Learning while working in small companies: comparative analysis of experiences drawn from England, Germany, Greece, Italy, Portugal and Spain

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CONTENTS

Acknowledgements

Introduction

The PARTICIPA study initially aimed at analysing the structural, organisational and individual factors that influence technical employees' decisions to participate in continuing vocational education and training (CVET). The study focused upon employees using technical skills from industrial small and medium size enterprises (SMEs) in England, Germany, Greece, Italy, Portugal and Spain. The study broadened, however, to consider the interaction of working, learning, performance, development, networking and knowledge creation of technical workers in SMEs. The findings from the project have been reported in detail in an earlier series of reports (Brown *et al.*, 2004a, 2004b, 2005). That the detailed findings are available elsewhere means that this report, written after completion of the research, can be reflective and concentrate on achieving three tasks:

- to map the patterns of learning, working and development in SMEs with a 'learning culture' in the six countries;

- to reflect on the usefulness of the ISSTAL model as a theoretical framework for conducting research in CVET;

- to draw out the implications of the 'lessons learned' from the project for policy, practice and research.

The three parts are self-contained and can be read separately according to your interests. Part One examines the findings from each of the six countries on issues concerned with learning, working and development in SMEs. The six countries are considered in turn in a way that facilitates comparative analysis in two principal ways. The first involves building towards the identification of the common characteristics that successful companies with an explicit commitment to learning and development (for technical workers) exhibit in all six countries. The second allows the findings from the case studies, particularly from England, Germany and Italy, to inform the influences on technical workers' desire for learning and development.

Part Two outlines reflections on our experience of using the ISSTAL model as a framework to examine participation in continuing vocational education and training. The PARTICIPA study was theoretically framed by the Interdisciplinary, Sequential-Specificity, Time-Allocation, Life-span (ISSTAL) model of social participation (Smith, 1980). This section outlines the technical findings associated directly with the ISSTAL model, and it shows that, with some adaptations, the model may serve as a theoretical frame to study and analyse relationships between individual and organisational characteristics and participation of technical workers in training.

Part Three examines findings from our research on Participation in Continuing Vocational Education, Training and Learning with a view to considering the implications for policy, practice and research. The commentary starts with an examination of individual, organizational and institutional, broad contextual and learning factors that affect participation in CVETL for technical workers, mainly in SMEs. The focus then shifts to how to create contexts that facilitate work-related learning for technical workers, before explicitly reviewing the research findings for the implications for policy and practice in

CVETL. The final section reviews the value added of a comparative perspective from research on Continuing Vocational Education, Training and Learning.

PART ONE:

LEARNING, WORKING AND DEVELOPMENT IN SMALL AND MEDIUM SIZE COMPANIES: EXPERIENCES DRAWN FROM ENGLAND, GERMANY, GREECE, ITALY, PORTUGAL AND SPAIN

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1.   Continuing development of technical workers in companies with a 'learning culture' in Spain, Portugal and Greece

1.1   Introduction

The reasons for grouping the analyses of technical worker participation in the three countries are two-fold. First, the chosen case studies in the ICT sector from Portugal and Spain represent similar trends and have an embedded learning culture (note the experience of several small ICT companies based in Rome show that those companies without such a culture have a very precarious existence). Second, the case studies drawn from outside the ICT sector all represent rather isolated examples of successful companies, which are relatively large in the contexts of Spain (Extremadura), Portugal (Alentejo) and Greece, that have an explicit 'learning culture'. The cases of the engineering construction company from Extremadura and the tomato paste company from Alentejo are examples of SMEs with an explicit commitment to learning and development. In the Greek case it proved impossible to find and negotiate access to an SME with a similar commitment to learning. As a consequence a different approach was taken. A larger company was chosen to exemplify a case of an organisation with an explicit learning culture and the results of the case study were fed back to two focus groups that were asked to consider why it was so difficult for much smaller companies to develop similar commitments to learning and development. It is then possible to draw out some common themes about the patterning of CVETL for technical workers in successful companies with an explicit commitment to learning and development in contexts where there are relatively few large companies and it is rare to find examples of organisations that have an explicit 'learning culture.' Note the more detailed results of the surveys and the case studies are given in Brown *et al*. (2004; 2005). Here the intention is simply to draw out some material that is of comparative interest and can shed light on exemplary processes of learning and development for technical workers in SMEs using an organisational focus.

1.2   Spain (Extremadura)

As elsewhere, the regional and sectoral surveys had shown that a variety of individual factors influenced participation in CVET and that public training institutions could make their training provision more attractive in a number of ways. However, access to opportunities for learning, training and development was significant and, in this respect, the case studies also showed that access to training was also dependent upon company policy and that an individual was far more likely to be able to access training opportunities if they were working for a company where work provided rich learning opportunities. The two case studies were conducted in the construction and ICT industrial sectors. The choice of those sectors was based on the fact that the construction industry is one of the most important in Extremadura and ICT is a fast growing sector with influences in all the economy. In addition, both companies are successful, growing and are considered as 'good practice' exemplars in their sectors. What is of interest is that the two companies express more the future than the present of Extremadura and are examples of the emerging group of entrepreneurs on which the region has depended over the last few years. These

companies are representative of a trend in the region (previously backward as regards business development and networks), due to a variety of circumstances, to grow faster than the national average and their development are helping generate a revived and vigorous business community.

The **ICT company** is a young dynamic expanding enterprise, where all the staff - around a dozen – (director, manager and all the workers) are under thirty-two years old. Since its creation in 2002, when it began its work as an enterprise specialised in the development of integrated IT solutions, it has generated a team of professionals with a considerable degree of self-sufficiency. The company maintains a policy of strategic alliances, designed to offer the best range of services to its clients, and this policy has resulted in an increasing number of enterprises opting for them as a partner. Among their clients are many in areas of public administration, institutions and private companies from Badajoz, Barcelona, Cáceres, Madrid, Melilla or Valladolid. Their policy on continuing training supposes that all members of staff can count on having up to date knowledge adapted to the firm's culture.

For the director of the company continuing training is regarded as essential for the firm. Due to the speed at which the ICT sector is developing, to be up to date on all the latest technological advances is fundamental. To achieve this, in his opinion, the most adequate method is self-training, but this self-training demands motivation, initiative and dedication on the part of the employees. Management is aware of the need to work so that employees feel identified with the firm's style from which the necessity for self-training emerges. According to the director, "the predisposition of workers for continuing training is very good, without differences of age, sex or working area". Off-the-job training is not carried out within the firm, but all employees are aware that the nature of their IT work activities permits a certain degree of self-training and learning based on everyday activities. However, the management is in favour of possible courses, masters or seminars that workers could attend. There is no objection to employees attending whatever courses they require. In fact they attend those that interest them, but there are no economic incentives given by the company to motivate them. Management also tries to train in complementary aspects to the specific tasks of the employees. In many cases this is individual training.

According to the interviewed worker, continuing training is very necessary for better performance on the job. However, his personal experience has shown him that his daily work also serves to facilitate continuous learning. Nevertheless, whenever he has been able to he has attended courses or seminars. On the part of the firm, there would be no problem about covering the costs and the journey to wherever a course was available, as has happened on other occasions, although there are no economic incentives for attending training. Where disposition towards training is concerned, this employee claims to be open to any type of course, as long as this provided benefits for him and the firm, since in his opinion: "in this profession we have, I feel obliged to train. We must retrain or if not become out of date".

The only impediment he sees to attending training courses is the little amount of time that his work allows him to be free. The best time for receiving training would be the summer when there is a lower volume of work; the best way to find out about courses would be through the internet, via e-mail, from whoever delivers the course.

The **construction engineering company** is one of the most influential enterprises in Extremadura as result of many years experience in the sector. It is the pioneer enterprise of the Group created in 1970, a group which has developed from a small company specialising in hydro-electric installations, which operated in a limited area, to an important multi-sector activity, materialised in six enterprises with a presence in national and international markets. The company employs about 330 workers and some of the workers believe continuing vocational training is essential for the success of their work in the firm. They claim that the sector in which they find themselves is in constant renovation and, due to the enormous competition, training becomes fundamental if they do not want to lose their jobs. Nevertheless, the director of Human Resources complains other workers appear not to have the expected disposition towards training, despite attempts to motivate participation with catalogues, publicity, and questionnaires to find suitable times for courses, etc. So, according to him, the company has not managed to increase workers' participation in training. Very few of the workers interviewed have received vocational training outside the firm, since training for the majority of the employees had been within the firm and run by the firm.

For the majority of the workers vocational training should be carried out during working hours, as long as the work load permits. However, few would object to receiving training at weekends or during holidays as long as the course was really interesting for them. The lower grade workers insist that training should be only practical, during working hours or in exchange for rest days later and in the same city as their work. The management of the construction company stresses the efforts they made to provide the most adequate training for the workers, who do not always show the same interest in training programmes as the director of human resources would like. In the construction company although top management has a positive attitude to training, middle management appear not to be entirely satisfied with the attitude or disposition of their employees towards their continuing training, despite efforts to find out their preferences. Nevertheless, employees stressed a positive attitude towards training, but also emphasised their preference for training to be provided during working hours. However, on the other hand, it seems that only being in favour of training is not a sufficient incentive for employees. Workers would have more positive attitudes towards continuing training if implied an increase in wages or some other reward.

So, it appears that a culture of providing incentives for continuing training on the part of the company does not really exist. Also channels of information for employees to find out about the available continuing training were almost non-existent. The majority of the employees receive information about training from the firm itself and/or from colleagues. The company though carries out a training needs analysis and designs a training plan, linked to its annual operating plan.

Overall, both companies had favourable attitudes towards training and provided a range of opportunities for further learning and development, but seemed to feel it was then up to the individual. Concerning the factors which favour attitudes towards continuing training, both managements expressed some interesting opinions, such as a greater flexibility in working hours, evaluating the work load and allowing and integrating continuing training within such time with flexibility. In addition, job stability is a very important variable once

the worker has the opportunity to identify with the company and, for this reason, become more motivated and available to participate in training and learning. With those ideas combined with a continuing training plan, workers may be more available to participate in training and in the firm's objectives.

The ICT company was working within a (sub)sector where opportunities for learning and development were embedded within the everyday work activities of most workers. By contrast the engineering company represented 'best practice' rather than being typical of the sector in its commitment to offering workers opportunities for further learning and development. The broader question remains, however, given the business fabric of Extremadura is constituted by more than 95% of micro and small companies, how should continuing training be organized and offered? Hence there is an important role for training provision, external to companies, and how to get companies and individuals interested in such provision remains a formidable challenge.

1.3   Portugal (Alentejo and Lisbon & Vale do Tejo regions)

Findings from the survey found access to training was an important influence on individual participation in CVET. Findings on attitudes about education, training and learning show technicians consider it important that trainers, apart from giving information about the subject-matter, should know how to facilitate learning. Concerning reasons for not participating in training, agro-food and ICT technicians converge in their perspectives. That is, technicians consider the main reason for not participating in training is that the timetables of the training offers are incompatible with their working timetable.

The case studies showed, once again, that access to training was also dependent upon company policy and that an individual was far more likely to be able to access training opportunities if they were working for a company where work provided rich learning opportunities. The two case studies were conducted in the agro-food and ICT industrial sectors. The choice of those sectors was based on the fact that the agro-food industry is one of the most important in Alentejo and ICT is a fast growing sector in the Lisbon & Vale do Tejo region. The two case studies comprised a small-sized agro-food (tomato paste) company located in Alentejo and a micro ICT company offering computing consulting services to other companies located in the Lisbon area.

The processed food industry is a major industrial sector, and the **agro-food company** employs 50 people from whom 6 are technically qualified and higher educated workers who play a key role in the production process, mainly in terms of supervising and helping the other less qualified workers. In addition to those 6 technical people, there are 8 other who perform a technical role since they are specialised in working with some machines. However, these last 8 people do not have a higher education degree. They learn about their activity through training and experience. In the administrative functions, including personnel management, accountability and other related activities, the company has 5 workers who have the secondary education and were qualified for their functions through training and experience. The 31 remaining workers are considered unskilled in qualification terms. In general, they own a basic education certificate and their activities do not require a technical qualification. However, at least two of the specialised machine

operators were recruited from people who were, at the time, considered unskilled. They have learned how to operate with machines from colleagues in the company.

Although training actions have been developed and implemented in the company, mainly in subjects related to operation with specific machines, the company does not have a training structure. Most of the shop floor training concerns the operation of the machines. For this training, the trainers are either the more experienced workers or the technical people from companies that have furnished the equipment. All the other needed training is bought outside of the company from specialised consulting companies. For instance, this year, some people have been attending training on quality and certification concerning the ISO standards.

The **ICT company** employs 10 people: 2 have a university degree, 4 attended higher education in computing sciences, 3 have a vocational school certificate on computing related subjects and the last one has a secondary education certificate in administration subjects. From the 9 technically qualified in computing related matters, two play a key role in strategic planning, innovation and technical support to the other employees. The 7 remaining employees are first-line workers who have the responsibility to deliver the specialized computing services to other companies. The company was created in 2000 and the average age of the workers is around 30 years. Given the size, the company does not have a training structure. The responsibility for the training function in the company belongs to the top manager who also performs the HRM (human resource management) function. All the needed formal training is bought from outside of the company from specialised consulting companies. However, collaborative learning among the employees and e-learning has lately been getting more important in the company. For instance, this year, most of the employees have enrolled themselves in e-learning offerings and have also attended short courses and seminars in very specialized matters. It appears that a learning culture exists in the company since all the workers are conscious of the importance of developing their competences not only for the success of the company but also for their own individual success and employability.

Analysing the results of the case studies it can be said that both managers and technicians from the two companies are unanimous in considering that continuous training and learning is essential to improve individual and company's performance. In addition, both managers consider it very important not only to invest in the development of workers' technical competences but also in their transversal and interpersonal competences. However, a slight difference exists between the two managers concerning company training policy. The ICT company manager gives more emphasis to employee's responsibility for their own learning and development than the agro-food company's manager.

> *'Companies should invest in development of the transversal and interpersonal competences of their employees (…) and the workers should invest in development of their technical competence. (…) for instance, I intend to invest in training in the domains such as time management, attending service and relationship with clients, and quality in service offerings. In addition, I want workers who wish to increase their knowledge about their activities and have the ambition to learn continuously (lifelong learners).' (ICT company manager)*

'The company pays special attention to continuing training of technical staff since its survival depends essentially from its level of competitiveness and this depends directly on workers' competence. (…) The company is working in a very competitive productive sector and is subject to competition from Spain, Italy and even from China.' (agro-food company manager).

'Initial and continuing training are very important for a professional who intends to be successful and maintain his or her job or, eventually, get a better one.' (ICT worker).

'In the tomato industry one has to pay permanent attention to your competences and needs for further learning. (…) no one is able to maintain his job if does not have a positive attitude to continuing training.' (agro-food worker).

Neither the ICT nor the agro-food company carry out explicit training needs analysis. In addition, the companies do not have a real training plan. However, both companies analyse the difficulties encountered by the workers in the development of their activities. In the ICT company, all the first-line workers meet together, once a month, with the two colleagues who play a supporting role for them. Sometimes the top manager attends those meetings. In those meetings (a kind of brainstorming), difficulties encountered by the workers are analysed and discussed. If a difficulty has not been solved (or not well solved) and the group is not able to see the solution, it is registered in a list of difficulties. Later on, the two workers responsible for the innovation and strategic planning delineate a plan to solve the difficulties taking into consideration the level of the difficulty of each one of the reported 'difficulties' and the priority for their solution. This plan is discussed with the top management. In the agro-food company, difficulties are also reported to supervisors but, in this case, individually by each worker. The encountered difficulties are analysed by the supervisors with management and from this analysis a plan is made for solving the difficulties. Hence the focus is upon performance improvement by resolving problems and this may have a training component – the whole process, however, also represents a form of collaborative learning,

The top managers of the two companies have slightly different positions in relation to incentives and support for workers´ training. This difference comes from the fact that the ICT company manager considers that workers should be responsible for their competence development in technical subjects while the agro-food company's manager believes that training should be the responsibility of the company. However, he also considers that workers have to pay attention to their own competence development.

'I am not sure if companies should support workers' training concerning their technical competence development (…) or if that responsibility should be up to the worker. (…) People who are more efficient and effective in their activity are usually those who take the initiative for their competence development. (…) In addition to the recognition by all colleagues, I reward those employees through salary increase and promotion.' (ICT company manager).

'The company supports all the costs involved in workers' training since this training is recognized by the top management as needed and useful for the company's performance. In addition, people who attend training and show they

are more competent are usually promoted and go up faster in the career ladder than the others'. (agro-food company manager).

Workers of the two companies closely follow the perspective of their managers concerning incentives and support for workers' training:

'(…) I feel I have to be primarily responsible for my competence development. (…) I took the initiative for taking training in Microsoft (…) and I got the MCSE certification. This gave me the qualifications /competences and possibility to go up to the second degree of the technical career in the company.' (ICT worker).

However, one ICT employee considered that taking training, in the evening, after working time, is usually very difficult. The position of the two managers regarding workers' social background and roles is very similar. Both consider that, in addition to the professional competence, social competences, the way of being in life and even workers' social roles in the community are relevant characteristics for being a good worker.

'Although the technical competence is very much taken into consideration for taking on or promoting a person, I have very much been paying attention lately to individuals' social competences and roles and their key-competences namely the ones related to interpersonal relationships.' (agro-food company manager).

'In addition to the specific qualifications, I chose and support those who show they have a positive way of being in life and own social competences.' (ICT company manager).

Both managers consider that their technical workers have a very positive attitude toward CVET, learning and development of competences. In the ICT company, workers show a willingness for learning new things related to their work and look for training or other modes of developing their competencies (for instance e-learning) by themselves. The same may be said for the agro-food workers. The difference is that the ICT employees have to support training by themselves while agro-food employees' training is supported by the company (when considered relevant for the company). In addition, technical employees of both companies identify and analyse their learning needs (difficulties in performing their tasks) and try to solve them.

'Technical workers have, in general, a very positive attitude towards training concerning technical matters related to their professional tasks. (…) Frequently, they propose to management to attend certain training courses they consider relevant for improving their performance in the tasks they are responsible for.' (agro-food company manager).

'I don't need to be concerned about my technical workers' competence development. They maintain themselves – they are very attentive towards their professional development. (…) If someone feels a learning need concerning his tasks, he looks for the way to satisfy the need.' (ICT company manager).

In general, according to both managers, attitudes towards training and learning appear to not be very much different from one technical worker to another. This is to say that the technical workers' personality characteristics appear to not have a significant influence in their attitude to continuing learning and training, even though, as expected, workers with

different personality characteristics exist in both companies. However, attitudes towards continuing training and learning are, in general, very much positive among all the technical workers. Technical workers also have a relevant intellectual flexibility. In fact, concerning training, all the technical workers of both companies were much more concentrated on the training (learning) contents than in the mode or strategy used to take it or to develop the correspondent competence. Their main concern was centred on developing their professional competences. However, all the interviewed technical workers indicated their preference to take training outside of the company with recognized specialized competent training entities.

> *'Concern about strategies and modes of training (and learning) is not much visible among the technical workers. (…) The major concern they have is centred on their professional valorisation.' (agro-food company manager).*

Interviewed workers also reported that learning at work with other colleagues is very important. Informal training (learning) has been very much practised in both companies. In the ICT company, workers get together once a week for evaluating how well services to clients have been delivered. From this evaluation, working norms and rules are usually improved. In addition, a 'one week training package' has been developed to be delivered by more experienced technical workers to new recruits. In the agro-food company, specific training actions concerning the operation of very specialised machines have been developed and delivered by more experienced technical workers (or specialised people from machine vendors) to less experienced workers. Practical training in other companies or in specialised entities has been reported as a very rich experience by those who have taken it. On the other hand, training taken in some Training Centres has been reported as a frustrating experience.

> *'The trainer was only reading the text he brought with him. (...) I felt that he was not comfortable with the subject matter (…).' (agro-food worker).*

> *'Many of the training contents followed by the Training Centres were not updated.' (ICT worker).*

Training costs and time availability are the main situational aspects that constitute barriers to participation of the technical workers in CVET in both companies. In the ICT company the costs of training and time availability are much more linked to the employees since the major responsibility for workers' competence development was on themselves. In the agro-food company, those aspects are much more related to the company. Training costs sometimes constituted an important participation barrier given the financial difficulties that the company was suffering at that time.

> *'One has to make sacrifices in money and in time if you want to be updated (…).' (ICT worker).*

> *'There are two main aspects that can be assumed as barriers to technical workers' participation in training: (1) Financing difficulties of the company for supporting training costs; and (2) Workers' time availability in some periods resulting from the seasonal characteristic of tomato production.' (agro-food company manager).*

Management and workers' positive attitudes towards CVET were considered as the main favourable factors concerning participation in training. However, workers of both companies have also considered that payment of the training costs by the company would increase participation of workers in CVET. In the past year, each technical worker of the ICT company has taken about 80 hours of training while the agro-food technical workers have participated in 30 hours of training, on average. Both the ICT and the agro-food companies pay special attention to introduction of innovations. According to managers of both companies, innovation and workers' continuing learning are the most important factors for maintaining competitiveness at the present time. Workers' perspectives (in both companies) are in line with managers' views concerning introduction of innovations. However, the ICT workers gave more emphasis than those in agro-food to the introduction of innovations. This is justifiable given the very rapid obsolescence of the computing components (hardware and software) requiring a quasi-permanent updating effort. In addition, the computing equipment has a much shorter life than the equipment utilized in the tomato paste industry. For those reasons, both companies have developed a strategy to be permanently aware of innovations in their respective markets.

The tomato paste company is member of a Portuguese Association of the Tomato Industry which, in addition to looking for international markets, delivers information on innovations to its members. When an innovation comes, mainly in terms of new equipment, the top manager asks for a cost-efficiency analysis in order to see what economic value will be obtained from the investment. A decision about introduction of the innovation will be taken on the basis of the results of that study and on the financial situation of the company. The ICT company follows a different strategy; all workers read the subscribed 'on-line' periodicals and pay attention (almost daily) to news on the internet. The relevant new information is then shared among all workers in their (weekly and monthly) meetings where decisions about the need for introduction of the respective innovations are made. The need for introduction of an innovation is then transmitted to the top manager who takes the final decision taking into consideration not only his workers' advice but also the opportunities and possibilities linked to the investment.

Overall the pattern of participation of technical workers in CVETL in the Portugese case study companies was remarkably similar to that found in Extremadura. The small ICT company was working within a (sub)sector where opportunities for learning and development were embedded within the everyday work activities of most workers. Furthermore the company actively encouraged collaborative learning as to how to overcome 'difficulties' arising from everyday performance. The agro-food company represented 'best practice' in its commitment to training, learning and development, especially for technical workers. Again learning was driven by a focus upon continuous improvement that was collaborative and focused upon overcoming problems and finding developments that improved performance. For Alentejo, as with Extremadura, however, the wider problem is that the number of companies offering 'high quality jobs' with such commitments to further learning and development are relatively few. Given the structure of employment in these regions comprises overwhelmingly micro and small companies, then it is as a matter of public policy as to how best continuing training should be organized. Form a national project perspective, these issues were addressed in publications and a dissemination strategy targeted both regionally and nationally.

1.4   Greece

In Greece, data was collected through in-depth interviews, focus groups and a case study of a 'successful' company in promoting the participation of its employees in learning activities. As the final aim of the project is to produce appropriate policy suggestions for the promotion of lifelong learning of employees, it is very important to identify more and/or less successful personal and organisational cases and understand the reasons behind the outcomes and, in the case of the successful ones, the extent of the transferability of the procedures followed. The case study was conducted in a company considered a 'model case' for promoting CVET participation of technical employees and examined the 'educational and training model' of the company, compared it with practices about training in other companies and tried to understand the functioning of the model and whether elements of this model could be transferred to other situations.

From the eleven in-depth personal interviews with employees it was clear personal characteristics play an important role in the decisions people make about whether they should participate in a training programme or whether they would do it willingly when it is 'offered' by their job or by other situational factors (such as free courses offered through someone's spouse). The extent of organisational factors influencing employees' decisions to participate or not in training varies greatly. Certain work environments make training part of the everyday tasks of employees and then there is no choice to avoid training while in other cases training is offered on an optional basis. In the latter cases, those employees that have positive attitudes towards training will take advantage of the opportunity and others would pass up the opportunity. There are also cases where supervisors have restricted the participation of their subordinates because they do not believe in the necessity of training or because they feel threatened by those who they see as possible rivals. Situational factors or opportunities people have to attend training programmes have a positive effect where people are positively oriented towards training.

Personal factors seem to have a strong effect for many and family factors have also an effect, which is stronger than the data shows, since family factors have already influenced personal attitudes. Work environments influence training participation in a variety of ways that are connected with the characteristics of the organisation and in some cases the characteristics of supervisors. The net result is always an interaction of these variables. Results from the quantitative phase of the project as well as from the personal interviews were presented to selected participants in two focus groups. During the discussion a number of important points were raised referring to the specific characteristics of training institutions, businesses and society that affect training participation. Personality issues and other individual characteristics were not raised in particular during this discussion.

The importance of 'learning culture or philosophy' in facilitating participation in vocational education and training (VET) by individual employees and companies was underlined. Moreover it was stated that this 'learning attitude' exists only in a small segment of businesses and the population. At the same time in Greece education is highly valued but the value is mostly connected to the outcome and the consequences connected with the outcome and not to the educational or learning process itself. The suggestions offered about changing the existing situation have to do with the transformation of the educational system at all levels and changes in the training and other labour market policy

measures. Some participants connected this point to the difficulty in separating education from training and initial from continuous training and the implications of this difficulty for policy design. The short history of training programmes in Greece and the higher value traditionally placed on education rather than training makes these distinctions unclear in the Greek case. However, it was clear that education because of its longer history is more often properly or officially accredited while this is not always the case with training. The importance of accreditation of training programmes and the accreditation of skills was raised as a factor that facilitates training participation of technical employees. Examples were given from the information technology case.

Another point that was raised was the importance of informal work-related learning and in general the process of tacit skills development during personal/family life and also during the working life of people. The development of these skills and their experiential development during working life are not accredited in a way that can be used as other skills and competencies. For example, the skills developed by someone working in the home are not officially recognised in the job market even though they are often similar to the skills required for certain occupations. Job experience is of course valued highly in certain circumstances and especially at an early or mid-term of someone's career. In some cases, especially when someone is changing occupations or employers at higher stages in his/her career, experience is not evaluated as much as it should be. The low horizontal educational mobility and the low occupational mobility in the Greek labour market partly explain this finding.

While in the first focus group participants were selected to represent different roles in the VET process and came from different work environments, in the second one invited participants were employees in the same company: **a cement producer**. Their common characteristic is that they work for a company that is considered very successful in promoting the participation of its employees in VET practices. The discussion took place in their company and started with the presentation of the outcomes of the project. It was very clear that learning, training and development are highly valued in the company and are considered part of everyday experience of employees. For supervisors it was considered a 'necessary investment' that pays back more than the money invested. Employees consider training necessary in order to perform well and advance in their career. Some employees believe they are lucky to work in an environment where training is valued highly and characterise training as a bonus offered by their job whereas some other employees consider it a necessary duty they cannot avoid. The role of training for adapting employees' technical skills to new technological developments was raised as an obvious reason for placing such a high value on training. Other important 'side-effects' of training include the communication of the company's philosophy or culture, "socialising employees into the family of the business", creating stronger ties among employees and between supervisors and workers and offering a pleasant experience to all. In other words, training improves job outcomes both by improving the technical skills of employees but also by creating a better working environment.

In this company everybody participates in training including higher managerial staff. The initiative for the training in most cases lies both on supervisors and employees. In some cases employees suggest training requirements, which are usually granted. Training

planning and evaluation is carefully designed. Even though it is recognised that measurable outcomes of training programmes are difficult to isolate, there is an effort to estimate them. In the environment of this company in which training is highly evaluated most employees do not refuse openly training participation. A few exceptions to this are attributed to mismatches between the attitudes of the person and the company.

For the construction of the case study data was collected from conversations with employees, from interviews with directors and from examination of written reports prepared by the company. The company is a leading company in Greece with respect to several issues. Financially it is one of the most profitable companies and it has been developing steadily and continuously. With respect to social issues – including VET participation practices – it is also a leader in the Greek market. It is one of the first Greek companies to pay considerable attention to social responsibility practices. Recently besides publishing its economic data every year, it publishes a 'social responsibility budget'. With respect to educational and training procedures, the policy of the company can be briefly underlined in the statement of one manager: "training is the best tool for the development of our people". Education is highly valued during the selection of their employees and it is considered as a minimum requirement for certain positions. At the same time it is argued that education does not equip the labour force with the necessary skills for effectively performing their tasks in the labour market. Because of this mismatch between labour market needs and educational outcomes, on the job training is necessary. In certain ways this mismatch allows companies to "build employees according to the specific needs of the company".

During training sessions, the company promotes not only the development of technical skills and competencies but also the development of a closer relationship among employees and between employees and supervisors. The company is using training as an opportunity to "educate its people on the values of the company, on the overall philosophy of the company". Therefore, training takes the role of a socialisation process of the employee into the community of the company. According to employees and managers VET is absolutely necessary and the company is obliged to train its employees in order to perform according to high standards and in order to guarantee the future development of the company. It was recognised that most Greek companies do not share these opinions. According to managers the reasons behind the differences between other companies and the examined company were, in part, attributable to thoughtful managerial decisions in the past as well as the present. At the same time it was underlined that the social environment in which companies are operating in Greece does not encourage these thoughtful decisions. For example, the lack of an overall learning culture makes the decision to create such a learning culture within a business a hard task. This characteristic creates difficulties not only in establishing successful practices but also in transferring existing ones to other environments.

Overall, the analysis pointed to particular organisational characteristics being related to the extent of work-related training participation:

- In very small companies, formal work-related learning is rare for both supervisors and employees. Leaning is based on formal education prior to employment and informal on the job learning. At the societal level there are some opportunities for

formal VET participation but business owners are often unwilling to participate or to let their employees participate. Operational problems, the lack of a 'learning culture' and problems with the way the training programmes are organised are some of the reasons for the low participation rates from people from these environments.

- In very competitive companies, formal work-related learning is part of the job. Learning is based on formal education prior to employment as well as on formal and informal on the job learning. The offer of formal VET opportunities is high and participation is required. Personal characteristics are not strongly related to the probability of participation but they do matter in the process of hiring and advancing in the job.

- In the public sector, learning is based on formal education prior to hiring. Formal work-related training is extensive compared to the private sector but it is not well linked to work needs. The offer of formal VET opportunities is high; but participation is often not required. Personal characteristics operate as facilitating or obstructing factors in VET participation.

- The analysis showed that certain personal characteristics are associated with higher participation in CVETL. It also showed that in different organisational settings practices CVET participation of employees differ significantly. It is not easy, however, to claim that for the low participation of an employee in a small company the blame lies solely on the organisational characteristics of the company. The employee of this company is of course limited by the organisational characteristics of his/her company but at the same time s/he is – at least to some extent – choosing this working environment based on his/her personal and family characteristics. In the same way, a well-educated ambitious employee of a competitive business benefits from the VET opportunities offered at his/her company not only because of the characteristics of the company but also because of his/her personal characteristics (attitudes and behaviour).

- In relation to the question of policy suggestions we need to reconsider the factors that facilitate or obstruct VET participation from a slightly different angle. The high relationship between certain personal and organisational characteristics and VET participation means that for certain groups it is easier to promote VET participation. Of course, taking into account the reasons behind these relationships is critical for achieving even higher rates. How to promote VET participation for the social groups or in environments that presently exhibit low participation rates is more challenging. One approach is to design tailor-made programmes and policies according to the specific needs of each situation. This way some of the problems mentioned by small business owners could perhaps be overcome. However, the point made in both focus groups about the lack of a 'learning culture' or a 'learning philosophy' we believe is of critical importance. In large competitive businesses such a 'learning culture' has been created with the efforts of the management of these companies but it is limited to the borders of the companies. In the public sector where the availability of funds, time and training programmes is high compared to the private sector this 'learning philosophy' has not been created.

We believe that policies to promote CVET should have two objectives. First, they should promote participation for groups that show low participation. Specific actions are required in order to overcome existing characteristics and minimise social exclusion from a 'learning society'. Second, and more importantly, the cultivation of a learning society can have horizontal benefits for both individuals and businesses. The promotion of a learning society rests among others on educational/training institutions and labour market institutions. The transformation of the educational system more towards learning and less towards credentials, the accreditation of formal and informal competencies, the opening of more horizontal and hierarchical routes in the education and training system, the stronger connection between VET programmes and the labour market (and not the transformation of the educational system to fit production purposes) are some of the required steps. In the labour market, working relations that enable or better promote work-related learning, meritocracy and the continuing combination of working and learning could also contribute towards building a more 'learning oriented society'.

1.5   Comparative perspective

From a comparative perspective what is of particular interest is how the analysis of patterns of CVETL for technical workers in successful companies with an explicit commitment to learning and development reveal a number of emergent common themes:

- Significant learning is embedded in everyday activities because of the structuring and organisation of work

- Significant learning occurs as a result of systematic reviews of everyday performance and the problems encountered and through a commitment to collaborative resolution of those problems

- There is an expectation that technical workers will engage in self-directed learning (learning from the Internet and e-learning is becoming important in this respect)

- The focus upon embedded learning is complemented by allowing access to formal training provision too

- Workers recognise that they have a responsibility to keep professionally up-to-date (and not to do so would have negative consequences for them as well as the company

- Learning from colleagues is explicitly encouraged and facilitated.

