

- *the innovation activity undertaken by companies depends to some extent on the type of shoes they manufacture. For example a safety footwear manufacturer will invest in RDI related to water repellent footwear or non-slip soles, etc. whilst fashion footwear companies have focused on measures to increase flexibility so that they can produce rapid, short run lines;*

- *some companies work very closely with research institutes, footwear associations and suppliers at regional, national and in some cases international EU level. This close collaboration results in the rapid uptake of research and innovation results by companies;*

- *technological innovations within the footwear industry are essentially incremental rather than major breakthroughs. They are often associated with factors such as increasingly short timescales, customisation and the provision of additional services. Organisational and structural innovation is also becoming more important;*

- *despite the innovation activity in the footwear industry, many of those interviewed agreed that more needs to be done to ensure the uptake of innovation by European footwear manufacturers, in order to assist the sector's long term competitiveness; and*

- *larger-scale and longer term projects are more difficult to finance and harder for companies (other than the largest players) to participate in. EU funding has helped to develop such projects, though stakeholders have found them difficult and time consuming to manage.*

Recommendations

Based on the findings of this Task, we recommend that the following actions are considered:

- ***Reducing administrative burden on accessing funding****: The European Commission, national and regional governments, research centres and industry associations should work together to provide better information for companies on available finance sources for RDI. Funding applications for RDI and access to government support programmes should be further simplified. The availability of funding needs to be promoted and marketed to footwear companies to increase awareness of different initiatives and programmes at the EU, regional and national level. There is also a need to foster a stronger alignment of funding and other support measures with the regional footwear needs, for example by including industry representatives in the selection process.*

- ***Initiatives and support to enter new markets****: The industry association in Portugal has been particularly successful in helping companies to export, for example by helping them to take advantage of EU funding to attend international trade fairs. This approach could be transferred to other countries and the EU could draw on the Portuguese experience to promote the assistance it provides.*

- ***Increasing collaboration to access RDI know-how****: RDI collaboration can help small footwear businesses to share resources and costly technology to improve their competitive position. Research outputs and technology can be offered to SMEs through collaborative work between the industry and the various research institutes. Research institutes need to place a particular focus on communication and collaboration with SMEs; approaches such as working with clusters and developing personal contacts could be explored further.*

- ***Enhancing partnerships to reduce barriers to innovation****: A strong partnership between industry and research centres is seen as vital to encouraging innovation. One way to address this would be the development of "Centres of Excellence" where research centres, practitioners, policy makers and university researchers come together to innovate and share resources. In order to attract SMEs' attention to these technology and innovation centres, tangible benefits should be offered in the short term as well as in the long term. At the same time industry participants need to give guidance and set the direction throughout research projects in order for the outcome to be relevant, applicable and successful.*

- ***Innovation training:*** *footwear companies, in particular SMEs, may not fully understand how current and emerging technologies and their applications are relevant to their business. One option to address this issue is to incorporate innovation into training programmes. This could include both a focus on innovation in formal training programmes and the operation of short courses for footwear company owners and managers, organised through industry associations and research centres. The European Commission could consider providing*

funding for such training initiatives. Research centres, education institutes, as well as associations at the national and regional levels could also initiate programmes to train the trainers, so that the skills and knowledge of current employees could be enhanced.

- ***Help in marketing and branding****: Branding, high quality and niche markets are ways of moving to higher value positions in the supply chain for footwear companies, and many of them are already taking such steps. Learning from the experience of successful companies could encourage others in the region to take similar steps. This could be achieved through 'best practice' seminars organised at regional and national levels, tailored to footwear company needs.*

- ***Support for protection of innovations****: many companies we spoke to considered that the process of protecting designs and innovations was too costly, too slow and too difficult to enforce. In the absence of reform of the EU patent system, industry associations, research centres, national and regional governments should examine ways to provide administrative and financial support for companies who want apply for footwear patents.*

- ***Effective and easily accessible advice and support tools****: the internet is becoming a popular tool for footwear firms looking to increase sales, undertake marketing or to simply communicate with their customers, although concerns remain over the high rate of returns of on-line sales. Industry associations and research institutes should work with SMEs in particular to develop their capability in e-commerce. Both SMEs and footwear related organisations emphasised the need for online support tools and digital media to access suppliers, agents, customers and generally to promote their brand and products. This would help companies in remote areas to get support when required, as well as making the most of collaboration opportunities to access knowledge and expertise Europe-wide.*

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LIST OF ABBREVIATIONS

ANCI	Associazione Nazionale Calzaturifici Italiani (Association of Italian Footwear Manufacturers)
APICCAPS	Associação Portuguesa dos Industriais de Calçado, Componentes, Artigos de Pele (Portuguese Footwear, Components & Leather Goods Manufacturers' Association)
ASSOMAC	Associazione Nazionale Costruttori Italiani Macchine ed Accessori per Calzature, Pelletteria e Conceria (National Association of Italian Manufacturers of Footwear, Leather Goods, Tannery Machines and Accessories)
CACSD	Computer aided control system design
CAD	Computer-aided design
CAE	Computer-assisted engineering
CAM	Computer-aided manufacturing
CEC	Confédération Européenne de l'Industrie de la Chaussure (European Confederation of the Footwear Industry)
CIMAC	Centro Italiano Materiali di Applicazione Calzaturiera (Italian Centre for Footwear Application Materials)
CLPO	Centralne Laboratorium Przemysłu Obuwniczego (former Central Laboratory of Shoe Industry in Krakow)
CNR	Consiglio Nazionale delle Ricerche (Italian National Research Council)
CTC	Centre Technique du Cuir, Chaussure, and Maroquinerie (Technical Centre for the Leather Industry, France)
CTCP	Centro Tecnologico do Calçado (Technical Centre for the Leather Industry, Portugal)
EURIS	European Union of Research Institutes for Shoes
FP7	Seventh EU Framework research programme
GDP	Gross domestic product
ICT	Information and communications technology
IFTH	Institut Français de l'Habillement et du Textile (French Institute for Clothing and Textiles)
INDACO	Dipartimento di Industrial Design, Arti, Comunicazione e Moda, Politecnico di Milano (Industrial Design, Arts, Communication and Fashion Department, Milan Polytechnic)
INESCOP	Instituto Tecnológico del Calzado y Conexas (Technological Institute for Footwear and Related Industries, Spain)
IPC	International Patent Classification
IPR	Intellectual property rights
ILI	Instytut Przemysłu Skórzanego (Institute of Leather Industry in Poland)
ITIA-CNR	Istituto di Tecnologie Industriali ed Automazione, Consiglio Nazionale delle Ricerche (Institute of Industrial Technology and Automation, Italian National Research Council)
OECD	Organisation for Economic Co-operation and Development
PACA	Provence-Alpes-Côte d'Azur
R&D	Research and development
RDI	Research, development and innovation
RFID	Radio frequency identification
SME	Small and medium-sized enterprise

1. INTRODUCTION

1.1 Background

The European footwear industry has been subject to an elongated period of transition since the early 1990s, following increasing competition from China, Brazil, and Indonesia. During these years EU manufacturers have maintained their competitiveness by outsourcing the most costly production processes to Asia or to Eastern European countries, as well as through a number of bilateral trade restrictions on imports of footwear. Nonetheless, industries in the Far East have gained a competitive advantage and European manufacturers have been forced to introduce cost cutting measures, which have included a reduction in employment within the sector.

In response to the challenges the footwear industry is facing, the European Commission has contracted RPA to undertake an assessment of the situation of the footwear sector in the EU and prospects for its future development. The assessment focuses on the current trends in research and innovation, restructuring, education and training and on small and medium-sized enterprises (SMEs), with specific focus on selected EU regions. The main goal of the study is to better equip stakeholders, including national/regional authorities as well as social partners and the business community, to respond to a potential crisis and minimise its socio-economic consequences, particularly in the less-favoured regions which are heavily dependent on footwear manufacturing.

The study consists of seven tasks:

- Task 1: EU survey;
- Task 2: Research and Innovation Centres;
- Task 3: Small and Medium Enterprises;
- Task 4: Restructuring and Modernisation;
- Task 5: Training;
- Task 6: Research, Development and Innovation; and
- Task 7: Preparation of a Synthesis Report.

This report sets out the findings of Task 6.

1.2 Objectives

The aim of Task 6 of the study is to look at the importance of research and innovation for the competitiveness of the EU footwear industry in three chosen regions of the EU. The objective is to provide retrospective analysis of what has taken place over the last 10-15 years, identify best practices in transforming R&D outcomes into marketable products and evaluate future prospects for R&D in the footwear sector.

The assessment focuses on the key areas influencing the effective implementation of research and innovation:

- the ways in which research and innovation outcomes have been implemented;
- key factors contributing to success or failure;
- the basis of business support, including relevant policies, initiatives, access to finance, the relationship of local businesses and research institutes;
- intellectual property rights; and
- future trends and prospects.

The assessment aims to highlight the way that individual footwear manufacturers collaborate with centres of excellence in footwear research, with local industry, as well with international counterparts, and seeks to identify regional differences that influence the successful implementation of research results. Furthermore, the project shall deliver recommendations on how to facilitate business uptake of research and development outcomes for footwear manufacturers.

1.3 Approach to Task 6

In agreement with the Commission, three regions were selected as case studies under Task 6. These are:

1. Italy: Lombardy;
2. Poland: Southern Poland (Silesia/Malopolska); and
3. Portugal: Norte.

Brief descriptions of the three regions are given in Box 1.1.

Box 1.1: The Case-Study Regions

The main footwear clusters in **Lombardy** are Vigevano – just south of Milan - and Bassa Bresciana. Vigevano is a traditional cluster composed of footwear companies, component manufacturers and footwear machinery manufacturers. Research institutes, including CIMAC, the research institute of the Italian Footwear Association (ANCI) are also based in Vigevano. Bassa Bresciana is mainly a leather industry cluster. Not all industrial clusters in Lombardy have maintained their competitiveness, as the Vigevano district has been negatively impacted by the emergence of Eastern-European and later Far-East Asian imports.

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In each region, we undertook interviews with individual footwear companies to understand their approaches to R&D and the mechanisms they have in place to transfer R&D outcomes into marketable products. We also interviewed industry associations and key research centres within each of the regions to identify the level of support and collaboration available for footwear companies.

The interviews were conducted using a semi-structured format and focussed on gathering details on research activities, policy and regulatory environment, implementation of results and potential barriers. Table 1.1 lists the number of different types of organisations we interviewed for the case studies. In some cases, more than one task was covered by the interview.

Table 1.1: Number of Interviews by Region for Task 6

Type of Organisation	Number of organisations interviewed			
	Lombardy[1]	**Southern Poland[2]**	**Norte[3]**	**All three regions**
Research centre	2	1	1	4
Enterprise	2	5	6	13
Association	1		1	2
Total	**5**	**6**	**8**	**19**

Notes:
1) Some interviews also covered Task 2: Research and Innovation Centres
2) Some interviews also covered Task 4: Restructuring and Modernisation and Task 5: Training
3) All interviews also covered Task 4: Restructuring and Modernisation

The main objective of this report is to explore the experiences of footwear businesses with the implementation of research and development. As part of Task 6 we have also undertaken a detailed review of relevant literature, statistics and studies, which provide a useful context for the information obtained through the face-to-face interviews (for this and other tasks of the study) and the survey we carried out for Task 1 of the study. The analysis includes a retrospective review of footwear research and innovation undertaken by manufacturers, registered footwear related patents, designs and trademarks, financial mechanisms for RDI, type of footwear products and sources.

1.4 Structure of this Report

The remainder of this Report has been organised as follows:

- Section 2 provides a brief introduction to the types of research, development and innovation undertaken in the footwear sector in the EU;
- Sections 3 to 5 contain the findings of the case studies undertaken in the three selected regions;

- Section 6 provides an evaluation of the key factors affecting the success of research and innovation for companies within the three regions; and
- Section 7 provides the conclusions and recommendations of Task 6.

2. RESEARCH, DEVELOPMENT AND INNOVATION IN THE EU FOOTWEAR SECTOR

2.1 Introduction

2.1.1 The Importance of RDI in Europe

Research, development and innovation (RDI) have a strategic importance for the competitiveness of the EU economy and the Europe 2020[1] strategy identified research and development as the key to economic recovery.

Furthermore, the European Commission endorses innovation processes by establishing strategies and research programmes, such as the European Territorial Cooperation (ETC)[2] and the Seventh European Framework Research Programme (FP7)[3] to assist companies with RDI.

2.1.2 Current Total Expenditure on RDI in Europe

The Europe 2020 strategy is the successor of the Lisbon Strategy, which expired in 2010. The target of the Lisbon strategy was to position the EU as the world's most competitive and dynamic knowledge-based economy by 2010.

In close connection with the Lisbon strategy, Member States subscribed to the "Barcelona Target" of devoting three per cent of their GDP to research and development by 2010. The target proved successful as a trigger for broad national investment. The Europe 2020 strategy was published by the European Commission on 3 March 2010 and this proposed to continue with the target of devoting three per cent of GDP to research and development.

Although only Denmark, Finland and Sweden having achieved this target to date, many countries increased research and development expenditure between 2006 and 2010, as shown in Table 2.1.

The table is ranked by percentage R&D expenditure in 2010; the cases-study countries are highlighted in bold. From Table 2.1, it can be seen that all three case study countries have had above the average rate of increase in R&D expenditure between 2006 and 2010, with Portugal having the highest rate of increase of all EU-27 countries.

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1 European Commission (2010**): Europe 2020: a Strategy for Smart, Sustainable and Inclusive Growth,** Communication from the Commission COM (2010) 2020 final, downloaded from: http://ec.europa.eu/europe2020/index_en.htm

2 Interact (2013): *European Territorial Cooperation 2007-2013 position paper*, downloaded from the EC Interact internet site: http://www.interact-eu.net/etc/etc_2007_13/4/

3 The EU research and innovation policy is the Seventh Framework Programme 2007-2013 (FP7), which has a budget of €50.5 billion.

Table 2.1: Total Research and Development Expenditure as a Percentage of GDP, 2006 – 2010 (Ranked by 2010 %)

	2006	2007	2008	2009	2010	% change in value 2006-10
Finland	3.48	3.47	3.70	3.92	3.87	11%
Sweden*	3.68	3.40	3.70	3.61	3.42	-7%
Denmark*	2.48	2.58	2.85	3.06	3.06	23%
Germany*	2.54	2.53	2.69	2.82	2.82	11%
Austria*	2.44	2.51	2.67	2.72	2.76	13%
France*	2.11	2.08	2.12	2.26	2.26	7%
Slovenia*	1.56	1.45	1.65	1.86	2.11	35%
EU (27 countries)*	**1.85**	**1.85**	**1.92**	**2.01**	**2.00**	**8%**
Belgium*	1.86	1.89	1.97	2.03	1.99	7%
Netherlands*	1.88	1.81	1.77	1.82	1.83	-3%
Ireland*	1.24	1.28	1.45	1.74	1.79	44%
United Kingdom*	1.75	1.78	1.79	1.86	1.77	1%
Luxembourg*	1.66	1.58	1.57	1.66	1.63	-2%
Estonia*	1.13	1.08	1.28	1.43	1.62	43%
Portugal*	**0.99**	**1.17**	**1.50**	**1.64**	**1.59**	**61%**
Czech Republic	1.49	1.48	1.41	1.48	1.56	5%
Spain*	1.20	1.27	1.35	1.39	1.39	16%
Italy*	**1.13**	**1.17**	**1.21**	**1.26**	**1.26**	**12%**
Hungary	1.01	0.98	1.00	1.17	1.16	15%
Lithuania	0.79	0.81	0.79	0.83	0.79	0%
Poland	**0.56**	**0.57**	**0.60**	**0.68**	**0.74**	**32%**
Malta*	0.62	0.58	0.56	0.54	0.63	2%
Slovakia	0.49	0.46	0.47	0.48	0.63	29%
Bulgaria*	0.46	0.45	0.47	0.53	0.60	30%
Latvia	0.70	0.60	0.62	0.46	0.60	-14%
Cyprus*	0.43	0.44	0.43	0.49	0.50	16%
Romania	0.45	0.52	0.58	0.47	0.47	4%
Greece	0.59	0.60	-	-	-	-

*Source: Eurostat, downloaded from the **Eurostat** internet site:*
(http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsc00001)
Data was last updated: 07/12/2011
** Data contain estimates*

Table 2.2 (next page) highlights business RDI expenditure in the EU as a whole and the three European case study countries. Italy has significantly higher business RDI expenditure compared to Portugal and Poland, due to its much larger economy.

Table 2.2: Total Business R&D and Innovation Expenditure in € million					
	2006	**2007**	**2008**	**2009**	**2010**
Italy	8 210	9 455	10 173	10 238	10 465
Poland	477	535	679	597	694
Portugal	736	1 011	1 295	1 311	1 249
European Union	**137 301**	**145 941**	**151 597**	**146 012**	**151 126**
Source: Eurostat - Business enterprise R&D expenditure (BERD) by economic activity and type of costs[NACE Rev.2] [rd_e_berdcost], last updated 30 November 2011					

A range of factors affect the extent of business investment in RDI. For example, according to Erawatch[4], the main barriers to private R&D investments in Portugal are linked to five main features of the Portuguese economy:

- the structural characteristics of the economy;
- the size distribution of Portuguese firms, with few very large firms, which typically have greater R&D intensity;
- the nature of domestic demand (intermediate and capital goods demand patterns are less sophisticated than European average, so hindering the local companies supplying advanced products);
- average company absorptive capacity is relatively weak, not only in terms of purchasing advanced inputs but also in terms of integrating in their staff qualified human resources; and
- the insufficient development of the venture capital market.

Indicators of Innovation

The European Innovation Scoreboard (EIS)[5] is published annually to track and benchmark the relative innovation performance of EU Member States. The countries are classified in the following way:

- **innovation leaders**: Denmark, Finland, Germany, Sweden, Switzerland and the UK;

- **innovation followers**: Austria, Belgium, France, Ireland, Luxembourg and the Netherlands;

- **moderate innovators**: Cyprus, Estonia, Slovenia, Czech Republic, Greece, ***Italy***, Norway, ***Portugal*** and Spain; and

4 Erawatch (2010): *Erawatch Country Report 2010: Portugal*, downloaded from: http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/reports/countries/pt/report_0005?tab=reports&country=pt

5 Pro Inno Europe (2008): **European Innovation Scoreboard 2008, Comparative Analysis of Innovation Performance**, Pro Inno Europe, published January 2009. (http://www.proinno-europe.eu/EIS2008/website/docs/EIS_2008_Final_report.pdf)

- **catching-up countries**: Bulgaria, Hungary, Latvia, Lithuania, Malta, ***Poland***, Romania and Slovakia.

The Innobarometer 2009[6] surveyed firms with at least 20 employees from innovation-intensive industry sectors, which included footwear companies. The survey specifically examined areas of innovation. The Innobarometer indicates that over 80% of companies have introduced at least one type of innovation between 2006 and 2008. Innovations included improvements to products, services, processes, marketing strategies and organisational changes.

Approximately a quarter (26%) of enterprises surveyed in the EU spends more than 5% of their turnover on supporting innovation. However, most (59%) enterprises spend less than 5% and the remaining firms do not spend any of their turnover on innovation.

2.2 RDI in the EU Footwear Sector

2.2.1 Introduction

The European footwear industry is an established manufacturing sector in which existing companies find it difficult to sustain a significant level of growth, given the strong competition it faces from countries with lower production costs, particularly China. This means that the industry has to pursue innovation strategies based on creativity, quality and differentiation of products. The differentiation of products is associated particularly with attributes such as design, comfort, materials and practical functions.[7]

2.2.2 EU Initiatives in Footwear R&D

The European initiatives undertaken as part of the European Framework Research Programme (FP7) are an important element of RDI in the footwear sector. Examples of recent projects include:

- DOROTHY: development of tools for the design of customer driven and high value-added footwear in the global production chain and corresponding business models[8];
- HEELLESS: development of a heelless shoe to reduce injury during running;
- SHOPINSTANTSHOE: development of a shoe from shape memory materials;

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6 EC (2009): *Innobarometer 2009 Analytical Report*, May 2009, Conducted by The Gallup Organization upon the request of DG Enterprise and Industry, downloaded from: http://www.proinno-europe.eu/page/innobarometer

7 Huang C, Arundel A & Hollanders H (2011): *How Firms Innovate: R&D, Non-R&D, and Technology Adoption*, paper presented at the DIME Final Conference, 6-8 April 2011, Maastricht

8 ETH (2008): **DOROTHY, Design Of customeR driven shOes and multi-siTe factorY** downloaded from: http://www.icvr.ethz.ch/research/projects/active/dorothy/box_feeder/dorothy_eng.pdf

- SSHOES: development of new production technologies for shoes for feet affected by diabetes as well as other high value added products;
- FIT4U: development of new technologies to involve the consumer in the design of shoes;
- ENVIRO-TEX-DESIGN: development of a virtual collaborative design environment; and
- NET-CHALLENGE: development of processes and ICT decision support tools for SMEs.

2.2.3 RDI Activities in the EU Footwear Industry

Process innovations in the European footwear industry focus around improved manufacturing efficiency and new technologies. Product innovations include development of new shoe designs, materials and components, especially in the fields of protective and sports footwear (see Figure 2.1 below).

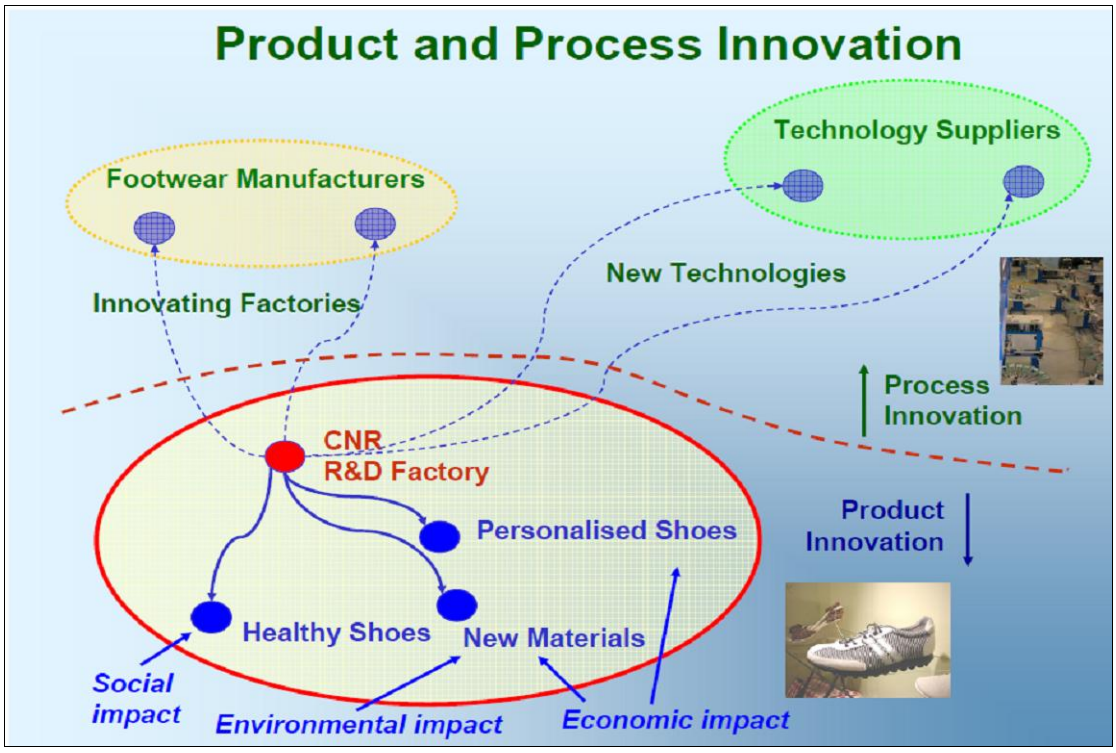

Figure 2.1: Footwear Product and Process Innovation[9]

As described in the report on Task 1 of this study[10], respondents to the survey were asked to identify the key areas of innovation in footwear. Company respondents were

[9] Jovane F & Carpanzano E (2007): *Research and Innovation in Manufacturing Systems in Lombardia: from regional to inter-regional and European successful activities*, – presented by Carpanzano E at Bi-regional Workshop, Lombardia-Baden-Wüerttemberg in Stuttgart, 29 January 2007

clearly focused on their products and associated production processes (as shown in Figure 2.2:). By comparison, all four industry associations identified service innovation as a key area of innovation for their members, while three identified products and the associated production processes.

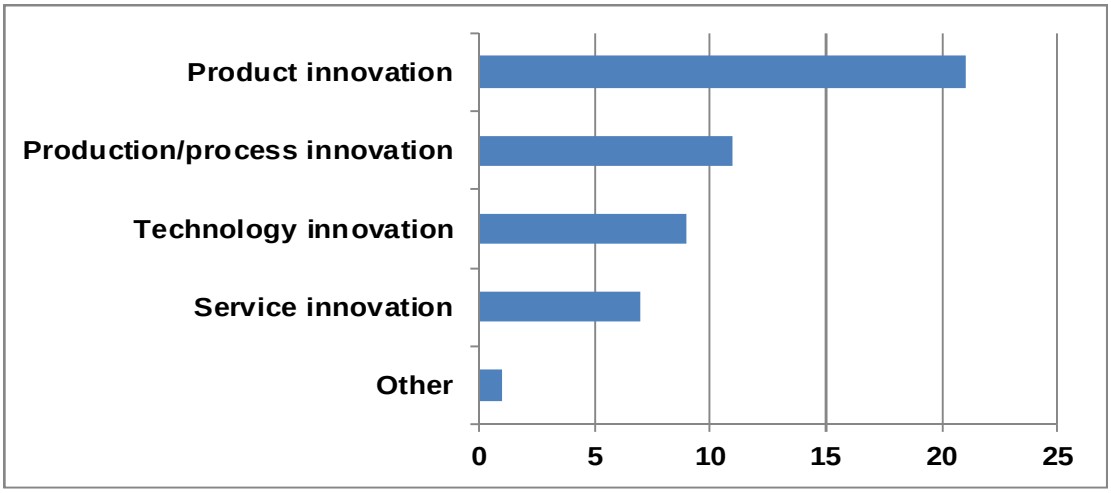

Figure 2.2: Responses from 24 Companies to*: What types of innovation you are currently undertaking?*

The literature research, case studies and Task 1 survey results suggest that innovation capacity is not always R&D related. The types of innovation introduced by footwear companies include:

- technological change through product and process improvement;
- organisational and structural change;
- improved product design;
- marketing initiatives and brand development; and
- improved quality of service.

2.2.4 Innovation Performance in Sub-Sectors

The footwear market is highly complex, with a variety of different customers, each with different requirements in terms of design, comfort and price. The footwear manufacturing industry can be divided into segments based on the end user, the type of product, the price and the material used (see Table 2.3 below).

[10] RPA (2011): **Task 1: Survey on the Situation of the European Footwear Sector and Prospects for its Future Development**, report for DG Enterprise dated November 2011 – hereafter referred to as Task 1 Report (Industry Overview)

Table 2.3: Segments Within the Footwear Market			
End user	**Type of footwear**	**Price**	**Material**
Women Men Children	Casual Formal Evening Sport Safety/protective	Super premium segment (Luxury) Premium segment (Fine) Medium Segment (Medium) Lower Segment (Economical)	Leather Textile Plastic/rubber Other

The Task 1 survey indicated that most companies were focused on the casual or formal segments of the market (see Figure 2.3). Nearly half of the companies responding were focused on just one segment of the market, while a quarter focused on two segments.

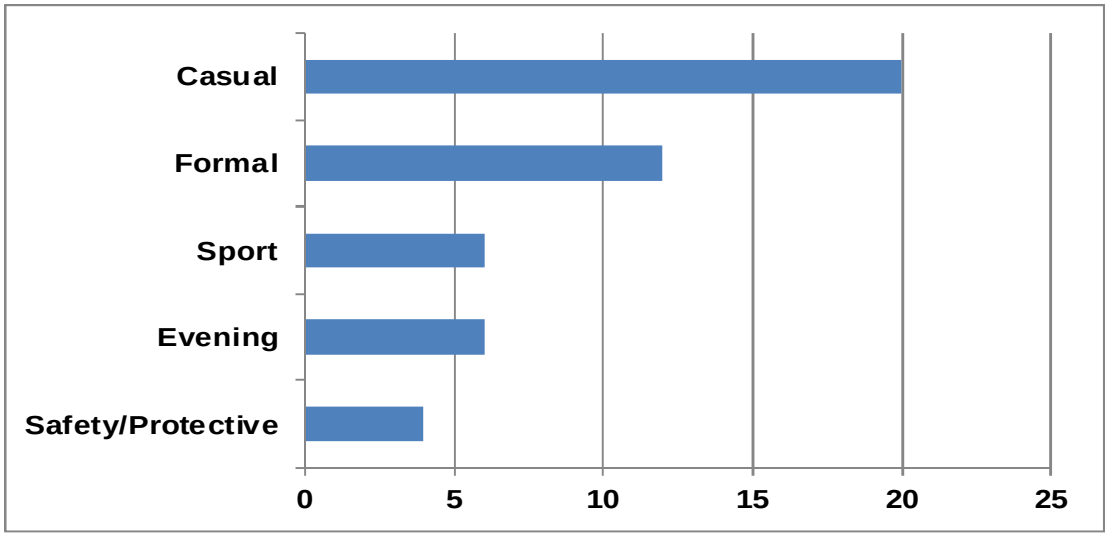

Figure 2.3: Responses from 25 Companies to: *What types of footwear product is your company involved with by Type of Footwear?*

While the manufacturing processes are similar, there is a varying level of importance of design and innovation within the footwear types. These requirements, in turn, are grouped into sets of relevant technical and functional criteria[11]:

- adopting new design and production technologies;
- maintaining low costs and convenient technical features;
- addressing the demands of footwear users by improving ergonomic, comfort and therapeutic issues;

[11] REDIT (2006): *Innovation and Technology Absorption for Growth*, presented at the Knowledge Economy Forum V, Prague, 28-30 March 2006.

- material and components innovation for aspects such as durability, breathability and abrasion; and
- opening new markets and increasing the competitiveness of the footwear sector through technological innovation.

2.3 RDI Partnerships

RDI can be demanding in terms of costs and expertise, especially for SMEs. One approach to RDI is to co-operate with other companies and organisations in order to maximise the potential returns from sharing knowledge. The formation of regional clusters is recognised by the European Commission[12] as a means to enhance innovation. Although our research did not identify specific RDI focused clusters, Box 2.1 below provides examples of traditional Italian industry clusters within specific footwear manufacturing segments in which RDI plays an important role.

Box 2.1: Examples of Specialised Footwear Clusters in Italy

The footwear cluster in **Montebelluna** in the region of Veneto in Italy has been labelled the "capital of the snow industry" for its dominance in the technologies for the production of ski boots. There are many firms clustered in the area of Montebelluna and its competency in sports footwear has strengthened even as the footwear industry has weakened elsewhere in Europe. The cluster now holds a significant share of global production of mountain boots, motorbike boots, in-line skates, and after-ski boots, although production has been increasingly outsourced to Asia. Its value chain is tightly integrated locally, with a considerable number of SMEs supporting the major manufacturers, ranging from design firms, assembly and installation companies, laces manufacturers, machinery producers, moulders, and shearing and uppers workshops as well as various components manufacturers. These SMEs support larger firms, some of which were created in Montebelluna, such as Tecnica, Nordica, Brixia and Dolomite, and others that arrived via acquisitions, such as Nike, Rossignol and HTM. Montebelluna has become well-known for collaboration between footwear firms in the area to innovate and bring new footwear products to the market.

Brenta is a cluster of footwear firms in Italy which specialise in the high-end footwear market for major fashion houses[13]. Shoes produced in the area are in the medium to high segment and predominantly women's shoes. Many companies within the Brenta cluster started out by establishing their own brand in specific product lines and were then approached in the 1990s by large international brands (for example, LVMH, Gucci and Prada). Therefore, in Brenta there is more of a concentration of investment in areas such as branding, advertising, marketing and sales.

Source: Amighini A & Rabellotti R (2004): How do Italian Footwear Industrial Districts Face Globalisation? European Planning Studies Vol. 14, No. 4, May 2006, article downloaded from: (http://www2.dse.unibo.it/prin/prin2003/workshop/wp3/WORKING_PAPERS/Amighini%20_Rabellotti).

Bloomberg (2006): Olympic Ski-Boot Capital Montebelluna Ends Slide With Designers article from: http://www.bloomberg.com/apps/news?pid=newsarchive&sid=a1qY4X9YO6sY

12 DG Enterprise (2009): **Innovation Clusters in Europe: A statistical analysis and overview of current policy support**, from http://www.europe-innova.eu/web/guest/publications/european-policy-documents

13 Amighini A & Rabellotti R (2004): *How do Italian Footwear Industrial Districts Face Globalisation?* European Planning Studies Vol. 14, No. 4, May 2006, article downloaded from internet site: (http://www2.dse.unibo.it/prin/prin2003/workshop/wp3/WORKING_PAPERS/Amighini%20_Rabellotti).

2.4 RDI Implementation

2.4.1 Organisational and Structural Innovation

The footwear industry needs to invest in RDI to raise its market share and remain competitive. Both manufacturers and suppliers can be involved in innovation. Improvements in technology, design software, logistics and marketing may provide an innovative edge[14]. Box 2.2 provides examples of IT-related research projects in Portugal.

Box 2.2: Examples of IT-related Research Projects in the Footwear Sector in Portugal

The pressure to drastically reduce the average size of the order, the diversity and sophistication of the models and the decrease in deadlines in various industrial sectors meant it was not viable to use traditional tools to plan and control production lines. This lead to uncontrolled processes and consequently a loss in productivity. Two national projects **SABE (Support Systems for Product Balancing/Scheduling)** which began in 2001 and **SIBAP (Automatic Balancing System for Production Lines)** which began in 2010 helped to bridge these gaps and provide support tools to balance and schedule production lines.

The **Agilplan** project began in 2009 and consists of a production planning system for footwear companies. The system is more agile and can plan production under uncertain conditions making it different from more traditional systems. It was designed for small and medium sized companies (SMEs) that produce footwear and similar components. The system allows for a smoother development of plans for manufacturing by order scenarios in a situation of uncertainly and lack of information. Agilplan adopts a user friendly interface which is simple to use, incorporating drag and drop techniques and software that automatically readjusts and re-plans production plans when new information becomes available.

A new project is soon to be developed called **NEWALK** – Materials, Components and Technology for future footwear. The project aims to develop new materials, functional components and advanced technology to create, produce and commercialise unique footwear (see also Box 2.4). This will be done in an integrated way, to design approaches and systems that will improve the process of receiving the material and sending it to production when manufacturing small ranges.

The **SIMULOG (Simulation and operation of internal logistics)** project began in 2007. It is a logistics and simulation project and allows equipment producing companies to identify potential problems in advance and significantly reduce the time and cost of developing and testing the solutions in the facilities of the client companies, thus increasing their competitiveness. It is possible to test the control software with the simulation models developed before the actual system is installed for the client company. This significantly reduces the cost of developing, improving quality and reducing drops in production during the installation phase.

ShoeID was developed with the aim of improving efficiency in the supply chain. The innovation is incorporated into a RFID (Radio-Frequency IDentification) Smart Floor; a customer can try on a pair of shoes and look at their own image recorded by a video camera. The image shows the customer standing in front of busy street scenes in Tokyo, London or New York.

Source: Interview with CTCP, October 2011 plus information from INESC Porto website (2011), downloaded from http://www2.inescporto.pt/uitt-en/news-events/news/inesc-porto-a-seus-pes/

[14] e-business w@tch (2004): **Electronic Business in the Textile, Clothing and Footwear Industries**, **Key Issues**, **Case Studies, Conclusions**, Sector Report: No. 01-II, August 2004.

However, a study by e-business W@tch in 2006 found that the footwear industry has the lowest overall use of ICT[15]. One reason for this lies in the traditional nature of footwear manufacturing, whereby production processes are still largely labour intensive and can only be partially automated. Nevertheless, an increasing amount of IT-related research is being carried out by the sector.

In addition, advances in data communication enable companies based in Europe to develop designs with factories in China by, for example, sharing 3D computer drawings in real time. Such examples were provided during interviews in Italy and also in France (which was visited for Task 4).

Of course, the use of ICT is not limited to development and manufacture but can also be applied to distribution and sales. By way of example, one of Poland's leading footwear manufacturers and retailers, NG2, has built a very large automated logistics centre in Polkowice in south-west Poland which is due to open in 2012. Most of NG2's shoes are manufactured in China and India with only a few lines of higher-quality women's shoes still produced at its Polkowice factory. The new logistics centre will have an inventory of five million pairs of shoes and will handle up to half a million shoes per day in order to serve its 700 shoe stores across Poland[16].

Environment

RDI into the environmental aspects of production is also of increasing interest to European footwear manufacturers and can improve brand image. Box 2.3 below provides an example of a footwear firm incorporating environmental friendly processes into shoe production.

Box 2.3: Eco-Friendly Policy

A shoe manufacturer in Italy which has been producing shoes since the 1960s has given particular attention to the environment and the eco-friendly production of shoes. The company has developed a technology called 'Aeros' which features a unique patented system of replacing the air inside the shoe in order to give a feeling of lightness.

The company has incorporated environmentally friendly policies into the production process:

- **hand sewn footwear**: avoiding the use of chemical adhesives by use of hand-stitching;
- **removable insole**: dependent on the customer's specific needs;
- **use of renewable energy**: specifically in the production chain;
- **logistics**: optimisation of delivery and avoiding the use of heavily polluting vehicles; and
- **packaging**: all packaging is made from recycled paper.

*Source: Downloaded from the **Aeros** internet site: (http://www.aeros.it/en/index.html)*

[15] e-business w@tch (2006): **ICT and e-Business in the Footwear Industry - ICT adoption and e-business activity in 2006**, Sector Report No. 2/2006, 2006.

[16] *NG2 builds Largest Automated Logistics Centre in the Eastern European Footwear Industry with TGW,* article from http://www.tgw-group.com/at-en/industries/apparel-distribution/case-study-ng2/ and related media reports.

2.4.2 Product Innovation

The development of innovative products, to meet the changing needs of consumers, has been an increasing focus of research for the sector. Examples of recent projects are given in Box 2.4.

Box 2.4: Examples of Research Projects on Product Design

The **Advanced Shoe** project aimed to develop:

- high performance footwear which offer protection and security from aggressive or hostile environments and which are used in, for example, heavy industry and agriculture.
- technical footwear for specific applications such as footwear for golf, mountaineering or climbing. Such footwear has specific requirements and thus is considered a 'niche' market with high value.
- casual but functional high performance footwear which can be used on a daily basis but contain properties that not traditionally found in footwear, such as increased resistance, increased waterproof properties and increased thermal comfort.

The objective was to integrate advanced materials with design and construction to develop high performance and multi-functional footwear with waterproof, heat and fire resistant properties as well as anti-slip, anti-fungal and anti-bacterial characteristics. The project resulted in the development of materials for high performance footwear and the testing standards for safety footwear and chemical and microbiological footwear.

The **Stress-Less Shoe** project studied the development of insoles, orthotics and shoes for people who carry extra weight, whether on a permanent basis such as obese people, or occasionally, such as pregnant women or hill-walkers who carry heavy rucksacks. The project developed orthotics, insoles and shoes which aimed to minimise the biomechanical stress associated with movement in humans who carry extra weight (permanently or occasionally). Despite the strain placed upon the foot by extra weight there is a lack of research into the implications of carrying significant levels of extra weight on the musculoskeletal system.

The **BionicFoot** project developed systems to evaluate the parameters of thermal and biomechanical comfort in footwear. The main elements associated with comfort in footwear are:

- correctly fitting shoes;
- appropriate temperature and humidity;
- arch and sole support;
- good flexibility;
- distribution of pressure on the sole of the foot; and
- the absorption of shock in the heel.

The project studied the interaction between the foot and footwear in order to develop more comfortable footwear, and ultimately meet the demands and needs of the customer. It developed test systems which simulated real-life scenarios and activities, which allowed the assessment of the temperature and humidity within the shoe, the distribution of pressure on the sole of the foot, cushioning and the absorption of shock. By conducting such tests it was possible to generate further knowledge into the interaction between the foot and footwear which will permit the development of more comfortable footwear. It is anticipated that the results of this project will aid in the development of different footwear with superior comfort.

Source: Interviews in Norte, October 2011

Fashion

One of the main drivers for product innovation is, of course, changing fashions – particularly for women's shoes. During interviews across Europe for this study, manufacturers were tending towards increasing numbers of 'collections' each year – with four collections now being the standard. This greater emphasis on more frequent changes in collections is explored in more detail in the Task 4 Report[17].

Another area which is driven by fashion is that of sports shoes (including 'trainers') – particularly for boys and young men. This sector may account for one third of the EU footwear sales. The sector is dominated by major brands which outsource all production to, mainly, Asian countries, as illustrated by the case of the German companies Adidas and Puma (see Box 2.5). However, the innovation is not necessarily outsourced as demonstrated by the dramatic new Laces R&D building, opened in late 2011 in Germany, which houses over 1700 Adidas designers, developers, scientists and marketing strategists[18].

Box 2.5: The German Sports Footwear Manufacturing Sector

German companies Adidas and Puma are two of the largest sports footwear manufacturers in the world. Adidas was founded in 1948 by Adolf "Adi" Dassler, following the split of Gebrüder Dassler Schuhfabrik between him and his older brother Rudolf. Rudolf established Puma in 1949. Both Adidas and Puma have headquarters in Herzogenaurach, in Bayern.

The Adidas Group consists of the Reebok sportswear company, TaylorMade-Adidas golf company (including Ashworth), and Rockport. As well sports footwear, the company also produces bags, shirts, watches, eyewear, and other sports- and clothing-related goods. The company is the largest sportswear manufacturer in Europe and the second-biggest sportswear manufacturer in the world, with American rival Nike being the biggest. The Group's net sales in 2010 were nearly €12 billion and it has 42 000 employees worldwide, with more than 3 000 working at the company's headquarters.

Puma produces athletic shoes, footwear, and other sportswear. It is part of the French PPR group. Puma's brands include PUMA (football, running, motorsports, golf, and sailing clothing and footwear), Cobra Golf (golf equipment) and Tretorn (leisure shoes, rubber boots and tennis balls). The company is known for its football shoes. Puma's sales in 2010 were €2.7 billion and it employed over 9 000 people.

Both companies follow a similar business model, focusing on design, distribution, marketing and sales whilst production is sub-contracted to third parties, often through long-standing partnerships. This gives flexibility as well as cost savings. Production for Adidas is carried out by more than 1,230 independent factories in 69 countries. Many of these are in China, India, Indonesia, Thailand or Vietnam. The main suppliers for Puma are located in China and Vietnam, in addition to Indonesia, Cambodia and Bangladesh. Both companies produce only samples in Germany, but import and then re-export large numbers of pairs from their German distribution centres.

Sources: http://www.adidas-group.com; http://about.puma.com/category/company/glance/

Combining 'new looks' with technological advance is a feature of the protective footwear market including ski boots, motorcycle boots and safety footwear. In

17 RPA (2012): **Task 4: Restructuring and Modernisation**, report for DG Enterprise dated March 2012 – hereafter referred to as Task 4 Report (Restructuring)

18 www.e-architect.co.uk/germany/adidas_laces.htm

relation to safety footwear, an example was provided, during interviews in Portugal, of a new range of men's safety footwear which resemble football boots and use lightweight materials. The company also offers a specialist ladies range, using a separate last rather than a modified men's last, which retains the safety features but offers variety in colour, material and style.

Some illustrative examples of recent innovations in ski boots are presented in Box 2.6.

Box 2.6: Some Illustrative Examples of Ski Boot Product Innovation

Improved liners with close but flexible fitting allow Atomic Ski Boots' innovative *Live Fit* technology to keep feet warm and comfortable when skiing. Atomic boots are now made in Bulgaria.

Some Rossignol performance boots use patented *SensorFit* technology for those wishing to select liners with particular degrees of flex on the base. Rossignol boots are made in Italy (Montebelluna), France and in China.

Fischer offers ski-boots with a 'vacuum fit' in which the boot lining polymer material is expanded to provide a perfect moulded fit to the user. Fischer boots are designed in Italy (Montebelluna) and are made in Austria and the Ukraine.