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2.   Technical workers learning while working in Rome

2.1   Introduction

The general findings, but particularly the case studies, from Greece, Portugal and Spain have indicated how the extent of access to continuing learning and training at work for technical workers was influenced by company policy and practice. Individual characteristics were important in certain respects, but individuals were far more likely to be able to access training opportunities if they were working for a company where work provided rich learning opportunities. From a comparative perspective the findings from Greece, Portugal and Spain were also highlighting how patterns of continuing vocational education, training and learning (CVETL) for technical workers in successful companies with an explicit commitment to learning and development revealed a number of emergent common themes:

- Significant learning is embedded in everyday activities because of the structuring and organisation of work

- Significant learning occurs as a result of systematic reviews of everyday performance and the problems encountered and through a commitment to collaborative resolution of those problems

- There is an expectation that technical workers will engage in self-directed learning (learning from the Internet and e-learning is becoming important in this respect)

- The focus upon embedded learning is complemented by allowing access to formal training provision too

- Workers recognise that they have a responsibility to keep professionally up-to-date (and not to do so would have negative consequences for them as well as the company)

- Learning from colleagues is explicitly encouraged and facilitated.

Now the case studies from Greece, Portugal and Spain offered fascinating insight from interviews with a range of key participants in the case study companies. They also drew attention to the importance of the sectoral dimension and how an examination of learning, development, working and performance in companies has to be situated in a broader context. So in order to extend the breadth and depth of analysis it would be helpful to examine in more detail the patterns of learning across a range of SMEs in the chosen sectors.

The Italian Participa partners were able to do this with an in-depth examination of working and learning in software development and audio-visual production (mainly but not exclusively in radio and television production) in the Rome area through a combination of contextual analysis, case studies and biographical interviews. This example is extended because it does take us significantly further in our search for understanding of the response of companies, and individuals working within those companies, to the challenges of

learning, development and performance improvement at individual, group and organisational levels.

2.2   Context: software development and audio-visual production in the Rome area

In Italy, analyses showed that software development and audivisual production, particularly in the Rome area, are highly dynamic sectors in which important phenomena concerning technicians in both sectors are taking place. Competencies, learning patterns and training needs of such professional strata are significantly reshaped by different intervening factors. In particular, the evolutionary paths of professionals in these activity sectors appear to be influenced by changes in firms' strategies and structures generated by three driving forces: market dynamics, technological innovation and new institutional conditions.

Market dynamics have recently brought about continual reshaping of both sectors, each one according to specific trajectories. In the software development sector relevant firms' restructuring and downsizing occurred during the last years of the nineties and the first years of the current decade, involving both large companies and SMEs, as a consequence of two main crisis factors. The first crisis factor related to a local market crisis due to different attitudes and spending capacities of public administrations, traditionally main sources of contracts for the sector as a whole in the Rome area. The second crisis factor can be attributed to the more global crisis generated by the traumatic end of the 'new economy' first phase. A substantial selection of actors and activities has taken place in the software sector: restrictions in demand and price falls allowed only the most innovative and best positioned firms to survive and, within such firms, the activity areas more capable in terms of innovation and effective performance. Also some 'district' characteristics of the sector – in which different supply chains and forms of co-operation among firms are in place – helped the survival of firms in several cases.

The audio-visual sector has also been reshaped by recent transformation waves, due to internal competition and to the consolidation of new equilibria within the interstitial areas of a market dominated by two large oligopolies. These are the public RAI and the private Mediaset, both holding as a whole a share that is close to 90% of their respective markets. The interstitial areas (which represent the field of this specific section of the Participa project) are actually occupied by lively small companies, in search of a clearer role also after a new phase of development following the – December 2003 – reform law regulating the entire media system (newspapers, television, radio).

The second driving force influencing the evolution of professionals in the two sectors is technology. In the software development sector, the advent of the Internet and the generalised diffusion of new Internet-based technological platforms, standards and products brought about substantial reshaping of several professional activities. Continuously up-dated technological knowledge is more and more needed in order to stay in touch with such radical transformations. At the same time new know-how must be accumulated within companies in relation to new client-service needs linked with new technological arrangements. In the audio-visual sector, work activities and firm structures have been deeply transformed by the combined use of Internet facilities and of new digital

technologies applied to voice- and video-recording. The latter has brought about job enlargement of professional jobs and reciprocal re-adjustment between professional and operational areas.

The third driving force has an institutional nature. Besides the already mentioned reform which will have several effects in the audio-visual sector, important organisational and professional dynamics have been induced in both sectors by new regulations issued by recent laws on work contracts aimed at introducing more flexible mixes of long-term and temporary employment. After periods in which hyper-regulation and de-regulation went on in parallel, a need for new forms of flexibility can now be observed in small and medium-sized companies. New contractual equilibria are necessary in order to keep a balance between the search for mobility and lower labour costs on the one side and the need for firm know-how preservation on the other (especially in situations where the skill shortage of qualified personnel is a continuing problem).

Due to the above driving forces, in both sectors important phenomena are taking place concerning:

- the increased quality of work processes transformations, side by side with emerging innovation patterns;

- the restructuring of hierarchical and communicative patterns, which reinforce the importance of informal organisation;

- the rise of new functions and roles (such as, for instance, the technically enlarged role of many radio and TV journalists).

2.3 Working and learning in software development and audio-visual production in the Rome area

As a whole new ways of working and participating in organisational processes seem to emerge, although with different connotations inside the two sectors, allowing new spaces for more qualified and empowered strata of professionals-technicians. In software development, the above tendencies are leading towards the reinforcement of professional strata that hold solid technical knowledge and competencies. In audio-visual production, where the technological infrastructure has a support function and where core activities are mostly of a communicative and creative nature, the emerging trends favour those who are able to adapt and develop within new technological patterns (which represent opportunities to gain new professional competitive advantages). Overall, after the recent transformation waves generated by the combined effects of market, technology and labour regulations, in both sectors job-keeping and professional development seem increasingly more dependent on personal and collective abilities for continuous learning and self-valorising innovative competencies.

Inter-firm mobility is still high, both in the upward direction (with connected professional gains) and in the downward direction (often accompanied with risks of job loss). However, a general trend towards stabilisation seems to characterise the professional strata in both sectors. After recent transformations SMEs in software development and audivisual production are still largely populated by people (very often young people) holding part-time or other kinds of temporary contracts. However, at the same time new strata of

professionals are emerging willing to stabilise their positions and able to develop new relationships with the company based on a mix of professional reliability, trust, loyalty and solidarity. Even specific instances of acting as 'internal consultants' have been observed: members of technical staff are in some cases able to provide visions and specific advice on processes and products to firm management which prove to be very useful for the survival and development choices of the firm.

In parallel new behaviours seem to emerge within firms' management. In cases observed through the tracing of life-stories, the well-known 'short-termism' of innovative and small-sized businesses – ready to start and close activities as soon as profit opportunities rise or disappear, and ready to hire and fire as well, according to contingent profit expectations – seem to be tempered by forms of behaviour closer to those depicted by neo-institutional authors in economics. These economists emphasise that firm stability is highly valued and know-how embedded in personnel is considered as the fundamental asset to be maintained over time, including in periods of crisis.

What are the consequences of the above trends on continuous vocational education and training is a key question. Evidence collected in SMEs in software development and audio-visual production show how deep is the divide between the continuous learning needed in fast changing productive processes on the one side and most of education and training interventions nowadays available from public institutions on the other side. A large majority of interviewees within the questionnaire-based inquiry and the life stories collection, as well as managers/entrepreneurs interviewed within the background analysis, stated that really important professional competencies can be acquired through experience. Only real organisational settings – according to the interviewees – can provide the conditions for learning in swiftly evolving environments. It seems clear that in such complex environments, formal/codified knowledge must be continuously updated but at the same time accumulation of tacit knowledge is key for being really able to participate in work activities.

In parallel, basic education is very often considered as insufficient and most of the experiences in vocational education are deemed to provide only a very superficial preparation in relation to real working needs. At the same time great interest is manifested for individual forms of professional growth through specialised press and several other kinds of opportunities for updating, including those available through the web (the latter more in software development than in the audio-visual production). Competence development is the real measure which is generally used in order to assess what is valuable and what is not in this field, and competence development is largely related to both explicit and tacit knowledge. People seem generally aware that, in contexts which are continuously reshaped by technological (i.e., by definition, formal) drives, formal knowledge without experience is – so to speak – empty but also experience without appropriate levels of formalisation is blind.

New spaces for evolutionary forms of training seem therefore open, but probably implying new approaches on the training supply side, substantially different from the current ones. In this regard the episode told within one of the life stories is in many ways emblematic. The protagonist – a young man who tried several times to get a stable job in the radio sector – finds an advertisement concerning a course on a very specific new technology.

Then he spends all his savings to pay the fee of such a course, attends it and from then on receives several offers which allow him eventually to make the right choice for his professional future and to get very fast and satisfactory returns on his investment.

What seems important in this story is not the availability of short and effective training activities as such. Rather it is the interplay between personal experience – through which the young man is able to understand a specific knowledge/competence need in his working environment – and formal training activities, which can be found on the market and can satisfy such specific needs, that is the key to the competence development process. In other words new forms of continuous interaction between the two kinds of knowledge – tacit and codified – seem needed. This interaction should entail, from a policy perspective, new forms of reciprocal recognition between the training world and the productive world, and should also imply more generalised lifelong learning attitudes from people in these types of working environment.

In fact, the project survey results show that the work practices generate major effects in terms of competence development, showing the implicit existence of a model of cumulative on-the-job learning that is widespread in both sectors (software development and audio-visual production). Moreover, most enterprises ensure forms of incentives targeted at the professional growth of the workers. The enterprises provide the interviewees with a wide variety of instruments, ranging from the exchange of experience to training courses. The exchange of experiences is the most widely used method. In practice, the enterprises use formal training together with informal strategies. The personal evaluation of this combination by interviewees largely coincides with the choices of their firms concerning instruments for knowledge development. The widespread positive evaluation regarding the exchange of experience is evidently due to factors such as their immediate nature, flexibility and limited cost. But training and other external instruments are not disregarded but appear as subsidiary measures within firm policies. Mobility, which should have remarkable effects on knowledge development, is surprisingly valued as important by only one quarter of interviewees.

All these findings seem to confirm the hypothesis that a general appreciation of the 'human capital' value is widespread in firms' policies and in individual behaviours as well. Job stability, continuous accumulation of know-how and on-the-job learning appear as powerful internal antidotes to recurrent crises due to market dynamics and to the risk of losing competitiveness because of a lack of internal resources. Training is one of the ways for competence development but not the most important: it appears as an element in a larger combination.

Although with some differences in practice, ICT plays a key role in both sectors either as a working instrument or a product/service provided. Besides being used extensively, the computer is deemed to be a creative instrument for almost all the interviewees. In the software companies, for example, creativity in using computers derives from the kind of task performance typical of the interviewees, non-routine but related to problem-solving abilities and intensive know-how applications. However, in the audio-visual production sector the use of the computer also strongly contributes to creative work activities. That means, the use of the ICT significantly contributes to the competence development of the users. In addition, e-mail and Internet and connectivity are consolidated aspects of work in

both sectors. All respondents have an e-mail address, and most of them make intensive use of e-mail facilities. E-mail and the web are widely used as instruments for swift information acquisition in both sectors.

Training at the beginning of the work activity in the enterprise is crucial for the transmission of consolidated internal know-how. On the basis of their experience, the interviewees of both sectors recognised the importance of shadowing with senior experts, while training, although not disregarded, seemed to play a less relevant role. Training courses largely relate to technical training and are mainly linked to updating needs, even though all respondents participated in training activities attending both technical courses and role-behaviour courses. Although technical training is prevailing, the percentage of those attending both types of courses appears significant showing that an impact is expected from training both for professional technical advancement and for enhancing career prospects.

Training can be considered as offering significant leverage also within dynamic work environments in which important quotas of knowledge for development can be acquired through informal exchanges. Such an important result is reinforced by the analysis of responses to the question "How much value do both experience and the acquisition of information (transferred through books, handbooks, Web sites…) have for learning and professional development?" Both modes receive a high score: experience comes first as usual but codified knowledge was also assumed as important. A greater consideration of experience does not decrease the importance of codified knowledge. Also individual choices seem to valorise the written forms of knowledge circulation and the opportunities provided by the Internet.

The qualitative research phase consisted of three different strands of activity: an analysis of twenty-four life stories of technical employees in companies of the two sectors; a case-study concerning a small-sized dynamic software-house; and a focus-group conducted with representatives of VET institutions in the Rome area. Results from these research activities aimed to deepen the contextual analyses of working in the software development and audio-visual sectors. In particular, the statistical survey showed that the weight of the ICT and Radio & Television Activities sectors on the 'Rome metropolitan area' economy is quite significant.

The nearly 7,500 enterprises registered in the ICT sector in 2001 and the 420 enterprises in the audio-visual production sector, in fact, represent 3.6% of the about 224,000 enterprises (including all kinds of enterprises, such as shops etc.) located in the capital. More generally, Rome is a centre of attraction for enterprises in these sectors in terms of national economy. With regard to the IT sector and computer-related services, Rome hosts 9% of the enterprises registered in 2001 and a higher rate accounting to 14.5% of the radio and television enterprises. With regard to the employment weight, IT enterprises located in Rome employ 14% of all the workers of the sector at national level; the audio-visual sector – as a result of the presence of the RAI - officially accounts for 54.3% of the total workforce employed in the sector, just in Rome.

Three quarters of Roman enterprises in the software and audio-visual sector, irrespective of the declared legal status, are in practice one-person companies. However, in the IT sector, 30% of the enterprises with no employee are limited companies and 17% of these

are partnerships. These figures further show the adaptability of a sector capable of (or forced to) constantly changing its structure through the formation of networks, partnerships and alliances although it is still disputable if ICT represents a real 'industrial district' according to criteria dictated by local systems economics. Altogether, the production context of ICT sector is highly diversified, with almost one-third of employees working with SME's. Following the available statistical classification, the majority of employment (73% of the total in the sector) turns out to converge on activities which are generically referred to 'software supply and ICT counselling' including a wide range of services, from devising applications to co-managing innovation activities.

The focus of the research has been concentrated on a variegated reality of small and middle-sized enterprise contexts, in which the research theme could be usefully developed. In particular, the main research question has been about the ways in which both companies and employees understand their own competence development needs and try to satisfy them. Some other questions concern issues which are parallel to the main one and can help in better focusing it, regarding for instance: the information channels used by people to get a job and to choose a VET/CVET pathway, the functioning of formal and informal devices for personal selection used by firms, the trajectories for 'legitimate peripheral participation' leading to the full membership in contexts of communities of practice, and several others.

2.4 Experience of learning and working in the software and audio-visual sectors drawn from individual biographies

The 24 life stories conducted involved technical employees of small companies in the sectors of software production and audio-visual production and broadcasting in the area of Rome. These stories have been selected from among a wide range of possible accounts – some collected within previous research phases – because they can be considered broadly representative of significant interplay regarding work and life situations that can be considered typical of the analysed sectors. This means in particular that low level profiles are relatively underrepresented in such a research exercise. In fact, also on the basis of preliminary attempts, it was decided to invest the largest amount of time and resources on people having dynamic experiences for work and competence development trends. As a consequence the interviewees were usually aware of the social-cultural dimensions of the research issues and able, at the very end, to shed light also on more disadvantaged paths within their sectors. However the approach which was applied to the collection of autobiographies[1] tended to highlight relevant meanings concerning personal and professional life of interviewees while allowing them the greatest autonomy in telling their stories.

Considering the interviewees as a whole the average age is 35; the educational qualifications are of a middle-high level (half of them hold University – mostly non-technical – degrees). In the software sector regular contracts and middle-level qualifications are prevailing, while people in the audio-visual (AV) sector are mostly

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[1] The methodology followed in this research activity has been generated according to the indications of different authors, in particular: L.Formenti, *La formazione autobiografica. Confronti tra modelli e riflessioni tra teoria e prassi,* Milano, Guerini, 1998; M.Castiglioni *La ricerca in educazione degli adulti. L'approccio autobiografico*, Milano, Unicopli, 2002; A. Alberici, La parola al soggetto, Guerini Studio, 2001.

employed on the basis of temporary contracts and have a status which is closer to free-lance collaboration than to employed work (one of them is employed in a family-owned micro-enterprise). All the interviewees have been working for more than five years, except two – at the lower level – in the software sector. Educational and professional careers have been complex for the majority of software technicians. Many of them started to work in the sector quite late (just before the age of 30), being employed in activities not related with their formal educational profile. VET has in fact represented for many of the interviewees a crucial chance in terms of life and work turn-around. Audio-visual professionals, on the contrary, show more linear behaviours: job choices have been more precocious (most of them started in their early twenties); they found their present job following a clearer orientation, through the facilitation of social relations, in many cases without recourse to specific previous training experience. In general, in the audio-visual sector there is a remarkable gap between educational and professional pathways.

Most of the people in the software development sector addressed themselves to VET after discovering that their formal education qualifications had low value on the labour market. Considering the graduates, only 2 out of 7 carry out a profession coherent with their qualifications. Therefore it is the lack of positive relations between the educational system and the labour market that can be considered as the main external variable triggering the choice for attending VET courses in that field. VET courses, offered within public programmes of regional VET institutions (free and certified at the regional level), although not socially acknowledged as important channels for professional achievement, seem to have unexpected returns. People use them as bridges to a new job and, in many ways, a new life. In particular within the software sector the decision to attend a VET course has been a real turning point for most of the interviewees. Within personal stories characterised by uncertainties and fluctuations, such a choice seems determined by chance and social imitation in some cases and, on the contrary, by the awareness of the need for self-re-orientation in other cases. Two of the interviewees illustrated this:

> *'I did not have a marked bent for information technology. I happened to be in that course by chance, just to find soon an acceptable job. As I was attending the lessons, I got more and more involved and finally I was really very keen on it'.*

> *'Discovering the possibility of creativity and imagination which is allowed by information technology has opened my mind: I discovered I had a lot of opportunities I hadn't thought about before. It has radically changed my life'.*

The positive judgement on initial training expressed by software technicians is even enhanced concerning their further training experiences. They believe that attending VET courses can help in acquiring and updating appropriate competencies which are essential to get and maintain a job. Concerning software technicians, the distinction between 'initial' and 'continuing' VET courses does not seem relevant. They interpret the courses as resources which have been subjectively exploited for work and social purposes. In some cases their cultural and attitudinal background (in particular for those holding in a degree in humanities or social science) represented a very good presupposition for open-minded choices related to a new professional trajectory in technological field. In other cases basic scientific knowledge and familiarity with IT tools helped in understanding the appropriateness of chosen VET initiatives in relation to a new work and life project.

Concerning AV technicians, the external variables that influence their vocational choices are less related to VET. Their stories are in many ways more linear: choices followed an intention to initiate a professional trajectory deemed to be very attractive and allowing to find good jobs. Almost all the involved people have learnt their basic skills through coaching and on the job: in some cases, the apprenticeship has taken place in parallel with normal school pathways. Only 2 people have attended specific initial training courses. Their appreciation with respect to training as a career starter is lower than the one expressed by software technicians. Their interest towards continuing training is on the contrary sharper, although 'continuing training' means something different from what is generally understood for VET. The majority of the interviewees in the AV sector expressed their interest in highly specialised courses, provided by private companies at high prices. One of the interviewees reported a clear success through this kind of training which was key in acquiring new knowledge for a new and well rewarded job.

All the interviewees belonged to social networks and these sometimes stimulated their choices, often as an alternative to already established educational/professional paths. Two of the interviewees declared:

> *'My family wanted me to keep the tradition and to become engineer as my father. I enrolled to the university, but was somehow troubled. I felt pressed to do things I didn't feel like doing. I would have wasted many years if I had not had some friends already working in the cinema industry. They helped me work in an environment I've always wanted to work in'.*

> *'I studied physics, which I was really fond of. I tried with the university career: unfortunately the job of researcher has turned out to be uncertain and little paid. That was a luxury I couldn't afford. A friend convinced me to attend a course for software design and management and to propose myself as a candidate for a post in a company which was investing on talented young people'.*

The main features of the stories in the software sector are represented by the variety of educational choices and by the dichotomy between the family wishes and the later on discovered vocation of the interviewees. Such a dichotomy is less perceivable and relevant in the biographies of AV technicians. They claim to have followed their own vocation, often supported by their family or friends and enhanced by attractive opportunities, as the following examples illustrate:

> *'I am a TV operator, and I've always liked to do such a job since I was a student because of its charm of allowing contacts with famous people... A school mate, who was the owner of a video-production firm, helped me'.*

> *'I studied accountancy, but I couldn't imagine myself behind a desk. I had a bent for manual skills. My uncle helped me: he works in the cinema industry and suggested me a course for projectionist. I attended it profitably and with pleasure and I found a job immediately'.*

This type of family and network influence is largely coherent with some of the characteristics of the AV sector in the Rome area. In particular it is coherent with the 'districtual' structure of the sector, composed by a few large companies (RAI, Cinecittà, Mediaset) and an interconnected filiére composed by a multitude of small and very small

post-production service companies. The latter, given the long-lasting cinema tradition (related to the well known Cinecittà studios, and several others), are for the most part family businesses with an average size of 3 - 6 employees. This is probably one of the reasons why many of the people interviewed do not need or do not feel that they need to do a vocational course but they have learned everything they needed directly in the field maybe, as in the case of some interviewees, already at a very early age.

In relation to individual characteristics adaptability seems to be the main common trait of the interviewees. A first group, including most of the 9 AV professionals, who were better able to follow their own vocation, show in particular a strong character allowing them to stand out for a better and more coherent planning of their pathway, which implied the identification of a set of intermediate steps to achieve their expected objectives. Another group seems to adapt to different situations through personal autonomy. These people have in common a versatile intelligence, many interests out of their work, and relations with different social networks. Their sense of independence pushes them not to exclude self-employment in their future. This hypothesis can be traced mainly among software technicians who tend to suggest it with respect to their current field of activity and to other sectors as well. Moreover, it is extremely significant that this sub-group includes all the three women who were interviewed.

Two people in the software development sector represent the 'disadvantaged' (of course not in a proportionate way). As with some other young people who provided their life histories, they attended VET regional courses as drop-outs from the university system. They reinvented their own lives through such courses which allowed a quick entry into the labour market and eventually a job (one as software technician, the other as webmaster). But the companies they joined are at the bottom of the scale both in terms of firm effectiveness and quality of work. Work is at present not a gratifying activity for these two people: there is no challenge or scope for creativity, any sense of achievement is frustrated. This is due to very tight time schedules, poor management (not only in terms of HR management but also of project management) and no innovations are introduced in mundane work processes. Some competencies acquired within the regional course tend to extinguish due to a lack of use, while the few good chances of learning from clients encountered in work experience had already vanished.

Despite such a negative picture, both the interviewees in low quality contexts tend to keep an optimistic attitude towards the future. An important role for further more favourable experiences is attributed to the regional CVET system. Both technicians are searching for new training opportunities which could help them in upgrading their own professional standing. Guidance services might be of great help but at present there is practically nothing in this field, which can be considered as the most remarkable deficit of the VET system. The latter seems to provide good support in terms of courses but nothing as far as personal guidance is concerned, even though this would probably be the most strategic type of help for this kind of audience.

With regard previous education most interviewees had a middle-high educational background, which meant that formally they might seem over-qualified (as graduates) for the kind of job they had chosen. They were, however, positive about their current work situation: software technicians skilfully manage to combine personal values and 'typical'

values of their profession: dynamism, personal mastery, problem-solving (even in a sort of altruistic stance), overcoming of traditional approaches to life and work. For instance, some interviewees proved to be very much interested in exploring the possibility to overcome the trade-off between competition and participation by taking the cue from their daily life, where they do not perceive such a sharp gap between individual acknowledgement and sympathetic and co-operative practices. AV operators appeared more prone to highlight their creative contribution in designing and implementing 'cultural contents' for a widespread exploitation, to which they link the possibility of personal display and social visibility.

2.5 Attitudes to work

In both sectors, daily work is perceived as 'complex and difficult' due to the intense working pace and the high level of concentration needed, but none of the interviewees complained about his/her lack of personal competence with respect to the tasks to be carried out. On the contrary, more often the capacity to cope with the engagements and with unforeseen events reinforces self-confidence and allows them to face external interferences within work environment. In the AV sector the latter aspect is more present, as highlighted above all by technical profiles. One of the interviewees stated:

> *'When I started as an apprentice I did many different things, because in our environment we have to be ready for any emergency... Specialisation is necessary, but flexibility is also needed and above all, we must be able to keep calm in critical situations because what is mostly demanded is to quickly and effectively solve problems'.*

This interview and some others highlighted a generalised stress on the interviewees' personal role in the AV production process and a diffused bent for an individualistic approach to work. In the software sector a co-operative approach seems to prevail, as the organisation is generally more structured and work relations are more based on permanent contracts. Moreover, working in projects implies that goal sharing and relational capabilities are crucial. As highlighted by one of the interviewees: "Relations are very important, and they are often the critical point". Even if associated with the need to constantly enlarge the working hours (on average, not less than 9 hours per day), team work has been considered as a very important resource by all interviewees. Broader collaboration, rather than necessarily formal teamwork, is in fact deemed to be a support in difficult situations, a natural environment for informal exchanges of information and knowledge, and a stimulus to enrich one's competencies.

New technologies, which are a fundamental component of the work environment, are also considered as a spur to personal creativity and imagination as well as a common basis for meetings and discussions. The perception of the work environment seems also to be influenced by belonging to professional aggregations which are numerous and varied in the software sector, like teams (more or less stable, depending upon project duration) or even broader aggregations (with colleagues, customers, other practitioners). When work is carried out at the customer's premises new 'communities' are formed, composed by technicians belonging to different companies and involved in specific segments of the same project. Other important aggregations, also positively influencing the perception of

work, are those created by the 'exchange' of specialists between SMEs in relation to the implementation needs in specific work phases. Both in small communities and in largeer ones, mutuality and support outline the work environment as a place for self-expression and creativity, which is characterised in most cases by a good quality of life.

A negative perception of work was expressed by the two young software technicians employed in lower work quality settings, characterised by poor management practices, leaking out of technical capabilities and a reduction in opportunities for external relations. Both young technicians held a precarious working position: work contract obligations are not respected, work activities are of a repetitive nature and are carried out in a nervous and depressing climate. Even if they defined such work experience useful anyway as a survival test and therefore as an opportunity for personal growth, in the very end both acknowledged their experiences eroded their self-confidence and exacerbated their worries for the future. One of the two interviews said:

> *'Beforehand [that is to say, before, the company's decline] the environment was lively, now it is just routine. I am working alone in front of the computer all the time and I easily become irritable. I am not even able to avoid bringing my uneasiness out of the company'.*

2.6   Competence development

In relation to competencies development the biographies underlined the importance of technical competencies as a crucial 'tool' which is deemed to valorise professional roles, to allow visibility on the labour market, and to enhance relations based upon mutual consideration and trust. This seems true for dynamic software enterprises, which consider technical skills as strategic capital allowing durable development. In such contexts the interviews highlight common views between workers and companies: for the former technical competencies allow them to keep and improve their own working conditions; for the latter, they allow the company to become more competitive.

In stagnant contexts, like those of the two young people mentioned beforehand, there is not care for such technical capabilities to be embedded in human resources. The gap between the two typologies of enterprise reflects upon individual pathways. In dynamic contexts relative importance seems to be attributed to competencies that, according to recent literature, could be referred to as wide-scope work process knowledge allowing people to operate coherently with contextual inputs and to understand the connections between different roles and activities. These competencies are seen as crucial but, in parallel, in the majority of cases are not consciously managed either by enterprises' management or by interviewees themselves. The latter recognise the importance of work process knowledge but nevertheless generally tend to consider it as 'self-generating' through experience. In particular, as far as relational competencies are concerned, which represent significant components of work process knowledge, the enterprises seem to adopt a 'laissez faire' attitude. Relational competencies fine-tuning and exercise are largely left to the sensitivity and availability of each single employee, except in some limited cases where training courses or organisational development actions are at least taken into account as possible choices. Interviewees claimed that relational competencies are very important and that they devote great attention to them. The need to carry out

one's own tasks in a harmonious context, where conflicts are controlled and personal abilities can emerge, seem, at best, to foster behaviours oriented towards a balance between competition and the defence of a 'common good' constituted by co-operation and shared values.

Concerning the reward for professional competencies, the majority of interviewees declared their appreciation for them, even at an informal level (praise, words of appreciation by superiors etc.), while, considering the critical situation of many enterprises, it is generally accepted that more substantial rewards (bonuses, incentives, fringe-benefits) could be at least postponed to better times. The need of an acknowledgement of acquired competencies, even at an informal level, rather represents a parameter for evaluating the enterprises' 'intentions' and prospects for development. In the same way, the supply of education and training programmes is appreciated not only per se but as a tangible sign of a company's health. In the audio-visual sector, competencies that interviewees mostly deemed worth mentioning, those which deserve being enriched and updated, are the technical ones. Yet, the approach is rather different with respect to what has been remarked about the software sector, due to the reduced weight of stable organisational variables. In some cases the importance of technical competencies has been recognised from a merely functional point of view, in terms of acknowledgement of their being money- and time-saving. In other cases the crucial link has been underlined between technologies and artistic personal capabilities (expressiveness, sensitivity, etc.). Improving or enhancing these competencies has been deemed to happen outside formal pathways and as a result of learning by doing and critical self-scrutiny of outcomes.

2.7   Learning from others (in work groups, communities or networks)

Learning from others (whether in work groups, communities or networks) appears to be an important strategy for this type of employee. In fact, all interviewed people are aware of the need for continuous learning and behave accordingly. It seems possible to define them as lifelong learners or learning aware. Their learning practices consist of a mix of activities aimed at improving both experience-based knowledge and codified knowledge. The former is acquired and developed through implicit and yet fundamentally important chances for organisational learning provided by daily working life that the majority of interviewees seem aware of. Especially within more dynamic firm contexts, experience is enriched through the variety of external relations (with customers, other technicians, suppliers, etc.) and of internal relations (within project teams, with more experienced colleagues etc.).

Behaving in group situations is considered a basic but effective chance for learning. As an interviewee remarked group behaviour represents the 'reagent' for assessing one's own level of understanding of the overall framework and, at the same time, both the place for conflict resolution and the compass for an organisational orientation. As already seen in relation to attitudes towards work process knowledge, the understanding of the 'place's style' emerges within daily experience and relations with the reference community. The implementation and development of individual capacities do not happen in a 'vacuum' of exchanges and contexts but in the 'full space' of participation – more or less aware, more

or less competent – to specific organisational communities. Their role is well expressed in statements such as "…community environment enriches from any point of view", or

> *'…even if competition starts to show up among us technicians, there is still a good margin for cohesion and reciprocity. Yet, it should be really important to have the capacity for more cross-fertilisation and for achieving a shared language and a common overall vision'.*

Even limits to local community co-operation are perceived as a burden to be overcome:

> *'…stopping to reflect with other people on what we are doing is a luxury we can hardly ever afford. It would be important to understand things when we are doing them. On the contrary, I often find myself reflecting upon them alone, or asking my friends for suggestions'.*

Actors suggested the existence of a "hunger for making sense" within different contexts, or, in other words, the need of collectively surfacing the characteristics of local organisational knowledge.

Besides the positive perception of belonging to professional aggregations, it must be noted that a significant part of professional learning is acquired through participation to communities and networks of different kinds. Interviewees in the software sector feel themselves as components of different, real and virtual, communities (with clients, technology providers, other professionals) and consider it as a quite important ground for developing their own competencies outside formal arrangements. As one of the interviewees recounts, "the coffee shop easily becomes a place for technological communication" favouring exchange between professionals that work in the same sector. Several chances are daily encountered which are deemed to be sources of learning: "sometimes I feel I learnt a lot by a simple phone call that allowed me to get informal advice based on someone's experience in similar situations". Another source of learning quoted from different interviewees is constituted by freelance experts that deal with specialised services in different environments and consequently contribute to experiential knowledge circulation amongst companies.

Accounts of interviewees in the software sector show that 'learning' is often nothing else than 'sense-making': interacting within communities and networks is a fundamental way for constantly re-building personal cognitive approaches to specific issues and re-constructing the sense of the whole work experience. As for the AV sector, experiential and social learning are widely diffused, but nevertheless their importance in less acknowledged than in the software sector. In particular experiential knowledge can be shared within several communities. Even if the relational intensity of the sector seems lower than in software, because of temporary employment and more individualistic approaches, the interviews allowed us to detect the existence of several communities whose members are linked to each other by mutual esteem and/or common projects. Some of these communities appear dynamic and open, even extended on a global level through the Internet.

2.8   Self-learning coupled with formal knowledge development

Concerning codified knowledge, the interviewees highlighted a significant diffusion of self-learning practices, strictly intertwined with the above learning and sense-making activities. However, company training has been also reported as relevant mainly in terms of being useful to more systematically re-start cognitive and imaginative faculties. In the software sector the interviewees – as already noted – people pay great attention to enriching their skills and are prone to build-up their own competencies by exploiting a wide range of options: they frequently study on books and handbooks, navigate specialised websites, attend targeted newsgroups, subscribe to specialised magazines and journals. Even the two technicians operating in low level contexts try to keep updated through self-training (books, reviews, web information), although this cannot fill the gap related to the lack of significant working practices.