Sources include:
http://www.atomic.com/en/Stories/2010_Home_3_1_LiveFit.aspx
http://www.bulgariaski.com/news/20081112/atomic_in_chepelare_en.html
http://www.rossignol.com/index.php?_lang=US&_cnt=CA&alias=rossignol-innovations-alpine&function=showTechno&insidefile=technoDetails.html&oid=TECH1011:crwjjxkh119z0
http://www.fischersports.com/en/Alpine/Technologies/Highlights/VACUUM-FIT?s_cc=1330159649

2.4.3 Components Innovation

The EU has a diverse footwear manufacturing sector, and most of the components needed to produce footwear can be found regionally within the footwear clusters. For example, the region of Lombardy houses many producers of highly specialised components.

Footwear components can consist of box toes, toe puffs, heels, soles, counters (stiffeners) etc. Footwear components companies are always striving to improve their products and an example of this can be seen in Box 2.7, where a manufacturer has successfully developed an innovative ladies shoe heel. Further examples from the Lombardy area are presented in Box 2.8.

Box 2.7: The Shock Absorber Heel

A German shoe manufacturer which specialises in innovative and comfortable footwear has developed an anti-shock heel for women's footwear. The new heel technology has integrated core stabilisers and pneumatic chambers within the heel which reduces the impact on the spine, spinal discs and joints. The aim of the heel is to increase comfort for women's shoes without compromising on fashion and design. This innovative system has been patented in Europe.

Source: http://www.wortmann-group.com/

Box 2.8: Examples of RDI by Components Manufacturers in Lombardy

A Milan based manufacturer has been producing a synthetic coated fabric for around 40 years. The coating and finishing are carried out in Milan and Velletri. The Velletri and Cisterna plant both have two high technology coagulation lines.

Another Milan-based company has been manufacturing footwear components since 1918. It has developed as a leading producer of toe puff (box toe) and stiffener materials, and adhesives for shoes and furniture. All the main types of adhesive are produced including PU, polychloroprene and a range of hot melts.

Another components manufacturer based in Vigevano began producing latex foam in the 1960s. This was shortly followed by PVC and PU coated fabrics, aimed at markets such as footwear, furniture, leather goods and bookbinding's. The company also produces "Porolining" material which is a well-established lining material in the footwear industry for good breathability and absorbency. The company also produces upper materials such as "Xellents".

Source: SATRA (2008): ***Italy: material and component suppliers,*** *SATRA Bulletin 2008*

As part of the case studies, we interviewed two component manufacturers who worked with their customers to develop innovative products. This included a Polish components manufacturer which produced innovative lightweight soles made from PVC and a Portuguese sole manufacturer which regularly suggested innovative products to its customers, based on its research into market developments.

2.4.4 Materials Innovation

According to the companies surveyed for the Task 1 Report (Industry Overview), leather remains the most important shoe material, and over 80% of the companies use leather. However, technological innovations in raw materials have evolved within footwear and some of the footwear producers and suppliers have made these improvements by collaborating with chemicals companies, laboratories, research and innovation centres to incorporate new and innovative material technologies (see Box 2.9).

Box 2.9: An Absorbing Fleece Technology for Shoes

A German footwear manufacturer and German chemicals company have jointly developed a unique, intelligent system which adapts shoes to suit different weather conditions. The manufacturer has produced an absorbing fleece with an innovative ventilation element. The material is breathable and adapts to differing weather conditions; for example, the material closes up in the rain and re-opens when it is dry.

When the material gets wet, the absorbing fleece in the ventilation element immediately expands and self-seals the system and remains watertight under high pressure. Then, as soon as the material in the sole of the shoe dries, it regains its breathability. The technology has been protected by international patents. The German shoe manufacturer has manufactured its first shoe with the technology and partnered with other shoe producers to manufacturer other shoes using this technology.

Source:
http://www.iqtex.com/downloads/en/en_IQTEX-and-BASF_Leather-International-Magazine.pdf

The use of new materials provides manufacturers with the possibility to differentiate their shoe products in the footwear market. Current examples of materials innovation within companies include improvements in:

- material composition, assuring comfort;
- leather-softening technology;
- cushioning systems for shoes using different materials;
- penetration-resistance through chemical, water and fire repellent technologies;
- the colouring process to guarantee a consistent shade in material; and
- digital printing techniques for advanced customisation and personalisation of footwear.

An example of design-led innovation in materials is shown in Box 2.10.

Box 2.10: Innovation in Materials

Ladies' fashion footwear manufacturers had used innovation to develop an alternative to the use of snakeskin, which is very fashionable for boots at the moment, but very expensive.

The company developed a form of leather printing and engraving which produces a mock-snakeskin effect; this was an initiative by the company itself and did not involve external partners. The company carries out this process itself and the resulting boots can be sold for half the price of real snakeskin boots.

The development needed to be carried out rapidly, as the trend for snakeskin is a current fashion feature which is unlikely to last for many seasons.

Source: Interview with a Portuguese company, October 2011

There is an increasing frequency of collaboration between specialist companies in sectors such as chemicals, rubber, fabrics, nanotechnology and European footwear manufacturers to produce innovative products (see Box 2.11).

Box 2.11: Nanotechnology for footwear - Military

A UK shoe manufacturer established in the 1970s produces shoes for the military, law enforcement and security personnel worldwide. In 2009, the shoe manufacturer introduced a new patented nano technology to repel liquids from their footwear called ion-mask technology, in collaboration with a research company specialising in liquid-repellent nano-coating technology for footwear and textiles. Originally developed for military clothing and designed to combat chemical agents, ion-mask technology is an ultra-protective surface enhancement. This surface enhancement technology works at a molecular (nano) level. Applied inside a plasma chamber, the ion-mask treatment binds invisibly to the material's surface and fibres, resulting in extraordinary benefits to the end user, without affecting the look, feel or 'breathability' of the boot. The technology permanently alters the surface of a product at a molecular level to repel water, liquids as well as chemicals and protect soldiers from chemical attack.

Source: http://www.magnumboots.com/uk/advantage/history.html

Another example is presented in Box 2.12 in which the driver is the development of more eco-friendly materials.

Box 2.12: Environmental and Sustainable Protective Footwear
A small safety footwear company in France has undertaken research into eco-friendly materials such as chrome free upper leather, natural fibers and recyclable materials. These materials can improve not only comfort for users but concurrently have less impact on the environment. The company collaborates with other organisations in its research activities, such as BASF (chemicals), research institutes such as CTC in France, INESCOP in Spain and IFTH in France (textiles).
Source: Interviews from France, October 2011

2.4.5 Service Innovation

In general in the EU, service innovations have been dominated by the development of internet sales, although a study by e-business W@tch in 2006 found that the footwear industry has the lowest overall use of e-business[19]. Our research for Task 3 Report (SMEs[20]) found that many smaller firms do not have their own websites and do not use the internet to sell their products. One reason for this is that access to the skills to use it is often limited. In addition, differences in sizing between manufacturers means consumers often need to try on footwear to ensure a good fit before purchase and, indeed, this is recommended for shoes for children. As such, online sales of shoes are often associated with a high level of returns[21].

With these points in mind, online sales are often poorly developed compared to the other market channels. However, examples of successful implementation of e-business were found in small family-run footwear companies in Poland and Germany, where market access had been increased through online sales.

Innovation can also be found within the services provided by footwear retailers, such as the development of a personalised 'virtual reality' service for buying footwear products, as shown in Box 2.13.

Box 2.13: The Magic Mirror and Virtual Shoes by ITIA-CNR
The Magic Mirror is a screen that shows the customer in a mirror wearing the pair of 'virtual shoes'. This is done by taking a 3D image of the customer's feet and overlaying it with a shoe design. This makes it possible to order a pair of personalised shoes, even if the footwear products are not available in the shop. This is an example of applying a new way of selling shoes.
Source: http://www.europe-innova.eu/c/document_library/get_file?folderId=261559&name=DLFE-9202.pdf

19 e-business w@tch (2006): **ICT and e-Business in the Footwear Industry - ICT adoption and e-business activity in 2006**, Sector Report No. 2/2006, 2006.

20 RPA (2011): **Task 3: Small and Medium Sized Enterprises**, report for DG Enterprise dated November 2011 – hereafter referred to as Task 3 Report (SMEs)

21 Figures of 20-50% returns for fashion related purchases can be found. In the USA, one in three shoes are returned (http://shoefitr.com/problem.php)

2.4.6 The Impact of Restructuring on RDI

RDI in the EU footwear industry has been affected by the significant restructuring the industry has undergone in recent years, particularly the transfer of production to lower-cost locations outside the EU (see the Task 4 Report (Restructuring)). While all or part of production has been outsourced in many cases, control over research and design has generally remained within the EU[22]. In response to continued price competition, EU footwear manufacturers have started to shift their focus to targeting niche markets and upgrading to higher value footwear. The CBI 2010 report indicates that the following are seen as the main sources of added value and new product innovations:

- **comfort** - soft leathers, perfect fit, warmth, inner soles with linings made from a single piece of leather, fabrics against moisture (see Box 2.9), membranes, breathable footwear or rubber soles, easier walking high heels (see Box 2.7);
- **design** - shapes that are rounded, refined and feminine. Sneaker designs are fusions of a sporty urban or solid technical look with refined shapes;
- **technology** - mixing different materials in soles, Gore-Tex, nubuck and canvas as well as use of computer-aided design (CAD) for footwear; and
- **niches** - variety in evening footwear, recycled footwear, urban footwear, outsized footwear, and specialised shoes (see Box 2.10).

2.5 Intellectual Property Rights

Intellectual Property Rights (IPR) allow entrepreneurs and enterprises to retain ownership of the inventions they create. As with ownership of physical property, IPR enables them to use and benefit from the outcomes of their research and therefore prevent third parties exploiting their ideas without permission[23].

Protection of IPR is a priority in order to ensure fair competition and the continuation of innovation and creativity within the footwear industry. There is a threat to the EU footwear industry with many counterfeit products on the market. Many companies lack the resources necessary to protect themselves (in court cases), therefore being exposed to counterfeiters. One Portuguese firm recognised that it should probably be doing more to protect its footwear designs (which have been copied in China and Brazil) but have not yet done so. Another Portuguese company offered sole concepts to its customers who have then used this and patented the resulting design themselves.

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22 Amighini A & Rabellotti R (2004): *How do Italian Footwear Industrial Districts Face Globalisation?* European Planning Studies Vol. 14, No. 4, May 2006, article downloaded from: (http://www2.dse.unibo.it/prin/prin2003/workshop/wp3/WORKING_PAPERS/Amighini%20_Rabellotti)

23 UK IPO (2007): *A resource about the power of trademarks, copyright, registered designs and patents, Think Kit*, UK Intellectual Property Office, 2007

Patents have been used by a number of the footwear firms interviewed in the case studies (see Box 2.14) to protect new inventions and give monopoly rights to the inventor(s). Patenting is frequently viewed by footwear firms as the most effective adoption method, but the effectiveness of patents is limited by:

- the opportunities for competitors to invent around a patent by making slight amendments;
- the speed of technological change and fashion cycles; and
- the availability of alternative methods (for example there are many inventions for breathable material/shoe technologies).

For example, a Portuguese company indicated that the tighter the protection and the more territories it covers, the higher is the cost of patents and additional renewal costs. Realistically, it may not always be the best route to pay for a patent if the company cannot afford the renewal.

Box 2.14: Patented Technologies

One company interviewed had many patents covering sports footwear, including:

- *Comfort and breathability*: a variation on the Geox air exchange sole;
- *Air conditioning*: atmospheric pressure injects new fresh air into the shoe, filling the vacuums left by the warm air that has been pushed out from the outlet valves thanks to the pressure exerted by the foot. The constant inlet of new air keeps the temperature of the foot unchanged and prevents it from sweating;
- *Top air*: the outsole of the shoe is composed of a rubber ventilation system which is open at the top. While walking air is ejected and this ensures effective flow of fresh air;
- *Rubber insert construction*: the sole of the shoe combines rubber with leather. The rubber used in the sole is made of a highly resistant, waterproof and non-slip material; and
- *Air jumping*: the outsole of the shoe is made of a spherical cells guaranteeing high comfort level which absorbs the weight at every step. This is used at comfort shoes. The shoe soles with their special tread pattern provide shock resistance.

As well as patented footwear technology, the company incorporates innovative solutions to the manufacturing process such as:

- A pouch construction method: extra soft foot bed;
- *Antistatic process*: rubber soles with micro conductors; and
- *Gore-tex*: waterproof and transpiration.

Source: Interviews from Italy

2.6 RDI Financial Support Mechanisms

Adequate access to finance is crucial for companies in the EU footwear sector to invest in RDI. Companies often find it difficult to obtain short term loans from banks or funding from governmental bodies to make the necessary improvements in organisational structure, marketing, products and processes[24]. However, there are a

[24] Huang C, Arundel A & Hollanders H (2011): *How Firms Innovate: R&D, Non-R&D, and Technology Adoption*, Paper presented at the DIME Final Conference, 6-8 April 2011, Maastricht

number of mechanisms which provide financial support EU footwear companies. These include:

- the European Framework Research Programme (FP7);
- the Community Framework for State Aid for Research and Development and Innovation[25] (see below);
- the Eco-Innovation Initiative through the Competitiveness and Innovation Programme (CIP)[26];
- national research programs; and
- regional initiatives.

Out of the 24 companies which had reported making investments in the survey for the Task 1 Report (Industry Overview), 14 had used regional, national government funding and EU funding (see Figure 2.4).

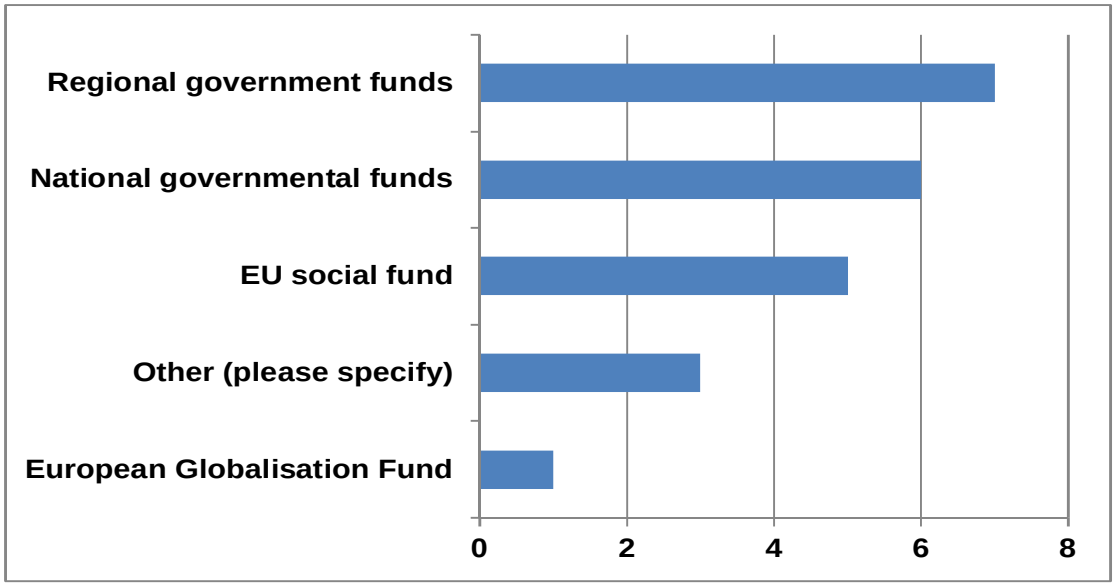

Figure 2.4: Responses from 14 Companies to: *How were these investments funded? Please tick all the 'public' finance sources that you have used*

SMEs often find it more difficult to obtain finance than larger companies, which negatively impacts their ability to innovate, train employees or simply restructure their operation. Therefore, financial support is crucial for companies to set up or expand their operations, particularly in difficult market conditions. Box 2.15 below demonstrates the financial support mechanisms used by one company in France.

25 EC (2006): *Community Framework for State aid for Research and Development and Innovation* (2006/C 323/01), downloaded from EC internet site:
(http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2006:323:0001:0026:EN:PDF)

26 EC: *EU's Competitiveness and Innovation Framework Programme (CIP), Eco-innovation initiative*, downloaded from EC internet site: (http://ec.europa.eu/environment/eco-innovation/)

Box 2.15: Financial Support for a Small Company in France
A small French company produces shoes for the safety and protective footwear sector. Its main area of research is related to safer soles to improve slip resistance. To remain competitive, the company allocates about 1.5 % of its turnover to RDI. The company did not previously have the financial resources to do this; it therefore used funds from the PACA (Provence-Alpes-Côte d'Azur) region and the EU Competitiveness and Innovation framework Programme (CIP) called 'eco innovation for leather'.
Source: Interviews from France, October 2011

The European Commission has adopted a Framework (the Community Framework for State aid for Research and Development and Innovation[27]) to clarify to Member States how best they can give support not only to research and development but also to innovation projects, without infringing state aid rules. The Framework sets out a series of guidelines for specific types of state aid measures – such as aid for R&D projects, aid to young innovative enterprises and aid to innovation clusters – that could encourage additional RDI investments by private firms, thus stimulating growth and employment and improving Europe's competitiveness.

[27] EC (2006): , downloaded from EC internet site: (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2006:323:0001:0026:EN:PDF)

3. CASE STUDY: LOMBARDY

3.1 Introduction

3.1.1 RDI in Lombardy

Located in the north of the country, Lombardy is one of the 20 regions in Italy. The region is divided into 12 provinces with close to ten million inhabitants. Milan is the regional capital, with over 1.3 million inhabitants. One of strongest sectors of the region's economy is fashion and design, areas where added value results from creativity and innovation[28].

There are approximately 500 centres in Lombardy that provide innovation services for companies across all industry sectors, 200 of which are focused on research and technology transfer. It also has 267 research structures within private companies in all sectors and 182 companies which are leaders in innovation[29].

The region boasts 15 universities, of which seven are state owned, seven are private and one is a higher education centre. They house a number of research departments that contribute to RDI (see Table 3.1).

Table 3.1: Lombardy Universities and Research Centres

Name	Students	Faculty	Research Departments
University of Milan	51 300	9	77
Politecnico di Milano	35 000	9	13
University Cattolica del Sacro Cuore	33 500	14	39
University Milan-Bicocca	27 500	8	49
University of Pavia	18 700	9	16
University of Brescia	14 000	4	36
University of Bergamo	13 300	6	7
Bocconi University	12 200	1	19
University of Insurbia	8 600	4	22
IULM – Institute of Modern Languages	4 450	4	-
Carlo Cattaneo University - LIUC	2 500	3	10
E-Campus Telematic University	2 307	5	-
Vita Salute San Raffaele University	1 900	3	4
IUSS – Institute of Higher Studies	350	3	-
UNITEL International Telematic University	91	3	-

Source: ***OECD (2011): Higher Education in Regional and City Development: Lombardy****, Italy 2011, http://www.oecd.org/dataoecd/55/57/49001152.pdf*

[28] OECD (2010): **The Region of Lombardy, Italy, Self Evaluation Report**, prepared by IReR, August 2010.

[29] EC (2011): *European Commission Community research and Development Information Service, Regional Research & Innovation Service: R&D in Lombardy*, downloaded from (http://cordis.europa.eu/lombardy/rd_en.html)

The European Regional Innovation Scoreboard (RIS) classifies Lombardy as a medium-high innovating region. It is ranked 74 out of 263 European regions for patent applications. Lombardy's Regional Development Plan (2010-15) has identified RDI and human capital development as key focus areas[30].

In 2011, the Regional Government of Lombardy and the Milan Chamber of Commerce signed a cooperation agreement for the promotion of creative enterprises in the Milan area (Lombardy Department of Industry, Handicraft, Building and Cooperation, 2011). The purpose of this was to support RDI activity in creative enterprises:

- by the assignment of scholarships for students and researchers;
- to encourage collaboration between young designers and enterprises; and
- raising awareness and information around access to finance.

The Regional Government introduced specific measures to support enterprises and business development, by allocating €85 million to district and meta-district policies[31].

3.1.2 The Footwear Industry in Lombardy

Lombardy is well established in footwear manufacturing, footwear components, leather parts and accessories, machinery and equipment. Footwear firms are mainly concentrated in the industrial cluster of Vigevano[32]. According to the CBI survey[33], footwear manufacturers in Lombardy mainly produce for the fine and luxury segments, where prices can range between €250 and €750 per pair depending on the brand name and the material used. Footwear manufactured in Lombardy is sold internationally; major markets include the EU, USA and Far-East Asia. The companies can be broadly divided into four categories:

- final footwear firms;
- specialised firms producing special parts and components of footwear;
- footwear machinery and equipment manufacturers; and
- sub-contractors of shoes (made-to-order firms, receiving all raw materials from their clients).

Table 3.2 presents the number of enterprises in particular sectors of the fashion industry in Lombardy compared to Italy as a whole.

30 OECD (2011): *Higher Education in Regional and City Development: Lombardy, Italy 2011*, downloaded from the **OECD** internet site: (http://www.oecd.org/dataoecd/55/57/49001152.pdf)

31 ibid

32 Amighini A & Rabellotti R (2004): How do Italian Footwear Industrial Districts Face Globalisation? European Planning Studies Vol. 14, No. 4, May 2006, article downloaded from internet site: (http://www2.dse.unibo.it/prin/prin2003/workshop/wp3/WORKING_PAPERS/Amighini%20_Rabellotti)

33 CBI (2010a): *Market Survey, The Footwear Market In Italy*, May 2010.

Table 3.2: Fashion Design Companies in Lombardy compared with Italy in 2010			
	Lombardy	**Italy**	**Lombardy's share**
Textile industry	4 891	18 924	25.8%
Garment manufacturing	8 652	51 544	16.8%
Leather wear manufacturing and similar	2 122	22 545	9.4%
Garment retail in specialised outlets	9 888	91 081	10.9%
Footwear and leather wear retail in specialised outlets	2 163	19 569	11.1%
Textile, garment and footwear street retail	8 722	71 807	12.1%
Source: *Colombo C and Camilla S: Creativity where past, present and future meet: the view from Lombardy (www.cetiqt.senai.br/redige), 2010*			

Table 3.2 indicates that Lombardy accounts for around 9.4% of Italy's share in leather manufacturing sector, of which footwear is a significant part. According to the Italian Association of Footwear Manufacturers (ANCI), in 2011 Lombardy accounted for around 13.5% of all footwear production in Italy.

Vigevano (in Lombardy) hosts the main cluster of companies producing shoe-manufacturing machinery in Italy. Around 45 companies specialise in the production of machines for different stages of the shoe production process. This is the highest concentration of companies in the shoe-manufacturing machinery sector within Italy. The companies are not necessarily competitors, because they produce different machines for different stages of the shoe production process. For example, some of them are more specialized in machinery for modelling and others in machinery for preparation and manufacture of uppers.

3.1.3 The Footwear Association in Lombardy

The Italian Association of Footwear Manufacturers (ANCI) is located in Milan and has approximately 1 000 members from the footwear industry. The association organises one of the largest annual industry fairs – MICAM, which provide footwear companies with a chance to network and share knowledge with other organisations.

ANCI founded the footwear research institute, CIMAC, in 1985 to offer services to Italian companies to improve quality of products through RDI activities, achieve their business objectives and growth plans to remain competitive in the world market. ANCI and CIMAC are both located in the Lombardy, benefiting from the close proximity to footwear manufacturers in the region[34].

The National Association of Italian Manufacturers of Footwear, Leather Goods, Tannery Machines and Accessories (ASSOMAC), based in Vigevano, supports manufacturers in the commercial area (e.g. organisation for the participation of companies in trade fairs) and also in the technological field (e.g. participate in discussion groups).

[34] http://www.ancionline.com/

3.1.4 Footwear Research Institutes in Lombardy

Lombardy has three main institutes carrying out RDI activities in the footwear sector:

- CIMAC: the Italian Centre for Footwear Application Materials, based in Vigevano;
- INDACO: the Industrial Design, Arts, Communication and Fashion Department of the Politecnico di Milano; and
- ITIA-CNR: the Italian National Research Council (CNR) and the Institute of Industrial Technology and Automation of the National Research Council (ITIA) based in Vigevano.

CIMAC, which is funded by its clients (mainly from the Italian footwear industry), was interviewed for this case study and ITIA-CNR was interviewed for one of the case studies presented in the report on Task 2 for this study[35].

3.2 Footwear Research, Development and Innovation Activities in Lombardy

3.2.1 Introduction

As part of this case study, interviews were undertaken with footwear enterprises to understand their approaches to R&D and the mechanisms they have in place to transfer R&D outcomes into marketable products. CIMAC was interviewed to understand how they collaborate with footwear SMEs in relation to RDI. Box 3.1 gives examples of two of the companies we interviewed. The information gathered from these interviews has been further supported by material collected from other interviews from northern Italy undertaken for other Tasks for this study together with additional material from literature/internet searches.

Box 3.1: Examples of Companies Undertaking RDI in Lombardy

Company one: This company is based in Vigevano and has been producing footwear since the 1940s. Its main focus has been on producing high-quality footwear and leather accessories (wallets, belts, briefcases). The company currently employs around 400 people (300 in production, 50 administrative staff and 50 people in retail stores). All processes, including design, cutting and sewing of leather components, packaging and shipping, takes place within the company. The shoemakers create each pair of shoes through a combination of stages involving work by hand and the use of machinery. Approximately 90% of the company's production is of men's shoes. Although the company has its own stores and an online shop, the majority of production (around 80%) is sold through multi-brand stores.

[35] RPA (2011): **Task 2: Research and Innovation Centres**, report for DG Enterprise dated November 2011 – hereafter referred to as the Task 2 Report (Research Centres)

Box 3.1: Examples of Companies Undertaking RDI in Lombardy
Company two: This is a family-owned company which was founded in the 1960s in Milan. The company ceased trading for after the owner suffered health issues. It started with an innovative idea – rubber arch supports which offer better massage and comfort. At its peak, the company had 20 workers and around 30 representatives, with a production capacity of 1 000 pairs of shoes a day. The owner is now trying to restart the company with the help of one worker. The business strategy of the company relies on the patented arch supports. However, this patent is soon to expire and there is no further innovation strategy in place.
Source: Case Study Interviews from Lombardy, 2011

3.2.2 Drivers for Innovation

The main drivers for innovation in Lombardy are fast changing fashion trends and increased demand for new collections. Companies identified that forecasting these trends is crucial in gaining market share and access to new markets. Changes in technologies and design are especially challenging for SMEs (this is explored in more detail in the reports for Task 2 (Research Centres) and Task 3 (SMEs)).

One means to face these challenges is to continually develop and explore new products as illustrated by one of the leading sole manufacturers in Lombardy (see Box 3.2).

Box 3.2: Rubber Soles in Lombardy
A rubber soles manufacturer in Lombardy produces soles for the outdoor footwear market – such as trekking and outdoor sports. The company produces 35 million pairs of soles per year globally, with 150 new models each season and sells in 120 countries, and is a partner to many brands. The company continuously innovates its products by producing high performance rubber soles and compounds, developing a range of high performance products suited for various sports and other activities – some of which are patented. The company realised that other types of footwear can also benefit from high quality rubber sole products and has started making safety, recreational and fashion footwear.
Source: http://www.vibram.com/index.php/us/

3.2.3 The Impact of Restructuring on RDI

In recent years, the footwear industry has seen the closure of a number of manufacturing companies and suppliers. There has also been deep restructuring and relocation of production by multinational companies to third countries such as Asia. These restructuring processes are still on-going – as explored in detail in the Task 4 Report (Restructuring).

Vigevano, which used to be one of the most important industrial clusters in footwear manufacturing has been badly affected by the economic crises and has fallen behind

other regional footwear clusters in Marche and Veneto in terms of both production capacity and innovation[36].

3.3 RDI Partnerships

Figure 3.1 provides a diagram illustrating the collaborative network of enterprises and the relationships that exist within the footwear sector in Lombardy.

As can be seen, all stages of footwear manufacture are present within the cluster, from design and material suppliers through to specialist companies providing lasts, soles and tools as well as the footwear production itself. There is also a strong ICT support for computer-aided design (CAD) and manufacturing (CAM) as well for product data management (PDM) and enterprise resources planning (ERP).

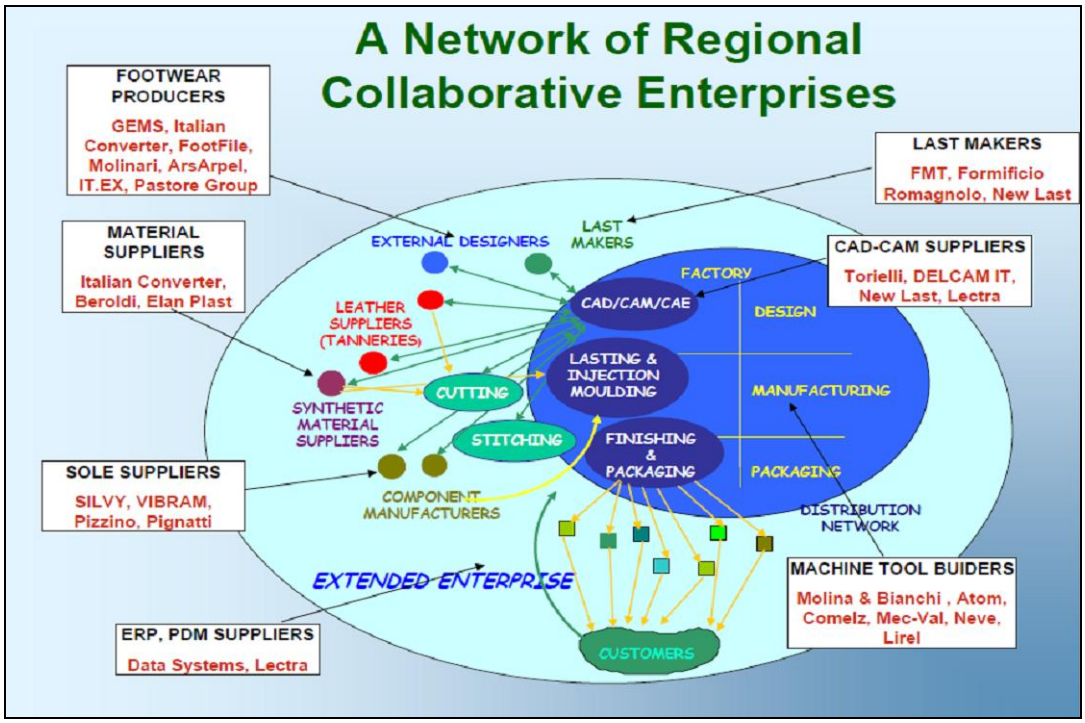

Figure 3.1: A network of Collaborative Enterprises in the Footwear Industry[37]

As highlighted in the referenced presentation, the key role for RDI is to develop new ways of organising and performing those activities in order to drive and sustain industry evolution. Within northern Italy, this is the essential role of ITIA-CNR.

36 Amighini A & Rabellotti R (2004): *How do Italian Footwear Industrial Districts Face Globalisation?* European Planning Studies Vol. 14, No. 4, May 2006, article downloaded from internet site: (http://www2.dse.unibo.it/prin/prin2003/workshop/wp3/WORKING_PAPERS/Amighini%20_Rabelloti)

37 Jovane F & Carpanzano E (2007): *Research and Innovation in Manufacturing Systems in Lombardia: from regional to inter-regional and European successful activities*, – presented by Carpanzano E at Bi-regional Workshop, Lombardia-Baden-Wüerttemberg in Stuttgart, 29 January 2007.

To further develop customer contacts, the case study companies interviewed said that they attended the major Italian trade fairs, such as MICAM and Pitti, as well as others in Germany and the United States.

Collaboration is often regarded as an advantage of being located within a cluster. However, many of the companies we interviewed indicated that, despite being geographically close to each other, they may not necessarily interact due to confidentiality issues and differing objectives with regards to R&D (see Box 3.3).

Box 3.3: Collaborations in the Cluster
One SME identified that being located in a footwear cluster had some definite advantages, such as possibility to hire new employees easily and to share costs of raw materials at bulk orders. The company also noted that being located in a footwear cluster strengthens its networking abilities with other manufacturing firms, suppliers and agents. However, the company did not mention geographical proximity of firms as a factor generating innovation and technological change. In fact, few firms share resources or undertake innovation activities together.
Source: Interviews from Lombardy, 2011

These views reflect those of a detailed examination of the equipment manufacturers in the Vigevano area as shown in Box 3.4.

Box 3.4: Summary of RDI and Footwear Machinery Manufacturers in Vigevano	
Elements	**Vigevano (Lombardy)**
Companies	45 companies
Major export markets	Europe and Asia
Products	A range of machines used in footwear manufacturing to perform different tasks.
General characteristics of innovations	Incremental improvements and innovations in components for machines. Some companies have introduced innovations that resulted in changes in the shoe production process (e.g. cut without cutting dies).
External collaborations	Many firms do not share technological knowledge with other firms. RDI activities are usually undertaken internally. There exist some joint formal or informal activities between firms and research institutions. There is an exchange of information and expertise with the principal customers – the shoe manufacturers. There is also support from ASSOMAC for participation in trade fairs and in discussion groups.
Internal collaborations	Some firms in the cluster of Vigevano have formal structures for undertaking innovation (the larger firms) and others have informal structures (the smaller firms). It is common to find teams of technicians who work exclusively for one firm for long periods of time. Hence the knowledge gained by technicians over time can be very valuable. Some companies rely on external technical consultants for the development of specific products. The information obtained from suppliers in respect of new materials and components are also important to this process.

Box 3.4: Summary of RDI and Footwear Machinery Manufacturers in Vigevano	
Geographic proximity	The close geographical proximity of machinery firms contributes to the spread of knowledge to footwear firms in the cluster. However, there is little direct information and knowledge exchange among the machine manufacturers.
Source: Ruffoni J (2007): ***Innovative Dynamic of Industrial Firms Belonging to Local Production Systems,*** *Department of Science and Technology Policy (DPCT)*	

As discussed in the Task 2 Report (Research Centres), there is, of course, a 'natural' market and interest for research organisations which are located in or in close proximity to manufacturing clusters.

3.4 Implementation of RDI Outcomes

3.4.1 The Process of Implementation

Footwear firms in the region undertake innovative activities via:

- internal learning processes through firms' own practices; and
- external learning process by cooperation with other parties such as universities, research centres, etc.

The research centres we interviewed indicated that footwear companies usually approach them with specific ideas, often focussing on particular qualities such as new materials, fire repellent materials, medical shoes etc.

3.4.2 Success Factors in Implementation

The most successful aspects of RDI implementation in Lombardy related to sales and marketing and product design. This fits with the strategies companies have adopted in response to international competition of moving to higher market segments and developing their brands.

One company we interviewed is focusing on improving its sales and marketing strategies. It has closed seven stores that were not located strategically. The company maintains a website and takes orders from customers via this.

Another SME is actively working with a small number of wholesalers and retailers, hoping to strengthen the position of its brand on the market. The company has also invested in marketing and communication campaigns.

Several companies within the Lombardy region are undertaking innovation in relation to products. One example of a company undertaking successful R&D activity and patenting its ideas is given in Box 3.5.

Box 3.5: Innovative *Fivefingers* Footwear Concept
A rubber sole manufacturer has developed a new footwear concept which mimics a lightweight and flexible glove for the foot, named *fivefingers*. It follows the shape of the foot, individually pocketing each toe. *Fivefingers* footwear is a new, innovative design which has been patented and manufactured in Vigevano by an Italian firm. The company has combined premium quality materials with the proven technology of previous patented soles to create alternative footwear design to enhance athletic performance. The company has spent years on product research and development, including cooperation with biomechanical institutions and field-testing.
Source: http://www.vibram.com/index.php/us/VIBRAM/What-we-do/Vibram-R-fivefingers-R

A similar example of a small footwear machinery manufacturer, which focuses on stitching machinery specifically, is presented in Box 3.6 below.

Box 3.6: Footwear Stitching Machinery Manufacturers in Vigevano
A shoe machinery manufacturer in Vigevano has been making footwear machinery for more than sixty years. The manufacturer offers a range of models with a variety of stitching capabilities. These machineries are exported worldwide. The manufacturer explores new technologies and looks constantly to improve its products. The company has several patents. Key targets for the company are to enable footwear producers to increase productivity during the stitching process and to progressively automate the shoe making process.
Source: http://www.falan.it/index.php?page=chi_siamo&lang=eng&m1=0&m2=0

ITIA-CNR and several of the companies interviewed indicated that CAD is used frequently in the footwear design process (see Box 3.7).

Box 3.7: Innovation using CAD software
One company operates in the fashion shoe segment and process innovation is infrequent. However, software for computer-aided design (CAD) and manufacturing (CAM) has been used by the company to ensure the consistency of products. Another SME indicated that it is largely labour intensive and find it difficult to become automated. Shoe design techniques are an important part of innovation and the company frequently use CAD software for the design phase. However, this is the only computerised element in the production process. Due to the intensity of manual labour, it is difficult to drive technological innovation forward.
Source: Interviews from Lombardy, 2011

3.4.3 Barriers to Implementation

In the high end fashion footwear segment, customers are often attracted to the handmade element of the shoe design. As such, it was noted in several interviews

(not only in Italy but also in France and Portugal) that, for luxury footwear manufacturers, there were few benefits of investing in technology and automated production.

3.5 Intellectual Property Rights

ITIA-CNR has a number of mainly national patents for management systems and equipment for the visualization of virtual shoes worn by a user and related methods. ITIA-CNR indicated that similar projects and products are often patented one after the other with minor alterations; therefore, these tend to lose their value very quickly. The strong competition between companies means they will try to imitate and out-do the latest innovation very quickly. As the industry is competitive, companies do protect their designs, but even the slightest change to a technology or product can be secured with a different patent.

Patents are important for SMEs which are trying to protect their footwear designs. One company interviewed produces and sells a range of rubber arch supports together with a selection (of around one hundred models) of footwear which offer massage and comfort aspects. The business strategy of this particular company relies on the realisation of patented arch supports. The patent was the result of the improvement of a German concept 'footbed' that was studied with a group of doctors and patented. The patent is now due to expire and the company has introduced no further innovations as they already have a marketable product and do not have the resources for extensive RDI.

Box 3.8 gives an example of a footwear components manufacturer in Lombardy which took legal action against another footwear company for patent infringement.

Box 3.8: Rubber Sole Manufacturer sues for Patent Infringement

The footwear components manufacturer (with headquarters in Italy) has commenced legal action in the United States against a US company for patent infringement. The patents involved cover footwear having individually articulable toe portions - innovative footwear for "barefoot running". The complaint alleges the US company's footwear is infringing several patents held by the Italian manufacturer. The patents cover a variety of footwear designs comprising individual toe pockets.

Before the Italian company's products were introduced, there was no minimalist footwear design constructed with individual toe pockets for "barefoot movement". The company launched the concept in 2005 and has since improved the technology and earned the patents. It has partnered with other major brands to create minimal barefoot sole platforms that are complementary to its design.

The company has stated that it will continue to take aggressive action against counterfeiters and those that infringe their intellectual property.

Source:http://www.vibram.com/index.php/us/VIBRAM/Brand-Protection/Brand-Protection/Vibram-sues-Fila-USA

3.6 Financial Support for RDI

3.6.1 EU Level Initiatives

CIMAC noted that, as the sector relies heavily on new ideas and innovation, EU level support and wider international collaboration and training programmes are necessary to maintain the country's leading role. ITIA-CNR also stated that closer collaboration with research centres is still needed and that international research should benefit from increased funding. These views reflect the general findings from the Task 2 Report (Research Centres).

The companies that we interviewed indicated that accessing EU support was not easy (see Box 3.9).

Box 3.9: Resource Constraints on Applying for EU Funds

One company unsuccessfully applied for EU funding for a children's shoes project, in collaboration with a tannery company. The company found the administrative work involved in getting the funding was too complicated.

In order to apply for funding, the company would require a full time employee to prepare the grant application and handle the administrative tasks. The company is not aware of any other EU funds that may be available to it.

Source: Interviews from Lombardy, 2011

3.6.2 National Initiatives

The footwear industry is an important contributor to the national GDP. Therefore, there are a number of on-going measures at a national level to support the footwear industry in Italy, in particular, funding for training in the footwear sector from the Ministry of Labour (as discussed further in the Task 5 Report (Training[38])).

However, ITIA-CNR considered that not enough financial support is available from the regional and national government. ITIA-CNR explained that if funding is available, then much of this is utilised in administrative proposals for EU projects. This limits the line of research to the areas of footwear and is not using national funding effectively.

3.6.3 Regional Initiatives

The region of Lombardy is financing a Meta-District programme to support SMEs representing manufacturing excellence. Financial support is given to these companies, to a maximum of €200,000 for three years. Currently the areas supported by the programme are:

[38] RPA (2012): **Task 5: Training**, report for DG Enterprise dated March 2012 – hereafter referred to as the Task 5 Report (Training).

- food biotechnology;
- non-food biotechnology;
- fashion;
- design;
- new materials; and
- information and communication technology (ICT)[39].

However, the companies we interviewed did not appear to be aware of, or have taken advantage of, regional initiatives (see Box 3.10).

Box 3.10: Lack of Financial Assistance
One company indicated that there is no regional assistance to support investment in the company. It was unaware of any kind of public support or initiatives or any local initiatives to help maintain the employment of people within the company.
Source: Interviews from Lombardy, 2011

ITIA-CNR indicated that its footwear industry related initiatives are funded via public and private partnerships (30% of the funds comes from private companies). When a new technology for the footwear sector is developed, the Institute makes an agreement with one or two companies, granting the technology in exchange of royalties on production units.

ANCI runs regional promotional campaigns to inform consumers about the process of footwear manufacturing and raising awareness of the industry and its role within the national economy.

3.6.4 Summary

Financial support for RDI is available from the EU (though the companies that we interviewed indicated that accessing EU support was not easy), national and regional governments. However, awareness of the availability of EU funds in particular appeared to be limited amongst companies in the region. As such, it would appear that more could be done by the industry associations and the authorities to alert companies to the opportunities which are available. In addition, ITIA-CNR indicated that not enough financial support is available from the regional and national government.

[39] Regione Lombardia (2011): *Metadistretti e Sistemi produttivi*, downloaded from website: (http://www.industria.regione.lombardia.it/cs/Satellite?c=Redazionale_P&childpagename=DG_Industria%2FDetail&cid=1213415480182&pagename=DG_INDWrapper)

3.7 Future Trends in RDI

The main drivers for future innovation highlighted by the companies interviewed are:

- to remain competitive;
- to respond to trends (such as fast fashion cycles);
- customised products;
- improved marketing strategies; and
- efficient production processes.

Most of the companies interviewed indicated that their position on RDI is unlikely to change drastically. Similarly, research institutes identified new forms of supply chain cooperation (including non-geographic clusters) and fast fashion as key future trends.

The Task 4 Report (Restructuring) indicated that companies in the region do not plan to make major changes to their business strategies in the near future. Fashion companies will continue to focus on the development and promotion of their brands while sports footwear companies are aiming to expand their markets in Asia, which is likely to require further innovation in distribution systems.

Most companies plan to continue maintaining their RDI activities within the region. This is particularly the case for fashion footwear, where proximity to fashion centres in Europe is seen as a critical factor. However, one company has relocated its RDI process to China (see Box 3.11). This may be replicated by other companies as part of a cost saving process. If this is the case, it could have significant implications for the future development of footwear RDI within the EU.

Box 3.11: Relocating R&D to Asia

A rubber sole manufacturer (mentioned in Section 3.2.2) recently announced the setting up of a Technical Centre in the Guangzhou province of China. This will be a new Far East headquarters for R&D and will consist of an innovation centre, industrialisation and production centre and a product performance test centre.

Source:http://www.vibram.com/index.php/us/VIBRAM/What-we-do/Vibram-R-fivefingers-R

3.8 Summary

Lombardy is well established in footwear manufacturing, footwear components, leather parts and accessories, machinery and equipment. Footwear manufacturers in Lombardy mainly produce for the fine and luxury segments.

Lombardy has three main institutes carrying out RDI activities in the footwear sector; CIMAC, the Italian Centre for Footwear Application Materials; INDACO, the Industrial Design, Arts, Communication and Fashion Department of the Politecnico di Milano and ITIA-CNR: the Italian National Research Council (CNR) and the Institute of Industrial Technology and Automation of the National Research Council (ITIA).

The main drivers for innovation in Lombardy are fast changing fashion trends and increased demand for new collections. Companies identified that forecasting these trends is crucial in gaining market share and access to new markets. Changes in technologies and design are especially challenging for SMEs.

Footwear firms in the region undertake innovative activities via internal learning processes through firms' own practices and external learning process by cooperation with other parties such as universities, research centres, etc. The research centres we interviewed indicated that footwear companies usually approach them with specific ideas, often focussing on particular qualities such as new materials, fire repellent materials, medical shoes, etc. They are primarily seeking assistance with the design and marketing of their products (as opposed to, for example, changes in production methods). Companies that we interviewed indicated that producing footwear for the high end fashion segment can limit RDI activity and the opportunity to invest in technology. This is true for many luxury footwear manufacturers, where the selling point to consumers is the handmade element of the production process.