Although the importance of informal learning is recognised and self-learning is widely diffused, most of the interviewees clearly acknowledge the need for structured continuing training interventions. The urgency to take advantage of a 'knowledge development methodology' is expressed by one of them:

> '...I feel the need to go back to study. At a certain moment one needs to link experience and informal learning with something more structured. Books, reviews, the web are not sufficient: you need a systematic approach, a method. And you can obtain this only through real training courses'.

Secondly, many interviewees consider training as a key solution to the expectations of achieving an 'overall vision' in terms of work process knowledge. A number of interesting experiences of company training have been identified through the interviews. Of course only dynamic and planning-oriented companies can provide structured courses while the great majority of SMEs tend to put in place short interventions in terms of on-the-job learning and, in one case, of coaching. Structured courses usually involve employees having a training experience of a medium-high duration, usually last from 2 to 5 days; sometimes outside firm premises, more frequently inside; quite often beyond the working hours; mostly aimed at developing technical competencies. Employees generally appreciate very much this kind of intervention, in many cases provided upon their own request. Such an appreciation is first of all about outcomes at the personal level. Training is seen as 'useful to more systematically re-start cognitive and imaginative faculties'. Moreover, as already outlined, a strategic and symbolic value is attributed to training opportunities: several interviewees claimed they appreciate training provision as a sign of interest from the firm. As stated by one of the interviewees,

> '... now that I'm working within an enterprise where I can undergo training during the working hours and this is paid by the company itself, I feel successful. I am a privileged person with respect to other workers'.

The provision of training pathways within company HR plans is frequently considered as an important variable for the orientation of employment choice. The majority of interviewed software technicians consider keeping their own jobs largely depends upon the improvement of their own real competencies and that training plays an important role at this level:

'...training is fundamental. Otherwise, you keep on staying at a low level: even good professionals are at risk without training. If they undergo little training, they are not visible on the market'.

Concerning the weak points of company training delivery, some of the interviewed employees underlined negative aspects such as low quality of teaching, unfriendly modalities (too often outside working hours) and high costs. Moreover, non-technical training is considered very rare, while of major importance mostly in terms of rationalisation of informal learning outcomes. In general, the lack of adequate training provision was highlighted by a number of professionals. Very often enterprises do not want to 'distract' their personnel, even for a short time, from working activities. This could be considered as incoherent management behaviour, provided that management shares the employees' concern about training as an important component of competence updating.

In the AV sector – as already noted – learning by doing is prevalent. Structured continuing training opportunities are mostly offered by technology providers. Opinions in this regard are not homogenous but quite significant. Most technicians, who consider the courses they have attended so far as basically useless ("they are just for selling new machines"), prove to have a more precise idea of what is a real training course, while the minority who appreciates those courses is made up of people who are more prone to confuse training with mere familiarisation in the use of equipment. The most important information at this level comes from interviewees who attended private highly specialised high-cost courses and found them very important for their professional development. One of these interviewees told that he spent all his savings to pay the fee of costly course, attended it and from then on received several offers which allowed him to eventually make the right choice for his professional future and to get very fast and satisfactory returns on his investment. What seems important in this story is not the availability of short and effective training activities as such but the interplay between personal experiences – through which the young man was able to understand a specific knowledge/competence need in his working environment – and formal training activities which could be found on the market and could satisfy such a specific need.

In some cases forms of quasi-structured learning are reported, devoted to updating specialised technicians. In one of the visited micro-enterprises, for instance, learning of associates was under the authority of the responsible person of the technical structure (the 'number two' after the entrepreneur). He usually follows up individuals' learning "for all the time which is necessary to make them autonomous. We need on average a couple of years to train a good technician". This is a good example of practices mixing on-the-job training and coaching, much more accepted in the sector than traditional formal continuing training.

2.9   Patterns of learning and development drawn from the ICT case study

The case study itself is more fully described in Tomassini (2005). Here particular attention is focused upon patterns of learning and development within the company. The company was founded in 1999 by a highly skilled and experienced electronics engineer with a small team composed of former collaborators. The mission of the company is to provide

customised software packages and Internet-integrated applications to a wide range of businesses and institutions. This implies that firm activities are composed by a mix of technological and consultancy approaches and are based on close relationships with client organisations. Besides providing customised products and dealing with the continuous evolution of these products, the company is able to flexibly provide know-how to customers through outsourcing one or more of its staff (at present 4 people) for limited periods of time on the basis of specific contracts. Flexibility mainly derives from its small size (total 15 employees) and its participation in a network of small companies and single experts providing outsourcing services in relation to the specific skills and experience needed for a specific 'component' of the process. These kinds of networks are typical of a sector in which intellectual capital is the most precious resource and market exigencies are extremely varied. Therefore, firm's flexibility is mainly linked to a technological strategy based on processes of continuous differentiation in business services, since the variety of developed services is not focused on a particular technique, but on the contrary on the advancement of a rather large range of supply.

The interaction with customers influences the kind of professional competencies needed: it requires a close link between marketing and technical abilities. Moreover it requires co-ordination, integration, fast exchange of information and procedures in order to satisfy both the technical requisites of the product and the performance requirements of the customer enterprises. As a whole, this workforce is highly skilled and almost all the staff are employed in technical functions. The entrepreneurial model is centred on the founding engineer, who deals with all managerial aspects and technical matters, in close co-operation with the small team which initiated the company with him. All key organisational functions are performed by the management team, in which core specialised skills, such as the original ones related to the processing of GIS-mapping data, are combined with several other technical and managerial capabilities acquired over time.

The most characteristic activities and capabilities of the company are those linked to the exploitation of the Internet resources. Most of the new information required for developing new products can be found on the Web, for free or bought from highly specialised providers. In some way this is an activity which can be defined as research, although no formal R&D department has been established. People in a specific team spend most of their time in researching new solutions through the Web. The Internet information processing team consists of 3 employees: an engineer, who has the role of technical supervisor; a graduate in economics, who acquired considerable skills in software development through both work experience and vocational training; and a young graduate in engineering (holding an apprentice contract) who permanently joined the team in order to assist the implementation of firm strategy. Such a research team processes the available information in order to find codes and programmes to be developed, mainly from open-source packages which are both cost-effective and flexible. The research activities are conducted with two objectives: either to find a software solution for a customer or to develop a new product for the market that has not yet been explicitly requested by a specific customer. In the first case, the research activity is highly targeted and technical/economic parameters are defined. In the second case, the research activity is left up to the team that has to find satisfactory solutions in terms of both technical feasibility and economic returns.

The human resource development strategy is based on creativity regarding mainly innovative solutions and product testing. Although there is a certain level of formalisation of roles for reasons linked to the planning of the firm's development, in particular situations of work overload everyone can carry out tasks which are not strictly pertinent to his or her function. However, creativity and technicians' freedom to suggest new product solutions are the leading values for the company's HRD strategy. Of course for lower-profile staff, who perform more routine activities, creativity has a different meaning. It is achieved mainly through stimulating a dialogue to put forward suggestions and proposals aimed at improving production processes. Flexibility and creativity imply an organisation open to information and knowledge sharing and in which values such as those attached to co-operation and motivation are highly rewarded. Although not explicitly schematised, the community of practice approach is largely present in both the organisation's members' mindsets and in management style and choices. Internal meetings, for instance, are organised in informal ways and largely based on free dialogue. The staff is given a strong sense of responsibility through direct assumption of responsibilities, autonomous handling of the relationships with customers, and self-management of working times. More than half of the staff's working time is spent in team working. According to firm's principles, people must feel free regarding their creativity and not be afraid to compete one with another, given the common background of co-operation.

The setting-up of the company can be considered as a form of spin-off in which a small group of engineers managed to develop a business project by exploiting their previous knowledge. Such knowledge does not simply imply technical skills: knowledge in this case is not just a synonym of know-how but must be understood in a broader sense, including know-how (how to apply technologies), know-what (where and for which service to apply the technologies) and know-who (which customers to focus on to develop product lines), as well as know-why (scientific understanding of the phenomena). The company is mainly aimed at developing the aspects of know-how and know-who in order to define its niche of business activity. As a whole the firm's modus operandi reflects the need to 'capitalise' on the variety of acquired skills. Accumulated experiences, for instance, are codified as much as possible within company handbooks and kept in specific repositories. However, the fundamental way of the firm's learning is of a dynamic nature: it can be considered as the one that literature in this field defines as 'learning by interacting', especially as far as external learning is concerned. Management is fully aware of both the importance of experience in increasing professional competencies and the need for a knowledge management aimed at learning by interacting. Learning does not grow only 'by doing' (i.e. accumulating experience in repetitive processes) or 'by using' (i.e. gaining incremental abilities in using machines and devices of different kinds). Learning development is due to the combination of different factors: the systematic exploitation of the web and its global-scale opportunities, the participation in the above mentioned experts network, the relationships with technologically advanced customers, and more in general the participation in the local innovation system of the Rome area.

Internally, previously indicated policies for fostering co-operation and social-professional identity – implicitly applying the communities of practice principles – constitute the background of significant forms of organisational learning. Given the high specialisation of the activities, competence development and learning largely depends on real flows of

knowledge. This is why newcomers' knowledge is not considered in terms of stock of knowledge – although of course already acquired skills are evaluated in the selection phase – but as something that has to be smoothly absorbed and worked through within the knowledge and learning fabric of the firm. As staff selection is based upon motivation, the development of specific competencies is de facto postponed to the moment when the worker is integrated into the company's activities. This approach implies that acquisition of tacit knowledge is put off to in-company immersion.

Practical training is considered as the main instrument for allowing learning at all levels. This is why – after hiring seven people in order to enrich the original nucleus – apprenticeship has been chosen as the typical form of work inclusion, to be developed in the future. There are three apprentices: one – as already mentioned – working in the team of developers and two in the lower qualified staff – although they are also graduates – engaged in data-entry activities. They participate in the company's life and are also involved in more formal aspects, such as periodic meetings with the owner, in order to assess their social learning abilities and to foster their membership in the company community. Previously hired personnel were socialised through coaching by members of the nucleus and through internal training courses held by both those members themselves and by external experts. After such initial experiences some further training activities have been carried out in the last few years upon request. External courses for core technicians have not been frequently demanded; however all requests have been approved by top management after scrutiny in terms of positive effects and immediate application to working routines. Acquired work competencies by new recruits are mostly achieved through coaching by expert personnel rather than through training courses. In general, the preference for coaching derives from the owner's idea that training is worth financing only when it is functional to some sort of practical application in the short term. However, he claims to be open to assess proposals linked to professional growth.

As far as outsourced technicians are concerned, they do not participate in training courses. It could happen within the firm in which they are operating, but this seems a rather remote hypothesis. The majority of training courses are in-company. The top management's training philosophy is that training has to be connected to firm's specialised technical needs and that it is impossible to find suitable modules on the training market for such needs. Training in this perspective covers a specific phase in the competence development process. Given the typology of reference market and the way of interacting with customers, most of the staff have to be able to meet customers' needs without being stiffly linked to routine approaches and therefore have to be able to acquire new competencies in order to provide new solutions: briefly people have to develop individual/team problem-solving and decision-making approaches. This implies that people could understand specific needs for either updating possessed technical knowledge or acquiring new knowledge. Training is a sort of explicit knowledge refilling.

A significant component of internal training activities is based on the use of structured knowledge tools, such as technical handbooks, collected over time in relation to specific work issues, which are deemed to be strategic for the workforce's learning and professional growth. Every course implies that technical documents, such as handbooks, are prepared by the teacher with possible integration from external sources (scientific

literature and information available on the web) in order to allow participants to have practical tools for work problem-solving. Internal training is delivered in company in a classroom equipped with multimedia tools. Those who are more involved in training activities are the technicians and the commercial manager. Courses can have a different duration (from one week to some months, within a flexible timetable consistent with company's activities). Internal training is solely technical and focused upon IT subjects. Courses are designed so as to include a theoretical part and a practical module which should preferably be applied to work activities in the short term.

Over time this pattern of training organisation and delivery has become a business. The company has experienced several occasions of providing its own training contents – with specific adaptations – to customer firms on the basis of common needs, like those of protecting acquired competencies from obsolescence and of developing human resource according both enterprise's and the individuals' exigencies. As with most SMEs in that specific stage of life, contradictory factors are accumulating in company learning strategies and practices in relation to business development. From one side the company follows a canonical development path based on expansion of successful activities sustained by continuous growth of internal competencies. Such growth happens at the technical level: people become more and more expert in finding technical solutions appropriate for customer needs. But from the other side the model of learning by interacting, externally and internally, which underpins business development is not at all consciously catered for as such: the spontaneity model of the early start-up is kept in place although roles and relations are becoming increasingly complex. Non technical training, for instance, is still overlooked: learning sources stem from daily practice but the company does not make any systematic investment for a better understanding of the functioning of such sources. Relational and cognitive issues which allow the company to keep on going and producing good results are de facto disregarded. No specific problem has been so far detected in the organisation functioning but it is likely to forecast that further levels of business expansion might allow discrepancies and points of crisis to emerge due to the combination of social and technical factors.

Several effects of this accumulation of 'skilled incompetence' (Argyris, 1990: here linked to being content with existing focus upon technical development to the neglect of more strategic considerations) might be expected in an organisation that does not develop specific plans for professional growth. The company's small-size allows fast knowledge sharing among people, ensures less dependence on a single resource and improves role flexibility. Yet the company's model of investment on human resources should be developed in order to comply with conditions of both keeping resources that can be hardly replaced and achieving long-term objectives. Moreover, the occurrence of significant reshaping of technological activities due to breakthrough events, or even to the effects of incremental innovation in the field, might cause unforeseen problems in an organisation which does not take opportunities to systematically reflect on its ways of interacting with the external side, of its being the locus of community practices, not just applying technological solutions. The fast succession of packages, systems and software languages implies quick obsolescence processes in staff competencies which are not only of a technical nature but also relate to trends and basic meanings in the field. The resolution of such contradictions is not easy and the imagination of experts and policy-makers should be

exercised on such issues, avoiding reiteration of proposals which already encountered several failures. In particular, it must be considered that the use of external training courses is constrined by the small size of the company, which cannot afford a high investment in training and cannot keep the human resources involved in training for long. It is very well known that removing, even partially, one or more persons from their ordinary work can have a significant impact on a small-sized company.

The case of a dynamic and healthy hi-tech SME seems to indicate that CVET should consider the value in assisting the development of these kinds of enterprise but that providers should consider the company as a unity – not only its individual members – and should take specifically into account the already developed external and internal learning paths.

2.10   Conclusions

Overview

As a whole such a multilevel inquiry shows that the participation of technical employees of the two sectors in formal CVET activities is low, confirming both the weak position of Italian CVET system in trans-national comparative data and the results of special inquiries carried out in order to assess social attitudes and experiences regarding CVET. Especially in SME contexts the demand of CVET services remains particularly low, while, at the same time, the supply of them is quantitatively lacking and insufficiently targeted. However, the outcomes concerning formal CVET have to be contextualised within a more complex picture of the interrelationships between training factors on one side and work, organisation, learning and competence factors on the other side. In such a picture CVET is not marginal, considering in particular that some kinds of VET/CVET interventions (especially within the software sector) are very effective in terms of enhancing participants' employability. But, at the same time, the analysis confirms that in innovative and fast developing sectors work-based learning is the main form of knowledge reproduction and acquisition, much more significant than traditional forms of VET/CVET. As a consequence, a generalised need for new forms of CVET emerges in both sectors, requiring new CVET policies the European, national and regional/sub-regional level.

The situational context: jobs with and without prospects

A severe organisational rationalisation is taking place within ICT SMEs that can be attributed to the emergence of the successful survivors of the deep crisis of 2000-2001. At the opposite side in the software sector, within a rather polarised industrial structure, a number of smaller businesses still exist – the unsuccessful survivors – continuously at risk, oriented towards low quality products, mostly competing on prices. These processes favoured the emergence of updated types of professionals in the upper stratum, not only technically competent but also holding significant social skills. On the other hand, in the lower stratum employment is largely precarious and excludes the possibility of real developmental trajectories. Within the audio-visual sector too, the production and employment structure is polarised: on one side there are the employees of SMEs which were able to follow the new paths of technological innovation offering products of increasingly higher quality and significantly in line with customers' needs; on the other

side there are low-level jobs in micro and small companies which are detached from innovative dynamics (as in several radio stations) and close to disappearance.

Work inclusion processes

Considering people's attitudes and behaviours in the two sectors, the principal analysis outcomes – those stemming from the questionnaire-based inquiry and the collection of life histories – show that access to work and career development are largely of a pragmatic and informal nature. Getting a job in these sectors is largely dependent on the functioning of informal social networks, in line with what important research has been underlining since the Seventies (Granovetter, 1973). The 'strength of weak ties' is demonstrated by the experiences of a number of interviewees who entered their present careers not through the classical education-training-placement-job sequential steps but through more variegated processes of inclusions through the help of relatives, friends or even through spontaneous relationships embedded in social environments.

In parallel, the nature of what is considered as a 'job' is highly variegated: different typologies of work are in place within an overall situation in which any uniformity has long gone, or perhaps never even existed. However, some regularities can be found in the two sectors. In the software sector – where the organisational innovation rate is high but companies tend to a certain degree of stability – inclusion in work processes takes the form of permanent and non-permanent work contracts in an almost equivalent proportion. In AV non-permanent work contracts (of the free-lance type) prevail due to the characteristics of production processes in which both stable organisations and 'ephemeral' organisations participate, the latter activated in relation to specific production projects and disbanded at the end of the projects themselves.

Very interesting evidence regarding inclusion processes has been provided by several life histories in the software sector showing that work inclusion is due to the acquisition of competencies through VET courses. This is the case of people that, at an age around 28, accessed VET courses in informatics as an alternative path in relation to previous education and life choices that had brought some of them to getting a degree in social science or humanities and to later understanding the low value placed on these in the labour market, or even to discovering new personal interests and bents. The influence of social networks seems relevant in the choice of VET courses and afterwards in job finding. At the same time the research outcomes demonstrate that VET can be the trigger of a significant turn-around in work and life chances in a way where even the distinction between 'initial' and 'continuing' VET is highly questionable for training activities that are addressed to adults who already had work experience and want to re-start their own professional development.

It is worth mentioning that VET courses are much more frequently offered in the software sector than in the AV one, where, as life histories demonstrate, clearer initial professional 'vocations' are manifested and informal apprenticeship is the rule. In some cases traditional VET or CVET is replaced by very dynamic forms of training supplied from private providers, especially equipped for satisfying specialised needs in the technological knowledge field.

Learning and competence development within working environments

After the phase of initial inclusion, keeping the job and progressing in work in both sectors is mostly assured by spontaneous forms of learning in which informal work-based learning and self-managed competence development converge. Work-based learning and competence development appear as crucial aspects, which largely compensate – for better of for worse – for the lack of wide-scale formal CVET interventions. The importance of these aspects has been underlined by both witnesses on the enterprise side (managers and entrepreneurs interviewed in the first activity phases) and interviewed employees. The latter appeared aware that technical competencies represent crucial tools for survival and development in their own working life. Effective and up-dated competencies are deemed to be fundamental not only for the functioning of companies as such but also, in individual terms, for self-valorisation and visibility on the labour market. Continuous technical competence development is considered as a crucial issue for personal achievement and for the growth of new forms of organisational relations based upon mutual consideration and trust.

Moreover, real competence development is assumed – by the majority of interviewees – to be linked to the acquisition not only of specialised knowledge concerning technical aspects of the work processes but also to relational aspects. These are deemed to be connected to forms of work in which contextual inputs are continuously scrutinised, the interplay between different roles and activities takes place outside bureaucratic schemes, and the ability of effectively interacting with external subjects like clients, providers, competitors is highly needed and valued.

Especially within dynamic contexts – as has been confirmed through the case study – professionals' competence development paths in small organisations are oriented towards the acquisition of what recent literature labelled as work process knowledge (Boreham, 2002; Boreham, 2004a; Boreham, 2004b), i.e. knowledge of the business production and labour processes in the organisation which is created and circulated through co-operative arrangements at different levels, allowing continuous learning and processes improvements. The small organisational dimension and the dynamic work conditions in both sectors stimulate in fact the continuous reproduction and innovation of such work process knowledge.

Within dynamic realities the work environment allows forms of continuous learning from others, i.e. learning from members of the work group and professional communities that every employee belongs to; learning through opportunities for interacting with more senior members (sometimes with explicit intention of 'passing on' knowledge and experience; and of exchanging information and knowledge even outside the organisation (especially with clients and providers). The communities of practice model (Wenger, 1998; Wenger et al., 2002) provides elements which seems coherent with these realities, as it depicts ways of working and learning (based on collective sense-making, engagement in a common enterprise perspective, and mutual support within concrete work situations) that are in fact typical of innovative SMEs. Learning is intrinsic in ways of working in which employees' co-operation and competition coexists.

In parallel a significant continuity seems to occur between learning in the working environment and self-learning, especially as far as the up-dating of technical competencies

is concerned. Both the questionnaire-based inquiry and the life histories interviews show that individual up-dating (through reading handbooks and specialised journals, navigating websites, and attending newsgroups) is widespread among technicians in the two sectors and is considered as a necessary activity for surviving and developing in fast changing contexts.

Where conditions for learning from others and self-learning are weak or lacking – as in organisations offering low quality jobs in the software sector – these opportunities proportionally decline. One important research outcome is that the structural polarisation of companies in both sectors, especially in software, has a very clear correlate in the polarisation of work conditions and learning opportunities. Regarding this phenomenon the employment reality can be visualised along an axis at the extremes of which two opposite situations can be identified. On the upper side there are professional strata that can be considered as the 'haves', placed in organisations that in some ways are 'learning organisations' where competence development is intrinsic in the functioning of work relations and supports the emergence of acknowledged professional identities. On the lower side one can identify the 'have-nots' operating within low quality work environments, at risk not only in terms of job security but also exposed to more or less radical isolation from competence development and from possibilities of self-promotion through self-learning. Several negative loops are in place within stagnant or declining organisations where the lack of professional growth perspectives represents a depressing factor for spontaneous learning inhibiting the formation of professional identities within the organisation and at the same time reducing opportunities for informal work-based learning and self-managed competence development.

In-company training

Some forms of formal training are developed within enterprises, in particular in the software sector, although the majority of enterprises tend to avoid 'distracting' their personnel, even for a short time, from working activities. Within the software sector internal training is typical of more planning-oriented companies which can provide formally structured courses while the great majority of SMEs tend to put in place only short interventions in terms of on-the-job learning. Structured courses are usually aimed at developing employees' technical competencies. Such courses, when they work well, are highly appreciated by employees not only for their intrinsic contents and the opportunities they offer to complement informal work-based learning with given quanta of explicit knowledge but also for their symbolic value, as a sign of interest from the firm for competence development of its employees. On the other hand, many respondents saw courses as too often characterised by poor quality teaching and being held at inconvenient times (after working hours). Non-technical training was very rare, but where it was held it might be very useful in order to build upon what had been achieved through informal learning.

Within the AV sector internal training seldom exists, except in forms that can be classified as apprenticeship (for newcomers) and coaching (within team management practices). Structured continuing training opportunities are mostly offered by technology providers, while very specialised and high-cost courses for handling new sophisticated technologies

are offered by small training businesses which in many ways can be considered as CVET and are significantly appreciated as they can assure remarkable returns to individuals who are to afford specific investments on them.

Need for new forms of CVET

The above depicted situation is typical of new forms of labour market in which the traditional dynamics of work demand/supply are replaced – although not completely – by knowledge demand/supply dynamics (Burton-Jones, 1999). Research activities carried out within the PARTICIPA project show that such dynamics are far from being represented by a pure 'free-trade' model. In particular software companies operate in a logic of protection of their internal intellectual capital and put in practice policies that – although not in a conscious way – have something to do with the idea of core competencies development, whereby internal resources assuring competitive advantage have to be continuously monitored and rewarded (Pralahad and Hamel, 1990). The high mobility which is typical of the software sector is not totally at odds with firm policies aimed at promoting 'internal labour markets' allowing more or less extended opportunities for informal work-based learning and individual competence development. Even in the AV sector where the work relations are highly individualised, as the free-lance model of work supply is largely diffused, important mechanisms are in place for preserving competence recognition, professional identity and trust.

As already underlined, such a model of organisational functioning and human resources management (HRM) assures high levels of work flexibility and constitutes some basic conditions for integrating individual experiences within broader-scope organisational learning. In parallel, other research outcomes highlight the weakness of such a 'spontaneous' model and some risks implicit in its reproduction. For enterprises, such points of weakness – as shown by the case study – can emerge in phases of firm consolidation and expansion in which leaving competence development to the responsibility of individuals may be an inappropriate strategy and in which, on the contrary, more structured models of HRM should be developed in order to accomplish longer term objectives. The accumulation of 'skilled incompetence' (Argyris, 1990) effects might be expected in an organisation that does not develop explicit plans for professional growth.

For individuals, 'spontaneous' learning from others and self-learning can represent powerful boosts for the acquisition of some degree of work process knowledge, but both these ways of informal learning cannot be considered as the only ways of competence development. First of all a positive development of informal learning requires that parallel opportunities be put in place for deepening the technical-scientific underpinnings of work activities. "…I feel the need to go back to study. At a certain moment one needs to link experience and informal learning with something more structured…" affirmed one of the interviewees, clearly expressing a way of thinking which is present in many other life histories.

Moreover, work-based learning of individuals and groups requires higher levels of aware management in order to produce sustainable outcomes, but at present such awareness seems to be low. Informal learning processes are felt as crucial by employees but at the

same time are not consciously handled or even conceptualised while deeply rooted mental models concerning work, organisation, knowledge acquisition and other important issues still survive. Many of the interviewees tend to consider the acquisition of work process knowledge as just self-generating through experience. Only a few realise that real learning has to overcome serious constraints in terms of time and action and requires the use of reflective skills concerning work activities (Schön, 1986). "Stopping to reflect with other people on what we are doing is a luxury we can hardly ever afford. It would be important to understand things when we are doing them…" stated one of the interviewees, providing an important view on a problem which is at the same time of a cultural and an organisational-managerial nature.

Innovative forms of CVET, significantly far from the traditional school-based model, could play an important role in relation to the above problems. Such a new role should be based on education-training strategies referred to the emerging characteristics of organisational knowledge and learning development. This seems to imply new choices at different levels regarding in particular: the overall strategic approach and even the fundamental meaning of CVET in socio-economic processes, the link of CVET policies with other development policies at the sectoral and regional level, the creation of new intervention frameworks adapted to the reality of adults employed in very different contexts.

In terms of an overall strategic approach CVET should acquire a wide-scope viewpoint on the nature of knowledge and competencies, especially in rapidly changing technology-based processes. Knowledge needed within such processes cannot be treated anymore only in terms of know-what (information about the explicit aspects of work activities) as it is typical of the great majority of initiatives (courses) in this field. Dealing with such processes also requires continuously accrued competencies in terms of know-how (based on awareness of the effects of the tacit cognitive components of work activities), know-why (i.e. continuously updated understanding of the scientific principles underpinning technologies and other aspects of work activities), know-who (regarding the social side of work activities) (Lundvall, 1992; Lundvall and Borras, 1999). This implies a new conception of CVET interventions, in which informal learning and the different modes of conversion of explicit knowledge into tacit knowledge and vice versa could also be taken into account (Nonaka, 1994; Tomassini 2003).

In terms of development policies, those devoted to CVET should be connected with other relevant policies aimed at promoting the overall growth of the industrial/service fabric of specific sectors and regions. This means promoting and sustaining through appropriate interventions the managerialisation of SMEs, in particular for the support of entrepreneurial competencies, considering that entrepreneurs having a technical background often lack the abilities and visions needed for carrying through solutions for complex problems at the organisational and HR level.

As far as the creation of new intervention frameworks is concerned, these should be adapted to the reality of adults employed in very different contexts. In general, two different macro-frameworks should be conceived. The first one should regard the employees operating in the lower side of the employment reality of sectors like software. The main aim of the interventions at this level should be the one of helping people in

overcoming their present situation: that is, it should help them acquire new skills which could allow them to leave their unsatisfactory and precarious jobs and to self-design a new professional future in the same sector or even outside it.

The second one should take into account the more or less consciously expressed needs of professionals who are engaged in situations where competence development is linked to concrete opportunities to participate in the creation and exchange of work process knowledge and where the combination of work-based learning and autonomous self-learning assures sound bases for further progresses. The main aim of the interventions in these cases should be the support of two relevant exigencies:

(i)   deepening the contents of self-learning through updating activities based on recent disciplinary and quasi-disciplinary advances; and

(ii)   increasing the employees' reflective abilities through familiarisation with appropriate methodologies ('action methodologies', 'reflective practices') to be applied at both the individual and the organisational level.

In both cases the traditional concept of CVET is significantly challenged. Operating within the above sketched framework implies CVET systems need to overcome the bureaucratic forms through which CVET courses are at present delivered. Such forms – as emerged in the focus group – are considered as dysfunctional even by direct actors (such as VET practitioners and managers of training institutions). In particular the 'ESF co-financed course' which still plays a not at all negligible function for those who are seeking to develop new professional prospects, can be considered an out-dated instrument from the viewpoint of really 'continuous' improvement needs. In sectors like those considered in the present inquiry new forms of participation in CVET activities will emerge if new policies are put in place in terms not only for education and training but also for organisational support and professional counselling for companies and for individuals.

A deeper engagement seems indispensable of the involved research communities on these kinds of topics, together with increased levels of co-operation between different institutional actors, in particular at the regional and sub-regional level.

2.11   Comparative perspective

We started this chapter with the idea, drawn from the experience of case studies in Greece, Portugal and Spain that successful companies with an explicit commitment to learning and development (for technical workers) exhibit a number of common characteristics:

- Significant learning is embedded in everyday activities because of the structuring and organisation of work

- Significant learning occurs as a result of systematic reviews of everyday performance and the problems encountered and through a commitment to collaborative resolution of those problems

- There is an expectation that technical workers will engage in self-directed learning (learning from the Internet and e-learning is becoming important in this respect)

- The focus upon embedded learning is complemented by allowing access to formal training provision too

- Workers recognise that they have a responsibility to keep professionally up-to-date (and not to do so would have negative consequences for them as well as the company)

- Learning from colleagues is explicitly encouraged and facilitated.

Now the relevance of all the above characteristics have been confirmed in the analyses of working, learning and development in software development and audio-visual production in the Rome area. The behaviour of the companies in the two sectors in Rome, however, drew attention to the way the success of companies could depend on the way they handled, either explicitly or implicitly, two key challenges: how to focus upon, protect and develop their core competencies and how to avoid the gradual development of 'skilled incompetence':

- Protection and develoment of the core competencies of the company: none of the companies were explicit about this as a formal goal, but the successful companies in, for example, software development had explicit processes in place (e.g. regular collaborative knowledge development and sharing sessions; project debriefing sessions; focus upon performance improvement etc.) that had the effect of developing, monitoring and spreading their intellectual capital. This also acted to ensure that individual development was recognised and acknowledged (even if not always formally rewarded).

- Meeting the challenge of the development of 'skilled incompetence' (Argyris, 1990) was much more of a challenge. For some companies the current way of doing things, including the constant search for and focus upon technical development, meant they neglected more strategic considerations, including plans for the professional growth of staff and opportunities to reflect systematically on their ways of interacting externally.

The breadth and depth of the Italian project investigations enabled us to go further in our search for understanding of the response of individual technical workers working within SMEs to the challenges of learning, development and performance improvement. In particular, we can now say more about what is driving the learning of technical workers in a range of contexts, including many where companies have ambivalent attitudes towards learning and development. Technical workers' desire for learning and development seems to be influenced by the following:

- 'learning by interacting' through interacting within communities and networks is a fundamental way for constantly re-building personal cognitive approaches both to specific issues and re-constructing the sense of the whole work experience. Technical workers were often engaged in a wide range of networks that helped with different aspects of their work-related learning and development, only some of which were explicitly linked to the organisation for which they worked.

- It was noticeable that in both personal and explicit company-linked work activities the search for knowledge was broad, going well beyond just development of technical skills. The search did incorporate aspects of technical know-how (how to apply technologies), but also involved know-what (where and when technologies

and knowledge could be applied), know-who (not just in relation to customers but also an active search for people who would be valuable as members of a personal network), and know-why (a fuller understanding of phenomena and processes, including in some cases a deeper scientific understanding).

- Technical workers seemed to be well aware that learning does not grow only 'by doing' (i.e. accumulating experience in repetitive processes) or 'by using' (i.e. gaining incremental abilities in using machines and devices of different kinds), but there were also advantages to a more systematic approach to learning and development, whether this utilised some or all of the following: the systematic exploitation of the web, participation in specialist networks, relationships with technologically advanced customers or colleagues, more general participation in the local innovation system (of the Rome area), or using opportunities for formal education and training.

- Learning from others with acknowledged expertise is sometimes facilitated through particular activities (e.g. work shadowing), sometimes through explicit knowledge development and sharing activities and at other times is built into the organisation of work activities (e.g. in the construction of project teams).

- Collaboration was deemed to be a support in difficult situations, a natural environment for informal exchanges of information and knowledge, and a stimulus to enrich one's competencies. This was the case even in settings that looked as though they would generate intense competition for limited permanent positions. In practice, learning seemed to be stimulated by the combination (or co-existence) of collaboration and competition.