Financial support for RDI is available from the EU (though the companies that we interviewed indicated that accessing EU support was not easy), national and regional governments. However, awareness of the availability of EU funds in particular appeared to be limited amongst companies in the region. As such, it would appear that more could be done by the industry associations and the authorities to alert companies to the opportunities which are available. In addition, ITIA-CNR indicated that not enough financial support is available from the regional and national government.

Most of the companies interviewed indicated that their position on RDI is unlikely to change drastically. Similarly, research institutes identified new forms of supply chain cooperation (including non-geographic clusters) and fast fashion as key future trends.

4. CASE STUDY: SOUTHERN POLAND

4.1 Introduction

4.1.1 Research and Innovation in Poland

Poland became a member of the European Union, along with nine other countries in 2004. It has a population of over 38 million people and is the sixth largest economy in the EU with one of the fastest growing economies in Central-Eastern Europe.

Officially registered R&D performing institutions in Poland[40] can be classified into three major government-funded types:

- 128 universities and other higher education institutions, structured in faculties, departments and institutes, many of which perform research;
- 80 research facilities of the Polish Academy of Sciences (PAN); and
- 201 ministry-supervised R&D facilities.

Most research institutions are self-governed by scientists; the involvement of the beneficiaries of the research results, such as the industry and the public, is not clearly defined. These research institutions have their own representatives in the Science and Technology Development Council, which gives them an influence on policy making at the highest strategic level. There are also three private institutes that function as foundations (focusing on research in economics).

4.1.2 The Footwear Industry in Southern Poland

Overview

The case study area comprises the two neighbouring *voivodeships* (administrative regions) of Malopolska and Silesia situated in the south of Poland. Both are important industrial regions and Krakow, the capital city of Malopolska, is Poland's second largest city after Warsaw.

Poland is the largest volume producer of footwear amongst the new Member States that joined the EU in 2004 and 2007. Companies mostly manufacture shoes in low and medium price range. The Polish footwear industry is concentrated in a few main cities: Czestochowa and Myszków (both in Silesia), Łaskarzew (Masovia), Nowy Targ and Kalwaria Zebrzydowska (Malopolska), Słupsk (Pomerania) and its surroundings. Malopolska and Silesia have the highest density of footwear manufacturers. This is partly due to the fact that 25 years ago the major state owned shoe manufacturing conglomerates were located in these two regions.

[40] Proneos (2006): **Private Sector Interaction in the Decision Making Processes of Public Research Policies**, report for DG Research with individual country profiles which are available from: http://ec.europa.eu/invest-in-research/monitoring/document_en.htm

In the early 1990s these factory properties were sold to a number of private investors - through the privatisation process - who were free to decide whether they wished to carry on the original activities of the enterprises. Currently, there are no big state owned manufacturing conglomerates and it was estimated by organisations that we interviewed that 97% of Polish firms are in private hands and 90% of firms are Polish owned.

Available Statistics

Data on the number of footwear companies operating in Poland vary, probably due to differences in definitions of the 'footwear sector'. According to data from the Polish Statistical Office provided during one of our interviews, there was a slight reduction in the total number of footwear manufacturing companies in Poland between 2009 and 2011, to a total of 4 600. According to this source, there were 1 650 companies based in Malopolska and 1 010 in Silesia. However, SATRA[41] and Sroka[42] and the CBI survey[43] indicate that the numbers of companies are much lower. The discrepancy between the number of companies may be also due to different indicators used in the collection of data. Polish Statistical Office accounts for footwear manufacturers with other leather industry companies such as manufacturers of footwear components, accessories and shops[44].

Estimates of the number of employees also vary widely. However, the Polish Chamber of the Shoe and Leather Industry[45] indicates that the footwear sector in Poland "provides employment to approximately 40 000 people working directly in shoe factories as companies strictly related to the leather industry (e.g. producers of components, chemicals, glues, soles etc.)".

Only about 100 of the companies operating in the footwear industry are of medium size, with most employing not more than 100 workers. The rest of the industry comprises very small and micro enterprises with 'craft workshop' characteristics. There are only a few significant domestic companies, such as But-S, Eksbut, Rylko, Bata, Conhpol, Nord, Lesta and Wojas[46].

41 SATRA (2011). Personal communication.

42 Sroka J (2010). *Representativeness of the European Social Partner Organisations: Footwear Industry – Poland*. Eurofound, Dublin. Document PL0907019. Downloaded from: http://www.eurofound.europa.eu/eiro/studies/tn0907017s/pl0907019q.htm

43 CBI (2010b). **Market Survey. The Footwear Market in Poland,** May 2010

44 Polish Chamber of Shoe and Leather Industry (2011), Personal communication

45 Polish Chamber of Shoe and Leather Industry (2010a).

46 Sroka J (2010). *Representativeness of the European Social Partner Organisations: Footwear Industry – Poland*. Eurofound, Dublin. Document PL0907019. Downloaded from: http://www.eurofound.europa.eu/eiro/studies/tn0907017s/pl0907019q.htm

Production and Consumption

Poland is the fifth largest footwear producer in Europe, after Italy, Spain, Portugal and France. During our interview, the Institute of the Leather Industry (ILI) indicated that between 40 and 50 million pairs of shoes are manufactured yearly in Poland.

In terms of consumption Polish consumers had bought 99 million pairs of shoes in 2010 placing the country 30th in terms of world ranking.

International Trade

According to the figures of the Polish National Statistic Office between 2000 and 2009, Poland's footwear exports to EU countries grew by 38% and by 2010 with an additional 23% to €304 million (representing around 25 to 30 million pairs). The main destinations for exports were Germany, followed by Russia and Spain. Footwear imports from EU countries grew by 27% from 2000 to 2009 and by an additional 15% to 2010 (see Table 4.1).

Table 4.1: EU-Poland trade in Footwear Products

	2000	**2009**	**2010**
Imports in € millions	135	172	199
Exports in € millions	178	248	304

Source: Central Statistical Office (2011): Foreign Trade of Poland

One noticeable development of the industry has been the increasing ties of the industry to German stakeholders, which are simultaneously Poland's main export market and supplier[47].

Nature of Footwear Production

According to the CBI Market Survey (2010), leather footwear products dominate the Polish footwear industry and, in 2008, accounted for about 60% of all production value but less than 18% of production volume. Footwear parts accounted for 20% of value but 64% of volume. Textile footwear accounted for over 9% of production value, although a higher proportion by volume. Other footwear, including waterproof footwear accounted for the remaining 11% of the value. According to the CBI Market Survey (2010), there are four distinctive footwear market segments in Poland:

- **the luxury or premium segment** consists of the most expensive shoes, usually imported from Italy, Germany, Spain and Portugal. It also includes a few Polish producers who are establishing brands associated with luxury, top quality and fashion and these shoes cost more than €75;

[47] APICCAPS: World Footwear 2011 Yearbook

- **the medium-priced segment** is dominated by local companies that offer a reasonable combination of quality and price. These shoes cost over €40 and are often available in clothing chains;

- **the standard segment** comprises cheap imports to a large extent, although there are some Polish suppliers; and

- **the economical or lower segment** represents the cheapest shoes costing less than €10. They are often described as shoe-like products of unknown origin and sold through hypermarkets, market stalls and factory outlets.

4.1.3 Footwear Research Institutes in Southern Poland

Introduction

Malopolska and Silesia are the second and third regions respectively in Poland in terms of R&D expenditures in general, after Mazowieckie[48,49], and are characterised by a high concentration of research organisations and innovative companies with a focus on high-tech and environmental protection activities.

The main research institutes and scientific units developing footwear innovations in Poland are the:

- Institute of Leather Industry (ILI)[50]; and
- Radom University of Technology[51].

These organisations also provide training courses to the footwear industry, as discussed in the Task 5 Report (Training).

Institute of Leather Industry (ILI)

Until 31 December 2007, the Krakow branch of the Institute of Leather Industry (ILI) acted as the Central Laboratory of the Leather Industry (CLPO). On 1 January 2008, on the basis of the decree of Polish Ministry of Industry, the CLPO in Krakow was merged with ILI. The organisational structure was incorporated into the main ILI office in Lodz (in central Poland[52]) and the Krakow facility now functions as an ILI branch office. The main aim of ILI is to support the Polish footwear and leather industry and its effective promotion in Poland and international markets.

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48 Malopolska Voivodoship (2008): **Regional Innovation Strategy of the Małopolska Region for 2008–2013**, available from: http://www.malopolskie.pl/Gospodarka/Regionalna/?id=1042

49 Silesia Voivodoship (2003): **Regionalna Strategia Innowacji Województwa Śląskiego Na Lata 2003-2013** (in Polish), available from: www.slaskie.pl/ris/ris_strat.pdf

50 Institute of Leather Industry (ILI), article downloaded from its website: (www.ips.Kracow.pl/)

51 http://pr.radom.pl/redirect.php?action=setcategory&id=1677

52 Although Southern Poland is the main areas for footwear manufacturing, ILI is located in Lodz, where one of the large state-owned footwear companies was formerly located.

The Krakow branch of ILI is the main research and development organisation for footwear in Poland. It has been active in the field of development and innovation in the Polish shoe and leather industry for around 40 years. The activities of the Krakow branch include[53]:

- scientific investigation, research and development work within:
  - functionality, comfort and usable quality of footwear;
  - examinations of children's and adults feet as well as those of persons with malformed feet;
  - innovative materials and plastics, including nanomaterials; and
  - modern design of footwear, construction, technology of production;

- quality expertise and expert opinions, investigation and valuation of: materials, footwear, adhesives, components and other shoe materials; and

- training, consultation, editorial activity for the shoe industry, materials engineering.

ILI also provides research, training and consulting services on:

- techniques and technology in footwear;
- materials and components for footwear;
- adhesives and other auxiliary materials;
- the finished shoes, design, testing, evaluation;
- comfort shoes;
- health shoes; and
- marketing and marketing management systems.

ILI is financed through two key channels:

- by the state budget, however it was estimated that this source of funding covers only 2% of the costs; and

- the remaining 98% of funds come from different sources e.g. property rental, externally-funded projects (including those for the European Commission), grants, training and provision of expert advice.

Technical University of Radom

The Technical University of Radom houses an important national centre for footwear education in Poland and is located in central Poland (between Warsaw and Lodz). Within the Faculty of Materials Science, Technology and Design the school offers a footwear design course[54] as part of the 3.5 year a bachelor's degree in design and a footwear design and technology course as a specialization within the 5.5 year chemical technology a master's degree.

53 Based on information provided by ILI to the Consultants and associated discussions.

54 http://pr.radom.pl/redirect.php?action=setcategory&id=1677

4.2 Footwear Research, Development and Innovation Activities in Southern Poland

4.2.1 Drivers for RDI

Within the Southern Poland, successive development strategy documents have been prepared by the regional authorities. In Silesia, the draft strategy for 2013-2020 is currently undergoing public consultation[55]. In Malopolska, the latest *Development Strategy for 2011-2020*[56], was adopted in September 2011. The Strategy identifies missions and priorities for the Region's development and sets out three strategic goals. One of these goals is strengthening the Region's competitiveness for sustainable economic development. This includes development policy areas that are of key importance for improving innovation in the Region.

Innovation and the ability and motivation to take advantage of research, new concepts, inventions and ideas play a key role in the strategy for Malopolska. The Strategy indicates that if the Region's innovation is to be strengthened then it is necessary not only to attract and maintain cutting-edge investments and technological progress but also to attract and keep creative and talented people who will contribute to Malopolska's innovation culture. Collaborative networks within industry also have an increasingly important role to play, especially for flow of information and knowledge.

Based on the interviews undertaken, the main driver for RDI by the footwear industry in Southern Poland was the need to remain competitive, through the development and adoption of new products and markets as well as taking advantage of new technologies (including new machines).

At the lower end of the shoe market, the key source of competitive pressure is cheap imports, particularly from China. By way of example, China now produces slippers at a cost lower than a company in Southern Poland can purchase the raw materials.

ILI indicated that, in medium and upper segments of the market, the main drivers were fast fashion, leading to a shorter time to develop collections, and the extended range of colours and designs for shoes demanded by customers. In response to these pressures, shoe manufacturers are interested in innovation in manufacturing to enable them to respond with more flexibility to new market demands, as well as the development of new products. One ladies' fashion shoe manufacturer indicated that competition from Italy was an important driver for better quality products. In turn, the need to maintain quality within the context of a faster design process and smaller product runs was a key driver for purchasing new, more efficient equipment.

55 http://ris.slaskie.pl/pl/aktualnosc/0/1321265461

56 Malopolska Voivodoship (2011): **Strategia Rozwoju Województwa Małopolskiego 2011-2020**, available from www.malopolskie.pl/Pliki/2011/projekt_4.pdf (in Polish)

4.2.2 Main Research Outcomes

The focus of research and development in Southern Poland is on incremental changes to products, processes and marketing methods rather than major innovations. For example, the company which produces soles has invested in new multi-injection moulding machinery to increase production rates. It is also seeking to develop new products for non-footwear markets, such as producing rubber car mats, using the expertise it has developed with footwear. Similarly, a company producing children's shoes has focused on innovation in product design (see Box 4.1).

Box 4.1: Innovation in Design of Children's Shoes

The company was established in 1992 with around 14 employees and has remained successfully in business ever since. Its brand is well known in Poland for designing and producing high-quality, 'healthy' shoes for children.

Its production rate is typically 60-80 pairs/day, five days/week. The shoes are primarily aimed at the Polish market with typical prices of up to PLN 80 (€20) for winter shoes and up to PLN 70 (€17) for spring/summer shoes. There are two collections per year with a few new models (and associated colour variations) appearing each time. New models are largely based on reviewing what else is on the market, including fashion shows. The company does not patent its products.

Source: Interview with company, October 2011

The children's shoe manufacturer has also adopted an innovative approach to marketing, developing its internet sales capacity (see Box 4.2).

Box 4.2: Internet Sales by Footwear Manufacturers

The company manufacturing children's shoes makes most of its sales via local shops and agents.

It also has an online shop, essentially a website which displays the various models, which has been operational for 18 months. This is primarily for individuals but has led to some international sales, which are assumed to be to Polish emigrants and their families (as the site is in Polish only). However, this is not the whole story, as the company had a recent order internet order from the Ukraine for fifty thousand pairs

Source: Interview with company, October 2011

In relation to the research and development work undertaken by the ILI research institute, one of the outcomes has been the collaborative development of specifications for what can be labelled as a 'healthy shoe' for children. Indeed, this work has led to the development of a Polish national standard as described further in Box 4.3.

Box 4.3: *Zdrowa Stopa* – the Sign for Healthy Shoes
Shoes marked with the Zdrowa Stopa (Healthy Foot) sign indicate a children's shoe which is correctly made in terms of design, technology and materials – as set out in the associated Polish standard. The sign is awarded by a Specialist Commission under ILI-Krakow comprising an orthopedic doctor, anthropologist, designer, technologist and materials scientist.
Source: http://www.ips.krakow.pl/znaki.html

4.3 RDI Partnerships

4.3.1 Key Actors

Within Southern Poland, the key actors with an interest in RDI within the footwear sector might be expected to include:

- manufacturers (and their suppliers);
- tanneries;
- the Institute of Leather Industry (ILI);
- other institutes and associations; and
- universities.

4.3.2 Partnerships between Research Institutes and Industry

Within Southern Poland, there is a formal 'technology platform' for the leather industry which was established in 2006 to encourage technological development and co-operation between industry, institutes and academia with a focus on conducting research and implementation of the results[57].

However, in practice, there appeared to be a very limited amount of partnering between companies and institutions with respect to RDI. In other words, whilst companies might use the expertise of the ILI to provide consultancy advice, training or testing facilities, research at the ILI appeared to be self-governed rather than directed at industry. The only links with universities appear to be in the form of training. The aspect of training is discussed further in the Task 5 Report (Training).

4.3.3 Inter-Industry Partnerships

The general impression from the interviews in Southern Poland was that companies do not co-operate except in cases of commercial expediency and that, in general, other companies are seen as competitors only. However, the ILI did comment that the willingness of footwear companies to cooperate with each other and with other

[57] ILI (2006): *Polish Technology Platform for the Leather Industry* (in Polish) and available from http://www.ips.krakow.pl/o-nas/37-polska-platforma-technologiczna-przemysu-skorzanego.html

organisations had increased recently. However, this applied only to the larger companies; SMEs still do not see the need to cooperate with other companies in the sector.

One company we interviewed is primarily a provider of soles to other footwear producers. The company has three routes to market which, in turn, define the scope for innovation:

- go it alone which, although not done very often, has, in fact, led the company to develop a new product line as discussed below in Section 4.4.2;
- work with shoe manufacturers and assemblers to design and produce suitable soles which may incorporate innovation (such as use of new materials and/or processes); and
- provide soles as directed on a sub-contract basis, for which there is a very limited scope for innovation.

By contrast, the manufacturer of children's shoes works closely with customers and suppliers on designing new products (see Box 4.3).

Box 4.4: Partnerships with Customers on Footwear Design

The children's shoe manufacturer often develops its designs in consultation with customers (retailers) and with one of its two sole suppliers. This sole producer is not allowed by contract to copy the design for use elsewhere. The other sole supplier makes soles to the company's design.

The second sole manufacturer has three main types of business partnership:

- it designs its own soles and then markets them (less common);
- it works with shoe manufacturers to design and then produce soles suitable for their products; or
- it provides soles as directed by a shoe manufacturer on a contract basis.

Source: Interview with company, October 2011

4.3.4 Relationships with Other Networks

There appear to be no established links between companies and research institutes in Southern Poland and other networks in Poland or elsewhere. However, some companies have developed links on an ad-hoc basis with other organisations and companies within an interest in RDI within the footwear sector. By way of example, one of the companies interviewed was involved in a multi-national FP7 funded project, as discussed in Section 4.6.1 below.

4.4 Implementation of RDI Outcomes

4.4.1 The Process of Implementation

Within Southern Poland, the incorporation of RDI into current practice appeared to be primarily the responsibility of company managers/owners as opposed to, for example, the outcomes of collaborative research programmes. As such, the rate at which such improvements could take place was strongly influenced by company-specific factors such as workload and availability of finance.

4.4.2 Success Factors in Implementation

Within Southern Poland, RDI has tended to focus on incremental developments carried out and implemented by individual companies, including:

- technology innovation through the purchase of new machines (such as laser cutters in larger companies);
- new designs and, occasionally, new products (see Box 4.4);
- new markets; and
- new routes to markets (such as internet sales).

Since most of the manufacturers are small and micro companies, access to finance is limited. This tends to mean that the implementation of RDI (of all kinds) is self-financed, which can lead to delays in the speed of implementation. On the other hand, it also means that company managers/owners are likely to be more cautious and considered in deciding on which measures should/could be implemented.

Box 4.5: Product Innovation

A manufacturer of rubber soles has developed a slipper with a textured plastic suede-like upper. It has recently begun production, and the company hopes that the product will account for 5% of production next year. The company is considering applying for a patent.

The company is also seeking to enter non-footwear markets, such as producing rubber car mats, using the expertise it has developed with footwear.

Source: Interview with company, October 2011

4.4.3 Barriers to Implementation

Within Southern Poland, RDI within the footwear sector is hampered by a number of factors.

As already mentioned, most developments are self-financed and many companies are not able to devote extensive resources to RDI. This point is echoed in the analysis of the leather sector by the Ministry of the Economy (as referenced in Section 4.3.2), which notes that the money spent on RDI within the Polish leather industry has halved

over the period 2005 to 2008[58]. This is probably linked to the major restructuring which the industry has undergone in the 1990s and 200s, as discussed in the Task 4 Report (Restructuring).

Also, as most footwear companies are small/micro enterprises and do not tend to co-operate with each other or with other organisations on RDI issues, their focus is very much on their existing clients and enhancing sales of existing products (albeit with new designs).

4.5 Intellectual Property Rights

The research and development sector in Southern Poland is among the assets of the region. Apart from schools of higher education, Malopolska possesses a group of very active R&D institutes, some of which are affiliated to the Polish Academy of Science[59]. There is a consensus that the potential of the institutions creating (or able to create) innovations in Malopolska is strong, and this makes it an outstanding region in relation to other regions. It is worth noting, however, that the regional authorities highlight the generally low level of numbers of patent applications and the need for increased awareness of the benefits of patent protection for innovative solutions.

However, the footwear sector does not appear to have taken advantage of this potential to date. This may also linked to the major restructuring which the industry has undergone in the 1990s and 200s, as discussed in the Task 4 Report (Restructuring), with the break-up of major state owned enterprises and their replacement by smaller firms which find it less easy to collaborate with large R&D institutes.

None of the footwear companies and organisations interviewed in Southern Poland had actively used patents or other measures to protect their new designs and products; this was similar to the approach adopted in some of the other case study countries. There appeared to be two main reasons; one was that the time to take out a patent was, in many cases, longer than the product lifetime (particularly with two to four collections per year). Secondly, small changes to a protected product could render the protection invalid.

[58] Ministry of the Economy (2011): **Analysis of the Competitiveness of Light Industry Sectors 2004 - 2008**, (in Polish) dated January 2011, available from: http://www.mg.gov.pl/Bezpieczenstwo+gospodarcze/Przemysl/Analizy+konkurencyjnosci#

[59] Malopolska Voivodoship (2008): **Regional Innovation Strategy of the Małopolska Region for 2008–2013,** available from: http://www.malopolskie.pl/Gospodarka/Regionalna/?id=1042

4.6 Financial Support for RDI

4.6.1 EU Level Initiatives

Some companies in the region have taken advantage of EU research funding. One company we interviewed is participating with five other partners from across the EU in the Naturalista[60] project (see Box 4.1 below), which is an EU funded Eco-Innovation Project which is exploring ways of recycling old shoes into new products (both shoe and non-shoe).

Box 4.6: The EU Naturalista Shoe Project

Europe's annual footwear consumption amounts to 2,600 million pairs, which means that 1.5 million tonnes/year of footwear end up in urban dumping sites. Additionally, the sector industries contribute 90,000 additional tones derived from by-products and rejects. This waste is mainly made up of a combination of polymeric materials, textiles and leather, which causes a high visual impact and its slow degradation, makes it persist in the environment.

However, the waste generated by the footwear manufacturing activities is an important source of energy and raw material that can be recycled. The EU Naturalista* Shoe Project addresses the reuse of post-used shoes and footwear waste and its utilization in new products by means of a mechanical treatment of footwear waste. The main disadvantage of footwear recycling is the need to separate the original components. This proposal aims to reuse footwear as a whole, without the need to separate its components, and to add it to higher value added products within the footwear, sports and road safety sectors.