- Much learning undertaken by technical workers is concerned with 'sense making' (both in relation to techncial processes and work process knowledge more generally). That is, developing a 'vision' of how work process knowledge fits in their work activities and those of the company more generally is an important driver of learning. Technical workers often want to make sense of their experience of work as a whole.

- Recognising the importance of work process knowledge, many workers recognised both the importance and the limitations of informal learning and looked for a 'methodology for knowledge development' that would help them achieve a more coherent and comprehensive understanding of company activities and their own practice. This often linked to more formal education and training provision and was seen as helpful in giving a basis for continuing learning and development.

- The above could be interpreted as a desire for learning through working and interacting and self-directed learning leading to contextual understanding to be interpersed with periods of more formal learning and development that allow for more considered reflection, a linking (and integration) of what has been learned by experience and informal means, and more rounded professional and personal development.

- Guidance services might be of great help to technical workers making their way through (or even out of) their chosen field, but at present there is practically nothing in this field. Time and again it became clear that individuals would have appreciated some guidance and support when making decisions that were often strategically important for their own career development.

- The need of an acknowledgement of acquired competencies, even at an informal level, was strong. In some cases this was seen as a signal for evaluating how much interest the company had in your development. In this way, the offer of participation in some formal education and training offerings was appreciated (even if the provision was not necessarily that good) because it was a tangible sign of company's health and that it valued you as an employee.

- The extent to which the work environment offered substantive opportunities for learning and development. This phenomenon can be visualised along an axis at the extremes of which two opposite situations can be identified. On the upper side there are technical workers (the 'haves') working in organisations that in some ways are 'learning organisations' where competence development is intrinsic in the functioning of work relations and supports the emergence of acknowledged professional identities. On the lower side one can identify the 'have-nots' operating within a low quality work environment, at risk not only in terms of job security but also exposed to more or less radical isolation from competence development and from possibilities of self-promotion through self-learning. Several negative loops are in place within stagnant or recessive organisations where the lack of professional growth opportunities represents a depressive factor for spontaneous learning inhibiting the formation of professional identities within the organisation and at the same time restricting opportunities for informal work-based learning and self-managed competence development. The characterisation of such environments as a spur to get on and get out does scant justice to the way that such environments can erode your self-confidence and drain your motivation to learn away from work.

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3. Continuing Vocational Education, Training and Learning of technical workers in Bremen

3.1 Introduction

So far our analysis has ranged across the responses of individuals and companies, mainly SMEs, to the challenges of learning, development and performance improvement in contexts where the formal vocational education and training systems are relatively under-developed. By way of contrast, the example of Germany draws attention to the ways patterns of learning in SMEs can be situated within well respected formal VET provision and expectations that each technical worker has a clear occupational identity (Beruf) to which he or she is attached. In practice, there are important sectoral differences, not least depending upon the reach and nature of the dual system (of the complementary college-based and work-based VET provision). Will a stronger institutional VET provision act to ameliorate the wide differences found in Italy, Greece, Portugal and Spain in the extent of access to continuing learning and training at work for technical workers because of variations in company policy and practice? From a comparative perspective will the findings from Italy, Greece, Portugal and Spain that patterns of CVETL for technical workers in successful companies with an explicit commitment to learning and development reveal a number of common themes be further substantiated? Those themes were that:

- Significant learning is embedded in everyday activities because of the structuring and organisation of work

- Significant learning occurs as a result of systematic reviews of everyday performance and the problems encountered and through a commitment to collaborative resolution of those problems

- There is an expectation that technical workers will engage in self-directed learning (learning from the Internet and e-learning is becoming important in this respect)

- The focus upon embedded learning is complemented by allowing access to formal training provision too

- Workers recognise that they have a responsibility to keep professionally up-to-date (and not to do so would have negative consequences for them as well as the company)

- Learning from colleagues is explicitly encouraged and facilitated.

The previous analysis has drawn attention to the importance of the sectoral dimension and how an examination of learning, development, working and performance in companies has to be situated in a broader context. So in order to extend the analysis it will be helpful to examine in more detail the patterns of learning across a range of SMEs in the chosen sectors in Germany: ICT and aeronautics. These examples should help us understand more about the role to be played by formal VET provision in complementing the response of companies and individuals to the challenges of learning, development and performance improvement at individual, group and organisational levels in SMEs.

3.2   Context: learning and working in aeronautics and ICT in Bremen

The sectoral surveys in Bremen (Grollmann *et al*., 2004) showed that the willingness to continue to learning was high in both sectors, even though technical workers in aeronautics had, on average, lower levels of formal education than those working in the IT sector.   In addition, the cross sector comparison shows that learning is very strongly connected to immediate workplace needs. Continuing to learn was typically seen as important for job-security, but workers believed CVET should take place during working hours and there should be support for learning through formal CVET provision. Participation in CVET was strongly linked to job satisfaction and a positive assessment of the work environment, but position in the organisational hierarchy was less strongly connected to job satisfaction: indeed more routine (but still skilled) jobs lead to a higher degree of job satisfaction. However, in comparison either to some of the cases discussed in other countries or to some other sectors in Germany all of the jobs in these sectors would count as 'good jobs' and the competition for these jobs or even to get apprenticeships in these sectors was great.

Satisfaction with CVET was positively correlated with fulfilment of expectations, alignment of prior information and actual provision, and outcomes that led to the improvement of job skills and knowledge. It is interesting to notice that consciousness about the importance of the quality of CVET provision in the aeronautics sector is not as high as in the IT field. This might, however, be explained by the relative oligopoly of CVET providers, and that certain types of training is compulsory in order to conform to official regulations. In such circumstances training could just be seen as given, whereas in the IT field employees had higher expectations of the quality of provision if they were to undertake formal training. Situational aspects such as time availability also played a critical role in an individual's decision to participate in formal training, as when the greater the possibilities to shape one's own time schedule the higher the participation in CVET. Similarly, the size of enterprises also plays a significant role. The bigger the employing enterprise, the stronger the participation in CVET. In addition, it seems that when employers take over the costs, participation rises. Findings also indicate that there are positive correlations between type of job-tasks and the ways respondents deal with problems. That is, problems in ICT work tasks were less likely to be solved by recourse to product-specific documentation and information than in aeronautics. Learning in work – especially in teams – plays a critical role for the aeronautic technicians; however the consciousness of this seems not to be as high as for technical workers in the IT sector. This could be partly due to different understandings of learning at work – some learning may not be identified as such, but rather simply regarded as part of everyday work activities.

In the IT sector, most employees had participated in formal CVET activities, at least once per year, during the last five years and the main motivation to take part in training offerings was related to workplace needs. However, they also agree that participation in CVET improves skills, raises prospects for mobility, increases their own ability to improve their working environment, and makes them more conscious of their responsibility. In addition, they consider that training offerings are usually good and directly related to the problems they face in the workplace. For this reason, findings also

indicate that employees have a very positive attitude towards CVET and to learning in the IT sector.

In the aeronautics sector, according to nearly all respondents, the most important means of obtaining the necessary qualification for their current job was their initial vocational education. As was to be expected from a rather traditional industrial sector with a long-established system of qualifications such as aeronautics, classical schemes of vocational education and training seem to play a much more important role than in the IT sector. However, measures of continuing vocational education and training and learning on the job are also highly valued as important factors. As regards overall participation in formal CVET, the majority of respondents indicate that they have been participating in training activities since the beginning of their occupational career. Participation in job-related programmes appeared to be motivated predominantly by workplace needs, that is requirements related to the performance of concrete job tasks and by the instructions or requirements imposed by the regulatory authority (*Luftfahrtbundesamt*). The intention to widen one's occupational horizon or the wish for advancement also have some influence in individual decisions whether to participate in further training, though these factors were not as important as among the respondents in the IT sector.

Like their counterparts in the IT sector, the employees of the aeronautics sector tend to be 'satisfied' or 'very satisfied' with CVET measures in general. Individuals were also satisfied with the fit between course content, the information given in advance and the direct applicability to the newly required skills for their function on the job. So, in terms of training quality and course content in relation with workplace problems, the aeronautics employees were in agreement with their colleagues of the IT sector. As already suggested by the results of the IT sector survey, these findings provide support for the assumption that the relation of the course objectives to the practical demands of the participants' occupational environment is crucial for the quality of CVET measures. This is also reflected in respondents' opinions concerning the positive effects of participation in training measures in improvement of professional skills, of career prospects in the company, of opportunities in the labour market outside the company, and in rising incomes. For this reason, it is very apparent that technical workers in the aeronautics sector have the same general positive attitudes towards CVET as those expressed by IT professionals. Similarly, aeronautics technical workers have also expressed a relatively positive attitude towards learning in general and that the necessity to learn constantly is not a burden for them. Notwithstanding the dissimilarities between the two groups in terms of educational and social background, there are no major differences in their attitudes and behaviour concerning CVET. More specifically, the lower educational level of the respondents from the aeronautics sector, which might have indicated a certain lack of motivation, actually does not seem to affect their overall willingness to learn, at least as far as formal learning activities are concerned. This result might possibly be interpreted as the effect of a particular attitude towards education and learning, namely, a pragmatic or reactive orientation in which learning activities take place primarily as responses to concrete and practical needs rather than being intrinsically motivated.

In a comparative perspective, the striking thing here is that the availability of, and the encouragement or requirement to take, relatively high quality formal CVET provision on

on a regular basis means that participation in formal training activity effectively becomes a non-issue at the individual level. It is seen as an integral part of occupational identity: formal training has a useful role to play in professional updating. Regular participation in formal CVET is regarded as natural rather than exceptional for technical workers in these fields. What may be of interest here, however, is how participation in formal CVET inter-relates with other forms of learning and their effect upon both individual development and organisational performance. More information on this issue may be gleaned from looking at case studies in the two sectors (for fuller descriptions of the case studies see Grollmann *et al.*, 2005).

3.3   Aeronautics case study

In this case study, the main focus was on formal (training) and more informal learning activities, but contextual information about the company was also collected. The case study company was an aeronautics SME specialising in the maintenance, repair, sales and chartering of small airplanes and private jets (usually for business use with a maximum of up to eight seats). Since 2003 the company also has a workshop specialising in flight electronics (avionics) at Bremen airport, taken over from a competitor, who went bankrupt. According to one of the owners there is only one competitor in Germany specialised in the same business field. The most substantial part of the revenue is generated through the sales department. However, an infrastructure for continuously servicing clients in technical and maintenance matters also contributes to revenue. Altogether the company employs 86 persons, of which 6-7 are apprentice aircraft mechanics (*Fluggerätmechaniker*). In addition the company has just introduced apprenticeship training in the field of warehousing.

Broadly clustered the technical staff (aircraft mechanics) can be divided into two groups: concerned with quality supervision (30%) and shop-floor mechanics (70%). The retention rates for employees staff is very high. Business activities are strongly determined through requirements of the specific vendor and the regulations of the Federal Aviation department. The high skills necessary to work in this sector lead to comparatively stable employment perspectives. Work on the shop floor is polarised into repair and maintenance and quality supervision, which itself is strongly determined through safety regulations of the aircraft business. The main strands of activities of the technical staff are: technical control, maintenance and repair and quality supervision and auditing.

Initial VET plays a significant role for entering work in this particular field. It is strongly shaped by the high safety regulations. The apprentices are not involved in work processes for the first year of training, which is spent in the learning lab, where they learn the fundamentals of metal engineering. It takes three and a half years to complete an apprenticeship in aircraft mechanics. After the first year the apprentices become involved in real work assignments and gradually play a larger role in technical control and maintenance. Only from the time of completion of apprenticeship are they allowed to sign their work themselves. Besides the apprenticeship training provided, the company also hosts the final examinations of the regional apprenticeships in the aircraft mechanics sector. According to one of the owners, only two or three out of ten apprentices become real candidates for further employment within the company. This aspect is mainly due to the higher educational aspirations of the apprentices or just because the company is not

interested in their further employment. High educational achievement and more likelihood of a commitment to occupational progression are the basis for the company preference to employ students of the *Realschule* (who leave after 10 years of schooling, without the entitlement to higher education that is accorded to those, mainly from the *Gymnasium*, who complete the *Abitur*) for their apprenticeships. The company seeks to retain them by facilitating them in gradually up-dating their knowledge.

In general, there is no formal system of Human Resources Development (HRD) or guidance with regard to CVET in this sector. The main strands of relevant CVET for the engineers (skilled worker) are regular vendor specific courses, when there is a new product line launched (new planes and new engines) and courses for the acquisition of supervisors' licenses (Type A and Type B) issued by the federal flight agency. Typical courses related to the introduction of new plane types take 14 days and cost 4.000 €, but together with travel and opportunity costs makes 10,000 € per individual on the course. Some of the engine courses are provided free by the vendor, but other costs have to be met by the company. There were very few cases of CVET having a more general focus, such as on communications or (technical) English. In former times this was more usual, but now being able to communicate effectively (including in English) is demanded as a necessary pre-requisite for employment in the sector. The technical courses are run by companies specialising in aircraft technical training. Sometimes logistical problems arise, because supervisors with the same competencies (in the legal sense of the term) cannot visit courses at the same time, because there are no substitutes available within the low number of staff. Because of licensing requirements and the fast technological change, mechanical engineering in the aeronautics maintenance sector can be regarded as a learning intensive sector. Information on CVET courses is mainly gathered by the supervisors and senior technicians themselves. In addition, the possibility exists for mechanics to put their wishes onto a list and wait for an opportunity to enrol on their chosen course.

Alongside such formal development, learning is also seen as integral to work for aircraft mechanics. Learning is described as a self-steered (self-directed) activity, especially for the diagnostics and troubleshooting part of the job profile. A fundamental principle in diagnostics is to start out with the least cost-intensive possible solution and if that does not prove to work then gradually move on to more sophisticated, and at the same time, more costly possibilities. One interviewee described an often used strategy was to go home in the evening and then, sitting at the computer, search the manuals for a possible solution in order to be prepared to advise the colleagues the next morning.

While the aeronautics maintenance sector is a very learning intensive and learning demanding field of work, this is not reflected in the educational credentials of the employees working in the sector. Rather the commitment to learning is realised through a constant process of learning in and parallel to work processes. That continuing learning processes in parallel to work processes are evident reflects a necessity to perform well in the job, due not only to formal reasons (safety regulations and fixed competencies in the legal sense of the word) but also to the very fast rhythm of technological change within the sector. Due to the flat hierarchy within the company, a particular individual commitment to the job, over and above what is formally required, is a necessary pre-condition to turn

performance in the learning intensive work into personal advancement within the company structures. The company manager looks for a 24/7 commitment, and he illustrates this with reference to a particular employee:

> *'He is one of our best men. Even though he has a family with four children, I can always call him, he works weekends. The best: if there is a repair case in Düsseldorf, I just sit him in a plane he flies there does the repair, signs it, issues the release certificate and comes back. In other cases I would have to send two or three staff members. You can see this is a real high-technology occupation, you can achieve a lot, I don't understand why people want to study (in higher education) necessarily. You can make an interesting career with us.'*

However, retention in the company is also quite high and constitutes an important strategy of the management since prior learning and experience of the whole staff is a key success factor for the company. Given the strong division of formal competencies between the staff, the CVET culture in this company might be called dualised (in that it has explicit company-based and education-based components), reactive and stable. Particularly for those working on technical control and supervision learning through interaction is important: much learning occurs through contacts outside the firm, including through direct contact with vendors.

There is clear evidence that all technical workers have access to formal and informal opportunities to learn both as part of and in parallel to their work. However, this does not imply uniformity – for about one in three technical workers the work is technically more complex and more learning-intensive (than being engaged in maintenance activities) and access to that work is controlled. You need to demonstrate organisational commitment, and in some cases require a 'political sponsor', as well as technical competence. Here you are moving into the field of troubleshooting and diagnostics or fine tuning and this requires additional expertise. The manager again makes clear that there is an explicit managerial interest in this process:

> *'The pilot says: 'There is that and that problem, what could be the reason for that?' Only about 25 to 50% of the staff are able to help him. The other 50% carry out the tasks, exchanges of parts etc. Not everyone needs to be skilled for everything and not everyone can be skilled for everything. [...] when it comes to our mechanics, we send them on courses based on two criteria: is he suited to do that course, who is the one who will make most extensive use of it? You can enrol into a list, but the main thing is: basically the skills and knowledge are our capital and for us it is important to have kind of a 24/7 access time to our capital and not 8/5.'*

The future for learning and working in aeronautics in this company is based on an essential continuity with past operations and working procedures. The reactive and dualised CVET culture observed in the case study is not necessarily a huge problem for 'sustainable' employability as long as there are, as at present, stable working conditions and retention remains strong. However, there are potential risks for employees: the strong tie to aircraft vendors and the increased international competition with regard to the aircraft maintenance sector. The case study company is operating to some extent in a distinctive market (small commercial aircraft maintenance), but the aircraft sales business

is presumably more susceptible to competition. Two other companies in this sector in the Bremen region have been severely affected, resulting in closure and/or redundancies. The company approach to learning and development is traditional in the sense that it relies on highly skilled labour, with clear occupational identities and exhibiting high organisational commitment.

In the longer term for the company a polarized HRD structure and a learning culture based on CVET and learning while working might risk overlooking innovation potential, for example in relation to possible competitive advantages of belonging to regional networks in the sector. There seems to be no broader strategic considerations – the vision of the future is that it will look largely like the past, only more technologically advanced. This might seem to be another example of 'skilled incompetence' (Argyris, 1990) where a company is well placed to continue on an accepted path, including delivering technical improvements, but without thinking through other strategic issues, including a broader approach to human resources development. Some companies in this sector have tried to do this, for example through support for formal educational progression for staff, over and above the accumulation of small work-related, and often vendor-specific, qualifications. For example, one company offers support for further education towards three different bachelor degrees (*Fachhochschulabschlüsse*) in electrical engineering, mechanical engineering, and business administration.

3.4   IT case study

The IT sector case study company was founded in 1908 as a supplier of office equipment and is located in the Technology Park near the University of Bremen. It is a family-owned enterprise and has about 150 employees (including apprentices). One of the interviewees characterised the company as a 'traditional enterprise in a modern branch'. It differs from many IT companies founded in the 1980s or 1990s in that the employees often have a skilled qualification having completed training in the dual system in another subject and have subsequently got involved in IT. That is the employees have moved with the company into IT, rather than being an IT start-up, and so, on average, have stayed in the company for a longer time and are older than their colleagues from other enterprises. Many of the IT workers had already completed 10 or 20 years employment with the company.

With the rise of the fourth generation in the family owned company in 1996 the management decided to concentrate their company activities in Information Technology. The company is now engaged in five business fields: IT-systems, software development, e-commerce, services and training. The company has its own CVET academy for two reasons: first in order to get new customers and second this small department is profitable. Since the IT sector crisis, the company is concentrating on core activities and core competencies, including as a computer retailer (system vendor), and therefore has sold some parts of the company. The services the company offers has changed in the last few years. That is, there are fewer standardised products, but more and more tailored combinations of services, hardware and software adapted to customer wishes are being

sold. These services are often linked to intensive consultation in which the customer's wishes and the company's offers have to be aligned, calculated and agreed.

The company has a lean organisational structure that is characteristic for many SMEs. This structure enables the management and the employees to react immediately and flexibly to the changes of the market. The four levels in the company are: business management, technical management, department management and the skilled technical workers. In its business area in the Bremen region the company and is one of the largest and one of the market leaders. Due to an unfavourable economic environment participation of employees in formal CVET is more constrained by imperatives of cost-cutting and efficiency than in the years of the IT boom. The company expects from the employees the ability to organise their training participation autonomously or to find the courses necessary for their job tasks and to adapt by their own initiative to the technical innovations in their working area. Taking such action on one's own initiative is considered as one of the key competencies which is expected from employees.

The following factors influenced IT technicians in whether to participate in formal CVET:

- whether the CVET offer was concerned with specific professional problems and interests as well as being linked to customers' requirements and adjustment to technical innovations. For this the 'instructions and recommendations of supervisors' had a high significance, as they could be aligned with the realisation of some of the company's strategic objectives concerning quality, efficiency and customer orientation.

- the IT technicians of the case study favoured especially 'advanced technical training' dealing with problem oriented and practical questions associated with their professional activities. Therefore the participation in CVET in this medium-sized company is often a result of the employees' self initiative and of negotiations with their superiors. Because the department managers are not IT specialists they trust the information of the employees when making their decisions.

- training that focuses on new qualifications and competencies, new market developments or are oriented on new standards of competitors and exceed the immediate employees' professional expertise like, for example, training on 'service project management' are normally initialised by superiors. That is, the initiative for CVET which has a strategic relevance for the company normally comes from the department managers or the company's management.

- high fees for IT CVET programmes in Germany has a marked impact on participation in CVET. Due to the high training fees many IT technicians only take part in CVET measures if the company bears the expense. However, in the company CVET strategy reaction to high fees was ambivalent. On the one hand, the company demands its employees take part in regional seminars for reasons of cost. On the other hand the company is prepared to accept high fees for strategically important training for key employees.

- there was a clear link between age and participation in CVET. In the case study company the IT technicians who were more than forty years old were particularly active in participation in formal CVET. Due to their particular professional

learning experiences and attitudes they had a stronger affinity to formal learning arrangements than their younger colleagues. One reason could be their mostly traditional learning socialisation in the dual system.

- The case study results also support the common correlation between company size and participation in CVET. In connection with company size additional factors like CVET budgets and 'cultures of formal learning' become visible. That is, in larger companies there is often a combination of factors that are supportive of CVET, e.g. the existence of established CVET departments which have deliberate strategies and budgets for CVET as well as the ability to motivate employees to take part in CVET measures. On the contrary, smaller companies due to lower financial and personnel resources often do not have the ability to support the engagement of skilled workers in CVET systematically. In this context it was noticeable that the IT technicians in smaller companies seemed reluctant to compensate for any CVET deficits by concentrated engagement in self-study. They preferred to update their knowledge in a less systematic way.

- while the sector survey showed many IT technicians viewed CVET as an instrument to realise their occupational career aspirations, the case study interviewees were less sanguine and did not perceive any direct relationship between CVET and career advancement. Above all the flat company hierarchies in SMEs confine career advancement chances.

- IT technicians seemed to believe that certificates are most apt to fulfil the need for professional appreciation of employees with lower school leaving certificates, and their relevance for technicians is questionable as work performance takes precedence.

- all respondents acknowledged the importance and relevance of informal learning for IT technicians. It is evident that especially in the IT sector with its high speed of innovations and short product cycles new knowledge and competencies cannot exclusively be acquired by participation in CVET measures. Therefore it is not surprising that the IT technicians estimate the relation between informal and formal learning to be four-to-one.

3.5   Learning while working in the IT Sector

That a majority of respondents learned their skills for the job on-the-job or through self-study is partly a reflection of the fact there was formal initial VET was not established, until IT training profiles were introduced in 1997. Some experts speak of there being about 80% of non-traditionally recruited staff in the IT Sector. Additionally, a new CVT system (IT-CVT) intended to be seamlessly connected to the initial occupations is ready for implementation. Although there are no results yet, some CVET experts have the opinion that the new occupation specialists are not directed to the needs of SMEs and work-processes. However, other CVET experts see those occupational specialists functioning mainly in an accreditation system of previous learning of those who did not directly enter the IT sector through either occupational training or with a relevant academic degree. Nevertheless, when there was a peak in shortages of skilled workers in the IT sector,

continuing education and training was one of the predominant strategies, alongside increased overtime work, used to remedy the situation (Falk, 2002).

One way of learning if you are engaged in challenging work is through dealing with day-to-day problems in the everyday work process (see Boreham, Samurcay and Fischer, 2002). IT technicians made frequent use of the Internet and online-help systems, but also drew upon help from peers and technical handbooks, as well as participating in team problem solving activities. The use of Internet forums as a collaborative way of solving problems could be especially important for those with wide job profiles in SMEs, since here the experts can not always draw on collegial experience and knowledge. Through factor analysis five different approaches to solving problems could be identified, if you became stuck and help was not readily available from colleagues. These involved using general sources and media; product specific sources; professional contacts; conducting experiments as to what might work; and using contacts from outside the firm.

Even though most IT technicians have not been through a formal apprenticeship, they still have a strong sense of occupational identity. Indeed engagement with and identification with the community of practice was important in helping technicians cope with the challenges of their work, and they thought it was important to support colleagues and being a member of a team and wider community was also valued. Positive attitudes towards learning for work and recognising the value of staying up-to-date were almost universally valued.

3.6   Conclusions

The studies have shown that there is high participation in CVET and positive attitudes regarding CVET in both sectors. In the IT sector CVET participation is correlated with company size, age and is linked to higher job security and less pressure of time. Such working conditions are more typical of bigger companies rather than SMEs. Furthermore bigger enterprises with CVET departments and better financial support for CVET facilitate participation of employees in CVET. The correlation between higher participation in CVET and age could have its roots in older workers experience of a 'dualised' learning culture and their consequent affinity for formal learning.

In this context a policy recommendation could be that financial support for CVET measures and guidance about CVET opportunities could be targeted at employees from SMEs because these employees and their companies often do not have enough financial and time resources to take part in CVET courses. The co-operation of companies and networks of enterprises with the objective to identify and to provide suitable CVET measures could improve the situation.

The individual motivations with regard to participation in CVET vary. Professional advancement aspirations and client-orientation play a bigger role in the IT-sector. In the IT-sector the important reasons for participation in CVET are immediate job demands, the need to widen the professional horizon and an orientation towards career progression. The IT case study has shown that recommendations of superiors also could play an important role for participation in CVET. As the most important reasons for non participation of IT technicians from SMEs in CVET we could identify the high costs, the low time resources and the absence of what they regard as adequate CVET measures.

Especially the case studies demonstrate that with regard to the content on training and individual learning in the case of both companies, highly specialised technical skills and knowledge play a significant role. Because of the more multiple purposes of learning in the IT-sector, learning content goes beyond the instrumental orientation of the aeronautics case, such as is illustrated through the 'project management course' in the IT case. In this context another finding of the online sectoral study is that there is a significant negative correlation between the size of the enterprise and the variety of tasks the employees undertake. That is the bigger the enterprise, the less varied are the tasks the employees have to cope with. ICT technicians value a mix of more generic training, on for example project management, and highly specialised 'advanced technical training' courses to improve their ability to solve problems they meet in their professional tasks.

That is, there is a need to focus upon the development of hybrid skills, not just focus on technical skills development alone. Hybrid skills refer to the ability of people to harness technical skills in support of business development. In this context a policy recommendation could be to support programmes with an 'entrepreneurial education' component as well as specialised technical training for employees in SMEs. That is courses should provide, on the one hand, knowledge to solve immediate and specific professional tasks and work process demands and problems. On the other hand, such courses or learning arrangements should also convey more strategic and generic skills such as for the better implementation of projects, such as time management, knowledge management and resources management.

In general, the respondents of the quantitative studies in both sectors view the quality of CVET courses positively. However, the IT technicians from the case study company who were looking for provision with high practical relevance and grounded in experience to help in looking for answers to concrete job problems were more critical of the value of CVET measures. They thought that CVET teachers often did not have a close feeling for professional reality and had little practical experience. The critical stance on some of the courses offered within the IT sector could be symptomatic of the lower degree of professionalisation of the IT sector as compared to the aeronautics sector which can build on stable structures within a long vocational tradition. In this context the policy recommendation is to establish a quality assurance system and to ensure that teachers in IT-CVET measures continuously strive to enhance their own practical experiences.

The study of two sectors shows that CVET certificates play very different roles. In the aeronautics sector, certificates are mandatory to accomplish distinctive operations on aeroplanes. But in both cases certificates brought in from the external 'training market' play only a weak role. Documented work experience is far more appreciated in both cases but especially in the IT sector. The IT case study has shown that for a high skilled technician in the IT sector certificates play nearly no role or even a negative one. The reason for this negative response is the explosion of vendor qualifications, like the 'pseudo certificates' issued by companies like Microsoft. Therefore a huge list of such certificates can even have a negative effect in an application process, and both IT technicians and managers of enterprises are interested in documented biographical real work experiences. That is contained in detailed reports about their performance in enterprises. From a policy perspective in order to get back to greater recognition and a higher acceptance of

certificates it is necessary to map out higher standards and to introduce more sophisticated assessment for the key aspects that underpin effective performance.

Both the quantitative studies and the case studies have highlighted the important role of informal learning in both sectors. Especially for the IT technician 'on-the-job' learning and 'self-study' is very important. Most of their professional knowledge they acquire by learning 'on-the-job' and therefore the ability to engage in self-directed learning for an ICT technician is vital. On the other hand, especially the case studies have shown the significance of participation in the initial training system for shaping lifelong learning processes take during the career in specific sectors. But initial training in the German 'dual system' emphasises formal learning processes. As a result of this orientation in the 'dual system affected' aeronautics sector we can observe a more 'reactive learning' orientation. That is supervisors' directives to take part in mandatory CVET measures play an important role. From a policy perspective, because of the high importance of informal learning in the IT sector and the increasing importance of self-directed learning the significance of self-study and self-directed learning should be emphasised more in the initial training system.

Finally, the online survey highlighted that many IT technicians were unaware of the new 'IT CVET system' and there was some scepticism as to whether the IT specialist profiles fit with the broad professional tasks and work processes of IT technicians. The new 'IT CVET system' is adapted to the operating processes of the larger companies (e.g. Deutsche Telekom AG) and their specialised job profiles (Grunwald and Rohs, 2000). In contrast to larger firms SMEs need all-rounder. Therefore the CVET needs of IT technicians in SMEs are not well served by the new 'IT CVET system'. Additionally, there is a great scepticism on the part of employees and managers in SMEs about certificates. A policy recommendation in this context could be to simplify the new 'IT CVET system' and to enrich the examination of IT specialists by CVET elements and modules which are more valuable for SMEs and their employees. Also the high differentiation of specialist profiles should be reduced.

3.7   Comparative perspective

The experience of case studies in Germany as well as Greece, Italy, Portugal and Spain shows that successful companies with an explicit commitment to learning and development (for technical workers) exhibit a number of common characteristics:

- Significant learning is embedded in everyday activities because of the structuring and organisation of work

- Significant learning occurs as a result of systematic reviews of everyday performance and the problems encountered and through a commitment to collaborative resolution of those problems

- There is an expectation that technical workers will engage in self-directed learning (learning from the Internet and e-learning is becoming important in this respect)

- The focus upon embedded learning is complemented by allowing access to formal training provision too

- Workers recognise that they have a responsibility to keep professionally up-to-date (and not to do so would have negative consequences for them as well as the company)

- Learning from colleagues is explicitly encouraged and facilitated.

The behaviour of the case study companies in the two sectors in Bremen, however, drew attention to the role that formal VET provision can play both in professional updating and in shaping attitudes more genrally towards continuing learning. As with some of the Italian cases, however, there was also an example of 'skilled incompetence' (Argyris, 1990) by one of the case study companies, where the focus upon technical development meant they neglected more strategic considerations, including plans for the professional growth of staff and opportunities to reflect systematically on their ways of interacting externally.

The breadth and depth of the German project investigations enable us to add further to our understanding of the response of individual technical workers working within SMEs to the challenges of learning, development and performance improvement. In particular, do the German findings align with those from the Italian project highlighted previously. The two sets of findings will be explicitly compared in considering the influences on technical workers' desire for learning and development:

- In both countries 'learning by interacting' through interacting within communities and networks is a fundamental way for constantly re-building personal cognitive approaches both to specific issues and re-constructing the sense of the whole work experience. Technical workers were often engaged in a wide range of networks that helped with different aspects of their work-related learning and development, only some of which were explicitly linked to the organisation for which they worked. On the other hand, in some settings access to a broad set of interactions was restricted to a particular group of technicians, whose opportunities for learning as part of their everyday were consequently much richer than those whose work and contacts were more restrcited.

- It was noticeable that in both personal and explicit company-linked work activities the search for knowledge was broad, going well beyond just development of technical skills. The search did incorporate aspects of technical know-how (how to apply technologies), but also involved know-what (where and when technologies and knowledge could be applied), know-who (not just in relation to customers but also an active search for people who would be valuable as members of a personal network), and know-why (a fuller understanding of phenomena and processes, including in some cases a deeper scientific understanding). This appeared to be essentially an individually driven activity in many of the Italian cases, whereas in the German case study companies the workers also had a strong attachment to their occupational identities (Berufe) and this meant that they thought it important that they kept up-to-date and had a broad understanding of their field. Indeed the low value given to accreditation of small fragments of technical knowledge as in vendor qualifications in IT could be seen as part of the belief that what mattered was holistic performance as a skilled technician.

- Technical workers seemed to be well aware that learning does not grow only 'by doing' (i.e. accumulating experience in repetitive processes) or 'by using' (i.e. gaining incremental abilities in using machines and devices of different kinds), but there were also advantages to a more systematic approach to learning and development, whether this utilised some or all of the following: the systematic exploitation of the web, participation in specialist networks, relationships with technologically advanced customers or colleagues, more general participation in the local innovation system, or using opportunities for formal education and training. The German technicians were more likely to use formal provision, but in both countries advanced technical training was particularly valued.

- Learning from others with acknowledged expertise is sometimes facilitated through particular activities (e.g. work shadowing), sometimes through explicit knowledge development and sharing activities and at other times is built into the organisation of work activities (e.g. in the construction of project teams). In the German companies learning from others was built into the fabric of formal training arrangements, most obviously but not exclusively through apprenticeship.

- Collaboration was deemed to be a support in a wide range of situations, a natural environment for informal exchanges of information and knowledge, and a stimulus to enrich one's competencies. Being a member of a team and/or of a wider community of practice was almost universally valued. Indeed in the instances where individuals were trapped in low quality jobs one of their major grievances was that they had few opportunities to collaborate and this restricted further their opportunities for personal development.

- Much learning undertaken by technical workers is concerned with 'sense making' (both in relation to techncial processes and work process knowledge more generally). That is, developing a 'vision' of how work process knowledge fits in their work activities and those of the company more generally is an important driver of learning. Technical workers often want to make sense of their experience of work as a whole.

- Recognising the importance of work process knowledge, many workers recognised both the importance and the limitations of informal learning and looked for a 'methodology for knowledge development' that would help them achieve a more coherent and comprehensive understanding of company activities and their own practice. This often linked to more formal education and training provision and was seen as helpful in giving a basis for continuing learning and development.

- The above could be interpreted as a desire for learning through working and interacting and self-directed learning leading to contextual understanding to be interspersed with periods of more formal learning and development that allow for more considered reflection, a linking (and integration) of what has been learned by experience and informal means, and more rounded professional and personal development.

- Guidance services might be of great help to technical workers making their way through (or even out of) their chosen field. Time and again it became clear that

individuals would have appreciated some guidance and support when making decisions that were often strategically important for their own career development.

- The need of an acknowledgement of acquired competencies, even at an informal level, was strong. In some cases this was seen as a signal for evaluating how much interest the company had in your development. In this way, the offer of participation in some formal education and training offerings was appreciated (even if the provision was not necessarily that good) because it was a tangible sign of the company's health and that it valued you as an employee.

- The extent to which the work environment offered substantive opportunities for learning and development. This phenomenon can be visualised as a continuum. The 'haves' are technicians working in organisations that in some ways are 'learning organisations' where competence development is intrinsic in the functioning of work relations and supports the emergence of acknowledged professional identities and/or they have regular access to opportunities for learning and development in formal CVET provision. The 'have-nots' are operating within a low quality work environment, at risk not only in terms of job security but also exposed to more or less radical isolation from competence development and from possibilities of self-promotion through self-learning. Somewhere in between are those technical workers working in organisations where opportunities for learning and development, either through work, interaction or CVET, are unevenly distributed. In these cases managerial judgements on your organisational commitment can be critical to your opportunities for further learning and development.

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4. Technical workers working and learning in companies and networks in England

4.1 Introduction

So far our analysis has ranged across the responses of individuals and companies, mainly SMEs, to the challenges of learning, development and performance improvement in Germany, Greece, Italy, Spain and Portugal. This has covered contexts where formal vocational education and training systems are relatively under-developed, and in the case of Germany where patterns of learning in SMEs can be situated within well respected formal VET provision and expectations that each technical worker has a clear occupational identity (*Beruf*) to which he or she is attached. So is there anything else missing in our analyis or should the English examples just act as a check against the emergent findings from the other five national contexts. Well so far it is striking that the unit of analysis has either been the individual technician or the SME. However, individuals stressed time and again that collaboration with peers and colleagues was important if you were to understand their approach to learning, development and performance: work-related learning has a very strong social dimension.

What is missing therefore is a sense that SMEs too may be acting collectively and that we need to understand more about their positioning within supply chains and other networks and how this impacts upon our understanding of learning, development and performance within SMEs. The results from the English project can shed some light on the effects of interaction of companies in patterns of learning in SMEs and how individuals and groups can learn from processes of inter-organisational learning in supply chain networks in engineering. The other area where it might be possible to add to the emergent analysis is through a consideration of some further individual life histories, to complement the Italian cases, in order to illustrate different types of attitudes towards learning and development in the ICT and engineering sectors. The intention here is therefore is to draw out key themes that extend or deepen the existing analysis.

4.2 Context: learning and working in engineering and ICT

Views of employers

Key findings from the sub-regional survey (in Coventry and Warwickshire) relating to technical workers' participation in CVET and learning indicates that the local manufacturing base, particularly in engineering, remains important and employs over a quarter of the workforce. Eleven per cent of the workforce consider themselves to be employed in ICT companies (see Brown (2004) for further details). Vacancies among skilled trades occupations were disproportionately likely to be hard-to-fill, with technical skills being in particular demand. Where workplaces experienced hard-to-fill vacancies they had a substantial impact on organisational performance, including difficulties meeting customer service objectives; quality standards; delays developing new products and services; and increased operating costs. The main responses to having hard-to-fill vacancies were to increase recruitment advertising; expand recruitment channels; increase salaries; and increase training (in 40 per cent of workplaces).

Approximately 20 per cent of workplaces reported that they had a skills gap, that is a gap between the skills possessed by staff and those required to meet the needs of the business. Where staff were not fully proficient this was mainly due to a lack of experience in those recently recruited or a failure to develop and train staff. The impact of staff not being fully proficient was much the same as for hard-to-fill vacancies: difficulties meeting customer service objectives or quality standards. Over half of those employers who had staff who were less than fully proficient had responded by providing more training. About a third of workplaces had training plans and about a quarter had a training budget, with the average training spend being £10,000 a year. The incidence of any type of business, HR or training plan increases with the number of people employed at the workplace. In the preceding 12 months 63 per cent of employers reported that they had arranged or funded either on-the-job or off-the-job training for their staff; this is up on the 55 per cent reported in 2001 and 47 per cent in 2000.

Respondents were asked about the barriers to providing training; 36 per cent said that there were no barriers. The most frequently cited reason was the cost of training (17 per cent of all workplaces) which was mentioned more often as a reason by those that actually provided on- or off-the-job training compared to those not providing either form of training. The only other significant responses related to lack of time to source training (12 per cent), or where the workplace could not afford to allow staff to take time off for training (12 per cent). Job specific training, followed by health and safety, new technology and induction training were the most commonly provided forms of training.

Overall the local economy continued to perform quite strongly and barriers to further growth were more likely to be related to recruitment of technical workers than the utilisation of the skills of those employed. Where there were barriers to company growth these were likely to be related to the need for product or service innovation. This means that training was likely to be at most a possible second order issue, following on from changes in product markets or in manufacturing or service processes. Only two per cent of employers considered that staff not being interested in developing their skills was a barrier to providing more training. Certainly for skilled technical workers individual willingness to participate in training was a non-issue. Cost of training, lack of management time to source training and pressures of work that meant that staff could not be released for training did, on the other hand, act as significant barriers to the provision of more training. It should be remembered, however, that most employers considered that their employees were adequately skilled to fulfil their current range of work activities.

From the survey of employers in Coventry and Warwickshire it was very clear that employers required increased levels of technical (practical and ICT) skills, although for technical workers these may be allied to the need to improve other skills such as communication, customer handling, flexibility and personal skills. Employers reported there were barriers to providing more training but they were not linked to staff attitudes: lack of interest from staff was consistently seen as of little importance. The barriers to providing more training were more likely to be the cost of training; lack of time to source training; or where the workplace could not afford to allow staff to take time off for training. The key point here is that the reasons technical workers do not participate more

extensively in training provided by their employers are much more likely to relate to supply, cost and management issues than individual factors.

Continuing vocational education, training and learning in the IT industry

Occupations in Information and Communication Technologies (ICT) range widely from those requiring very specific in-depth technical knowledge and expertise to others where a broader technical ability is needed alongside good interpersonal skills or expertise in specific applications areas. ICT skills are used in both the development of ICT products and in their application across a wide range of services and industries. Given the pace of development in the industry, there are significant changes taking place in occupational and employment structures for people working in the ICT sector. These were mapped through an Assessment of Skills Needs in Information and Communication Technology that took place in 2000 (Connor *et al.*, 2001).

Firstly, there is a high proportion of small companies in the ICT sector. Larger companies, however, account for the majority of the workforce. ICT dedicated businesses, establishments in electronics and telecommunications, are likely to be larger than those in computer services, whilst data processing and data base companies and the new media and web design companies tend to be much smaller – often micro businesses. Secondly, significant numbers of particular groups of ICT staff are self-employed or work as independent contractors. Job turnover is significantly higher than in other occupations (Connor *et al.*, 2001).

When it comes to the organisation of work, employers seem to be trying to achieve a balance between autonomy and control. There appears to be differences as to the scope of autonomy and responsibility given to employees: that is, an individual may be given autonomy but within a relatively narrow area. In other cases the autonomy is tightly constrained by the nature of the work and the pattern of work organisation: for example, as a member of a very large team working on software development. Elsewhere considerable autonomy may be given to teams as to how they organise their work and achieve their goals.

It is also interesting to note that there are a couple of 'classical' systems differences between the operation of UK labour market and, for example, the German labour market that applies particularly strongly in the ICT sector. In the UK an important focus is upon learning while working through responsibility in the job itself, whereas in Germany much greater attention is given to preparation and learning for responsibility through a comprehensive programme of initial training. Another crucial difference is that frequently moving between employers is much more common in the UK than in Germany. In the UK context such mobility means the transfer of skills and knowledge, including tacit knowledge, is facilitated through staff often changing their jobs. (Mason and Wagner, 2000).

According to Connor *et al.* (2001) the main gaps felt by ICT employers were:
- general IT user skills – mostly, but not significantly so, in the non ICT dedicated sector

- general awareness of development in IT and telecommunications industry – particularly among larger establishments

- problem solving

- oral communication skills

- customer handling skills / customer service.

Mason (2000) argues that that there are two major skills deficits among ICT professionals. The first is in general IT systems and competencies in areas such as networks and operating systems combined with the inter-personal communications and team-working skills required for effective interaction with work colleagues and with customers. The second is in IT 'consultancy skills' – defined as a hybrid skill set combining up-to-date technical knowledge with the capability to 'understand other people's businesses' and who could therefore take responsibility for the design of systems that will meet clients' IT needs and networking requirements.

Further training organised by the employer may seek to develop the skills of their workforce - both their technical and 'soft' skills of communication and teamwork. Much attention is given to learning while working. However, companies vary greatly in the extent to which their regular working arrangements provide a rich or poor learning environment. Similarly, in some cases training is aimed at improving only technical skills and in others is part of a programme offering wider learning opportunities. The latter can depend on the size of the companies as large firms have an advantage in being able to offer a greater range of formal training opportunities, as well as, in some cases, a structured development programme. The latter may be associated with work on a range of projects and/or in a variety of departments or contexts.

Generic skills are seen as almost universally important if working with ICT and Connor *et al*. (2001) in their UK assessment of ICT skill needs identified three main themes. The first is that to develop or operate effective ICT solutions, ICT staff increasingly have to combine a high level of technical skill with the ability to work with other fellow professionals as part of a team and/or with internal and external customers to understand and meet their requirements. A second main development involves being capable of working in a rapidly changing environment, which means that attributes such as the ability to work flexibly and imaginatively are of growing importance. Finally, ICT professionals need to be customer sensitive and apply their skills in an integrated business environment.

These themes are reflected in another ICT Skills Survey (NOP, 2001) where respondents identified the importance of the following non-technical skills for working in ICT related roles:

- Problem solving – particularly for software development professionals and ICT operations managers

- Oral communication skills – of most importance in sales and training roles

- Team working skills – especially for software developers and trainers

- General IT user skills – thought to be most important in less skilled roles such as ICT support operators, administrators and helpdesk operators

- Customer handling – highlighted for sales professionals but also seen as important for trainers, customer systems support professionals and helpdesk personnel.

There is very strong demand from employers for people with technical IT skills and 'soft' skills, including abilities to work in teams and communicate effectively with customers. Those with these skills are in demand in all areas of the country and there are few work constraints on employees moving between geographical areas. People may be able to work as self-employed consultants or use the technology to work remotely (with in some cases considerable distances between where they live and work). Additionally, a culture has developed whereby many technical workers (especially graduates) expect to change employers several times early in their career, as a means of broadening their experience, applying their skills and knowledge in a variety of settings and improving their salary. Employees learn by moving from company to company, and this process also leads to a transfer of 'tacit knowledge' (Mason and Wagner, 2000).

The IT industry is very diverse as are patterns of work organisation. In working on software development in large companies there may be considerable flexibility in work to the extent of working in multi-national teams where the work crosses time zones and never stops. In some companies much of the work is now team-based, but in other contexts the dominant mode of working is still individual. The technological basis of work is changing so rapidly that this too requires a degree of flexibility in terms of willingness to update and learn new technical skills. Some areas of work also require significant creativity and this too depends upon a degree of flexibility in thinking. Some companies are offering flexibility in working patterns in order to accommodate those employees seeking more of a life/work balance.

Continuing vocational education, training and learning in engineering

In order to understand participation of technical workers in CVETL in engineering it is important to get a sense of what is happening to the organisation of work across the industry as a whole. There is great variation and some employers have embraced quite radical change. They have been changing roles and responsibilities and experimenting with different patterns of work organisation (including team working, manufacturing cells and varying skill mixes). In some cases the emphasis is more work intensification rather than high performance. Other companies are shifting from direct manufacturing to provision of engineering services and this requires changing skill sets for many employees that remain with the company.

However, there remain enormous variations in the degree of skill required of workers in different workplaces and companies. One significant difference is between companies where skilled workers are a very small minority and production is largely routine and those where more highly skilled workers play more of a role in production, support and related activities. There seems to be a clear divide between those cases where most workers are being given more autonomy and responsibility and those where the manufacturing process is being even more tightly controlled, with an emphasis upon cost reduction.

Jobs performed by workers with intermediate level technical skills in engineering range from those requiring very specific in-depth technical knowledge and expertise to others

where a broader technical ability is needed alongside good interpersonal skills. The increased competition occurring in much of the industry is driving changes in occupational and employment structures and patterns of organisation of work for people working in the sector. There is a strong demand from employers for skilled workers with 'modern' skill sets, including abilities to work in teams and communicate effectively. This is despite the continuing overall reductions in the numbers employed in engineering. All companies have been introducing greater flexibility in work and expect staff to accept resulting changes in patterns of work organisation. The drivers of this in some cases were because of a switch to team working, while in others it was due to an attempt to improve manufacturing practice through a focus upon continuous improvement (and on quality, costs and delivery). In some cases there was an explicit attempt to follow Japanese 'best practice' in this area, with an emphasis upon machine turn-round times, 'right first time' and so on. Changes are being driven by a desire to improve competitiveness and major manufacturers themselves have been pressurising their own suppliers, sometimes through the use of very aggressive year on year cost-downs. Flexibility in work organisation has been a major goal of employers in engineering, although there are major differences in how companies are trying to achieve this.

Further training organised by the employer may seek to develop the skills of their workforce - both their technical and 'soft' skills of communication and teamwork. Much attention is given to learning while working. However, companies vary greatly in the extent to which their regular working arrangements provide a rich or poor learning environment. Similarly, in some cases training is aimed at improving only technical skills and in others is part of a programme offering wider learning opportunities. The latter can depend on the size of the companies as large firms have an advantage in being able to offer a greater range of formal training opportunities, as well as, in some cases, a structured development programme. The latter may be associated with work on a range of projects and/or in a variety of departments or contexts.

Generally greater attention is being given to work-based learning, in relation to team-working, continuous improvement programmes, supervisory training and supply chain development. External training and qualifications are also being used either for some staff or as part of general employee development training. Some companies were making much greater use of graduate level entry for supervisory or production support positions. Companies vary greatly in the extent to which regular work activities provide a rich or poor learning environment, depending upon how work is organised, the nature of production and the size of the company. Different groups of workers may also have differential access to further education and training. Overall, employers' commitment to learning is very variable, but general competitive pressures and actions across supply chains is driving at least some learning in the workplace.

4.3 Experience of learning and working in the ICT and engineering sectors drawn from individual biographies

Extracts from three individual biographies are chosen here to illustrate different 'types' of attitudes towards continuing vocational education, training and learning that could give further insight into reasons for participation in particular forms of CVET. Three distinct

patterns of participation can be identified. These are outlined in the examples given below, and the illustrations are followed by a discussion of some of the implications of the different approaches for continuing vocational education, training and learning.

A **'classic example' of participation in formal CVET** as an important element for individual progression (in a career that involved working in both large and small ICT companies) is given by a young female graduate with an engineering undergraduate degree who started work as a network designer working on data communications in a large telecommunications company. Although this was a technician level post the company recruited graduates to these positions and offered them development programmes that would lead through to positions as professional engineers. Learning while working facilitated development of her knowledge base on data networks, both from a practical and a development perspective, and she also participated in a substantive formal training programme, that led to achievement of vendor (Cisco) qualifications on Networking. She also started on a professional development training programme, that required keeping a development log, consulting with a mentor and developing a portfolio of work that demonstrated increasing expertise. Hence her commitment to learning and development in a number of forms was very high. A couple of years after achieving professional status she became a technical consultant with a small firm of IT consultants. This is quite a popular move early in a career in IT, because it gives you experience of work in a number of different settings while working for clients. It is a way for young workers to build up their experience quite quickly. After another couple of years she wanted to update her technical expertise and she joined a very large IT company specialising in network developments. She was also attracted by the opportunity to participate in their training programme: she receives training and regular technical updating - the training can take several weeks at a time. The work again involved working intensively with clients.

It is interesting to note that she is pursuing a dual development strategy where she uses formal training to update her technical skills and learning through experience of working intensively with clients as a means of developing her communication skills. As a consequence she has the hybrid skills (high level technical skills coupled with the ability to communicate effectively in the service of business development) that are in such demand in the IT sector. The mix of bouts of formal training and learning coupled with intensive working with clients gives her very good future career prospects (in the company or elsewhere in the industry). This is a 'classic example' of participation in formal CVET being used as a basis for individual progression. It is also an example of one aspect of a 'typical' technical graduate career in England: moving between jobs very quickly. As well as learning how to apply what they have learned in different contexts, Mason and Wagner (2000) point out that this high degree of mobility helps spread tacit knowledge about working methods.

The second example could be defined as an example of where **'workplace learning is used to transform attitudes towards working and learning'**. This individual was working for an engineering Tier 1 supplier as a supply chain facilitator and his work took him into a large number of companies, especially SMEs, in the supply chain. He had worked for the lead manufacturer in the supply chain for 27 years and his most recent previous role was as a senior expeditor in the purchasing department. (Note although he

does not technically work for a small company, most of his current work takes place in such companies and his role is crucial in helping improve the business effectiveness of such companies through a commitment to learning and training allied to business development). For most of his career at the company, after his initial training, he received little formal CVET and learned most of what was required on-the-job. However, the company wanted to transform some of the work processes of companies in its supply chain. This individual was asked if he wanted to play a key role in the process as he already had good relations with a number of suppliers. To start this process he was given five days formal CVT at a workshop where he learned a number of techniques for manufacturing process improvement. This, however, was only the introduction to the process of continuous improvement, most learning would come through working in his new role as a supply chain facilitator. Learning and skill development came particularly through participation in teams focusing upon how to make manufacturing process improvements in practice both in his own plant and in those of a range of suppliers.

Learning experiences were very rich. They included learning while working in a job with considerable challenges; learning through working with someone with acknowledged expertise; learning through working in multi-disciplinary teams; learning through organised reflection and review; learning through the application of knowledge learned in CVT to work activities; learning through working with suppliers; learning through exposure to other working environments; learning by doing without any formal training (e.g. through giving presentations). This is in addition to what was learned on the 5 day course and through tutor-supported study for a formal level 3 NVQ qualification as a change agent. The combination of different forms of learning is particularly interesting in the above example. It does show how promoting business effectiveness, focusing upon improvements in quality, cost reduction and delivery, with learning and skills development as a means to an end rather than as an end in itself, can stimulate participation by small companies and their employees.

The third case, defined as a **'strong commitment to self-directed learning'**, draws on the experience of an individual who started out as an electronics engineering technician, and then changed to being an IT technician on the basis of his self-taught IT skills. He worked in both large and small companies. His lack of participation in formal CVET while working for three different employers is coupled with a very explicit commitment to self-directed learning. He qualified as and worked as an electronic engineering technician with a very large telecommunications company that experienced major job losses in the 1990s. He was then employed in a small company selling computer ancillaries, a job in which he utilised his self-taught IT skills. He was "not very good at selling, so [he] applied for a job carrying out electronics repair at a university." However, because the university found it very difficult to recruit IT technicians (pay was very low compared with the private sector), in practice very quickly nearly all of his time was spent helping install computers and problem solving. He had had

> *'experience of working with things like Excel spreadsheets and such like ... and knew quite a lot from reading (computing) magazines, I'd never actually touched a computer (technically) but I knew about it from reading and I've learnt*

programming and some of those skills plus the electronics were sufficient to get by initially.'

He had virtually no training or professional development in his role as an IT technician. He attended one short course on Windows 2000. However, generally he does not ask to go on such training courses because he does not really believe in the value of many formal courses:

'I am not convinced of the value of training courses, typically the good ones are about £350 + vat a day and it's arguable as to whether you learn anything that you couldn't have learned in a £35 book on the subject'.

There has been relatively little support, except that

'very peculiarly this year there was, centrally, the university offering support: everyone was given up to £300 to spend on personal development whether it be on courses, I like many opted for books so I bought quite a few technical books'.

He tended to be self taught and his style of developing knowledge was *"either buy books or get knowledge from scouring the world wide web nowadays".* Learning experiences were very rich. They included learning while working in a job with considerable challenges and through solving problems; learning by doing without any formal training; learning and technical updating through self-directed study (using technical books and through searching the Internet) are all evident in the above case. His non-participation in formal CVET is partly based on his values (he thinks most IT training is a 'rip-off') and his own preference for learning from books, through engagement in problem-solving at work and talking things through with people. He is someone working in IT support who is a self-directed learner, keeps technically up-to-date and actually likes communicating with and helping people and this will mean he has high employability, even if he does not participate in formal CVET.

4.4 Implications of individual differences in approaches to continuing vocational education, training and learning

The above examples illustrate that technical workers do have very different approaches to learning and development. The cases also exemplify three distinct approaches to learning and development, according to whether greatest use was made of formal CVET provision; opportunities for learning while working; or self-directed learning. Some individuals made regular use of formal CVET provision, with courses lasting from a few days to several years. The longer courses, such as Master's programmes, were often taken in an individual's own time. The second group mainly took advantage of learning while working. Indeed the interviews in both sectors highlighted the rich array of learning experiences that could be utilised if work itself was challenging. This included learning while working in a job with considerable challenges; learning through working with someone with acknowledged expertise; learning through working in multi-disciplinary teams; learning through organised reflection and review; learning through the application of knowledge learned in CVT to work activities; learning through working with suppliers; learning through exposure to other working environments; learning by doing without any formal training. The third group made use of self-directed learning that remained outside

either formal education or training and did not take place at work. Here learning and technical updating was accomplished through self-directed study, for example, using technical books and through searching the Internet. Another means of learning was through personal networks, where for example two or more technical staff from different departments or companies would regularly meet socially but also use the occasion to discuss their work. This could specifically include discussions about new developments, different ways of approaching problems or reflections upon work processes.

In practice, many people use all three forms of learning. Additionally, it was striking that some of the most successful forms of learning identified in the interviews occurred when the aim was improving business effectiveness, through a focus upon improvements in quality, cost reduction and delivery. In these cases learning and skills development was seen as a means to an end rather than as an end in itself. It was also noteworthy that such approaches could stimulate small companies to pay more attention to processes that led to significant employee skill development.

What is also apparent is that employees are active agents in how they construct their own learning and development. Employees are not just reactive to training opportunities and the strategies of trainers and managers, they may also be organisers of their own learning (Poell, 1998). On the other hand, there were also numerous examples of where, given the structure of social relations at work, learning could be seen as a collective activity grounded in working practices rather than comprising predominantly individual effort on continuing vocational training programmes taking place away from the workplace.

The social nature of work-related learning and knowledge development is perhaps most clearly evident in those cases where an individual forms a close attachment to her or his immediate work-group. This not only draws attention to the social context in which knowledge is acquired, developed and applied, but also how this influences the processes by which the individual learns. Indeed the basic structures for the interpretation of experience, although based on idiosyncratic frameworks that at the same time favour and limit the individual process of sense-making (Resnick, 1991), can themselves be shared, developed and changed through interaction with other members of the work-group (Brown, 1997). Individuals learn what type of learning will be useful to share with colleagues, and they also learn about where and from whom further knowledge could be gained.

4.5   Learning in SMEs in supply chain networks

The English case study of participation in continuing vocational education, training and learning was conducted in an engineering supply chain network (for further details see Brown, 2005). The case study was 'constructed' from the responses of three different SMEs participating in CVETL activities in the same sector of activity - in this case the companies were linked together in an aerospace engineering supply chain. The companies were chosen because they demonstrate 'good practice' in improving people's engagement in training and learning related to competence development and meeting business needs. In addition, all of the chosen companies have a significant proportion of full-time technical workers. The case study was building on the results from the survey and focus groups that highlighted the significance of supply chain learning. Interviews were

conducted with employees at different levels and this was supported by non-participant observation and analysis of documentary and video sources. The three companies involved in the case study had 60, 100 and 204 employees respectively. Because some of the key CVETL activities took place in the lead company of the learning network (a major aerospace systems supplier) interviews were also conducted with employees from that company, even though it was not an SME. This was in order to provide a contextual background for activities across the supply chain as a whole. The focus of the data collection was upon engagement in substantive learning rather than in participation in formal training per se. In this way it was possible to identify a more multi-layered approach to barriers to work-related learning for individuals and to consider a wider range of ways in which effective work-related learning may be promoted, especially for technical workers working in small and medium size enterprises. This also highlighted the interaction between formal and informal approaches to learning, skill development and knowledge creation.

Small and medium sized enterprises (SMEs) in engineering face intense pressures resulting from the strategies, tactics and operational methods of the large companies that dominate their markets, particularly where these are linked to supply chain restructuring. Yet stresses on SMEs and operational demands force them to deal continually with immediate tasks and problems, and they generally operate within extremely limited time horizons, leaving them with few opportunities to develop an overall strategic approach to their business. One focus of the engineering study has been upon organisations in advanced supply systems in the aerospace industry. The supply chains in the aerospace industry are not confined to a single region, but for the purposes of mutual learning, development and support supply chain learning networks do have a degree of geographical clustering. The three companies chosen for this case study are participating in an aerospace supply chain network based in an area straddling the West Midlands / South West English regions. Both these regions have clusters of both large and small companies that have been involved in precision engineering for well over fifty years.

The strategic and operational contexts of SMEs have been influenced by the changing patterns of innovation within supply systems for complex products in the automotive, aerospace and other engineering industries in the last decade. Recently large companies have sought to develop much stronger links with a smaller number of suppliers in 'their supply chains'. In the case chosen the supply chain is clearly driven by large firm control that is facilitated by intensive use of information and communications technologies and is used to achieve tight co-ordination over all stages of production. On the other hand, the lead company (a Tier One supplier of complete aerospace systems) is seeking to develop more of a partnership arrangement with chosen suppliers. This changing contextual background of supply chains in engineering gives an indication of the extent to which continuing vocational education, training and learning in the engineering industry needs to be considered across companies as well as within them.

The main capabilities sought in suppliers by the lead company include consistent product quality; manufacturing flexibility; continuous improvements in production methods to meet regular customer 'cost-downs'; inter-organisational capabilities to meet increasing pressure for tight integration and co-ordination of production, product design and

development and other functions across the supply chain. One example of this process is that if a company is awarded the highest supplier ranking the components or sub-systems supplied by that company go straight into the production process of the lead company without further inspection or checking. The driver of this process is an attempt to improve manufacturing practice through a focus upon continuous improvement (and on quality, costs and delivery). This was linked with an explicit attempt to follow Japanese 'best practice' in this area, with an emphasis upon machine turn-round times, 'right first time', 'lean manufacturing' and so on. Changes are being driven by a desire to improve competitiveness and the major manufacturers and tier one suppliers have been pressurising their own suppliers, sometimes through the use of very aggressive year on year cost-downs.

The aerospace supply chain learning network was set up to provide opportunities for collaborative learning and knowledge development across organisations and to facilitate improved performance within and between companies involved in the supply chain. The intention was to train 'change agents' in each of the companies who would then be responsible for learning, development and process improvement in their own organisations. The initial training and continuing technical support was provided by specialist tutors (Master Engineers) and learning support tutors who were experienced at supporting distance learners in a distributed network.

The training was designed to generate organisational and inter-organisational learning as well as individual learning and development. In particular, the focus was upon supporting SMEs in adapting to demands for increasing knowledge as a foundation for supply chain relationships, and in extending their adaptive and innovative capabilities. The intention therefore was to stimulate economic innovation in SMEs through innovative learning. The learning network was process oriented, comprising workplace teams of operators, specialists and managers, that linked eight suppliers to the lead company (a Tier One supplier of complete aerospace systems). The network functioned through learning about the core tools and skills needed to improve performance. Teams undertook 'hands-on' learning by doing, which involved problem identification and the development and testing of solutions. The companies were expected to use measurement and improvement tools designed to meet the increasingly demanding quality, cost and delivery standards of customers. It was recognised that this could also involve cultural change as the companies sought to adapt to an increasingly competitive environment.

In the network, the lead company persuaded their suppliers to identify key individuals with central responsibility for shopfloor innovation in supply management. These people, nominated as 'change agents', also followed a course on Stimulating Competitiveness in Supply Chains. They were invited to a series of one week, intensive workshops at the lead company, led by the engineering tutor together with help from the learning support tutor. In the four week intervals between workshops, the change agents applied what they had learned in a practical context in their own companies. As the course progressed, the focus shifted from work in individual companies to collaborative learning across the network of participating companies. There are obvious advantages of such a programme for the tier one company that sees rapid benefits in terms of the cost, quality and delivery performance of suppliers. There are also competitive advantages for all the companies in

the network. Students also gain as individual learners. Overall, the expectation is that the future competitiveness of the companies will be enhanced, whether they are working with this particular customer or not.

Company A is a relatively small specialist engineering company that produces specialist parts for aircraft and nuclear submarines. The company employs 60 people and technically qualified workers play a key role in the company. The person most directly involved in the 'change agent' training has for the last six years been the chief inspector at the company. Previously he worked as an inspector at the lead company in the supply chain network for 10 years. The main benefits and highlights from the 'change agent' training and subsequent application of what has been learned involved:

> *'the improvements have included significantly better Overall Equipment Efficiency (OEE); weekly efficiency monitoring; reduced set-up times (90 minutes to 30 minutes because it has been possible to pre-set machines); the introduction of a kanban system with access straight into production line of lead company in the supply chain network - we receive a fax and five days later they have the parts. The value stream mapping has proved useful, particularly in being able to concentrate our efforts on upon loss-making jobs and find out in which areas we have problems and why. For example, we focused upon one support bracket behind the propeller that often warped - this was because of a heat treatment distortion. One example of focusing upon a problem was the amount of time team leaders were spending on rectification of fabrication problems - analysis revealed the damage was being caused when the products were moved within the factory, so we now have special foam boxes to transport products. The problems can be revealed by inspection or through problems with tooling - one key question is then what it costs not to take action. It is also useful to involve more people in the work of the improvement teams - it can be particularly helpful to talk to workers and team leaders. On the other hand, we are a small company so we are conscious of the human resources being used.'*

Problems were encountered, however.

> *'The main problem was to get management to accept that these approaches were valuable in the first year. They need the OEE evidence that the approach is working. So in the first year I was a bit of a one man band - I kept getting knocked down, but I kept coming back. Improvement days, continuous improvement plans, monthly meetings have all been useful in convincing management one peg at a time. There have been no problems with the shop floor. Balancing the two roles (inspection and improvement) has been a challenge as I tend to spend one or two days a week on 'problem jobs'.'*

The technical workers quickly appreciated the value of the new techniques and were willing to learn new ways of working. In fact it was harder to convince the management:

> *'at monthly meetings I would produce charts and evidence of the improvements. For example, in our non-destructive testing unit we had a first-in first-out system, but we have adapted this through the introduction of priority cards that has*

resulted in a reduction in the lead time from four days to two days. I adapted the idea from the lead company in the supply chain network.'

One reason for the positive response from the workers was their work was less pressured, instead of always having to respond to immediate pressures and apparent crises, the flow of work was much better planned:

'we have continuous roll-out plans, whereas previously we were responding much more day to day. There is now a more regular flow to the work: with fewer large batches.'

Sustaining long-term continuous improvement could be difficult, but the 'change agent' felt that at least it should be possible to build on what had already been achieved:

'The visual aid charts have played a role in convincing the directors as has the change in the relations with our major customer that takes 80% of our work. Previously we were rated a category C supplier, but now we are category A and our products go straight into their lines as a result of increased quality and we are meeting targets of cost reductions of 30%. We use Pareto analysis, action plans and data monitoring to ensure we stay on track.'

Involvement in the 'change agent' training led to personal development for the chief inspector:

'I have become more interested in problem solving, and I have involved departmental managers more. The problem is I have my own job to do as well, but people appreciate the value of this so I can get cover for my job. I still want to carry on learning and gain further qualifications, either with the Open University or maybe go down the NVQ [National Vocational Qualification] 4 route. If I want more training I will take it a step at a time to the directors, but if I want to I will continue anyway.'