The key issues to be addressed can be summarised as follows:

- Selective footwear refuse collection in order to prevent it from accumulating in urban dumping sites.
- Waste treatment by means of cutting into pieces, screening, and separation of metallic elements.
- Adding the milling as filler in polymeric formulations for the manufacture of footwear soles and insoles, floorings (sports areas, playgrounds, roads, etc.) and road safety articles.
- Manufacturing an ecological footwear line incorporating ecological soles and insoles developed in the project.
- Marking and certification of every product obtained as a result of the project, using a system that indicates that such products have been obtained from recycled footwear. An anti-counterfeiting and traceable technique will be used, such as the addition of micro-taggants with colour codes. These codes are unique and will differentiate environmentally friendly footwear.

As a consequence of the action to be developed, footwear becomes a 100% recyclable and consequently reduces the environmental impact.

**NATURALISTA project, Post-used shoes recovery in footwear industry and other applications, is a project financed by European Commission, Eco-innovation 2008-2011 Program, with proposal number ECO/09/256025/NATURALISTA, with duration of 24 months, from 1st September 2010 to 31st August 2012.*

60 *Eco-Naturalista Project*, article downloaded from **Eco-Naturalista** the website: (http://www.eco-naturalista.eu/www_pages/Summary.aspx)

ILI indicated that accessing EU funds has become more difficult in recent years as the European Commission has classified shoe manufacturing as a traditional economy sector. As the Commission makes fewer funds available for traditional sectors, as they are less valuable for the overall economy in comparison to other sectors, this has limited the pool of finance on which the sector can draw.

There appeared to be an awareness amongst the companies interviewed that EU funds could be available. However, the companies we interviewed indicated that accessing EU funds often required the involvement of regional authorities, which appeared to introduce additional administrative hurdles. Furthermore, the procedures were often quite complex. One company had hired a consultant to assist it with preparing the required documentation, but its application had still been unsuccessful.

4.6.2 National Initiatives

One of the interviewees mentioned that it had obtained some limited R&D funding from the Government, which was used unsuccessfully on a non-shoe development project. However, it appears that there is little or no national funding available for footwear RDI.

4.6.3 Regional Initiatives

No regional initiatives have been given to any of the companies interviewed. All companies stated that their R&D investments are self-financed.

4.7 Future Trends in RDI

One option for EU footwear manufacturers to spread their risks is through diversifying into other, non-shoe, products such as bags, belts, jewellery, etc. One company we interviewed in Malopolska used its skills in injection moulding to manufacture new products for other market sectors e.g. rubber mats for the car industry, but retained a strong focus on the footwear components market.

More generally however, it appeared that research, development and innovation are not really embedded into the business plans and future strategies of the enterprises we interviewed. Evidence from the interviews and the study by the Ministry of the Economy (as mentioned in Section 4.4.3) shows there is little investment allocated to research and innovation. This is largely due to the fact that companies perceive the impact of innovation and R&D to be minimal on their businesses, but also because there is a lack of funding and assistance for small and micro footwear companies from government and others for R&D.

Incremental innovation, even if it takes place within R&D departments, typically builds on existing technologies, products, services, or routines and modifies them. ILI mentioned that, going forward, Polish footwear companies will need to make their production processes more efficient. There will also be a need to introduce new technologies into products and processes for the companies to remain competitive.

Finally, in its review of the light industry, the Ministry of the Economy indicates[61] that the main areas for RDI within the footwear sector should be:

- new materials – primarily in response to a move towards replacing PVC with other plastics;
- new leather processing techniques – in order to address environmental concerns associated with traditional leather tanning methods; and
- organisation management within companies – as a continuing trend away from large production lines to small units for short/flexible production runs and improvements in logistics.

4.8 Summary

Poland is the largest volume producer of footwear amongst the new Member States that joined the EU in 2004 and 2007. Southern Poland has the highest density of footwear manufacturers. This is partly due to the fact that 25 years ago the major state owned shoe manufacturing conglomerates were located in this region. In the early 1990s, the factory properties were sold to private investors.

The main research institutes and scientific units developing footwear innovations in Poland are the Institute of Leather Industry (ILI)[62]; and Radom University of Technology. However, there appeared to be a very limited amount of partnering between companies and institutions with respect to RDI and companies do not co-operate except in cases of commercial expediency.

The footwear industry in Southern Poland needs to continually develop new products and markets as well as taking advantage of new technologies (including new equipment) in order to survive, particularly when competing with China at the lower end of the shoe market. However, beyond incremental changes to products, processes and marketing methods, no significant major research outcomes were identified in Southern Poland. RDI has tended to focus on:

- technology innovation through the purchase of new machines (such as laser cutters in larger companies);
- new designs and, occasionally, new products;
- new markets; and
- new routes to markets (such as internet sales).

Within Southern Poland, the incorporation of RDI into current practice appeared to be solely the responsibility of company managers/owners. The rate at which such improvements could take place was strongly influenced by factors such as workload and availability of finance. None of the footwear companies and organisations

61 Ministry of the Economy (2011): **Analysis of the Competitiveness of Light Industry Sectors 2004 - 2008**, (in Polish) dated January 2011, available from http://www.mg.gov.pl/Bezpieczenstwo+gospodarcze/Przemysl/Analizy+konkurencyjnosci#

62 Institute of Leather Industry (ILI), article downloaded from its website: (www.ips.Kracow.pl/)

interviewed in Southern Poland had actively used patents or other measures to protect their new designs and products.

It appeared that research, development and innovation are not really embedded into the business plans and future strategies of the enterprises we interviewed. Evidence from the interviews and other research shows there is little investment allocated to research and innovation. This is largely due to the fact that companies perceive the impact of innovation and R&D to be minimal on their businesses but also because there is a lack of funding and assistance for small and micro footwear companies from government and others for R&D.

5. CASE STUDY: NORTE

5.1 Introduction

5.1.1 Background

Portugal has a significant presence in the footwear market. According to APICCAPS, in 2010 Portugal's shoe industry comprised approximately of 1,350 firms. The industry is comprised of mainly of small and medium-sized companies. The average company employs just over 24 people, larger than the average in Spain or Italy. The average size has fallen significantly in recent years (in 1998 it was 34 people). This is mainly due to the closure of large, foreign owned companies in the last decade.

With around 33,000 employees, footwear is one of the nation's primary employers within the manufacturing sector. During 2010, the industry focused on maintaining levels of employment. In a period of reducing output, this resulted in a 9% reduction in labour productivity from over 2,000 pairs per worker per year to about 1,900. However, the reduction in value of output per worker was only 3.6%, to €42,000. This is a long-term trend in the industry ; the quantity produced per worker peaked in around 2000 and has reduced since, due mainly to the closure of large factories which focused on high production runs. By contrast, value added per worker increased throughout the decade. Restructuring in the footwear sector in Norte is explored in more detail in the Task 4 Report (Restructuring).

Innovation in products and materials has been critical in the development of the Portuguese footwear industry. Since the early 2000s there has been increased emphasis on design and more frequent changes in collections. This has been made possible by technology, such as CAD systems, exchanging files with customers to make samples, 3D CAD. The industry has also moved into new market niches, such as military and security footwear, health products and comfort shoes aimed at the ageing population. Such innovation is on-going.

5.1.2 The Footwear Industry in Norte[63]

The Norte region is located in the north of Portugal and is one of five regions of mainland Portugal. The capital of Norte is the city of Porto. The region has around 4 million inhabitants and is one of the poorest regions of Portugal. Norte has the second lowest labour force productivity in the country and one of the highest unemployment rates.

Portugal's main footwear-producing region is in Norte, focused around the city of Porto. It contains 96% of all Portuguese footwear companies and employs 98% of people working in the industry. Therefore, in effect, the regional industry and the national industry are effectively the same thing.

63 Information in this section is drawn from the APICCAPS' annual statistical publication.
APICCAPS (2011)*:* **Footwear, Components and Leather Goods Statistical Study 2011.** Porto, Portugal, the Portuguese Footwear, Components & Leather Goods Manufacturers' Association.

The supply chain in Norte includes equipment producers, suppliers, component producers and footwear manufacturers. The region of Norte has three main footwear producing areas:

- the "old" industrial district south of Porto, around Sao Joao da Madeira, Santa Maria de Feira and Oliveira de Azemeis, where many small companies are located (together with the Footwear Technology Centre of Portugal (CTCP));
- the fringes of the city of Porto, where the larger factories of foreign companies were located and where some plants still remain; and
- the Felgueiras and Guimaraes areas, where more medium sized Portuguese companies are located.

According to APICCAPS, the municipality of Felgueiras alone employs one third of the people in the footwear industry, with a further 10% in Guimaraes. Together with Santa Maria de Feira and Oliveira de Azemeis, these four municipalities account for around 70% of total footwear sector employment in Portugal. About 67% of the components industry workforce is also concentrated within these municipalities.

The Portuguese footwear industry has changed over the last couple of decades, making it a typical example of a mature industry where low costs are no more a competitive advantage and innovation has become a top priority. In the 1970s and 1980s, the industry grew based on the low labour costs and on economies of scale based on large volume orders; in the 1990s this was no longer possible. Throughout the 1990s, many global buyers of footwear moved their operations and orders from Portugal to Asia and Eastern Europe. However during the last decade the Portuguese industry has developed a strategy innovation and expanding into the wider global market. Restructuring in the footwear sector in Norte is explored in more detail in the Task 4 Report (Restructuring).

Production

The Portuguese industry produced around 62 million pairs of shoes in 2011, with a value of around €1.4 billion. Production by the industry has been reducing since the beginning of the century; during the 1990s, Portugal produced over 100 million pairs a year (see Table 5.1). The reduction in output was due to a series of circumstances, including competition from China and other Asian countries for market share and foreign investment, following the removal of trade barriers. The expansion of the EU to countries with lower labour costs, and greater proximity to the markets of central Europe, also increased competition for foreign investment (see Task 4 Report (Restructuring) for more detail).

Table 5.1: Production, Exports and Imports of Footwear in Portugal by Numbers of Pairs, 2004-2010

Year	Production (million pairs)	Exports (million pairs)	Imports (million pairs)
1994	108.8	89.4	15.0
2004	84.9	75.2	33.2
2005	72.3	64.3	39.2
2006	71.6	63.8	41.2
2007	75.1	71.8	55.6
2008	69.1	64.7	50.1
2009	67.0	63.3	54.4
2010*	61.5	68.1	67.6

Source: APICCAPS (2011a)
**APICCAPS Forecast*

Consumption

The first decade of the century has been one of near stagnation in the domestic market for footwear in Portugal, due to low growth rates in the economy as a whole, with a decline in average prices over the period. The market was valued at €543 million in terms of retail sales in 2010, 9% lower than in 2009. By volume, the Portuguese bought around 61 million pairs in 2010, around 5% fewer than in 2009. The decline in prices is partly due to increased consumption of non-leather footwear. Between 2005 and 2010, consumption of textile and plastic footwear increased by 47% and 77% respectively and consumption of water resistant footwear grew by 20%. By contrast, sales of men's and ladies leather footwear grew by only 7% and 6% by volume respectively over the same period. Sales of all other types of leather footwear fell.

Footwear Components

The footwear industry is the core of an important cluster of the Portuguese economy that includes, in particular, the footwear components and leather goods industries. In the case of the components industry, since 2010 employment has remained stable at around 4000 people. The leather goods industry is less representative at around 1000 people.

Table 5.2 provides information on the footwear components industry in Portugal. Overall, the number of firms and employees has been declining steadily since the 1990s and Portugal has been a net importer of components throughout this century, with imports around 50% higher than exports.

Table 5.2: Production of Footwear Components in Portugal, 2004-2010				
Year	**Number of Companies**	**Number of Employees**	**Value of Exports (€ million)**	**Value of Imports (€ million)**
1999	263	5569	99.2	143.3
2004	303	5431	72.8	118.9
2005	305	5268	58.9	103.6
2006	297	4707	51.4	95.8
2007	256	3917	45.8	111.9
2008	276	4090	49.1	97.9
2009	259	3901	48.0	80.3
2010*	258	3895	45.5	89.2
Source: APICCAPS (2011a) **APICCAPS Forecast*				

5.1.3 Innovation in Norte

The footwear industry in Portugal is one of the key sectors of the economy for development of new technologies and innovations. It is also one of the key export sectors of the country. According to APICCAPS[64] the protection of intellectual property has not been a traditional strategy for footwear manufacturers in Portugal. However, it became fairly obvious that Portuguese companies can only remain in the market and prosper by pursuing differentiation strategies, supported by research, development and innovation. Over the last decade the industry has developed a strategy based on innovation, research and development as well as expansion to the wider global market. Pressures to innovate came also from the buyers of footwear e.g. retail. Shoes have increasingly become a life-style purchase, with an increase in orders for urgent and small sized batches of higher end fashionable products (with a higher variety of models and colours) and a decrease in orders for large batches of standardised shoes with longer lead times.

5.1.4 Footwear Association in Norte

APICCAPS is the Portuguese Footwear, Components and Leather Goods Manufacturers' Association. It is a nation-wide association based in Porto, founded in 1975 with the aim of promoting the development of the sectors it represents and those of its 700 members. It represents the following business sectors:

- footwear industry;
- footwear components industry;
- leather goods industry (bags, wallets, gloves, belts, etc.); and
- equipment for the above mentioned sectors.

APICCAPS has taken a leading role in driving restructuring and innovation in the footwear sector. It developed a Strategic Plan for the sector, covering the period 2006-2013, which was based on APICCAPS and its members' understanding of

[64] APICCAPS (2011)*:* **Footwear, Components and Leather Goods Statistical Study 2011,** Porto, Portugal, the Portuguese Footwear, Components & Leather Goods Manufacturers' Association.

market conditions, supported by several university studies. The studies identified a number of options for the future of the Portuguese footwear sector; one of the most important was a focus on production innovation to increase productivity (which is important for international competitiveness) and flexibility and closeness to the market to enable companies to meet the requirements of customers for rapid production of small product runs (which allows for frequent changes in fashion, which in turn drives consumption). The flexibility model only works in the medium to high price and quality range; it is not a viable approach for low-cost footwear.

The plan was agreed by all members and is being implemented by the companies. Progress with the plan is being followed up by APICCAPS and by the Universities to check whether amendments are needed. Such close cooperation with Universities is not a common model in Portugal; the Universities involved do not have specific footwear departments but specialise in industrial strategy and economics.

The Portuguese footwear industry has been moving up the quality scale since the 1990s; this has been a trend for the Portuguese economy as a whole post EU entry. The aim is to increase added value and service and to create well known Portuguese brands, rather than simply producing low-cost footwear for overseas brands. This was necessary after foreign footwear companies largely pulled out of Portugal in the period 2000 to 2001, moving production to locations in Asia with lower labour costs.

5.1.5 Footwear Research Institutes in Norte

The Footwear Technology Centre of Portugal (CTCP) is the only footwear research institute in Portugal and benefits from being very close to the industry geographically, as well as to APICCAPS, in Sao Joao da Madeira. CTCP was set up by APICCAPS in 1981 initially as a footwear quality control laboratory. It became a technology centre in 1986, with the support of two institutes of the Portuguese Ministry of Economy (IAPMEI and INETI). It grew to six people by 1987, 24 by the mid-1990s and currently has 48 staff. Most of the staff have technical qualifications, in a range of disciplines including informatics, engineering but also include economists and two designers.

CTCP began as a quality control laboratory carrying out tests for companies, mainly on exports to the EU. In the 1990s, as the industry began to move towards fashion shoes, with smaller batches and faster response times needed, CTCP began offering consultancy and technical assistance to help the industry with this transformation, providing advice to individual companies on process and equipment changes needed to make their operations more flexible. The assistance focused on upgrading to more modern equipment, optimising the layout of factories and management of manufacturing. CTCP still provides such services for smaller companies and those with limited internal technical capability.

More recently, CTCP has offered industrial R&D services, acting as an external technical development department for leading companies. It undertakes joint projects with manufacturers, which requires close cooperation with them; the projects often take two to three years to implement. CTCP also works with equipment suppliers,

working on topics such as logistic systems for automation and CAD for development, patterning and production.

Twelve staff members work in technical assistance and consultancy. CTCP members of staff also have links with around 50 researchers in the Universities of Porto and Minho. CTCP works on R&D projects, which may be funded by the EU (under the 7th Framework Programme) and by the Portuguese Government.

CTCP also undertakes some training and provide short courses for supervisors and managers responsible for innovation (e.g. on CAD/CAM, informatics, planning). This training is carried out by CTCP staff and outside consultants; the focus is on learning from experience elsewhere and encouraging participants to think about how the problems their firms experience can be solved. CTCP can also bring equipment suppliers and companies together for specific training on new equipment. However, the focus is on encouraging the development of user-friendly machinery that does not need extensive training. CTCP's current objectives and activities are shown in the box below.

Box 5.1: CTCP Objectives and Activities

Main objectives:

To support technique and technologically the companies of the footwear sector;
To promote technique and technological training of the human resources of the companies;
To promote the industrial improvement of the product quality and processes;
To prepare and spread technical information to the industry; and
To carry out and stimulate works of investigation, it development and demonstration.

CTCP executes its objectives through the following **activities:**

- Physical and Chemical laboratory tests of raw materials and final products;
- Products certification;
- CE Marking;
- Research into new materials, equipment and processes;
- Fitting and Comfort Analysis;
- Leather utilization;
- Test Methods and standards;
- Environmental and Safety Consulting;
- Production and Manufacturing Consulting;
- Quality Certification schemes (ISO 9000, 14000, 18000);
- Training services, professional expertise and teaching resources;
- Sectorial studies;
- Software development;
- Information and Communication services;
- Protection of Industrial Property;
- Internet and Professional Database; and
- HSW - Health and safety at work.

Source: CTCP web site (www.ctcp.pt/)

CTCP is a membership organisation; its membership is separate from that of APICCAPS but many companies are members of both organisations. It works with

the footwear industry sector and any other sector that supports it. Its annual budget is around €2.8 million; this is allocated 30% to consultancy, 20% testing, 25% training and the remaining 25% to R&D.

5.2 Footwear Research, Development and Innovation in Norte

5.2.1 Introduction

Innovation is widely acknowledged as key to economic development, since it potentially leads to productivity and competitive gains. Structural changes over the last couple of decades have forced Portuguese companies to adopt technological innovations at the shop floor level. These have been essential in shifting from the production of large batches to small batches and to constantly develop and produce fashionable shoes (this has been discussed in some detail in the Task 4 Report (Restructuring)). Additionally, being a mature industry, technological innovations are essentially incremental rather than instant. In this regard, and considering that the basis for competitiveness is more and more associated with intangible factors such as time-to-market, customisation and the provision of additional services, organisational innovation is becoming more and more crucial.

In order to assess the evolution of research and innovation practices in Portugal and prospects for the future, we have interviewed the following organisations, institutes and footwear companies to gain a better understanding:

- **APICCAPS** the Portuguese Footwear, Components and Leather Goods Manufacturers' Association;
- **CTCP** the Footwear Technology Centre of Portugal; and
- **six** small and medium sized enterprises (please see Box 5.2 below for summary descriptions).

Box 5.2: Companies Interviewed

Company 1: This company is a family firm that was founded in 1972; the current Managing Director is the second generation of the family to be involved in the business. The company is the largest producer of soles for footwear in Portugal. It manufactures soles in a wide range of plastics and rubbers; natural rubber, thermoplastic rubber, styrene-butadiene-rubber, polyurethane, thermoplastic PU, ethylene vinyl acetate and PVC. These are sold under the registered trademark. The company's sales were around €16 million in 2010 and it expects a 15% increase this year. Around 50% of products are exported, mainly to Western Europe (Spain, France, Germany, Netherlands and the UK). It employs 250 people at its two plants (in Villa Nova de Gaia and São João de Madeira – 40km apart). Its customers for soles include major brands such as Ecco and Church; it sells some cheaper products to non-premium brands, such as Zara. It also sells to the safety footwear market. Order sizes can range from 500,000 down to 2,000.

Company 2: The company is a family firm which used to produce footwear under contract for major brands. It now produces women's fashion footwear in the super-premium segment (with retail prices from €300 to several thousand Euros. It sells to the most upmarket retailers. The company produces 30,000 pairs per year and has 50 staff, plus a few sub-contract stitchers and sales agents.

Box 5.2: Companies Interviewed

Company 3: This company began 25 years ago and specialises in safety and work footwear. It produces around 500,000 pairs of shoes per year. 90% of its shoes are exported – mainly to Europe. It employs 170 staff in total. Of these, 120 work in production at the company's single factory in Guimarães and the remainder in commercial functions. The company is very focused on technical developments in safety footwear and has developed a number of innovative features for footwear. It has two main brands; one is the main safety footwear brand and another which is intended to be more fun and fashionable (e.g. ladies safety shoes, in a range of colours and including high- and wedge heels).

Company 4: This company began in 1973 producing a range of children's shoes. However, after one year the company introduced a women's range, and now only produces women's shoes. Its business strategy is to be innovative in its products, which are in the medium to high price bracket (around €100 to €150 per pair). The company employs around 195 people and produces (and exports) around 300,000 pairs per year.

Company 5: This company is a family business founded in 1976 and specialises in producing high end women's shoes. During the 1970s, the company focused on the domestic market and in the 1980s it began exporting, working under contract for foreign firms. The 1990s saw the introduction of improved technologies such as water-jet cutting and CAD/CAM to increase output. The company produces 250,000 pairs of shoes annually. The emphasis now is on growing the brand and improving marketing. The rest of its production is for private labels. The footwear is sold for €100 to €200 per pair in the shops.

Company 6: This company began in 1995 with the support of CTCP to develop machinery specifically for the changing demands of the Portuguese footwear sector. The company began by manufacturing water jet cutting equipment before developing other technologies. The company has not only developed an international market for its equipment but has also transferred its knowledge to equipment for other materials (such as stone cutting equipment). The company now employs 60 people.

Source: Interviews from the Norte Region, October 2011

5.2.2 Drivers for Innovation

According to CTCP, the key driver for innovation in the Portuguese footwear industry has been the changing competitive position of the industry. In the 1980s and early 1990s, Portugal was seen as a low-cost manufacturing destinations for British and German footwear companies. Portuguese companies therefore invested in increasing production capacity and automation to take advantage of the opportunities for large-scale sub-contracting. Following the relocation of British and German-owned companies from Portugal in the late 1990s and early 2000s, to even cheaper production locations in China and elsewhere in Asia, the industry underwent a major restructuring. To survive in the new competitive environment, companies began to move towards the development and production of their own brands of fashion shoes, with smaller batches and faster response times needed. This required organisational and structural innovation to enable greater flexibility and more effective production management. Box 5.3 provides an example of this process.