The training did not just lead to individual development, as one of the key aspects of the training was the need to facilitate the learning of others when cascading the approach within the company:

'I teach the approach to others regarding, for example the application of the 5Cs, and we also have a notice board for our achievements. Although I have had no formal training in helping others I am used to it, because I teach chess. The change agent training was the first formal training I had had since completing my initial five year engineering training - which reached the equivalent of A level standard.'

Company B is a precision engineering company that makes specialist parts that are used in aircraft sub-assemblies and in other industrial settings. It has about 200 employees, with considerable numbers of technically qualified workers many of whom work on the shop floor. The person most directly involved in the 'change agent' training had responsibility for personnel and business development. He had worked for the company for 20 years since leaving school. After completing his apprenticeship, he had worked on machines for two years and then switched to planning production. Then he was quality manager for

seven years, before combining roles as business development and quality manager for a year, prior to being given his current job. After involvement in training at the lead company he was charged with cascading the training to employees involved in production and/or technical activities in his company.

He considered the main benefits and highlights from the 'change agent' training and subsequent application of what had been learned to include:

'success in developing people: so far 54 people have been involved in business development. There have also been improvements in communications and team ethics. The improvements have included 28% higher Overall Equipment Efficiency (OEE) (sustained for over six months); the creation of multiple manning areas where two people work five machines; and machine set-up reductions from 5 hours to 2 hours that have given us extra capacity. We have had greater management involvement at directoral level and we can now measure business performance at shop floor level. The shop floor are pleased too, because they had become frustrated that their ideas had not been taken up previously. We are also working more closely with a major customer (the lead company in the supply chain network), and we have more idea of the problems and solutions of other companies. We have been swapping development ideas: for example, about ladder racking. Personally this has given me a new lease of life and a new learning focus. It has also led to recognition in my own company.'

However, introducing major changes in manufacturing processes and practices also generate problems. The main difficulties were:

'Negativity from some people: some with good reasons and some without. The latter 'well poisoners' can be very disruptive, so all you can do is concentrate upon the positive people. There is also the issue of time constraints: the fact that change does take time and the fact that there are no 'quick fixes' often leads to frustration.'

The 'change agent's' response to these difficulties was:

'to seek to educate people as to what we were trying to achieve, put much emphasis upon communication and to have my own personal objectives and mission statement. [In order to sustain medium-term continuous improvement] we are focusing upon delivery performance targets. We also have a training plan to try to ensure the momentum is maintained.'

Sustaining long-term continuous improvement was likely to be harder:

'this becomes more difficult. We do have director support and direction, not least because the company needs the financial benefits. We do though need to give greater emphasis to training and development and we should form a dedicated performance improvement unit. We could use more people in the business improvement teams. We are looking at our own suppliers too - they are at the crux of some of our own non-delivery problems. The improvements will pay for themselves if we can sustain 80% OEE.'

Company C is an aviation engineering company that makes parts for aircraft sub-assemblies and jet engine components and has about 100 employees, 55 of whom work on the shop floor. The quality manager was the person most directly involved in the 'change agent' training. After involvement in training at the lead company he was charged with the subsequent application of what he had been learned back in his own company. All employees involved in production and/or technical activities have been involved in learning, training and development associated with the attempt to introduce processes of continuous improvement.

Many of the techniques learned in the workshops and subsequent training at the lead company were applied in company C, although some required considerable adaptation. The quality manager pointed out:

> 'the improvements themselves have included higher Overall Equipment Efficiency and the analyses have shown that many of the issues raised are common. Adapting the value stream map has proved useful, as has the use of video because it produces irrefutable facts. Indeed one worker requested the video in order to show what people in the office make me do! The shop floor workers have been really involved, because it makes their lives easier and targets become easier to achieve.'

> 'The use of the measures has been important in giving people ownership and a focus for tackling their problems. We do have an awareness of the cost of maintaining the measures too. The work with the teams has meant that management have identified a number of 'rising stars' and management have included them in management development plans. This is designed to cope with skills shortages and involves eight people [technical workers] being given one day a month training for six months.'

The diffusion of responsibility for training and implementation of these practices from management to the technical workers themselves was seen as a crucial step in getting people committed to the processes of continuous improvement: 'ownership of the process is important, as is visual impact. It is also a question of delivering some improvements while managing expectations (as to the limits of what can be achieved).' Sustaining continuous improvement in the medium term is important and:

> 'involving the supervisor and the work team are crucial. So that you get a critical mass supporting the change, not just a single person. It helps if they can see 'rungs on a ladder', so that they can see where they are and what has been achieved. Of the four supervisors three have now been on the training [organised by Master Engineers]. So there are two improvement teams and a third is being established.'

In order to achieve and sustain long-term continuous improvement (CI) 'the change programme needs to be viewed as a top-down imperative and a bottom-up pressure in relation to Overall Equipment Efficiency and so on.' However, application of the CI processes was not unproblematic, not least because of the challenge of adapting 'flow' tools (most applicable to assembly line and similar processes) to non-flow processes. For example:

'the conventional value stream map would take ages to develop in our context, but we can adapt it to a product family approach. At one work centre there would be many different products, typically coming through in small batches, so it is important to look at the processes in terms of common threads. For us an order of 10 is a lot, but each component may have between 500 and 3000 features. Only 300 aircraft may have been produced, so we may have to wait 18 months before we get our next lot of 10. The average price of one of our components is £3,000 and we are working with aluminium, titanium and so on.'

4.6 Processes of learning in supply chain networks

The technical workers quickly appreciated the value of the new techniques and were willing to learn new ways of working. One reason for the positive response from the workers was their work was less pressured, instead of always having to respond to immediate pressures and apparent crises, the flow of work was much better planned: 'we have continuous roll-out plans, whereas previously we were responding much more day to day. There is now a more regular flow to the work: with fewer large batches.' Sustaining long-term continuous improvement could be difficult, but the 'change agents' felt that at least it should be possible to build on what had already been achieved. Issues about participation in CVETL can become a non-issue, where the focus is upon improving the job (and the activities may not be viewed as learning or training, but rather simply viewed as part of natural work activities). The training did not just lead to individual development, as one of the key aspects of the training was the need to facilitate the learning of others when cascading the approach within the company.

The intention of the formal part of the CVET was to encourage both formal and informal learning in the participating companies. One way to achieve this was to encourage a decentralised view of the processes of knowledge creation within the network. The focus upon SME skill needs in supply chains was the stimulus for organisational and inter-organisational learning and knowledge management across supply chains, as well as supporting individual learning. One implication of this approach is that it might be worthwhile considering a reshaping of the boundary between higher education, continuing education and training and organisational development. The underlying pedagogical idea is that there is considerable value in attempting to link processes of knowledge creation with approaches to tackling the core problems of manufacturing practice as a means of engaging learners (in SMEs) that have traditionally been difficult for formal education and training institutions to reach.

It is also clear that innovation and learning within organisations are essentially social processes. Hence within the network particular attention was given to building relationships to support innovation that went across companies in the networks. The support for change agents was itself designed so that they would be able to support process innovations within their companies. This means that the networks offered not only a mechanism for technology and process transfer and exchange of ideas about development and practice, but also a means of supporting those interested in acting as change agents in support of development and innovation. Networks, such as the one exemplified in this case study, have the potential to grow as a general means of innovation transfer in supply

chains. The network sought to give people not only access to innovative ideas, but also to give learners opportunities to shape these ideas in ways that were directly useful to them in their work. This applied particularly to the work with company change agents.

A major concern with the development of much learning in continuing vocational education and training that is supposed to support practice is that the knowledge generated is often decontextualised. This may then mean it is of relatively little use to employees in coping with many of the problems they face in practice. This potential problem in this network was overcome through focusing closely upon what the Master Engineers and those involved in the network saw as the key problems of manufacturing practice in the workplace itself. This ensured attention was given to problems and dilemmas that are central to manufacturing practice. These problems and dilemmas have significance both for individual and organisational performance. The problems are likely to contain combinations of practical concerns, organisational issues and socio-cultural problems.

The approach to process improvement using Master Engineers who ran workshops and gave practical demonstrations of how to analyse and improve work processes by following the work flow was underpinned with an inter-locking series of products that covered a range of important topics. These included workshops and support materials that examined aspects of Value Stream Mapping; Supply Chain Organisation; Team Leader Training; and so on. Details of this approach, together with case studies of their implementation are given in the DTI (1999) publication 'Quality, Cost, Delivery: seven measures for improved competitiveness in manufacturing industry'. This approach also means that employees are directly involved in processes of active knowledge creation.

This particular network also benefited from additional mechanisms for support of participants to make them more effective learners and offered support too for work-based learning as a process. The formal learner support was delivered through a system of learning support tutors and NVQ assessors, but peer support throughout the network organisation also played an important role in supporting learning and reflecting upon the learning and development that had been achieved. The substantive support for learning and development of change agents within the companies also resulted in an increase in the capacity of those companies to support other forms of work-based learning. As some of the learning was grounded in improving manufacturing processes and practice there was little doubt that this contributed to improvements in efficiency. The competitiveness of SMEs may also have been improved insofar as a consequence of these developments the companies were able to operate more effectively within supply chains. This is particularly important as major manufacturers (including Tier 1 suppliers) are expecting greater independence in ways of working with suppliers and are expressing an increasing commitment to processes of quality training (Abreu *et al.*, 2000). The number of suppliers the large companies wish to deal with has also been significantly reduced and many of these companies now explicitly grade their suppliers. Hence there is a premium upon smaller companies showing that not only do they produce quality price competitive products, but also that they are able to operate effectively within integrated supply chains.

More generally, what is of particular interest is the way that training policies are operating here. That is, formal training in process improvement techniques for technical workers are being combined with creating opportunities for the application of these processes in a

collaborative manner which in turn generates significant learning experiences at work. Indeed in many cases the roles of those undergoing training were broadened, for example through participation in improvement teams, and the organisation of work itself was often changed as a direct consequence of participation in these activities.

The benefits of participation in the network to companies and for individuals performing their work roles were evident in improved organisational effectiveness. However, what personal advantages might an individual gain from participation in the network? Also how far do personal variables and attitudinal factors come into play in decisions whether to participate in the learning networks? In relation to participation it was interesting that nearly all participants in the network had taken only rarely participated in any formal continuing vocational education and training since completing their apprenticeships. However, after participating in the network many did express an interest in investigating ways in which they could continue their learning. So involvement in this network clearly represented a different type of learning to that previously on offer and participation in the programme of CVETL acted to change the attitudes of the participants towards learning.

This means it was structural factors (the nature of the particular provision of the combination of formal CVET and opportunities for learning at work) that were much more influential than factors associated with individual agency in the decisions whether or not to participate in CVETL opportunities associated with this network. Virtually all technical workers approached in the small SMEs expressed a willingness to participate in the improvement teams. Indeed change agents reported that managers were often more difficult to convince. This was understandable in that the focus was upon processes that were problematic for the workers. Crucially participation in the improvement activities often contributed to a transformation of the workers' learning identities: as a consequence they saw themselves as willing to engage in other learning activities in future. One reason for this may have been the extent to which much of the assessment was formative, expressly designed to support their learning. Assessment was primarily being used to support learning, rather than to judge the learners. There was, however, summative assessment too and final accreditation did have a role to play for some learners who were keen to have their achievements formally recognised. Most participants were, however, interested in the process of learning and development rather than being concerned with formal recognition of their achievements.

4.7   Conclusions

One major problem faced in trying to generate interest of SMEs in learning and development (and in generating small business growth) lies with the career motivations and personal expectations of individual owners and managers. Many small firms adopt practices that are antithetical to efficiency and growth (Gray 1993). Indeed the most common small business ambition is for independence and autonomy rather than profits and growth (Gray 1998). Hence it is important not to understate the extent of learning support (and in some cases a cultural shift) required to make this approach applicable in a range of other settings. It is also clear that companies had to commit to organisational change and development before individual employees and teams could participate in this combination of CVETL activities. If individuals attended 'lean manufacturing' workshops

or similar events without a company commitment to collaborative process improvement then their whole learning experience would be very different.

On the other hand, this particular example was very successful in its context. Hence it is worthwhile drawing out four lessons for supporting learning in SMEs. **First, it is clear that the focus upon improving organisational performance contributed to improving commitment to learning at work of both companies and individuals that have traditionally been hard to reach.** Examples of demonstrable improvements in quality, cost and delivery made the link between learning and performance transparent. The support of large companies as lead organisations in supply systems was significant too. SMEs were much readier to take part in an initiative that had the explicit approbation of a major customer than if they were approached directly by providers of education and training. The participation of major manufacturers in networks proved to be powerful initial 'hooks' to engage SMEs in learning activities.

Second, once committed and after overcoming initial suspicions of learning and working with staff from other companies, there were considerable benefits from collaborative learning. The networks involving change agents from different companies working together meant that, in addition to transfer of 'good practice', they could get a 'feel' for the capabilities of the other companies and this opened up possibilities for greater collaboration (for example, in joint bidding for contracts). In the network there was value in learning as a member of a group, including from others with a variety of backgrounds - with mutual learning across hierarchical levels as well as between horizontally between departments and companies.

Third, there was a formal learning framework in the initial stages and a continuing structure of learning support - it was not just a question of bringing people together. The use of a wide range of learning methods helped improve commitment towards learning. These methods included: participation in production process improvement reviews and implementation; Master Engineer workshops; group discussions; assignments; portfolio-building; discussions with tutor; use of computer-mediated communications for discussions, document transfer and tutor feedback. It was important there were rapport and good working relationships between engineer and tutor in order that technical development and learning processes were mutually supportive. There was a key role for the learning support tutor in helping learners build and then sustain commitment towards their learning goals. The tutor role involved providing advice, guidance and information and supporting all aspects of learning. Learners at all levels greatly appreciated the support and encouragement of tutors.

Fourth, the final stage was an attempt to move towards still more expansive learning beyond the immediate context. Many of the change agents recognised the value (and potential transferability) of the skills they were developing and this contributed to their commitment towards learning. For example, the skills required in coping with the challenges of trying to implement change involved compromise and dialogue and helped hone their communication skills. The project gave people support to help them engage in patterns of thought conducive to learning. The project gave learners generally, but especially the change agents, the time and space to engage in critical thought, self-

reflection and personal development. This included opportunities for both collaborative and self-directed learning.

Overall then, the model of learning used in the network with its emphasis upon networking, knowledge creation, linking an initial focus upon performance with a progressive broadening of ideas about learning and development was particularly well suited to its context: supporting learning and development in advanced supply systems. The model of learning for technical workers, rather than the particular details of the approach, could be transferable. If the model was underpinned by corresponding commitment of effort and resources, then it could be successfully implemented in a range of other contexts. **The key lesson from Participa is perhaps that well-designed provision that integrates CVET and opportunities for substantive learning in the workplace can overcome the potential reluctance of individuals in SMEs to participate in CVETL. On the other hand, such provision does require whole-hearted commitment of the company to a process of organisational development: that too represents a substantial challenge**.

4.8   Comparative perspective

From a comparative perspective, it is clear that the findings from all six countries show that successful companies with an explicit commitment to learning and development (for technical workers) exhibit a number of common characteristics:

- Significant learning is embedded in everyday activities because of the structuring and organisation of work

- Significant learning occurs as a result of systematic reviews of everyday performance and the problems encountered and through a commitment to collaborative resolution of those problems

- There is an expectation that technical workers will engage in self-directed learning (learning from the Internet and e-learning is becoming important in this respect)

- The focus upon embedded learning is complemented by allowing access to formal training provision too

- Workers recognise that they have a responsibility to keep professionally up-to-date (and not to do so would have negative consequences for them as well as the company)

- Learning from colleagues is explicitly encouraged and facilitated.

The behaviour of the English case study companies, however, drew attention to the role that learning in inter-organisational networks could play in professional updating and in shaping attitudes more generally towards continuing learning. The English project investigations could be aligned with the German and Italian findings highlighted previously. Together the three sets of findings inform the influences on technical workers' desire for learning and development:

- In all three countries 'learning by interacting' through interacting within communities and networks is a fundamental way for constantly re-building personal cognitive approaches both to specific issues and re-constructing the sense

of the whole work experience. Technical workers were often engaged in a wide range of networks that helped with different aspects of their work-related learning and development, only some of which were explicitly linked to the organisation for which they worked. On the other hand, in some settings access to a broad set of interactions was restricted to a particular group of technicians, whose opportunities for learning as part of their everyday were consequently much richer than those whose work and contacts were more restrcited.

- It was noticeable that in both personal and explicit company-linked work activities the search for knowledge was broad, going well beyond just development of technical skills. The search did incorporate aspects of technical *know-how* (how to apply technologies), but also involved *know-what* (where and when technologies and knowledge could be applied), *know-who* (not just in relation to customers but also an active search for people who would be valuable as members of a personal network), and *know-why* (a fuller understanding of phenomena and processes, including in some cases a deeper scientific understanding). This desire for sense-making could be driven by one, or a combination, of **an individual search for undestanding, be embedded in occupational identities** (thereby influencing attitudes and behaviour) **or a function of participation in networks with an explicit learning dimension.**

- Technical workers seemed to be well aware that learning does not grow only 'by doing' (i.e. accumulating experience in repetitive processes) or 'by using' (i.e. gaining incremental abilities in using machines and devices of different kinds), but there were also advantages to a more systematic approach to learning and development, whether this utilised some or all of the following: the systematic exploitation of the web, participation in specialist networks, relationships with technologically advanced customers or colleagues, more general participation in the local innovation system, or using opportunities for formal education and training.

- Learning from others with acknowledged expertise is sometimes facilitated through particular activities (e.g. work shadowing), sometimes through explicit knowledge development and sharing activities and at other times is built into the organisation of work activities (e.g. in the construction of project teams). In some settings learning from others was built into the fabric of formal training arrangements, for example through apprenticeship, advanced training seminars or Master Engineering workshops.

- Collaboration was deemed to be a support in a wide range of situations, a natural environment for informal exchanges of information and knowledge, and a stimulus to enrich one's competencies. Being a member of a team and/or of a wider community of practice was almost universally valued. Indeed in the instances where individuals were trapped in low quality jobs one of thier major grievances was that they had few opportunities to collaborate and this restricted further their opportunities for personal development.

- Much learning undertaken by technical workers is concerned with 'sense making' (both in relation to techncial processes and work process knowledge more generally). That is, developing a 'vision' of how work process knowledge fits in their work activities and those of the company more generally is an important driver of learning. Technical workers often want to make sense of their experience of work as a whole.

- Recognising the importance of work process knowledge, many workers recognised both the importance and the limitations of informal learning and looked for a 'methodology for knowledge development' that would help them achieve a more coherent and comprehensive understanding of company activities and their own practice. This often linked to more formal education and training provision and was seen as helpful in giving a basis for continuing learning and development.

- The above could be interpreted as a desire for learning through working and interacting and self-directed learning leading to contextual understanding to be interpersed with periods of more formal learning and development that allow for more considered reflection, a linking (and integration) of what has been learned by experience and informal means, and more rounded professional and personal development.

- Guidance services might be of great help to technical workers making their way through (or even out of) their chosen field. Time and again it became clear that individuals would have appreciated some guidance and support when making decisions that were often strategically important for their own career development.

- The need of an acknowledgement of acquired competencies, even at an informal level, was strong. In some cases this was seen as a signal for evaluating how much interest the company had in your development. In this way, the offer of participation in some formal education and training offerings was appreciated (even if the provision was not necessarily that good) because it was a tangible sign of the company's health and that it valued you as an employee.

- The extent to which the work environment offered substantive opportunities for learning and development. This phenomenon can be visualised as a continuum. The 'haves' are technicians working in organisations that in some ways are 'learning organisations' where competence development is intrinsic in the functioning of work relations and supports the emergence of acknowledged professional identities and/or they have regular access to opportunities for learning and development in formal CVET provision. The 'have-nots' are operating within a low quality work environment, at risk not only in terms of job security but also exposed to more or less radical isolation from competence development and from possibilities of self-promotion through self-learning. Somewhere in between are those technical workers working in organisations where opportunities for learning and development, either through work, interaction or CVET, are unevenly distributed. In these cases managerial judgements on your organisational commitment can be critical to your opportunities for further learning and development.

- At the individual level three distinct approaches to learning and development, according to whether greatest use was made of formal CVET provision; opportunities for learning while working; or self-directed learning.

- When learning experiences were very rich it was striking the range of learning opportunities that could be undertaken. They included learning while working in a job with considerable challenges; learning through working with someone with acknowledged expertise; learning through working in multi-disciplinary teams; learning through organised reflection and review; learning through the application of knowledge learned in CVT to work activities; learning through working with suppliers; learning through exposure to other working environments; learning by doing without any formal training (e.g. through giving presentations).

- Individuals learn what type of learning will be useful to share with colleagues, and they also learn about where and from whom further knowledge could be gained.

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PART TWO:

EXPERIENCE OF USING THE ISSTAL MODEL AS A FRAMEWORK TO EXAMINE PARTICIPATION IN CONTINUING VOCATIONAL EDUCATION AND TRAINING

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5. Participation in Continuing Vocational Education, Training and Learning: ISSTAL as an analytical framework

5.1 Overview

A critical issue for sustainable socio-economic development of all regions of Europe is the ability to ensure that those who are employed have the capacity and ability to update their qualifications to cope with the continuing changes in the workplace. This requires adequate and effective policies to be designed, developed and implemented for enhancing participation in continuing vocational education and training. The PARTICIPA study aimed at analysing the structural, organisational and individual factors that influence employees' decisions to participate in continuing vocational education and training, and looked at employees using technical skills from industrial small and medium size enterprises in Germany, Greece, Italy, Portugal, Spain and the United Kingdom. The study was theoretically framed by the Interdisciplinary, Sequential-Specificity, Time-Allocation, Life-span (ISSTAL) model of social participation (Smith, 1980), as the ISSTAL dimensions appeared to relate to participation in continuing education offerings and engagement in informal learning processes. The study used a cross-sectional survey approach with an instrument specifically developed to collect data from a random sample drawn from a population constituted by employees using technical skills from industrial small and medium size enterprises in specific regions in the six countries. The survey was complemented by case studies, life stories and focus group discussions intended to deepen understanding of the survey results.

Results showed that the ISSTAL model, with some adaptations, may serve as a theoretical frame to study and analyse relationships between individual and organisational characteristics and participation of technical workers in training (For further details of the research findings on the quantitative phase of the research see Brown *et al*., 2004). However, the model should be adapted in order to take into consideration competence development through learning activities outside formal training settings such as self-directed learning, learning at work, and learning supported by others. In practice, in contexts where technical work itself is challenging, most continuing vocational learning takes place outside formal training settings. Even in contexts where participation in formal

CVET appeared relevant for competence development, there was a need to consider self-directed learning as an important strategy for skill acquisition.

It is clear that, taking into consideration all the survey results, the ISSTAL model, with some necessary adaptations, mainly on aspects related to competence development through informal and non-formal learning and learning at the workplace, may be a useful research framework to identify and estimate the relative importance of the main factors influencing employees with technical skills to participate in learning job related aspects. The model may be particularly useful for investigating the take up of CVET offers by those temporarily not in employment or working in contexts where there are limited opportunities for learning while working.

In Greece, Portugal and Spain individuals' images of learning appear as particularly important influences on participation in CVET activities. On the other hand, in England, Germany and Italy structural issues around provision of opportunities for learning and training were seen as influential in patterns of participation. Across all countries technicians appeared to value training offered at the company and most technicians, but particularly those in ICT, consider that participating in continuing training and learning activities is very relevant for their future career development. Concerning reasons for not participating in training, many technicians cited the main reason being the incompatibility between the timetables of the training offers and their working timetables.

5.2   Context

According to previous studies active adults participating in educational activities were, mainly, individuals in technical professions, people with high socio-economic status and/or with higher level of education, and young adults (Brunner, Wilder, Kircher and Newberry, 1959). According to the same study, individuals' level of formal education appeared to be the more determinant factor in adults' participation in continuing training. Although carried out in 1950s, that study achieved results that appear to be very close to situation of the many European regions. Motivation specialists have tried to link adult motivation and/or attitude with participation of adults in training activities and others have based their participation research on the social psychology theory (Cross, 1981; Darkenwald and Merriam, 1982).   However, studies carried out more recently open different perspectives of research and pose new problems. For instance, workers' decisions to take training appears to be influenced by factors related to marketing of training programmes, individuals' social involvement, personal and professional difficulties, and individuals' motivation (van Tilbourg, 1989).

On the other hand, personal difficulties, lack of confidence, financing costs, lack of interest in formal educational activities have been used as criteria to establish a typology of non-participants (Darkenwald and Valentine, 1990). More systematically, Peter Cookson (USA) has been studying adults' participation in learning activities based on a social participation model known by ISSTAL (Interdisciplinary, Sequential-specificity, Time-allocation, Lifespan) developed by Smith (1980). This model appears to serve as a good theoretical framework for studying the determinants of workers' participation in learning activities (Cookson, 1986).   In fact, the ISSTAL model presents three characteristics of particular importance to theory and research of active adult's

participation in continuing training: a conceptual and interdisciplinary research frame; sequential specificity of relationships among independent variables and participation; and the perspective of time distribution across an individual's life.

Based on the above considerations, the ISSTAL model (Fig 1) appeared to be interesting model to frame the study of participation in continuing vocational education and training activities of workers with technical skills in the European regions. Furthermore, this model appeared to provide a framework to identify and understand the core components of the workers needs, to analyse the influence of their past experience, and to understand their perceived needs for future training. The main elements of the theoretical framework for this study were then based on the ISSTAL (Interdisciplinary, Sequential-Specificity, Time-Alocation, Lifespan) model of social participation developed by D.H. Smith and already used in USA by Cookson (1986) for studying adult participation in learning activities. However, the study has also taken into consideration a constellation of concepts, namely participation in organisation, knowledge as power in the workplace, flexibility in organisations, the learning organisation, the organisational culture, the professional identity, and the social and work values.

Fig 1. Model of adult participation in continuing education

LESS

MORE

RELEVANT

RELEVANT
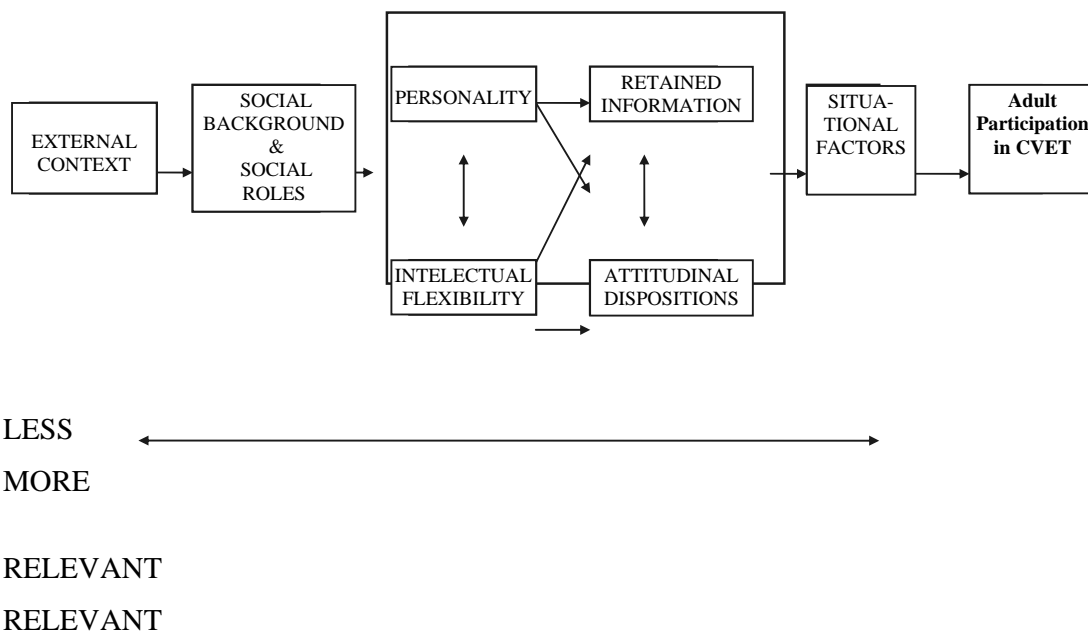
<u>Note</u>: Adapted by Cookson (1986) from Smith's ISSTAL model (1980)

5.3 Research methods

The study was theoretically framed by the ISSTAL model of social participation and used a cross sectional survey approach complemented by a set of case studies, life stories and focus groups to further understanding the participation factors. Quantitative and qualitative approaches were used in order to understand different aspects of the project inquiry. Quantitative data allows for broader generalisations while qualitative data provide richer information on specific issues allowing for a deeper understanding of the question at hand. The combination of both types of data has provided reliable and rich information about the factors influencing CVET participation. The project was designed to identify and analyse the factors associated with participation in CVET activities and to understand how those factors influence decisions of technical workers to participate in continuing training activities. The target group of the study constituted technical workers employed by SMEs in the participating regions. In each region the Information and Communication Technology (ICT) sector was investigated together with a sector of activity chosen by the region based on a set of specific factors related to the relevance of the sector to the development of the participating region. Thus, the studied sectors were:

(1) in Germany (Bremen), IT and aeronautics;

(2) in Greece, construction, food production, and telecommunications;

(3) in Italy (Rome), software development and audio-visual production (especially radio & TV);

(4) in Portugal (Alentejo & Lisboa e Vale do Tejo), agro-food and ICT;

(5) in Spain (Extremadura), building and ICT;

(6) in England (Midlands), engineering and ICT.

The study was developed in six phases:

1) Literature review to elaborate a State of Art concerning adults' participation in continuing training and learning activities;

2) Desk research concerning sectors of the activity studied in each participating region with special reference to the issue of workers' participation in continuing VET;

3) An exploratory cross sectional survey administered to a sample of the studied target-groups;

4) Analysis and interpretation of data collected through the questionnaire;

5) Conducting Focus Groups to gather additional data concerning the phenomenon of workers' participation in continuing VET;

6) Conducting a set of case studies (one/two for each participating region) and life stories to better understand results from the previous phases of the study.

In addition to these phases both in UK and in Greece, secondary data on education and training participation was analysed. The first phase consisted essentially of updating the literature review already done for the preparation of the project. This updating literature review included also literature reviews made in each participating region, namely in the non-English speaking countries such us Germany, Greece, Italy, Portugal and Spain. The second phase, developed simultaneously with the first phase, was oriented to capture information concerning the sectors of activity to be studied with special relevance for workers' participation in CVET activities. The third phase consisted essentially of conducting a survey questionnaire with a sample of employees with technical skills selected in each participating region. Administration of the survey questionnaires in each participating region was conducted in the way that each region considered most appropriate to meet specific regional characteristics and conditions.

Data captured through the survey questionnaires was analyzed and interpreted in the fourth phase. Data from databases set up with information from the survey questionnaires was statistically analyzed using multivariate techniques. Analysis considered each region and sector separately although comparisons among regions and sectors were performed based on the matrix of the main class-dimensions of the ISSTAL model. The multivariate data analysis was designed by the partnership in order to estimate relationships among the different factors and their influence in the workers' participation in the CVET activities. Workers' participation in CVET activities played the role of the criterion variable to evaluate importance of each factor in worker's decision to participate in CVET activities. In the fifth phase, focus groups were conducted in each region aiming to deepen understanding of the survey data. Each Focus Group was composed of 6 to 10 people representing VET policy makers; trainers and/or training designers; SME Managers; workers' (union) representatives; and trainees. In the sixth phase, case study data was collected by semi-structured interviews and non-participant observation from one or two cases by each participant region chosen according to specific criteria established after the survey phase. The case study aimed essentially to deepen results from the previous phases in order to better understand the phenomenon of workers' participation in continuing training and learning activities.

5.4   Data collection on ISSTAL variables

The research studied adult participation in continuing training and was designed to analyse the factors associated with technical workers' participation in continuing VET activities. For this reason, participation in continuing VET activities was selected as criterion (dependent) variable. The predictive (independent) variables were the factors assumed to be associated with technical workers' participation in CVET (Table 1).

Table 1 - The ISSTAL model: List of variables

Classes	Variables
Social background & social roles	Ascribed social roles Achieved Social roles Experience & activities Resources & resource access
Personality & intellectual flexibility	Psychological functioning Beliefs & values Intellectual activities
Attitudinal dispositions toward to	Learning & education Profession & job Training entities Training activities
Retained information	Level of participation in training Satisfaction with training Satisfaction with schooling Self-perception as student
Situational factors	Marketing of training Participation barriers Job characteristics

The predictive factors (independent variables) of the participation in continuing education (criterion variable) were framed by six classes (Cookson, 1986):

Class 1 - External context

Class 2 - Social background and social roles

Class 3 - Personality and intellectual flexibility

Class 4 - Attitudinal dispositions

Class 5 - Retained information

Class 6 - Situational factors.

The external context is related to characteristics of the local where continuing education is taking place. This variable has not been taken into consideration in the survey and case

study phases of the study. It was considered in the comparative analysis among the six regions. The social background & social roles concern individuals' ascribed and achieved social roles, life and professional experience and activities, and resource availability and access to resources. Personality and intellectual flexibility includes factors of psychological functioning, personality characteristics, and intellectual capacities of individuals. Attitudinal dispositions frame factors concerning individual's values, attitudes, expectations and intentions. Retained information includes variables related to individuals' learning orientation, beliefs, and knowledge they have about learning. The situational factors are related to temporary situations and aspects that may be associated to participation in learning activities. In the research, adult participation in continuing education, the criterion variable, is defined as the technical workers' involvement in purposive and deliberate learning through continuing education and training programmes.

In the survey phase, data was collected through an instrument specifically developed for the study. The first version of the survey questionnaire was developed in Portuguese and then translated to English. The Germany, Italian, Spanish and Greek versions were developed from the English and/or the Portuguese versions. The instrument was developed taking into consideration a modified version already developed for the Alentejo region (Portugal) of the social participation model of ISSTAL (Smith, 1980), and fitted to the European context. It was organised into five parts: (1) Social background & social roles was composed of five groups of indicators: a) Ascribed social roles, b) Achieved social roles, c) Experience & activities, d) Physical deficiencies, and e) Resources and resource access; (2) Personality and intellectual flexibility was subdivided into three scales: a) Psychological functioning, b) Beliefs and values, and c) Intellectual activities; (3) Attitudinal dispositions included items collecting three types of attitudes toward: a) Learning and education, b) Profession and job, and c) Training conditions; (4) Retained information was organised into two aspects: a) Level of participation in training activities, b) Satisfaction in relation to experienced training activities; and (5) Situational factors comprised three aspects: a) Marketing of training activities, b) Awareness of limitations and barriers, and c) Awareness of professional factors. Most of the variables were measured by scales of multi 5-point Likert-type items developed along the domain of each construct.

The questionnaire was pre-tested and evaluated in terms of validity and reliability. Validity was estimated by two ways: (1) Content validity (Multi-item scale and instrument) through a panel of judges (experts), and (2) Discriminant validity through Spearman correlation measures (Table 2). Results suggest that all of the multi-item scales have discriminant validity. The Instrument and scale reliability was examined by the Cronbach's alpha coefficient based on the data from the pre-test conducted with 25 technical workers who were not a part of the sample (Table 3). Alpha coefficient for all scales is near to the recommended 0.70 cut off. Since some changes were introduced after the pre-teste, the Cronbach's alpha coefficient was also performed on the final data base. Results indicate that scale reliability was improved after those changes (Table 3).

Table 2 - Discriminant Validity of Multi-item Scales

Scales	Personality	Attitude	R. Information	Situational
Personality	1.0000			
Attitude	0.2134	1.0000		
R. Information	0.1573	0.2471	1.0000	
Situational	- 0.1037	0.0256	- 0.0376	1.0000

Table 3 - Scale Reliability

Scales	Alpha	Alpha
Personality and Intellectual Flexibility	0.7983	0,8223
Attitudinal Dispositions	0,7371	0,8917
Retained Information	0,6820	0,7625
Situational factors	0,6752	0,7587

The common denominator for the design of the surveys carried out in the different countries was the ISSTAL model. However, within the research process of the PARTICIPA project it soon became clear that the model was more appropriate for some countries than others with regard to the overall research approach and methodology. The Spanish and the Portuguese research teams stuck to the main lines of the framework provided through ISSTAL, while the German and Greek teams operated with the model to some extent. However, the British and Italian research teams structured their research using just the topics of the model because based on their expertise on learning within the different sectors they felt that there were more appropriate research paradigms. In practice, individuals' competence development through informal and non-formal learning and learning at the workplace plays a very important role in UK and Italy. Learning is not bound to venues devoted to learning but happens or can happen incidentally as well as systematically integrated into work processes. The respective outcome, then, is the development of a skill or a competence, an ability to perform a specific function or activity necessary to fulfil one's job as an important component of vocational learning. Even so, taking into consideration all the survey results, it can be said that the ISSTAL model, with the necessary adaptations, namely the aspects related to competence development through informal and non-formal learning and learning at the workplace, may be a useful research framework to identify and estimate the relative importance of the main factors influencing employees with technical skills to participate in learning job related aspects.

5.5   Research findings

In **Germany**, the external contextual factors appear to exert the weakest influence and situational variables the strongest effect on CVET participation. Concerning social background and social roles dimension, age presents a slight positive correlation with CVET participation although when age increases orientation to progression and self-reflexivity and willingness to learn decline. In addition, the lower the position in the companies' hierarchy the stronger is the commitment to learning. With regard to traits and intellectual capabilities, it is interesting to mention that there is a correlation between intellectual capability and the wish for an individual to widen his or her occupational horizon. In the aeronautics sector the willingness to learn is as high as in the IT sector even though the level of formal education is not as high.

The cross sector comparison shows that learning is very strongly connected to immediate workplace needs. In the attitudes and disposition dimension, a 'typical' worker stance to learning appears stress its importance for job-security, that CVET should take place during working hours and the main expressed need for support in learning was through CVET measures. All these opinions correlate positively with participation in CVET and individuals who score high on the job security factor also expect a high utility from CVET. There is also a strong relation between job satisfaction and the assessment of the work environment. The level of tasks is less strongly connected to job satisfaction as routine jobs lead to even higher degrees of job satisfaction.

Social values seem to be of greater importance to respondents for the assessment of job-satisfaction than economic or subject-related orientations. Concerning gathered and retained information, although there was a strong direct correlation between assessment of the job and assessment of the different aspects of quality of CVET measures, no direct relationship between previous educational experiences and CVET participation was found. Satisfaction with CVET was found to be positively correlated with fulfilment of expectations ($r=0.511$), alignment of prior information and actual courses ($r=0.406$), and improvement of job skills and knowledge ($r=0.377$).

Quality consciousness in the aeronautics sector was not as high as in the IT field. This might however be better explained by the relative oligopoly of CVET providers than by the personal traits of the learners. Finally, with regard the situational aspects dimension, this appeared to influence most individual's decision to participate in learning. For instance, it can be said that time availability plays a critical role. The wider the possibilities to shape one's own time schedule the higher participation in CVET ($r=0.271$). Similarly, the size of enterprises also plays a significant role. The bigger the employing enterprise, the stronger the participation in CVET ($r=0.288$), and when employers pay for CVET participation rises. There are positive correlations between type of job-tasks and the ways respondents deal with problems. That is, problems in work multimedia tasks are less likely to be resolved by reference to product-specific documentation and information. Learning in work – especially in teams – plays a critical role for the aeronautic technicians; however the consciousness of this seems not to be as high as in the IT sector.

In the **Portuguese regions** (Alentejo and Lisboa & Vale do Tejo) survey findings for each class dimension of the ISSTAL model have produced similar results (see Tables 4 & 5).

Table 4 - Alentejo Region. Path Analysis: table of effects

| Predictor class	Dimensions	Total Effect	Direct Effect		Indirect Effect	
			Beta	Sig.	Beta	Sig.
Social background & Social roles	Ascribed roles	-0.152	-0.019	S	-0.133	S
	Achieved roles	0.298	0.010	S	0.288	S
	Experience	0.485	0.018	S	0.467	S
	Physical Deficiencies.	0.292	0.052	S	0.240	S
	Resources	0.361	0.062	S	0.299	S
Personality & Intellectual flexibility	Psycho. Functioning, Beliefs & Values	-0.259	-0.004	S	-0.255	S
	Intellectual flexibility	0.392	0.016	S	0.376	S
Retained Information	Images of learning experiences	0.547	0.570	S	-0.023	S
Attitudinal Dispositions	Attitudes to education & learning, to profession, to training conditions	0.284	0.235	S	0.049	S
Situational Aspects	Marketing, Awareness of limitations, Awareness of professional factors	-0.164	-0.164	S		

Table 5 - Lisboa & Vale do Tejo Region. Path Analysis: table of effects

Predictor class	Dimensions	Total Effect	Direct Effect		Indirect Effect	
			Beta	Sig.	Beta	Sig.
Social background & Social roles	Ascribed roles	0.214	0.004	S	0.210	S
	Achieved roles	0.297	0.007	S	0.290	S
	Experience	0.263	-0.006	S	0.269	S
	Physical Deficiencies.	-0.129	-0.004	S	-0.125	S
	Resources	0.297	0.006	S	0.291	S
Personality & Intellectual flexibility	Psycho. Functioning, Beliefs & Values	-0.176	0.092	S	-0.268	S
	Intellectual flexibility	0.403	0.134	S	0.269	S
Retained information	Images of learning experiences	0.513	0.449	S	0.064	S
Attitudinal dispositions	Attitudes to education & learning, to profession, to training conditions	0.219	0.279	S	-0.060	S
Situational aspects	Marketing, Awareness of limitations, Awareness of professional factors	0.195	0.195	S		

The findings seem to indicate that individuals' images of learning constitute the predictor

ISSTAL class dimension that most influences participation of agro-food and ICT technicians in CVET activities. The second most important influence appears to be intellectual flexibility for the ICT technicians and experience for the agro-food technicians. However, the agro-food and ICT technicians' intellectual flexibility are similar. In addition, those predictor dimensions present the major positive effects on participation in both regions and sectors. Effects of the other ISSTAL class dimensions in individuals' participation are also relevant with the exception of the ascribed roles and situational aspects for the agro-food technicians and the physical deficiencies and psychological functioning for the ICT technicians. Those dimensions present beta scores with approximately half value of the other dimensions. In addition, the majority of the predictor class dimensions have lower direct than indirect effects except for images of learning experiences and attitudinal dispositions. This means that the ISSTAL model, with some minor adjustments, maintains, in general, its configuration and serves for explaining participation of the agro-food and ICT technicians in CVET activities (see Figures 1 & 2).

FIG 2. THE ISSTAL MODEL (after adjustment following the survey results)
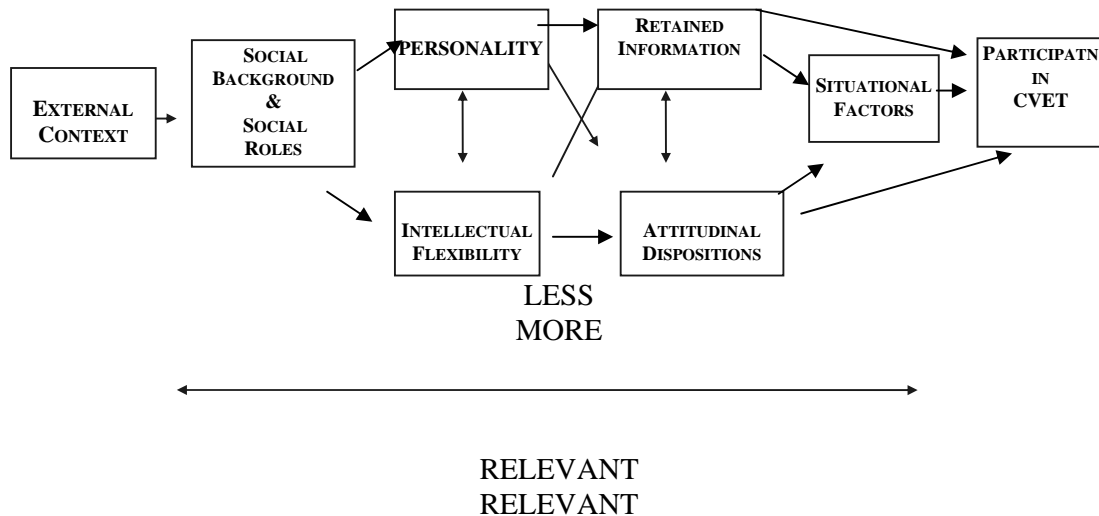
Taking into consideration the results obtained from a more detailed analysis (reported below), the adjusted ISSTAL model presents three minor differences from the original. First, the model does not have a box framing the Personality, Intellectual Flexibility, Retained Information, and Attitudinal Dispositions dimensions. Second, all Social background & Social roles dimensions have effects in Personality and Intellectual Flexibility factors. Third, retained information and attitudinal dispositions dimensions have an important direct effect on Participation in CVET activities (PCVET). Within the ascribed roles, gender has not a significant (direct or indirect) effect on PCVET; while age has a significant negative influence and living locally until age of 18 has a significant positive effect on PCVET. Hence the negative effect of the ascribed roles comes from the effect of age. Concerning achieved roles, formal education presents the major significant effect on PCVET. It is also worth noting the effects of the Professional life cycle, Professional level, and Self-reported class indicators. The other indicators are either not relevant or not significant. In relation to the experience dimension, both indicators (Characteristics of job tasks and Type of job) have significant positive effects. From the nine Physical deficiencies considered in the survey instrument, only the Oral deficiencies and No physical deficiencies indicators presented a significant effect on PCVET in the case of the agro-food sector. In the case of the ICT sector, none of the Physical deficiencies indicators presented a significant effect.

Concerning resources, Access to training was the indicator with the major effect on PCVET. However, Access to museums and Home ownership (for agro-food technicians) Access to Library and Access to Festivities (for ICT technicians) also have an effect on PCVET. As mentioned above, Retained information and Attitudinal dispositions predictor classes are the only dimensions in which the direct effects are higher than the indirect effects. For this reason, this constitutes one of the adjustments to be made to the ISSTAL model. The other adjustment is because the Social Background & Social Roles indicators

do not have a significant relationship with the Retained information and Attitudinal dispositions dimensions. Hence the effect of the Social Background & Social Roles predictor class is through the Personality and Intellectual Flexibility dimensions. In summary, the findings for ICT technicians of the Lisboa & Vale do Tejo region are very similar to those for the Agro-food technicians of the Alentejo region.

In addition to analysing the utility of the ISSTAL model, attitudes about education, training and learning and reasons for not participating in training were also examined. Technicians consider it important that trainers, apart from giving information about the subject-matter, should know how to facilitate learning. Additionally technicians consider that the training entities should have people to give information concerning training offers and training courses should be offered near work or where they live and they prefer training to be offered at the company. ICT technicians consider that participating in training is very relevant, can bring them benefits and that education is as important for adults as for children, as they do not consider that studying in adulthood is embarrassing. Concerning reasons for not participating in training, agro-food and ICT technicians converge in their perspectives. That is, technicians consider the main reason for not participating in training is that the timetables of the training offers are incompatible with their working timetable. In addition they consider that attending training offers is not a relevant difficulty in terms of family life.

In Extremadura (Spain), results for the ISSTAL model seem to indicate that images of learning, intellectual flexibility, and psychological functioning are the predictor class dimensions that most influence participation of building and ICT technicians in CVET. Taking into consideration results obtained from a more detailed analysis (Tables 6 & 7), some additional conclusions can be drawn.

Table 6 – Extremadura (Building sector). Path Analysis: table of effects

Predictor class	Dimensions	Indicators	Total Effect	Direct Effect		Indirect Effect	
				Beta	Sig.	Beta	Sig.
Social background & Social roles (1)	Ascribed roles	Gender	0.085	0.051	NS	0.034	NS
		Age	-0.440	-0.438	S	-0.002	S
		Living local until 18 years	0.306	0.226	S	0.080	NS
	Achieved roles (1)	Civil status	-0.087	-0.112	NS	0.026	NS
		Children	0.019	-0.013	NS	0.032	NS
		Formal education	0.199	0.216	S	-0.018	NS
		Profession (level)	0.268	0.259	S	0.009	NS
Social background & Social roles (2)	Achieved roles (2)	Condition face to work	-0.333	-0.192	S	-0.141	S
		Organisation*	-0.236	-0.221	S	-0.015	NS
		Professional life cycle	-0.067	-0.142	NS	0.075	NS
		Self-reported social class	0.275	0.205	S	0.070	NS
	Experience	Characteristics of job tasks	0.158	0.232	S	-0.074	NS
		Type of job (routine/no routine)	0.355	0.071	NS	0.013	S
	Physical Deficiencies.	Visual deficiencies	0.084	0.073	S	-0.011	NS
		Hearing deficiencies	0.106	0.106	NS	-0.002	NS
		Respiratory deficiencies	0.239	0.182	NS	0.057	NS
		Renal	0.093	-0.107	NS	-0.014	NS
		Oral deficiencies	0.081	0.106	NS	-0.026	NS
		Other physical deficiencies	0.110	0.117	NS	-0.008	NS
		No physical deficiencies	0.006	0,001	NS	0,005	NS
	Resources	Family income	0.045	0.049	NS	-0.004	NS
		Home ownership	-0.127	-0.160	NS	0.033	NS
		Car ownership	0.149	0.107	NS	0.042	NS
		Access to museums	-0.037	-0.054	NS	0.017	NS
		Access to theatre	0.435	0.368	S	0.066	NS
		Access to library	0.148	0.132	NS	0.016	NS
		Access to Festivities	-0.087	-0.112	NS	0.026	NS
		Access to training	0.377	0. 043	S	0.073	NS
Personality & Intellectual flexibility	Psycho. Functioning, Beliefs & Values	Personal	0.182	0.130	NS	0.052	NS
	Intellectual flexibility	Intellect	0.228	0.215	S	0.013	NS
Retained information	Images of learning experiences	Images	0.730	0.087	S	0.043	S
Attitudinal dispositions	Attitudes to education & learning, to profession, to training conditions	Attitude	0.038	0.097	NS	-0.059	S
Situational aspects	Marketing, Awareness of limitations, Awareness of professional factors	Situational	0.186	0.186	S		

Table 7 – Extremadura (ICT Sector). Path Analysis: table of effects

Predictor class	Dimensions	Indicators	Total Effect	Direct Effect		Indirect Effect	
				Beta	Sig.	Beta	Sig.
Social background & Social roles	Ascribed roles	Gender	-0.250	0.126	NS	-0.376	NS
		Age	-0.020	0.224	S	-0.244	NS
		Living local until 18 years	0.030	0.076	NS	-0.046	NS
	Achieved roles	Civil status	-0.307	0.228	NS	-0.535	S
		Children	-0.014	-0.007	NS	0.007	S
		Formal education	0.079	0.025	NS	0.054	NS
		Profession (level)	0.190	-0.134	NS	0.324	NS
		Condition face to work	0.618	0.215	NS	0.403	NS
		Organisation	0.101	0.181	S	-0.080	NS
		Professional life cycle	0.176	0.152	NS	0.024	NS
		Self-reported social class	0.478	0.144	NS	0.334	NS
	Experience	Characteristics of job tasks	-0.219	-0.157	NS	-0.062	NS
		Type of job (routine/no routine)	0.892	0.367	S	0.525	S
	Physical Deficiencies.	Visual deficiencies	0.623	0.029	NS	0.594	NS
		Motor deficiencies	0.103	0.016	NS	0.087	NS
		Hearing deficiencies	0.361	0.341	NS	0.020	NS
		Blood circulation	-0.565	-0.189	NS	-0.376	NS
		Respiratory deficiencies	0.335	0.011	NS	0.324	NS
		Oral deficiencies	-0.444	-0.291	NS	-0.153	NS
		Other physical deficiencies	-0.342	0	NS	-0.342	NS
		No physical deficiencies	0.655	-0.127	NS	0.782	NS
	Resources	Family income	0.630	0.186	NS	0.444	NS
		Home ownership	0.508	0.329	S	0.179	NS
		Car ownership	-0.206	-0.138	NS	-0.068	NS
		Access to museums	0.370	0.046	NS	0.324	NS
		Access to theatre	0.092	-0.115	NS	0.207	NS
		Access to library	0.066	-0.139	NS	0.205	NS
		Access to Festivities	0.546	0.065	NS	0.481	NS
		Access to training	0.028	0.099	NS	-0.071	NS
		No Previous	0.126	0.243	NS	0.167	NS
Personality & Intellectual flexibility	Psycho. Functioning, Beliefs & Values	Personal	0.917	0.210	S	0.707	S
	Intellectual flexibility	Intellect	0.941	0.447	S	0.494	S

Retained information	Images of learning experiences	Images	0.566	0.327	S	0.239	S
Attitudinal dispositions	Attitudes to education & learning, to profession, to training conditions	Attitude	0.475	0.233	S	0.242	S
Situational aspects	Marketing, Awareness of limitations, Awareness of professional factors	Situational	0.307	0.307	S		

Within the ascribed roles, on one hand, gender has not a significant (direct or indirect) effect on PCVET; on the other hand, age influences significantly and negatively participation and living locally until age of 18 years has a significant positive effect over PCVET. From these results, one can say that the negative effect of the ascribed roles comes from the effect of age. Concerning achieved roles, self-reported social class, formal education, and condition face to work constitutes the factors that present the major significant effect on PCVET. It is also worthy of mentioning the effects of the Professional level in the case of the building technicians. In relation to the experience dimension, both indicators characteristics of job tasks and type of job significantly affect participation. In relation to Physical deficiencies, only visual capacities had a small effect on PCVET in the case of the building technicians. Concerning the ICT technicians none of the physical deficiencies indicators presented a significant effect on PCVET.

Concerning Resources, access to theatre and access to training (in the building sector) and home ownership (in the ICT sector) were the indicators with an effect on Participation. Concerning results about feeling about education and learning, findings appear to indicate that trainers, apart from giving information about the subject-matter, should use methods that facilitate learning and must have the needed qualifications to deliver training. In addition, training programmes should be held near one's place of work or one's house (less than 10 Km) and companies should incentive employees to participate in training that should be delivered in working period. Furthermore, training entities should have enough information on the training courses since technicians considered it very important to have detailed information on them before taking the decision to participate. On the other hand, training programmes should neither be held in hotels, restaurants, or universities nor delivered in the summer months. Building and ICT technicians considered that going back to school as an adult is an embarrassing situation. However, according to results the majority of the technicians considered training as an important measure for their professional development.

5.6   Conclusions

The project used the ISSTAL model as a theoretical framework to study and analyse the factors influencing employees' participation in CVET. The ISSTAL model appeared to

constitute an interesting theoretical framework to study and understand active adults' participation in continuing vocational education and training activities in European regions. In addition, the ISSTAL dimensions appear to be related to participation in continuing education offerings and engagement in informal learning processes. For those reasons, the ISSTAL model was used as the organising frame for the research carried out in the different European regions participating in the study. However, within the PARTICIPA project, it soon became clear that the model was more appropriate for some countries than others with regard to the overall research approach and methodology. The main reason was based on the fact that in some countries such as UK and Italy, for instance, individuals' competence development through informal and non-formal learning and learning at the workplace plays a very important role. Thus, the Spanish and the Portuguese research teams stuck to the main lines of the framework provided through ISSTAL, while the German and Greek teams operated with the model to some extent. However, the British and Italian research teams structured their research using just the topics of the model because based on their expertise on learning within the different sectors they felt that there were more appropriate research paradigms.

The overall findings suggested that participation in continuing vocational education and training (CVT) is more influenced by individual agency in Portugal, Spain and Greece, whereas structural factors (in terms of forms of provision of CVET and learning) are more influential in Germany, Italy and the UK. It is clear though that, taking into consideration all the results, the ISSTAL model, with some necessary adaptations, mainly on aspects related to competence development through informal and non-formal learning and learning at the workplace, may be a useful framework to identify and estimate the relative importance of the main factors influencing employees with technical skills to participate in learning job related aspects. The model may be particularly useful for investigating the take up of CVET offers by those temporarily not in employment or working in contexts where there are limited opportunities for learning while working.

The German results exemplify a strong influence of the situational variables that are located more at the right hand side of the ISSTAL model. The research in the German setting also illustrated the strong influence of social background and social roles as classical indicators of participation in CVET. As in Germany, within the Greek setting the social and background roles play a significant role. So, based on the results for the German setting as well as for the Greek study, we can say, that within the framework of the ISSTAL model, it is social background as well as situational variables that demand further attention.

Concerning the results from the survey in Portugal (Alentejo and Lisboa & Vale do Tejo) the ISSTAL model served as a useful theoretical frame to study and analyse relationships between a set of characteristics and aspects and participation in training activities of the technical workers of the agricultural-food companies in Alentejo and of ICT companies in the Lisboa & Vale do Tejo region. On the one hand, the analysed dimensions were related to participation in continuing education offers. On the other hand, the number and nature of class predictive factors and their dimensions, though slightly different from the ones posited in the ISSTAL model, do not suggest the need for major changes in the model. Those differences may have resulted from the different interpretation and perspective

concerning dimensions and their indicators and/or characteristics of the context, the first class of variables considered in the ISSTAL model.

Findings suggest that images of learning, intellectual flexibility, and experience dimensions are the most influential characteristics on participation in continuing training. However, effects of the other class dimensions are also relevant with the exception of the ascribed roles and situational aspects that present 'beta scores' with approximately half value of the other dimensions. In addition, the majority of the predictor class dimensions have lower direct than indirect effects on participation in CVET except for images of learning experiences and attitudinal dispositions. Furthermore, differently from what is predicted by the original ISSTAL model, both retained information and attitudes have a relevant direct effect on participation. In fact, both managers and technical workers that were interviewed have direct or indirectly indicated that image of their previous learning experiences (retained information), and attitudes towards training (and learning) (attitudinal dispositions) appear to be the more relevant aspects influencing their decision to participate in further activities of CVET. Those conclusions are in line with other research results that indicate that previous learning experiences and attitude towards learning have a significant effect in the people's will of participation in further learning activities (Brookfield, 1996; Field, 2000; Longworth & Davies, 1997). The same conclusion can be drawn for the intellectual flexibility (personality & intellectual flexibility) particularly concerning the flexibility in modes of learning and preferred training strategies (Brookfield, 1996; Field, 2000).

Given that analysis and discussion in the Focus Groups and results from the case study confirm, in general, the survey results, the conclusion that the ISSTAL model may serve as theoretical framework to analyse relationships between a set of characteristics and participation in training activities of the technical workers of agro-food and of ICT companies can be reinforced. The major of the analysed dimensions in the survey study were reported by the interviewed managers and technical workers to be related to participation in continuing education offerings. For this reason, in summary, the resulted/adjusted ISSTAL model presents three minor differences from the original one. First, the model does not have a box framing the Personality, Intellectual Flexibility, Retained Information, and Attitudinal Dispositions dimensions. Second, all Social background & Social roles dimensions have effects in Personality and Intellectual Flexibility factors. Third, Retained information and Attitudinal dispositions dimensions have an important direct effect on Participation in CVET (PCVET).

The results concerning the attitudes about education, training and learning show the technicians of both sectors (agro-food and ICT) consider as most important that trainers, apart from giving information about the subject-matter, should know how to use methods that facilitate learning. In addition to those feelings, technicians consider important that the companies should allow people to participate in training, training entities should have people to give information concerning training offers and the training courses should be offered near either work or where they live. Agro-food technicians value training offered at the company. On the other hand, ICT technicians consider it very much relevant to participate in training provided the training is beneficial for them and that education is as important for adults as for children. Findings have also pointed out that technicians

working either in the agro-food or in ICT companies consider the incompatibility of the training timetables with the working periods constitutes the main reason for not participating in training, mainly when companies have to respond quickly to clients' demands or, as in the case of the agro-food, there is a specific period of work overload work. Nevertheless, it is interesting that technicians of both sectors also consider that attending training offers is not a relevant difficulty in terms of family life which may indicate some availability to attend training during their free time. As a side result, findings appear to indicate that quality in CVET should be promoted and developed and that there is a need to integrate incentives to make employers and employees aware of the role of training for job performance. Furthermore, the need for self-directed learning, in addition to participation in CVET offers, was also recognised as playing an important role, mainly in the ICT sector.

The survey results in Extremadura (Spain) were very similar to the Portuguese ones. That is, findings also appear to indicate that the ISSTAL model may serve as theoretical frame to study and analyse relationships between a set of characteristics and aspects and participation in training activities of the technical workers of building and of ICT companies. So, the number and nature of class predictive factors and their dimensions do not suggest the need for major changes in the ISSTAL model.

Concerning findings for each class sector, Intellectual activities, Psychological functioning, Beliefs & values, images of learning and Access to training are the predictor class dimensions that most influence participation in continuing vocational education and training activities. In relation to disposition towards continuing training, results indicate that management in both firms consider training for their workers as important to maintain company competitiveness. Concerning factors which favour attitudes towards continuing training, results indicate that a greater flexibility in working hours, evaluating the work load and integrating continuing training within such time with flexibility is very much considered as a factor to promote not only positive attitudes towards training but also the level of participation in training. Job stability was also found to positively favour attitudes concerning participation in training.

Overall then, in the Spanish and Portuguese settings it was found that the ISSTAL model may serve as a theoretical framework to study participation in training activities by technical workers. Some deviations from the model might be due to the different interpretation and perspective concerning dimensions and their indicators and/or characteristics of the context, the first class of variables considered in the ISSTAL model, as stressed in the Portuguese study. The German results exemplify a strong influence of the situational variables that are located more at the right hand side of the ISSTAL. The German results also illustrate the strong influence of social background and social roles as classical indicators of participation in CVET. The results from Greece as well as Germany show, within the ISSTAL model, to pay attention to social background as well as situational variables.

So, overall, the main conclusions related to the ISSTAL model can be summarized as follows:

- The ISSTAL model, with some adaptations, may serve as a theoretical frame to study and analyse relationships between a set of individual and organisational

characteristics and participation of technical workers in training. However, the model should be adapted in order to take into consideration competence development through learning activities outside formal training settings such as self-directed learning, learning at work, and learning supported by others. In fact, in contexts where technical work itself is challenging, much continuing vocational learning takes place outside formal training settings. Even in the contexts where the participation in formal CVET appeared to have a more relevant role than 'non-formal' learning for competence development, there were some indicators pointing out to the need to consider self-directed learning as an important strategy for skill acquisition.

- Another aspect that the ISSTAL model, or any other research approach in this area, should take into consideration is that technical employees have the need not only for updating their technical skills but also for developing further a range of more generic skills, including planning, problem solving, communication, IT and management skills. Learning how to organise knowledge effectively and apply it appropriately too is vital for technical workers' development.

- Research findings show a good level of accordance with the original model in the Spanish and the Portuguese contexts. For instance, images of learning, intellectual flexibility, psychological functioning, beliefs and values, retained information and attitudinal dispositions appeared to be the predictor class dimensions that most influence participation in CVET. However, in the Greek and German settings those variables categorised under social background and the situational variables were found to have major effects on participation in CVET. In addition, situational factors were also very much stressed in the British and Italian studies. That social background plays a major role for participation in and success of further learning activities is already a well-known fact across Europe. As a result it might be more interesting to find explanations for the significance of the situational factors.

- The more general research findings showed that experience has been identified in all the different contexts investigated as a dimension of particular importance for participation in CVET. Experience as a factor points to the importance work can play as a learning catalyst. This is true of the utilisation of the learning potential of communities of practice, the incidental acquisition of 'tacit' knowledge or the learning conducive character of particular work tasks. In addition, research has shown that there is only a weak relationship between the technical workers' actual advancement after participation in training and their expected advancement (as a possible source of motivation for working and continuing participation in training). These findings lead to a recommendation that public training institutions should design and implement policies to promote participation in training and learning among not only the technical workers but also the owners and managers of SMEs in order to enhance both professional development and company development. In particular, a policy for self-learning through e-learning strategies should be developed and implemented.

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PART THREE:

**IMPLICATIONS OF THE PARTICIPA PROJECT FOR POLICY, PRACTICE
AND RESEARCH**

Alan Brown, Massimo Tomassini and Eduardo Figueira

6. Participation in Continuing Vocational Education, Training and Learning: commentary on the implications for policy, practice and research

6.1 Introduction

This commentary attempts to draw out the general lessons arising from the project as a whole – that is, it draws on the more detailed findings from the research reported in Bremen working papers series (Brown *et al.*, 2004a; 2004b; 2005). In particular, it does not run through the results from each individual country or from each phase of the research. Here the concern is with the broad lessons that draw upon particular examples and themes as appropriate, with an emphasis upon raising matters that are of general concern for one or all of research, policy and practice. This commentary is organised around a series of factors affecting participation in continuing vocational education, training and learning (CVETL) and a number of issues (threads) that are progressively drawn together, and greater attention is placed on implications for policy, as the commentary unfolds.

Distinguishing between working and learning at work can be difficult, and identifying separate factors that affect learning at work can also be challenging, because in many cases they interact so strongly. The distinctions made below should be understood as aids to understanding rather than as distinctly different issues. Factors affecting work-related learning draw upon the relational aspects of learning at all levels. It is a dynamic rhetoric. The commentary starts with an examination of individual, organizational and institutional, broad contextual and learning factors that affect participation in CVETL for technical workers, mainly in SMEs. The focus then shifts to how to create contexts that facilitate work-related learning for technical workers, before explicitly reviewing the research findings for the implications for policy and practice in CVETL. The final section reviews the value added of a comparative perspective from research on Continuing Vocational Education, Training and Learning.

6.2 Individual factors affecting participation in Continuing Vocational Education, Training and Learning

The Participa project involved an investigation into the factors influencing the participation of technical workers in continuing vocational education, training and learning (CVETL) activities in six countries. The findings suggested that participation in continuing vocational education and training (CVET) is more influenced by individual agency in Portugal, Spain and Greece, whereas structural factors (in terms of forms of provision of CVET and learning) are more influential in Germany, Italy and the UK.

It is clear that, taking into consideration all the survey results, the ISSTAL model, with some necessary adaptations, mainly on aspects related to competence development through informal and non-formal learning and learning at the workplace, may be a useful research framework to identify and estimate the relative importance of the main factors influencing employees with technical skills to participate in learning job related aspects. The model may be particularly useful for investigating the take up of CVET offers by those temporarily not in employment or working in contexts where there are limited

opportunities for learning while working. The model does, however, have a clear individual focus and in many circumstances it would be useful if this were complemented by a more explicit organisational focus and greater attention being given to the interaction between learning and working.

In Greece, Portugal and Spain individuals' images of learning appear as particularly important influences on participation in CVET activities. On the other hand, in England, Germany and Italy structural issues around provision of opportunities for learning and training were seen as influential in patterns of participation. Across all countries technicians appeared to value training offered at the company and most technicians, but particularly those in ICT, consider that participating in continuing training and learning activities is very relevant for their future career development. Concerning reasons for not participating in training, many technicians cited the main reason being the incompatibility between the timetables of the training offers and their working timetables.