Box 5.3: Changes in Competitive Position Driving Innovation

One footwear company interviewed explained that during the 1990s, the company focused on restructuring of its technology base. In 1995, the company was producing footwear under sub-contract for five customers. This was profitable but the company considered it too risky. It therefore decided to invest in organisational and structural innovation to enable it to do the basics more efficiently and increase output. This allowed it to increase production through greater automation and to approach new foreign customers to seek sub-contracting work. It invested heavily (€0.5 million per year) in new technologies. The company was one of the first in Portugal to use water jet cutting, CAD/CAM and automated cutting knives.

In the 2000s, the loss of contracts with major brands, which moved production to lower-cost countries outside the EU, prompted the downsizing and move to focusing on own-brand production and product innovation. A lot of the automated technology was no longer needed, because producing for its own brand required smaller series and larger numbers of styles (around 100 styles per collection, with 700 different combinations of styles and colours). The automatic conveyers were removed from the factory and production is now much more manual.

Source: Interviews from the Norte Region, October 2011

5.2.3 Main Research Outcomes

The move to own-brand production rather than subcontracting, resulting from the change in Portugal's competitive position, has driven a need for greater flexibility in production. This created a market for more flexible equipment, which allows small batches to be produced efficiently.

APICCAPS began to deliver innovative technologies and machinery to meet this requirement in the 1990s, in a consortium with its subsidiary CTCP, Portuguese footwear and equipment manufacturers and universities. It focused in particular on new cutting technologies (water jet, laser), as these allowed for greater flexibility in production. Some new equipment manufacturing companies were formed as a result of this cooperation. However, the limited size of the sector in Portugal post-restructuring led the company to seek other markets in Europe and beyond, as well as developing equipment for other industrial sectors (see Box 5.4).

APICCAPS believes that having a local market for equipment is more important than having a pre-existing equipment industry in prompting innovation. It considers that Portugal has been more innovative than Spain or Italy in the development of water jet cutting equipment, but still faces strong competition from Italian companies such as Molina e Bianchi.

Box 5.4: Continuing RDI by a Footwear Equipment Manufacturer

The company began by making innovative cutting equipment for the footwear industry, but has moved into other sectors and transferred its knowledge of water jet cutting to other materials, including stone, ceramics, frozen and fresh food, plastics, metals and composites. It develops two to three new machines per year. The company works with customers to develop customised solutions to address their problems. This latter move in technology has allowed the company to develop very flexible integrated production systems for the footwear sector based on robots. The systems require steering software, and thus competences in software development are critical. These are delivered by the sister company based in Lisbon (which was founded in 2001).

The company exports to other EU countries, the Middle East (stone cutting machines to Dubai and Saudi Arabia), Australia and Canada. Working with leather cutting for the automotive industry, the company gained expertise in laser cutting. This process was later introduced into the footwear sector, first for cutting but also for roughing, engraving and particularly for welding.

The company is also developing new products through a range of current R&D projects, including:

- development of a robot assembly line, working with a footwear company and a research centre;
- development of upmarket cutting technologies for flexibility, efficiency and cost reduction, in the face of increasing leather prices; and
- quality control equipment: development of a prototype to test complete footwear with more sophisticated walking simulation than is currently available and the ability to test for comfort (temperature and sweating).

Product innovation has included reducing the costs of equipment. Initially, its water jet cutting machines cost around €500,000, the cost is now around half of this (and knife cutting equipment is even cheaper). The company provides aftercare service for its equipment. It has a remote maintenance system via IT, but also sends engineers out to factories using its equipment and carries out initial training of the workforce using the equipment (either directly of via agents). Services now account for 20% - 25% of the company's turnover.

Source: Interviews from the Norte region, October 2011

It is interesting to note, though, that while the industry in Portugal considers water jet and laser cutting to be an innovative approach, companies in Germany (interviewed for Task 4) indicated that oscillating blade cutters had significant advantages over these technologies. Although water jet and laser cutting are ideal for small scale manufacturing or sampling (as it eliminates the need for costly cutting dies at the tooling stage), the technologies do have limitations in terms of material utilization. In particular, leather can absorb the water and polymer used in water jet cutting, and is scorched by a laser.

Restructuring of the footwear industry in Norte has also led to a range of different innovations, from changes to the production process through the development of new brands to an increased focus on marketing and innovation. For example, one component manufacturer that was interviewed had made many changes to production processes in recent years, including use of new materials (e.g. biodegradable, eco-friendly materials and recycled rubber). The company's expertise is in plastics, injection and moulding and it focuses on innovation, with a wide product range and will continue to do so in the future. This shows the significance of product innovation in maintaining and expanding the company's markets. Innovation allows it to take ideas to its customers, building long-term relationships and providing value which helps to protect it against competition from lower-cost manufacturers.

According to APICCAPS, innovation in market access has focused on promotion of the image and reputation of the industry (overcoming a past poor image linked to the previous emphasis on low-cost production, which led customers to expect lower prices). APICCAPS has an annual marketing and promotion plan to address this problem. The focus was initially on promotion to wholesalers and retailers, with advertising in professional journals. Now the campaign is moving on to direct targeting of consumers. This was seen as the focus of the next phase of the strategy plan – with particular regard to overcoming the apparently negative image of Portuguese industry.

Companies themselves are focusing increasingly on developing their own brands, rather than sub-contracting. This has required skills in design; one SME achieved this by contracting an independent designer, and in sales and marketing, which it achieved partly by contracting agents in each market. The company has a very efficient ordering and invoicing system. An article number (barcode) is assigned to each product and customer. The barcode is swiped as each order is packed and this links to the automatic invoicing system.

The loss of major sub-contract clients and the focus on own-brand production meant a major change in marketing for another SME. Ten years ago the company had 10 to 20 main customers, it now has over 1000. Most of these are independent retailers and small chains across the EU. As a result, the minimum order size has been reduced and the company uses local agents to sell footwear. However, company employees also travel more extensively to meet clients. This has required a complete change to the company's logistics operations. It has increased the size of the commercial back offices to deal with the much increased volume of invoices generated due to the increased number of customers. The warehouse has also been reorganised and the company uses an RFID system, linked to enterprise resource planning (ERP) and customer relations management (CRM), which allows invoicing as soon as a shipment leaves the warehouse.

Another company has continued to innovate in the manufacturing of soles and has progressively looked to widen its customer base to reduce risks, for example entry into a new market for professional footwear. This new range has required a different approach to marketing, including direct sales to consumers through the company's website. The company has attended fashion footwear trade fairs to exhibit and promote their range of footwear. Another footwear manufacturer tries to maximise the promotion of its products by advertising on each shoe box not only the shoes inside but also of other shoes in the product range.

5.3 RDI Partnerships

5.3.1 Key Actors

Research in the footwear sector in Portugal has involved a range of actors. These include the footwear research institutes, universities, APICCAPS and individual companies. Partnerships with Universities do not necessarily involve footwear departments. For example CTCP works with the University of Minho's chemical engineering department on polymer engineering. Similarly, the industry also works with research institutes that are not specific to the footwear sector, such as the Instituto de Engenharia de Sistemas e Computadores do Porto (INESC Porto).

5.3.2 Partnerships between Research Institutes and Industry

CTCP focuses on measures to improve flexibility and efficiency, whether through new technologies, new management or organisational approaches. Examples of the most innovative developments that CTCP has worked with industry to implement include:

- logistics systems for transport and storage within factories;
- cutting systems, especially water-jet cutting;
- laser technologies for roughing, graving and decorating leather;
- specialist (non-stitching) machinery; and
- quality control machinery.

Although much of its R&D work is tailored to the requirements of the (Portuguese) footwear industry as a whole, CTCP also provides technical advice to individual companies. For example, CTCP has worked with equipment manufacturers to develop a particular piece of machinery to meet the needs of an individual manufacturer. The machinery maker benefits because the product that has been developed can then be adapted for sale to other customers.

CTCP works in different ways with different types of organisations (see Box 5.5). For example, larger companies have innovation departments with one or two people following up on university research etc. CTCP is able to work with them on collaborative R&D projects. Smaller firms do not have such departments, so CTCP provides this service for them. These companies tend to have a short-term perspective; CTCP helps to introduce innovation into the company.

Box 5.5: CTCP's Relationship with Manufacturers and the Industry

CTCP works closely with the footwear industry and supporting sectors, by providing:

- technical assistance services for smaller footwear companies (who require the finished products of the R&D process;
- research and development projects with more advanced footwear companies, who are able to take initial ideas forwards;
- collaboration with equipment manufacturers and software companies to help develop equipment for the footwear industry (Portugal had a traditional basic mechanical equipment-making industry but CTCP had a key role in the development of a more sophisticated sector); and
- collaboration with other supporting sectors, such as current work on RFID for retailing.

Findings are disseminated in a number of ways, including direct dissemination to R&D partners and technical assistance customers, through the CTCP web site (which includes detailed information in a members-only area) and through leaflets describing particular projects.

Source: Interviews from the Norte region, 2011

5.3.3 Inter-Industry Partnerships

As well as partnerships with research institutes and academic bodies, footwear companies have developed inter-industry RDI partnerships. This includes partnerships between footwear manufacturers and their suppliers, both within and outside the footwear industry, and with customers (see Box 5.6).

Box 5.6: A Network of Relationships within the Footwear Industry

One component manufacturer interviewed indicated that it works closely with the chemical industry, which supplies its materials, and is able to test new materials on the supplier's behalf, using the testing facilities that are part of its manufacturing process. It also maintains close links with its customers, aiming to bring innovative ideas to the customers rather than just manufacturing what is ordered. The company works with local suppliers where possible, to benefit the local economy.

The component manufacturer also works closely with its customers. Most soles produced are specific to particular customers to meet their needs for fashion, comfort and safety. The component supplier monitors footwear fashion developments and then suggests sole designs to its clients.

Another company carried out joint research with local suppliers to develop composite toeboxes for safety footwear as an alternative to the traditional steel toecaps. This move had two benefits for the company; the toeboxes exceed the safety performance of steel toecaps but are lighter, allowing more comfortable footwear to be developed. In addition, sourcing toeboxes locally reduced costs compared to steel toecaps (which had to be imported) whilst also providing a new market for local suppliers.

Source: Interviews from the Norte manufacturers, 2011

5.3.4 Relationships with Other Networks

CTCP collaborates with other footwear research centres in the EU, including CTC in France, INESCOP in Spain and centres in Italy. The majority of such collaborations take the form of joint projects funded through EU initiatives. For example, CTCP is a partner in the FP7 funded *European Footwear Products and Process Technology*

Platform which facilitates the exchange of ideas and information on RDI within the European footwear sector[65].

Learning from other industry sectors has been an important aspect of RDI in Portugal (see Box 5.7).

Box 5.7: Learning from Other Sectors
A major advantage of CTCP is the way it gathers knowledge from other sectors. Around 30% of the time of R&D staff is spent going to exhibitions, learning from other sectors. Its links with Universities are not with specific footwear departments but with departments having expertise in particular areas, such as informatics. This also helps CTCP to draw on the experience of other sectors.
Source: Interview with CTCP, October 2011

5.4 Implementation of RDI Outcomes

5.4.1 The Process of Implementation

CTCP tends to work initially with the most advanced companies, which have R&D departments, to develop new products or processes. Once these companies are able to demonstrate that the innovations are successful, they are taken up by others, including smaller companies (who may be sub-contractors to the advanced companies). For example, a particular CAD system was developed in 1997 with two companies; within two years, it was being used by 200 firms. The sector has seen considerable success in transforming R&D results into marketable products and/or processes.

Where companies carry out research and development in their own facilities, research outcomes can be implemented directly into products. For example, the safety footwear company has an in-house podiatry and biomechanics research laboratory to ensure that the lasts it uses provide the correct mix of comfort and protection. It also has a research department and an innovation laboratory, which has recently been certified according to a national standard. Some of its recent innovations are listed in Box 5.8 (next page).

Another company has the ability to carry out all aspects of footwear production itself, to reduce its dependence on suppliers. It even has a small in-house leather tanning and dyeing facility (leather is bought in unfinished from all over the world (mainly South America and Asia) and then treated in-house).

65 http://www.eu-footwear.eu/index.php

Box 5.8: Innovations from a Safety Footwear Company

A safety footwear producer has listed the key areas of technical innovation for the company in recent years:

The Clima Cork System: A layer of cork (formed from a by-product of the production of bottle corks, milled and glued) is inserted between the insole and the outer sole. It protects from heat and moulds to the shape of the foot to increase comfort. This has been patented for 15 years.

Responsive Shock Absorption: this is a shape of the heel and sole (with gaps) which provides protection six times greater than is required by the standard. It helps to protect the spine of people regularly jumping from trucks, such as refuse collectors.

Toe box: This protective footwear uses a composite toe box, completely enclosing the toe area, instead of a steel toecap. It offers better protection to the foot.

3D vario: different insoles can be inserted into shoes to change the volume of the shoe. It takes account of variations in the 'height' of the foot between different people with the same length and width fitting, and can also be altered if a person's feet expand or contract during the day (e.g. from standing for long periods).

Source: Interviews from Norte Region, October 2011

5.4.2 Success Factors in Implementation

The footwear sector in Portugal has seen considerable success in transforming R&D results into marketable products and/or processes. One of the main factors influencing this success appears to be the close links between different industry players; universities, research institutes, and companies, in which the industry association has played a key role.

According to APICCAPS the most successful implementation has been the use of innovation to increase productivity and flexibility, which has enabled the industry to remain competitive, and also focus on exports and seeking new markets. CTCP considers that a key factor in the effective transfer of research outcomes is the ability to bring together different organisations that can then work together on implementation.

Another reason behind the success in innovation is ensuring that RDI is closely focused on the key issues facing companies. One of the main issues for the Portuguese footwear industry has been the need to build its own brands (through product innovation) and develop expertise in marketing (through service innovation) as illustrated in Box 5.9 (next page).

Service innovation also needs to be linked to enhanced customer service. One fashion footwear company we interviewed focuses on flexibility and rapid response to customers. Orders can be as low as 10 pairs; every 15 days the company groups orders, produces the shoes and dispatches them to customers via commercial courier companies. It guarantees to re-stock customers within three weeks.

Box 5.9: Using Brand Building, Marketing and Sales Expertise

One company previously manufacturing safety footwear decided to diversify its product range and move into professional footwear. It was prompted by the view that they could offer a competitive product, because the market focuses more on quality and technology than on price. The company indicated that introducing its own footwear brand required the company to learn about other markets and selling direct to customers, rather than to shoe manufacturers. The shoe range required a different approach to marketing, including direct sales to consumers through the company's web site. For their professional brand of shoe the company attends fashion footwear trade fairs and exhibits at specialist fairs for safety footwear.

The safety footwear manufacturer is developing a new marketing concept 'innovation at your feet', which provides eight typologies by occupation for customers to identify with and offers appropriate footwear for each. It also tries to maximise the impact/promotion of its products. For example, each carton of shoes has a picture not only of the shoes inside but also of other shoes in the range.

Source: Interviews from the Norte region, 2011

5.4.3 Barriers to Implementation

The case study interviews identified a number of barriers to implementation of RDI, including:

- the focus of research projects;
- the nature of outputs; and
- lack of resources in companies to implement outputs.

CTCP considered that SMEs in particular face problems with implementing R&D outputs because they do not have innovation departments. For this reason, R&D outputs need to be in the form of finished products before SMEs can adopt them.

They also face problems in terms of finance (for new equipment, new IT systems etc.). A fashion footwear manufacturer indicated that it would like to introduce novel product lines, for example bags and clothing, and develop its own retail activities, but was unable to do this due to cash flow problems. Lack of short-term loan finance from the banks, which has become a problem since the financial crisis[66], means the company's revenues are taken up by covering the gap between paying for raw materials and receiving payment for its products and it therefore cannot invest properly in the business.

5.5 Intellectual Property Rights

Protecting intellectual property rights can be a key factor in promoting RDI, as it enables those responsible for innovation to gain from their activities. However, smaller companies do not always apply for patents as it is an expensive and time

[66] As reported in the Task 1 Report (Industry Overview), the impacts of the global financial crisis have led to a significant tightening of credit requirements by banks, particularly for micro-companies.

consuming process (see Box 5.10 below). Furthermore, once patents are issued companies do not always have the money to take action against any infringements.

Box 5.10: Protection of Designs

One component company indicated that a potential barrier to further innovation within the company is the protection of its designs. The current process for protection is not really effective for the company. Patenting innovations is costly and takes too long. Just registering a brand can take two years. Companies need expertise and skills to obtain patents and protection for their products in a global market not just for the EU. For worldwide protection patents need to be taken out country-by-country and this can be expensive and impossible for a small company to take on.

The company has offered sole concepts to customers who have then used this and patented the resulting design themselves. The company recognises that it may need more protection in future, as from previous experience, not all customers are loyal. The company urged for simpler procedures for obtaining a patent and assistance with worldwide registration. Another SME recognised that it should probably be doing more to protect its footwear designs (which have been copied in China and Brazil) but have not yet done so.

Source: Interviews from the Norte region, 2011

Another company which has focused on product innovation for its brand of footwear, has given particular attention to the consequences for footwear design of changing demographics such as people becoming older, heavier and/or suffering from conditions such as diabetes. As a result of RDI for this specialist market, it has required the largest number of patents per company in Portugal outside the chemicals sector. The company has only taken out Portuguese rather than EU patents, because they are cheaper to enforce and Portuguese patents take one to two months whereas Euro patents take three to four years (mostly because all Member States have to approve them).

CTCP has taken out some national patents and has presented two or three international ones (but these are not yet complete). Taking out patents is an expensive process and, in addition, CTCP does not have the money to take action against infringements. It is better to present an idea in public, which means that the idea cannot be patented by anyone else.

However, CTCP has helped companies to register models, brands, logos by assisting them to complete and submit the necessary forms in an effective manner. Figure 5.1 (next page) shows that the number of registrations grew rapidly and then slowed down in 2008. CTCP continues to work with equipment manufacturers to improve the footwear equipment. However, CTCP does not see patents as a particularly valuable tool and considers that its innovations to market ratio is good.

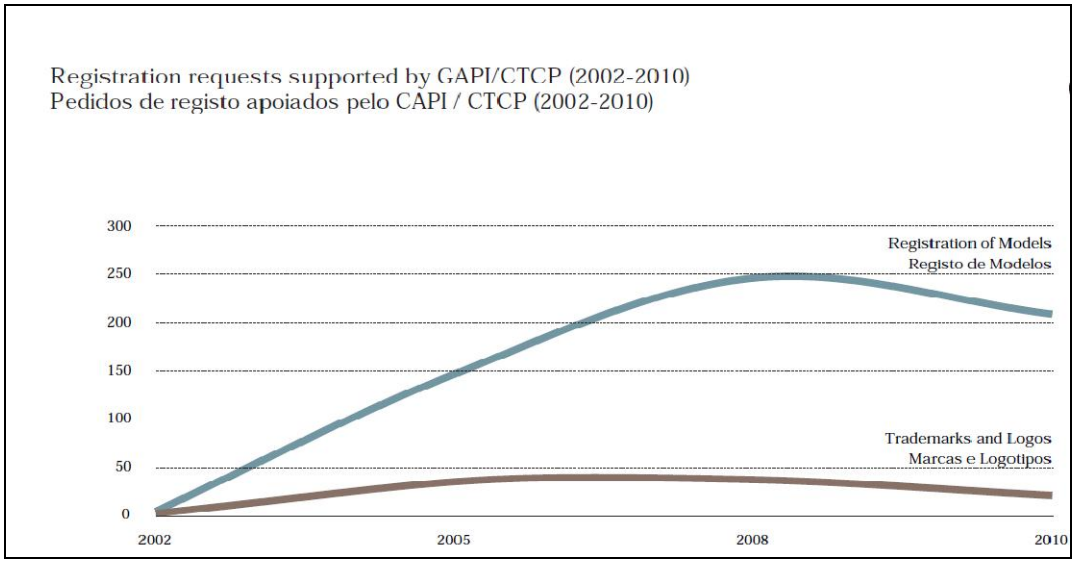

Figure 5.1: Registration Requests by Portuguese Footwear Manufacturers

5.6 Financial Support for RDI

5.6.1 EU Level Initiatives

CTCP noted that both national and EU funding is available for research and development. CTCP has been very successful in accessing EU funding because it has developed a good understanding of the requirements of funding programmes (R&D programmes must be innovative and transferable to industry whilst University projects must be creative and know-how focused).

The footwear equipment supplier has participated in a number of R&D projects that received EU funding, including projects on:

- traceability (creating logos with deliberate defects to ensure a guarantee of source);
- multifunctional materials (where the company worked on quality control equipment linked to research on materials with minimised permeability); and
- CEC-made shoe project: work with Ecco on a prototype laser roughing system that allows the sole and uppers of a shoe to be in a single piece, which gives much greater design flexibility.

However, CTCP noted that the outputs of EU-funded project are often far from those required for practical applications. Significant additional work will be needed to make the outputs of the CEC-made shoe project into a commercial product. Also, the approval process for projects seems to involve academics, who are less in touch with the industry, rather than sector experts. This means that Universities, which are good

at writing the academic proposals, are more likely to be successful at winning the funding. The projects have thus focused on new knowledge, rather than practicability. This is less of a problem for the more advanced companies, which are able to take initial ideas forwards, but more problematic for SMEs, which require finished products.

With assistance from the EU Regional Development Fund, APICCAPS invests €10 million euros per year in promotion, including the current campaign *Portuguese Shoes - Designed by the Future*[67]. It exhibits on behalf of the Portuguese footwear industry as a whole at major trade fairs across the EU, USA and worldwide and helps companies to access EU Regional Development Funding to assist with the costs of attending such fairs. All the companies interviewed mentioned that they received assistance to attend footwear trade fairs. This was recognised as being very important to maintain closeness to customers. Without the funding, some companies would not be able to attend so many fairs, which would make marketing more difficult.

5.6.2 National Initiatives

APICCAPS mentioned that the Portuguese Government has been very supportive of the industry, including helping the industry to access EU Regional Development Funds. The footwear sector has a good reputation with the Government because of its record in exports and it has received assistance in the form of export credit guarantees, which have been very important, as well as small grants for SMEs to work with consultants/advisors. Another company said that during the 1990s, loan finance was available for investment in technology. Loan finance was also available for investment in the 2000s; it is short-term finance to aid cash flow which is the current problem following the economic crisis (as indicated in Section 5.4.3).

One company received some assistance from the Government when its private insurance company started cutting the availability of insurance and withdrawing cover from established, reliable clients without good reason. The company also received some support for press publicity in Germany, the Netherlands, Portugal and Spain. However, this took two years to receive the funding and six months in man days for the associated administration.

Currently, there is a 'de minimus' level of €200 000 over three years below which Government assistance to individual footwear companies with development is not subject to EU state aid rules. Although this can be of considerable assistance to very small companies, APICCAPS considers that the cap is too low to have a significant impact on the larger companies.

5.6.3 Regional Initiatives

No regional initiatives were identified during the interviews. This is because, as Norte accounts for a very high proportion of the national footwear industry, it is supported by the national government.

67 http://www.portugueseshoes.pt/

5.7 Future Trends in RDI

According to APICCAPS' Portugal Report 2011, the major challenges for the footwear sector include the rising costs of raw materials, which make up over 40% of footwear costs and the impact of the continuing stagnation in EU economies on the demand for footwear. APICCAPS anticipates that current RDI trends will continue, with further improvements in efficiency, increasing focus on quality and service and moves into additional export markets. APICCAPS expects the current close links amongst the industry, the research institute, universities and equipment suppliers to continue. For manufacturers, maintaining and strengthening close links with customers will also be important.

One company indicated that the economic crisis of recent years had not had a major effect on its plans. It still intends to make major investments in new technology for manufacturing soles, to expand by moving to larger premises and to hire more people. The company will continue to work closely with customers and with its suppliers in the chemical industry to maintain the rate of innovation.

Another company anticipates evolution rather than revolution and that its focus in future will be on maintaining the quality of design and production as well as close relationships with customers. Both of these are vital to the company's success.

A safety footwear company mentioned that the move into innovative and better-styled products has been very successful, enabling the company to expand its exports in the EU and elsewhere. The company will continue to concentrate on smaller distributors and direct sales. It aims to increase both the number of customers and the numbers of pairs sold to each. Continuing development of its own brands, with an increasing emphasis on stylish product ranges. A key factor will be changes in the characteristics of people requiring safety footwear – with an older customer base and more focused on the service sector. However, the company is already researching and developing products for these markets.

For another company there will be continuing emphasis on flexibility and customisation in the footwear market, with increased emphasis on material savings, eco-friendly production and environmental efficiency in machinery (e.g. reduced energy and water use).

According to CTCP, RDI will continue to focus on addressing the need for footwear manufacturers to become more efficient and more responsive to customer needs. Any developments that assist in this process, whether it is equipment, materials or systems, will be important. R&D has been growing in importance for CTCP since its foundation and its importance is expected to continue. The on-going process of restructuring in the Portuguese footwear industry indicates that RDI will continue to be important. The main trends seem to be in improving service through marketing and sales or/and innovation in materials or components. These are discussed in more detail below.

5.8 Summary

The footwear industry in Portugal has been through a process of major restructuring in recent years, in response to changing competitive pressures (as explored in more detail in the Task 4 Report (Restructuring)), which has driven its approach to RDI. The focus was initially on organisational and structural innovation for efficient large-scale production but more recently on enabling flexibility, product and service innovation. This has involved new cutting technologies, IT systems, product design and materials and marketing innovations.

The Norte region, which is home to the majority of the footwear industry in Portugal, hosts a range of institutions providing support to RDI, including universities, research institutes (both footwear-specific and more general) and the footwear industry associations. These actors appear to work closely together, along with the Portuguese Government, to develop and implement the results of RDI activities. This has had a range of benefits, enabling R&D to be closely geared to the requirements of the sector and allowing different actors in the supply chain (equipment suppliers, component suppliers and assemblers) to work together. It has also been particularly successful in accessing EU support for research and marketing. This successful outcome is due, in large part, to the very active roles of the industry association, APICCAPS, and the footwear technology centre, CTCP.

There are a number of barriers to the implementation of RDI outcomes in the sector. These include the nature of outcomes of some larger R&D projects, which do not appear sufficiently close to commercialisation for any but the largest manufacturers to take forward within the tight market timescales to which companies operate. For SMEs in particular, there are also financial and other resource barriers to implementation. For these reasons, SMEs focus most on incremental changes rather than technology breakthroughs.

Most organisation we spoke to consider that, in future, RDI in the footwear industry will focus on further improving efficiency, especially in the use of materials, responsiveness to the needs of clients and exploring new export markets. One aspect of this is likely to be greater environmental awareness and resource efficiency, which is the focus of a number of recently-launched projects. The current close links between the industry, research institutes, universities and equipment suppliers looks set to continue; for manufacturers, maintaining and strengthening close links with customers will also be important.

6. BEST PRACTICES IN TRANSFORMING RDI OUTCOMES INTO MARKETABLE PRODUCTS

6.1 Introduction

The importance of research, development and innovation (RDI) was recognised as a key factor to sustainable and economic growth in each of three case study regions.

In Lombardy (Italy) and Norte (Portugal), RDI in the footwear sector was actively supported through collaborations amongst companies and other organisations.

In Southern Poland, there is a formal 'technology platform' for the leather industry which was established in 2006 to encourage technological development and co-operation between industry, institutes and academia with a focus on conducting research and implementation of the results. However, in practice, there appeared to be a very limited amount of partnering between companies and institutions with respect to RDI.

Consideration of the various factors which can impact RDI, together with examples of best practice, is presented in the sections below, drawing upon the experiences from all three regions.

6.2 Role of Research Institutes

Table 6.1 summarises the structure, funding, activities and client base of the institutes.

Table 6.1: Structure, Funding and Client Base of the Research Institutes

Institute Region	Structure	Funding	Activities	Industry R&D Client Base
CIMAC Lombardy	Independent institute founded by industry association (ANCI)	Industry, plus government and EU funding for specific projects	Primarily testing and certification, plus applied R&D	Primarily ANCI members, but also companies world-wide
ITIA-CNR Lombardy	National research institute	Government	Applied R&D, plus researcher training	Regional and national companies
INDACO Lombardy	University Department	Government	Primarily academic, plus industry training and applied R&D	Regional companies
ILI Southern Poland	National research institute	Government 2% and 98% from other sources e.g. property rental, EU-funded projects, grants, training, consultancy	Applied R&D, training, materials engineering	Regional and national companies

Table 6.1: Structure, Funding and Client Base of the Research Institutes				
Institute Region	**Structure**	**Funding**	**Activities**	**Industry R&D Client Base**
CTCP Norte	Footwear Technology Centre set up by APICCAPS	Membership organisation, annual budget is around €2.8 million	Applied R&D, logistic systems for automation, CAD for development, testing, patterning and production,	Regional and national companies

Lombardy hosts three centres of footwear innovation, CIMAC, INDACO and ITIA. CIMAC was founded by, and is funded by the industry while INDACO is an academic institute and ITIA is part of the National Research Council (CNR). Despite their different structures, all three institutes have established a strong collaboration with industry which has involved enterprises directly in research projects. The research and centres are also well integrated with the wider footwear research community through their involvement in a number of EU wide projects.

In **Southern Poland**, ILI provides research, training and consulting services to the regional (and national) footwear sector. However, in practice, there appeared to be a very limited amount of partnering between companies and institutions with respect to RDI. In other words, whilst companies might use the expertise of the ILI to provide consultancy advice, training or testing facilities, research at the ILI appeared to be self-governed.

CTCP is the only footwear research institute in **Norte** and benefits from being very close to the industry geographically, as well as to the headquarters of APICCAPS. CTCP takes a proactive role by approaching companies with new ideas for products and processes. Its responsibility is to be ahead of the companies in terms of R&D developments. Often companies do not know exactly what they need or what is available to them (e.g. what new materials or equipment will be needed in the next two years) but have objectives in terms of reducing costs, increasing value added, etc. CTCP's role is making the links between problems and know-how for footwear firms. CTCP also collaborates with research institutes and universities in the region that are not specifically focused on footwear but have relevant skills, such as IT and process management.

The research institutes in the three regions are thus quite different in the way they are structured and funded. In both Lombardy and Norte, despite these differences, effective links have been established between research institutes and industry. In Southern Poland, however, the process does not appear to have worked so well.

6.3 RDI Collaborations and Clusters

There are footwear clusters in all three case study regions of Lombardy, Southern Poland and Norte which facilitate RDI collaboration amongst manufacturers, researchers and other industry stakeholders. These clusters comprise companies and organisations working on all aspects of footwear design and production, particularly in Lombardy and Norte. In Southern Poland, although most elements were present (including raw materials, components, design, research and production), specialist equipment and lasts appeared to be imported and collaboration amongst the different parties was more limited.

All the companies interviewed within the three case study regions identified a number of advantages of being located in clusters, but these were mostly informal rather than formal collaborations. Nevertheless, examples were provided of where collaboration took place between a footwear manufacturer and a components manufacturer, or between a footwear manufacturer and a specialist related industry such as a fabric innovator, chemicals company, nanotechnology company etc.

Even though companies in the footwear sector are often geographically close to each other, they may not necessarily interact, because of confidentiality issues and different objectives with regards to RDI. These views were expressed in Lombardy and reflected the findings of a detailed study into the equipment manufacturers of Vigevano (an area of Lombardy). Similarly, in Southern Poland, it appeared from the interviews that companies do not co-operate except in cases of commercial expediency.

However, in Norte, the proactive positions of the industry association (APICAPPS) and the national research centre (CTCP) appeared to encourage companies to consider the potential for opportunities for RDI collaboration. Perhaps the best example was the creation of an equipment manufacturer to meet the needs of the Portuguese footwear industry. This company now operates internationally in footwear and other industry sectors.

In all three case study areas, the main form of RDI collaboration for companies was with their immediate customers, to assist with the developments of designs, technological improvements and marketing. Clearly, such collaborations are informed and influenced by an awareness of developments in the footwear industry sector more generally. As such, there is an important role for industry associations (such as APICAPPS in Norte and ASSOMAC in Lombardy) and research institutes (such as CTCP in Norte; CIMC, INDACO and ITA-CNR in Lombardy; and ILI in Southern Poland) to assist with this.

6.4 Intellectual Property Rights

In **Lombardy**, ITIA-CNR indicated that the centre itself has a number of (mainly national) patents. In its view, projects and products are often patented one after the other with minor alterations added to them; therefore. these tend to lose their value very quickly. The strong competition in the footwear sector means they will try to imitate and out-do the latest innovation very quickly. Furthermore, even the slightest change to a technology or product can be secured with a different patent which may deter some companies from taking out patents.

Nevertheless,we did identify examples of companies protecting their designs by taking out patents and, in one case, taking action when breached.

None of the footwear companies and organisations interviewed in **Southern Poland** had actively used patents or other measures to protect their new designs and products. There appeared to be two main reasons, one was that the time to take out a patent was, in many cases, longer than the product lifetime (particularly with two to four collections per year). Secondly, small changes to a protected product could render the protection invalid. It may also be because the incremental nature of innovations did not lend themselves to patenting.

Although protection of designs is seen as increasingly important, smaller companies in **Norte** do not always apply for patents as it is an expensive and time consuming process. Furthermore, once patents are issued, companies do not always have the money to take action against any infringements. Companies have found it easier to apply for national patents than for EU and worldwide patents. The CTCP holds a number of patents, but does not see patents as a particularly valuable tool. It therefore considers it better to present an idea in public, which means that the idea cannot be patented by anyone else.

In summary, the use of intellectual property rights was not seen as a priority area within the case study areas. Although there may be merit in protecting a new development in technology, there was general agreement that protecting designs was not worthwhile due to the short lifetimes of shoe designs. In relation to technological developments, patents were not generally regarded as particularly beneficial, due not only to the time and costs of obtaining and enforcing them (particularly at an international level) but also because minor changes by competitors could render them ineffective.

6.5 Financial Support for RDI

The issue of financial support for RDI in the footwear sector is more than a question of how much is being spent and on what projects. At an EU level, there are major research projects funded by FP7 and other programmes which often involve research organisations and companies from several countries. However, for a small footwear company trying to improve its products, the most useful contribution to its RDI might be a €1000 grant to attend a trade fair to see what other companies are doing.

In **Lombardy**, ITIA-CNR stated that not enough financial support is available from the regional or national government. ITIA-CNR explained that most of the money allocated for research is aimed at supporting centres to put together proposals for EU projects. This does not appear to be an effective use of funding, as it limits the line of research to the areas of footwear development identified in EU projects.

In **Southern Poland**, there appeared to be an awareness amongst the companies interviewed that EU funds could be available and, indeed, one of the companies was involved with a major EU funded project. However, ILI indicated that getting financial support from EU funds had become more difficult in recent years. This was reflected in other interviews in which it was indicated that accessing EU funds often required the involvement of regional authorities which appeared to introduce additional administrative hurdles.

In general, there was little or no funding available for the footwear industry in Southern Poland and, for most companies, RDI investments are self-financed. One firm mentioned that it obtained some limited funding from the Government, which was used unsuccessfully on a non-shoe development project.

In **Norte**, EU funding had been obtained for a range of projects – including support from EU Regional Funds for the work of APICAPPS in promotion of the Portuguese footwear sector. However, CTCP noted that the outputs of EU-funded footwear research projects under the 7th Framework Programme are often far from those required for practical applications. There was a perception that, due to the influence of academic organisations, projects tend to focus on new knowledge, rather than practical issues. This is less of a problem for the more advanced companies, which are able to take initial ideas forwards, but more problematic for SMEs, which require a more useful product.. Although there no regional funding, the fact that Norte contains most of the Portuguese footwear industry meant that national Government support and funding was available to assist with RDI.

Most of the organisations interviewed across the three case study areas indicated that EU research funding could be useful, but they have found that the administrative work involved in accessing the funding too onerous. Some companies indicated that would need to hire a new person or a consultant simply to put a proposal together and handle the administrative tasks involved.

6.6 Implementation of RDI Outcomes

6.6.1 Overview

For most micro, small and medium-sized companies within the European footwear industry sector, RDI forms part of their day-to-day business, as footwear products are continually being developed for the next model range.

As such, the RDI steps are often small and incremental. For example, the design of a popular shoe may only need to change slightly for the next collection or there may be a minor change in the composition of the glue to provide a stronger bond with the sole.

However, meetings with footwear manufacturers across the EU during this study have illustrated that the search for improvements to enhance the prospects for company growth or, in some cases, survival must extend to all stages of footwear production from raw material supply to selling shoes to the customer. At each stage, measures had been taken by companies, often without any external assistance, which could be interpreted as transforming RDI outcomes into marketable products.

6.6.2 Organisational and Structural Innovation

Changes in organisation and structure may occur as a result of repositioning in the marketplace. One example from Norte is the move by an equipment manufacturer to adapt the equipment for new industry sectors. Footwear companies in the region have been through different stages of organisational and structural innovation; investing in mass production techniques when sub-contracting to overseas firms in the 1980s and 1990s then changing to more flexible, small batch production of their own brands in the 2000s.

More generally, various examples were found of the increased use of ICT, from design to automated production to automated warehouse operations.

6.6.3 Product Innovation

The main area of product innovation in Norte has been the move from subcontracting to producing own brand footwear, described above.

In all three regions, companies continuously develop their products in response to market changes. Most footwear companies now produce two or more model ranges per year which, by definition, involves a degree of product innovation. Clearly, this ever-evolving design is the key to the high fashion end of the market.

Elsewhere, one noticeable trend from the interviews was the emerging importance of healthy, comfortable shoes for consumers with particular needs, such as those who are overweight or who spend a long on their feet at work, and this was a focus of RDI in several companies visited. One company in Norte has combined this with response to

fashion, by developing fashionable safety footwear for both men and women from Norte.

6.6.4 Components Innovation

Footwear producers generally use components supplied by other companies. The most common component is the sole and the interviews included sole manufacturers all three case study regions. The key to successful RDI in components appeared to be close cooperation between the sole supplier and the footwear producer to ensure the best outcome. It was, however, noticeable that both sole companies were beginning to enter new markets, to take advantage of their expertise gained from manufacturing soles.

Of course, combining fashion and technological advances is a key element of sports footwear, such as ski-boots. Changes in technologies for components such as linings and soles are particularly important for ski-boot RDI.

6.6.5 Materials Innovation

Although leather is still used for most shoes, the leather can be treated in many different ways and one area for RDI is the increasing pressure for leather treatments to be more 'environmentally friendly'.

Similarly, there also pressures for more 'environmentally friendly' plastics – which may also provide enhanced performance in some areas. Examples were found of footwear companies working with chemical companies on these issues.

6.6.6 Service Innovation

The internet enables the smallest company to sell internationally. Such an example was found in Southern Poland where a small family firm was selling shoes to families (with Polish connections) around the world.

6.7 Future Trends in RDI

From the three case study regions, product-related developments (to develop new ones or to upgrade existing ones) were the main focus for footwear manufacturers, together with improved business models and marketing innovations.

Another important trend identified by some of the footwear companies interviewed was the acceleration of incorporating IT into footwear production. This includes the use of IT in the production process, to facilitate small production runs and to customise the products in a cost effective way, as well as in sales and logistics.

Footwear firms are also exploring different sales and marketing strategies and trying to approach the international markets in a different ways (including internet sales) to maximise opportunities to sell their goods.

Although many major companies have outsourced production to the Asia, RDI tends to be retained in Europe. Clearly, there is the possibility that, in future, RDI could also be relocated to Asia which would diminish the importance of the European footwear industry in the mass production markets.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

The aim of Task 6 report was to look at the importance of research, development and innovation for the competitiveness of the EU footwear industry in three chosen regions of the EU.

The objectives were:

- to provide retrospective analysis of what has taken place over the last 10-15 years;
- to identify best practices in transforming R&D outcomes into marketable products; and
- to assess future prospects for R&D in the footwear sector.

The key conclusions of the study are that:

- most companies have undertaken some form of research, development and innovation in all of the regions examined, delivering a wide range of different innovative outcomes. In most cases, responsibility for RDI remains in the EU, even where companies have relocated production to third countries. However, we did find one example of a company setting up an RDI facility in China;

- the innovation activity undertaken by companies depends to some extent on the type of shoes they manufacture. For example a safety footwear manufacturer will invest in RDI related to water repellent footwear or non-slip soles, etc. whilst fashion footwear companies have focused on measures to increase flexibility so that they can produce rapid, short run lines;

- some companies work very closely with research institutes, footwear associations and suppliers at regional, national and in some cases international EU level. This close collaboration results in the rapid uptake of research and innovation results by companies;

- technological innovations within the footwear industry are essentially incremental rather than major breakthroughs. They are often associated with factors such as increasingly short timescales, customisation and the provision of additional services, organisational and structural innovation is also becoming more important;

- despite the innovation activity in the footwear industry, many of those interviewed agreed that more needs to be done to ensure the uptake of innovation by European footwear manufacturers, in order to assist the sector's long term competitiveness; and

- larger-scale and longer term projects are more difficult to finance and harder for companies (other than the largest players) to participate in. EU funding has

helped to develop such projects, though stakeholders have found them difficult and time consuming to manage.

7.2 Recommendations

Based on the findings of this Task, we recommend that the following actions are considered:

- **Reducing administrative burden on accessing funding**: The European Commission, national and regional governments, research centres and industry associations should work together to provide better information for companies on available finance sources for RDI. Funding applications for RDI and access to government support programmes should be further simplified. The availability of funding needs to be promoted and marketed to footwear companies to increase their awareness of different initiatives and programmes at the EU, regional and national level. There is also a need to foster a stronger alignment of funding and other support measures with the regional footwear needs, for example by including industry representatives in the selection process.

- **Initiatives and support to enter new markets**: The industry association in Portugal has been particularly successful in helping companies to export, for example by helping them to take advantage of EU funding to attend international trade fairs. This approach could be transferred to other countries and the EU could draw on the Portuguese experience to promote the assistance it provides.

- **Increasing collaboration to access RDI know-how**: RDI collaboration can help small footwear businesses to share resources and costly technology to improve their competitive position. Research outputs and technology can be offered to SMEs through collaborative work between the industry and the various research institutes. Research institutes need to place a particular focus on communication and collaboration with SMEs; approaches such as working with clusters and developing personal contacts could be explored further.

- **Enhancing partnerships to reduce barriers to innovation**: A strong partnership between industry and research centres is seen as vital to encouraging innovation. One way to address this would be the development of "Centres of Excellence" where research centres, practitioners, policy makers and university researchers come together to innovate and share resources. In order to attract SMEs' attention to these technology and innovation centres, tangible benefits should be offered in the short term as well as in the long term. At the same time industry participants need to give guidance and set the direction throughout research projects in order for the outcome to be relevant, applicable and successful.

- **Innovation training:** footwear companies, in particular SMEs, may not fully understand how current and emerging technologies and their applications are relevant to their business. One option to address this issue is to incorporate innovation into training programmes. This could include both a focus on

innovation in formal training programmes and the operation of short courses for footwear company owners and managers, organised through industry associations and research centres. The European Commission could consider providing funding for such training initiatives. Research centres, education institutes, as well as associations at the national and regional levels could also initiate programmes to train the trainers, so that the skills and knowledge of current employees could be enhanced.

- **Help in marketing and branding**: Branding, high quality and niche markets are ways of moving to higher value positions in the supply chain for footwear companies, and many of them are already taking such steps. Learning from the experience of successful companies could encourage others in the region to take similar steps. This could be achieved through 'best practice' seminars organised at regional and national levels, tailored to footwear company needs.

- **Support for protection of innovations**: many companies we spoke to considered that the process of protecting designs and innovations was too costly, too slow and too difficult to enforce. In the absence of reform of the EU patent system, industry associations, research centres, national and regional governments should examine ways to provide administrative and financial support for companies who want apply for footwear patents.

- **Effective and easily accessible advice and support tools**: the internet is becoming a popular tool for footwear firms looking to increase sales, undertake marketing or to simply communicate with their customers, although concerns remain over the high rate of returns of on-line sales. Industry associations and research institutes should work with SMEs in particular to develop their capability in e-commerce. Both SMEs and footwear related organisations emphasised the need for online support tools and digital media to access suppliers, agents, customers and generally to promote their brand and products. This would help companies in remote areas to get support when required as well as making the most out of collaboration opportunities to access knowledge and expertise Europe-wide.

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