Even within a broader perspective upon learning in the workplace, it was clear, particularly from the individual biographies, that the extent of individual participation in a range of activities at work, engagement in learning and working and expectations for career development varied widely. From an individual perspective, life history, understanding of current position and opportunities, aspirations and dispositions and attitudes to work, learning and career development are all part of the mix of factors affecting the patterning of work-related learning. These factors come together strongly where an individual develops a clear picture of himself or herself as an 'experienced skilled worker with particular types of technical and other expertise' and this may then subsequently shape how they view working, learning and their interaction.

Self-directed learning

This sense of self as an 'experienced skilled worker with particular types of technical and other expertise' was perhaps clearest among those whose work-related identity incorporated a view that they needed to play an active role in shaping their own learning and development. As a technician's career develops self-directed learning often becomes increasingly important. Indeed learning as a self-directed activity was often built into the job, especially where it required diagnostics and troubleshooting. The technician was the person who had the clearest idea of what he or she needed to learn. Some German technicians pointed to how an often used strategy was to go home in the evening and then access the Internet and search the manuals for a possible solution in order to be prepared to advise the colleagues the next morning. The case study results from contexts in all countries reinforced the importance of the interaction between the 'situational' variables of the ISSTAL model and personal characteristics.

Many of our case studies were in environments that were very learning intensive and demanding. In such circumstances it is not surprising to find that who flourish in such environments have very positive attitudes towards learning and quite a sophisticated array of strategies to find out what they need to know and to develop the necessary competencies required to support their own career development. The mastery of continuing learning processes in parallel to work processes constitutes a necessity in order to adapt to the very fast rhythm of technological change in some of the sectors under

review in this study. In all sectors, but particularly in ICT, we identified individuals who paid great attention to enriching their skills and building up their own competencies by exploiting a wide range of options: they frequently studied books and handbooks, navigated specialised websites, attended targeted newsgroups, subscribed to specialised magazines and journals. This is in line with the findings of Poell (1998) that employees are not just reactive to training opportunities and the strategies of trainers and managers, they may also be organisers of their own learning.

Adult (non)participation in learning

Individuals who were seen as 'non-learners' could be split into two different groups. First, there were those individuals who would like to undertake learning but were unable to do so because of external barriers and, second, there were those who did not want to engage in learning, through lack of confidence, motivation and disaffection. The needs of the former group could be addressed by paying more attention to the location, cost and timing of some programmes. Programmes for the second group, however, need to pay particular attention to attitudinal issues, including the development of confidence and motivation. The nature of the job meant that most of the technicians interviewed or surveyed needed to engage in some skills updating. Where individuals were reluctant to engage in more substantive learning these were likely to be related to the nature of (off-the-job) training provision and difficulties fitting this into working and other activities. This is important as, our study demonstrates, particularly in England, Germany and Italy, if learning is more directly linked into working activities then there would appear to be very few barriers to nearly all technical workers engaging in further learning.

Experience of learning and working exemplified through individual biographies

Individual biographies can exemplify different 'types' of attitudes towards continuing vocational education, training and learning. Three distinct patterns of participation were identified in the project. One individual may give particular emphasis to participation in formal CVET as an important element for individual progression. Although even here such a strategy may not be used exclusively, for example, a dual development strategy could be used, where formal training is used to update technical skills while learning through experience of working intensively with clients could develop communication skills. For another individual it may be that workplace learning is preferred. Indeed in some cases success in this form of learning can act to transform attitudes towards learning more generally. Learning experiences at the workplace were sometimes very rich. They could include learning while working in a job with considerable challenges; learning through working with someone with acknowledged expertise; learning through working in multi-disciplinary teams; learning through organised reflection and review; learning through the application of knowledge learned in CVT to work activities; learning through working with suppliers; learning through exposure to other working environments; learning by doing without any formal training (e.g. through giving presentations). The combination of different forms of learning can occur even where the focus is upon process improvement, with learning and skills development as a means to an end rather than as an end in itself. Work-related learning can also be driven by a strong commitment to self-

directed learning, where an individual is interested in a search for understanding, solving problems or just as a very positive attitude towards learning.

Implications of individual differences in approaches to continuing vocational education, training and learning

The above examples illustrate that technical workers do have very different approaches to learning and development. The cases also exemplify three distinct approaches to learning and development, according to whether greatest use was made of formal CVET provision; opportunities for learning while working; or self-directed learning. Some individuals made regular use of formal CVET provision, with courses lasting from a few days to several years. The longer courses, such as Master's programmes, were often taken in an individual's own time. The second group mainly took advantage of learning while working, highlighting the rich array of learning experiences that could be utilised if work itself was challenging. This included learning while working in a job with considerable challenges; learning through working with someone with acknowledged expertise; learning through working in multi-disciplinary teams; learning through organised reflection and review; learning through the application of knowledge learned in CVT to work activities; learning through working with suppliers; learning through exposure to other working environments; learning by doing without any formal training. The third group made use of self-directed learning that remained outside either formal education or training and did not take place at work. Here learning and technical updating was accomplished through self-directed study, for example, using technical books and through searching the Internet. Another means of learning was through personal networks, where for example two or more technical staff from different departments or companies would regularly meet socially but also use the occasion to discuss their work. This could specifically include discussions about new developments, different ways of approaching problems or reflections upon work processes.

In practice, many people use all three forms of learning. Additionally, it was striking that some of the most successful forms of learning identified in the interviews occurred when the aim was improving business effectiveness, through a focus upon improvements in quality, cost reduction and delivery. In these cases learning and skills development was seen as a means to an end rather than as an end in itself. It was also noteworthy that such approaches could stimulate small companies to pay more attention to processes that led to significant employee skill development.

What is also apparent is that employees can be active agents in how they construct their own learning and development. On the other hand, there were also numerous examples of where, given the structure of social relations at work, learning could be seen as a collective activity grounded in working practices rather than comprising predominantly individual effort on continuing vocational training programmes taking place away from the workplace. The social nature of work-related learning and knowledge development is perhaps most clearly evident in those cases where an individual forms a close attachment to her or his immediate work-group. This not only draws attention to the social context in which knowledge is acquired, developed and applied, but also how this influences the processes by which the individual learns. Indeed the basic structures for the interpretation

of experience, although based on idiosyncratic frameworks that at the same time favour and limit the individual process of sense-making (Resnick, 1991), can themselves be shared, developed and changed through interaction with other members of the work-group (Brown, 1997). Individuals learn what type of learning will be useful to share with colleagues, and they also learn about where and from whom further knowledge could be gained.

Value of broadening focus from participation in formal CVET activities to participation in work-related learning

The survey results gave insights into the influences operating at an individual level, but overall it is clear from this study that, for relatively well-educated people working as technicians we need in a number of contexts to be able to represent participation in work-related learning as a social activity not just an individual decision. Furthermore, the individual interviews, focus groups, contextual information and case studies all drew attention to the fact that learning at work, as either an individual or a collective activity, was often grounded in working practices rather than comprising predominantly individual effort on continuing vocational training programmes taking place away from the workplace. As a footnote to this issue it is interesting that while learning from others, including through personal networks, is a vital source of learning at work, this type of activity does not fall within the scope of CVT for the EUROSTAT CVT survey. To fall within the scope of CVT for that purpose would require a greater degree of formality and pre-planning.

The whole idea of focusing largely upon participation in formal Continuing Vocational Education Training therefore has severe limits. Participation in a wider range of work-related activities needs to be considered in order to adapt to a changing conception of learning and knowledge in which the orientation towards competence development and the integration of learning and working (including through the use of informal and non-formal learning) are emphasised. The paradigm of enrolling and participating through being taught and taking home a qualification makes way for a more fundamental conception of learning, which sees potential for learning in all kinds of different human activities, among which work plays a significant role. Similarly, in many settings it makes sense to switch the unit of analysis between the individual and the company or network. That also means that learning can be situated within a broader context of organisational development and performance and acknowledges that work-related learning has a very strong social dimension. Individuals stressed time and again that collaboration with peers and colleagues was important. This switching of perspective can also be achieved by tracing individual biographies as individuals move through different organisational contexts. Certainly for many skilled technical workers individual unwillingness to participate in training was often a non-issue. Cost of training, lack of management time to source training and pressures of work that meant that staff could not be released for training did, on the other hand, act as significant barriers to the take-up of offers of training.

6.3 Institutional and organizational factors affecting participation in Continuing Vocational Education, Training and Learning

That the unit of analysis should switch between levels is also emphasised by the German case. The institutional perspective being particularly important in that context – with the dual system and changes to CVET provision operating not only as significant direct influences on learning and development but also in how they influenced individual ideas about the type of CVET provision that should be made available.

Participation in formal CVET programmes

The German aeronautics and IT industries were examples of where there were substantive CVET programmes that were taken by many technicians and almost universally seen as useful for skills updating and relevant to workplace needs. In the IT sector, most employees had participated in CVET activities, at least once per year, during the last five years and recognised its value in relation to workplace needs, skills updating and possible career progression. Crucially provision was seen as directly related to the problems participants faced in the workplace and this was a factor in their very positive attitude towards formal CVET provision. Attitudes towards formal CVET were also shaped, particularly in the aeronautics sector, by participation in the initial training system. This seemed to help shape ideas about lifelong learning processes that should take place when pursuing a career in specific sectors. Initial training in the German 'dual system' emphasises the value of formal learning provision alongside learning in the workplace.

Elsewhere formal CVET provision was often seen as patchy and not always relevant for workplace needs. This was particularly likely in highly dynamic sectors where this posed a real challenge to CVET providers. However, the Italian study shows how the outcomes concerning formal CVET have to be contextualised within a more complex picture of the interrelationships between training factors on one side and work, organisation, learning and competence factors on the other side. In such a picture CVET is not marginal, considering in particular that some kinds of VET/CVET interventions (especially within the software sector) are very effective in terms of enhancing participants' employability. But, at the same time, the analysis confirms that in innovative and fast developing sectors work-based learning is the main form of knowledge reproduction and acquisition, and much more significant than traditional forms of VET/CVET. As a consequence, a generalised need for new forms of CVET emerges in dynamic sectors, requiring new CVET policies the European, national and regional/sub-regional level.

This is not, however, a plea to play down the value of advanced technical training – it is rather that this needs to be one component of a strategy for promoting CVETL. Indeed well-designed courses aimed at developing employees' technical competencies were highly appreciated by technical employees, not only for their intrinsic contents and the opportunities they offer to complement informal work-based learning with explicit knowledge but also for their symbolic value, as a sign of interest from the firm in the competence development of its employees. On the other hand, many respondents saw courses as too often characterised by poor quality teaching and being held at inconvenient times (after working hours). Non-technical training was very rare, but where it was held it

might be very useful in order to build upon what had been achieved through informal learning.

Innovation and change as a challenge for formal CVET provision

In all countries innovation and change posed a particular challenge for formal CVET provision in dynamic sectors such as ICT. This challenge could be exemplified by the case of Italy, where both the software and audio-visual production sectors, particularly in the Rome area, are highly dynamic. Competencies, learning patterns and training needs of technicians were significantly influenced by changes in firms' strategies and structures generated by three driving forces: market dynamics, technological innovation and new institutional conditions. New ways of working and participating in organisational processes emerged, creating new spaces for more qualified and empowered strata of professionals-technicians. In software, the above tendencies were leading towards the reinforcement of professional strata with solid technical knowledge and competencies. In the audio-visual sector, where the technological infrastructure has a support function and where core activities are mostly of a communicative and creative nature, the emerging trends favour those who are able to adapt and develop within new technological patterns (which represent opportunities to gain new professional competitive advantages). Overall, after the recent transformation waves in both sectors professional development seems increasingly dependent on personal and collective abilities for continuous learning and self-valorising innovative competencies.

However, evidence collected from SMEs in both sectors showed a deep divide between continuous learning needed in fast changing productive processes on the one side and most of education and training interventions nowadays available from public institutions on the other side. One answer seemed to be for the providers to concentrate upon provision appropriate for entry at different levels, together with some highly specialised technical provision (sometimes offered by specialist providers), but to recognise that most continuing professional development would take place outside formal provision.

A large majority of interviewees within the questionnaire-based inquiry and the life stories collection, as well as managers/entrepreneurs interviewed within the background analysis, stated that really important professional competencies can best be acquired through experience. Real organisational settings – according to the interviewees – can provide an important setting for learning in swiftly evolving environments. It seems clear that in such complex environments, formal/codified knowledge must be continuously updated but at the same time accumulation of tacit knowledge is key for being really able to participate in work activities.

Given that basic education was very often considered as insufficient then this was the area where providers could most usefully focus upon improving their provision, and it would be particularly useful for them to seek partnerships with employers so that trainees could also experience a variety of work place settings.

In the German context, from a policy perspective, because of the high importance of informal learning in the IT sector and the increasing importance of self-directed learning and the significance of self-study then self-directed learning should be emphasised more in

the initial training system. Another particular policy recommendation in this context could be to simplify the new 'IT CVET system' and to enrich the examination of IT specialists by CVET elements and modules which are more valuable for SMEs and their employees, rather than almost exclusively addressing the needs of large companies. Also the great differentiation of specialist profiles could be reduced, through a search for common factors that underpin effective performance, coupled with use of opportunities of individuals to compile records of experience and achievement in specialist areas (including through use of professional portfolios).

Role for less formal forms of professional development

In all countries some participants expressed great interest in less formal forms of professional development, whether this was utilising specialised press, the Internet or other opportunities for professional updating. The point to make it here, however, was that such forms of updating were not necessarily individualised – collective forms of updating through networks and consultations with others were very important too. Competence development could be seen as the driver here: a measure which could be used in order to assess what is valuable and what is not, with competence development being related to development of both explicit and tacit knowledge. Our participants seemed generally aware that, in contexts which are continuously reshaped by technological and organisational change, formal knowledge without experience is – so to speak – empty but also experience without appropriate levels of formalisation is blind.

Combining different forms of professional development

New spaces for evolutionary forms of training seem therefore open, but probably implying new approaches on the training supply side, substantially different from the current ones. In this regard the episode told within one of the life stories is in many ways emblematic. The protagonist – a young man who tried several times to get a stable job in the radio sector in Rome – finds an advertisement concerning a course on a very specific new technology. Then he spends all his savings to pay the fee of such a course, attends it and from then on receives several offers which allow him eventually to make the right choice for his professional future and to get very fast and satisfactory returns on his investment. What seems important in this story is not the availability of short and effective training activities as such. Rather it is the interplay between personal experience – through which the young man is able to understand a specific knowledge/competence need in his working environment – and formal training activities, which can be found on the market and can satisfy such specific needs that are key to the competence development process. In other words new forms of continuous interaction between the two kinds of knowledge – tacit and codified – seem needed. This interaction should entail, from a policy perspective, new forms of reciprocal recognition between the training world and the productive world, and should also imply more generalised lifelong learning attitudes from people in these types of working environment. In practice, findings from all countries show that work practices can generate major effects in terms of competence development, showing the implicit existence of a model of cumulative on-the-job learning that is present in some companies in all sectors and is widespread in technologically advanced sectors.

Most of our participants seem well aware that some professional development is occurring as a consequence of 'normal' work activities in many settings, and those who were in learning-poor work environments seemed acutely aware that this was leaving them very vulnerable on the wider labour market. For companies too, job stability, continuous accumulation of know-how and on-the-job learning appeared as powerful antidotes to recurrent crises due to market dynamics and to the risk of losing competitiveness because of lack of internal resources. Viewed in this light, training is just one way of supporting competence development and not the most important: but it does have a role as an element of a larger combination of measures and can be particularly important at particular times.

Organisational culture

The extent of organisational factors influencing employees' decisions to participate or not to participate in training varied greatly. Examples from Greece, Portugal and Spain all highlighted how some work environments made learning part of the everyday tasks of the employees and it was considered natural that employees would participate in formal training whereas, in other cases, companies were reluctant to release staff for training in practice during work time, even if broadly supportive of the need for training in principle. In the latter cases, those employees that had positive attitudes towards training sought other ways to take advantage of learning and training opportunities, while the less committed passed up these opportunities. There were also cases where immediate supervisors restricted the participation of their subordinates either because they do not believe in the necessity of it or because they felt threatened. It is clear that in these cases it is less of a question as to whether the company has a 'learning culture' and more a question of whether the organisational culture and patterns of working and supervision are generally supportive of individuals and groups who want to learn or not. Thus many small companies are not antithetical towards learning per se, rather their particular patterns of working may make it difficult for them to support particular forms of learning, often particularly those events taking place away from the workplace. In these cases it is important to see if employees can be given access to a range of learning opportunities in their workplace, whether through 'normal' work activities, special projects or organised training.

A more pressing problem remains as to how to support workers employed in lower work quality settings, where work activities are of a repetitive nature and there are limited opportunities for personal growth, as such contexts can, as some of the Italian case histories show seriously undermine workers' self-confidence and they can feel as if they are falling behind in the development of the skills required of a competent technician. The gap between the two typologies of enterprise, learning-rich and learning-poor, impacts upon individual pathways. In dynamic contexts broader competencies, including a broad-scope work process knowledge allows people to operate coherently with contextual inputs and to understand the connections between different roles and activities. These competencies are crucial but, in the majority of cases they are not consciously managed either by enterprises management or by interviewees themselves. Similarly, the fine-tuning and exercise of relational competencies are largely left to the sensitiveness and availability of each single employee, except in some limited cases where training courses

or organisational development actions are offered. Interviewees claimed that relational competencies are very important and that they devote great attention to them. The need to carry out their tasks in a harmonious context, where conflicts are controlled and personal abilities can emerge at best, seem to foster behaviours oriented towards a balance between competition and the defence of a 'common good' constituted by co-operation and shared values. The irony then is that individuals working in companies with a positive 'learning culture' generally get lots of opportunities to develop their skills, outside of formal training events even where the companies are happy for their staff to attend such external training. In contrast, in those companies with little interest in learning and development there may be restricted opportunities for engagement in either substantive learning at work or through formal training.

One major problem faced in trying to generate interest of SMEs in learning and development (and in generating small business growth) lies with the career motivations and personal expectations of individual owners and managers. Many small firms adopt practices that are antithetical to efficiency and growth (Gray 1993). Indeed the most common small business ambition is for independence and autonomy rather than profits and growth (Gray 1998). Hence it is important not to understate the extent of the cultural shift required before some small companies commit to organisational change in a way that emphasises the value of learning and development .

Challenges for successful small firms not focusing on longer-term development

The success of small companies could partly depend on the way they handled, either explicitly or implicitly, two key challenges: how to focus upon, protect and develop their core competencies and how to avoid the gradual development of 'skilled incompetence'. The case study companies in ICT showed that comapnies were often quite good at protecting and developing their core competencies,even if was not a formal goal. The successful companies in, for example, software development had explicit processes in place (e.g. regular collaborative knowledge development and sharing sessions; project debriefing sessions; focus upon performance improvement etc.) that had the effect of developing, monitoring and spreading their intellectual capital. This also acted to ensure that individual development was recognised and acknowledged (even if not always formally rewarded).

Meeting the challenge of the development of 'skilled incompetence' (Argyris, 1990) was much more of a challenge. For some companies the current way of doing things, including the constant search for and focus upon technical development, meant they neglected more strategic considerations, including plans for the professional growth of staff and opportunities to reflect systematically on their ways of interacting externally. A number of case studies were examples of successful SMEs who were exploiting opportunistic approaches to learning and business development. From one side a company followed a canonical development path based on expansion of successful activities sustained by continuous growth of internal competencies. Such growth happens of course at the technical level: people become more and more expert in finding technical solutions appropriate for customer needs. But from the other side the model of learning by interacting, externally and internally, which underpin business development is not at all

consciously cared for as such: the spontaneity model of the early start-up is kept in place although roles and relations are becoming increasingly complex. Non-technical training, for instance, is often overlooked: learning sources stem from daily practice but the company does not make any systematic investment for a better understanding of the functioning of such sources. Relational and cognitive issues which allow the company to keep on going and producing good results are de facto disregarded. No specific problem may have been detected so far in organisational functioning but it is likely that further levels of business expansion might lead to crises as a combination of social and technical factors.

Several effects of the accumulation of 'skilled incompetence' (Argyris, 1990) might be expected in an organisation that does not develop specific plans for professional growth. A company's small-size allows fast knowledge sharing among people, ensuring less dependence on a single resource and improves role flexibility. Yet the company's model of investment on human resources should be developed in order to comply with conditions of both keeping key human resources and achieving long-term objectives. Moreover, the occurrence of significant reshaping of technological activities due to breakthrough events, or even to the effects of incremental innovation in the field, might cause unforeseen problems in an organisation which does not systematically reflect on its ways of interacting externally side, its community practices, and its approach to applying technological solutions. In such circumstances public policy should be directed at offering support for apparently dynamic and healthy companies in looking at the broader horizon and considering the company as a unity – not only in terms of its individual members – and should take specifically into account its existing external and internal learning paths.

6.4   Broad contextual factors affecting participation in Continuing Vocational Education, Training and Learning

So far the focus has been upon the extent to which individual responses and organizational and institutional factors influence patterns of participation in CVETL. However, there are some broader contextual factors at work too and it may be useful to outline some of these so as to give a guide to how these may influence the shape of CVETL in particular settings. Below consideration is given to the increasing skill intensity of many skilled workers' jobs and the background to CVETL in two industries (ICT and engineering) is briefly sketched. The sectoral dimension is perhaps underplayed in many policy proposals and these and other contextual factors can be quite strong and supporting learning in companies in particular settings has often to be situated in a broader context.

Increasing skill intensity of technical workers' jobs

Changes in occupational structure, in qualifications and in skills required vary by economic sector and region, but overall the 'skill intensity' of many technical workers' jobs is increasing. This has implications for the increasing requirement for upskilling through learning while working, self-directed learning or participation in continuing vocational training. As a consequence the qualifications levels of technical workers have been rising, and people in these jobs need more training, and more time is required after initial qualification to reach experienced worker standard than previously. Technical

workers increasingly need not only to update their technical skills but also to develop further a range of more generic skills, including planning, problem-solving and communication skills. IT skills, management skills and learning how to learn and how to support the learning of others have also gained in significance. There are also very substantial regional variations in the pattern of recent, current and expected future skill needs within and between countries.

Continuing vocational education, training and learning in the IT industry

All countries involved in the Participa project looked at patterns of participation in CVETL in the IT industry. Occupations in Information and Communication Technologies (ICT) range widely from those requiring very specific in-depth technical knowledge and expertise to others where a broader technical ability is needed alongside good interpersonal skills or expertise in specific applications areas. It is also interesting to note that there are a couple of 'classical' systems differences between the operation of the UK labour market and, for example, the German labour market that applies particularly strongly in the ICT sector. In the UK an important focus is upon learning while working through responsibility in the job itself, whereas in Germany much greater attention is given to preparation and learning for responsibility through a comprehensive programme of initial training. Another crucial difference is that frequently moving between employers is much more common in the UK than in Germany. In the UK context such mobility means the transfer of skills and knowledge, including tacit knowledge, is facilitated through staff often changing their jobs (compare Mason and Wagner, 2000).

In all countries employers sought to develop the skills of their workforce - both their technical and 'soft' skills of communication and teamwork. Generic skills are seen as almost universally important for staff working with ICT. ICT staff increasingly have to combine a high level of technical skill and customer sensitivity with the ability to work with other fellow professionals as part of a team and/or with internal and external customers to understand and meet their requirements. They are working in a rapidly changing environment, which means that the ability to work flexibly is important.

Jobs performed by workers with intermediate level technical skills range from those requiring very specific in-depth technical knowledge and expertise to others where a broader technical ability is needed alongside good interpersonal skills. The increased competition occurring in much of the industry is driving changes in occupational and employment structures and patterns of organisation of work for people working in many sectors. There is a strong demand from employers for skilled workers with 'modern' skill sets, including abilities to work in teams and communicate effectively.

Continuing vocational education, training and learning in engineering

In order to understand participation of technical workers in CVETL in engineering it is important to get a sense of what is happening to the organisation of work across the industry as a whole. There is great variation and some employers have embraced quite radical change. They have been changing roles and responsibilities and experimenting with different patterns of work organisation (including team working, manufacturing cells

and varying skill mixes). In some cases the emphasis is more work intensification rather than high performance. Other companies are shifting from direct manufacturing to provision of engineering services and this requires changing skill sets for many employees. However, there remain enormous variations in the degree of skill required of workers in different workplaces and companies. One significant difference is between companies where skilled workers are a very small minority and production is largely routine and those where more highly skilled workers play more of a role in production, support and related activities. There seems to be a clear divide between those cases where most workers are being given more autonomy and responsibility and those where the manufacturing process is being even more tightly controlled, with an emphasis upon cost reduction.

There is a strong demand from employers for skilled workers with 'modern' skill sets, including abilities to work in teams and communicate effectively. This is despite the continuing overall reductions in the numbers employed. All companies have been introducing greater flexibility in work and expect staff to accept resulting changes in patterns of work organisation. The drivers of this in some cases were because of a switch to team working, while in others it was due to an attempt to improve manufacturing practice through a focus upon continuous improvement (and on quality, costs and delivery). Changes are being driven by a desire to improve competitiveness and major manufacturers themselves have been pressurising their own suppliers, sometimes through the use of very aggressive year on year cost-downs. Flexibility in work organisation has been a major goal of employers in engineering, although there are major differences in how companies are trying to achieve this.

Generally greater attention is being given to work-based learning, in relation to team-working, continuous improvement programmes, supervisory training and supply chain development. External training and qualifications are also being used either for some staff or as part of general employee development training. Companies vary greatly in the extent to which regular work activities provide a rich or poor learning environment, depending upon how work is organised, the nature of production and the size of the company. Different groups of workers may also have differential access to further education and training. Overall, employers' commitment to learning is very variable, but general competitive pressures and actions across supply chains is driving at least some learning in the workplace.

6.5   Learning factors affecting participation in Continuing Vocational Education, Training and Learning

So far the emphasis has been upon the variety of individual and contextual factors that influence patterns of participation in CVETL. However, we need to examine factors relating directly upon the learning process, not just consider those factors that frame the learning.

Formal support is vital in early career learning

Training at the beginning of the work activity in an enterprise is crucial for the transmission of consolidated internal know-how. On the basis of their experience, the interviewees in a number of different contexts recognised the importance of shadowing or working with more experienced practitioners early in their career at a new company. Explicit training, although not disregarded, seemed to play a less relevant role. Training largely related to induction or technical training mainly linked to skills updating. While much knowledge can be acquired through informal exchanges, formal support early in a company career can help find out whether this is actually taking place. A greater consideration of experience does not decrease the importance of codified knowledge, rather formal support is needed to ensure that both these processes are taking place.

While individuals' competence development through informal and non-formal learning and learning at the workplace played a particularly significant role in UK and Italy, it was clear that in other contexts too much of what a technical worker learns occurs within the frame of 'normal' work activities. Learning is not bound to venues devoted to learning but happens or can happen incidentally as well as when it is systematically integrated into work processes. The key is to have some means of checking whether the development of particular skills and competences are occurring alongside the development of the ability to perform specific functions or activities necessary to fulfil one's job. There is an irony here in that the value of more diffuse forms of learning increases the importance of some formal support early in a career: technical workers had a strong desire to know how they were getting on and explicit feedback on their progress was highly valued.

Learning from others (in work groups, communities or networks)

Learning from interaction was widely perceived as a valuable process and learning from others was an important strategy for technicians in most contexts across all countries. Nearly all of our interviewees could be considered to be 'learning aware': either recognising the need for continuous learning or, at least, recognising that they needed occasional up-dating. Their learning practices generally consisted of a mix of activities aimed at improving both experience-based knowledge and codified knowledge. The former was often acquired and developed implicitly through engagement with colleagues within the organisation, through daily working life. Especially within more dynamic firm contexts, this experience was enriched through the variety of external relations (with customers, other technicians, suppliers, etc.) and the use of more organised internal activities (within project teams, sessions with more experienced colleagues etc.). Sometimes, as in both Italy and England, the workers were participating in formal networks, which involved people from a range of companies, and were focused on solving practical problems.

Working intensively in group situations often offers rich opportunities for learning. Such settings represent ways in which individuals can assess their own level of understanding of issues, ways of working, solving problems and so on. They also offer opportunities for individuals to assess departmental or organisational orientation, the patterning of work process knowledge, and an understanding of a 'place's style' that emerges within daily

experience and relations with the reference community. The implementation and development of individual capacities do not happen in a 'vacuum' of exchanges and contexts but rather in the 'full space' of participation – of the more or less aware, more or less competent – in specific organisational communities. Actors in the Italian context, in particular, talked of the existence of a 'hunger to make sense' of and within different contexts, or, in other words, the need of collectively surfacing the characteristics of local organisational knowledge.

Besides the positive perception of belonging to professional aggregations, it must be noted that a significant part of professional learning is acquired through participation in communities and networks of different kinds. Interviewees, especially in ICT, typically saw themselves as members of different, real and virtual, communities (with clients, technology providers, other professionals) and considered these as an important ground for developing their own competencies outside formal arrangements, even "the coffee shop easily becomes a place for technological communication" favouring exchange between professionals that work in the same sector. Having a number of sources of help could be invaluable: "sometimes I feel I learnt a lot by a simple phone call that allow me to get informal advice based on their experience in similar situations".

So a work environment rich in opportunities for development of technical workers allows forms of continuous learning from others. These include learning from members of the work group and professional communities (Wenger, 1998; Wenger *et al*., 2002); learning through opportunities for interacting with more senior members (sometimes with explicit intention of 'passing on' knowledge and experience); and learning through exchanging information and knowledge outside the organisation (especially with clients and suppliers). In such circumstances, in innovative SMEs, ways of working and learning are based on collective sense-making, a perspective that emphasises engagement in a common enterprise perspective and mutual support. Learning is intrinsic in ways of working in which employees' co-operation and competition coexist.

Importance of formal knowledge development

'Learning' is therefore often intimately bound up with 'sense-making': interacting within communities and networks is a fundamental way for constantly re-building personal cognitive approaches to specific issues and re-constructing the sense of the whole work experience. However, even where experiential and social learning are widely diffused, formal approaches to learning can help in a wider process of sense-making. That is, even where codified knowledge is spread through a mixture of diffusion through communities coupled with self-learning practices, formal approaches to learning can potentially take sense-making to a new level, not least through a process of systematic engagement with cognitive and imaginative faculties not necessarily always used in more regular activities.

Although the importance of informal learning is recognised and self-learning is widely diffused, most of the interviewees clearly acknowledge the need for structured continuing training interventions. This was demonstrated by an Italian interviewee who felt the need for an explicit 'knowledge methodology': "…I feel the need to go back to study. At a certain moment one needs to link experience and informal learning with something more structured. Books, reviews, the web are not sufficient: you need a systematic approach, a

method. And you can obtain this only through real training courses". Also many interviewees considered formal training as a key solution to the expectations of achieving an 'overall vision' in terms of work process knowledge development in their field.

Interestingly, the offer of training was also appreciated for the strategic and symbolic value attributed to it as a sign of interest from the firm: "… now that I'm working within an enterprise where I can undergo training during the working hours and this is paid by the company itself, I feel successful. I feel privileged". The provision of training also, of course, could be linked to the improvement of their own skills and competencies too.

Need for support for learning at work

Organised learning support could play an important role in the development of knowledge and skills of technicians. The organised learning support could involve the use of mentoring and coaching; rotations, visits and shadowing; reference to 'experts', but the number of cases of 'good practice' were overshadowed by examples of where the absence of organised support for learning on-the-job left people struggling 'to sink or swim' partly according to how well they put their own arrangements in place. Feedback from colleagues, and consultation and collaboration within working groups could be particularly useful, as could processes encouraging mutual consultation and support. Membership of task groups or project teams could help people develop new skills, fresh perspectives or deepen their organisational or contextual understanding. One key aspect of personal development was whether the individual was able to access the often tacit knowledge that was held by particular individuals rather than embedded in social activities. Personal networks could therefore be vital in speeding the process of continuing learning and development.

Need to support the development of hybrid skills

That is there is a need to focus upon the development of hybrid skills as well as, rather than just, technical skills development. Hybrid skills refer to the ability of people to harness technical skills in support of business development. In this context a policy recommendation could be to support programmes with an 'entrepreneurial education' component as well as specialised technical training for employees in SMEs. That is courses should provide, on the one hand, knowledge to solve immediate and specific professional tasks and work process demands and problems. On the other hand, such courses or learning arrangements should also convey more strategic and generic skills required, for examplethe, in the better implementation of projects, such as time management, knowledge management and resources management.

Value of individuals working across a range of contexts both within and between organisations

It was noticeable that both the individual biographies and the case studies drew attention to how much individuals learned from having to apply their skills, knowledge and experience in a variety of different contexts – whether this was within companies or was linked to individuals working across a range of organisational contexts (whether of

suppliers, customers or clients). This was helpful not only because it often injected additional challenges into work activities but also because it often led to reflection upon different ways of working. The examples from England, Germany and Italy also drew attention to the effects of interaction of companies in patterns of learning in SMEs that were embedded in various networks.

Learning through competence development and growth of work process of work process knowledge

Learning and competence development were often closely entwined, particularly in those contexts where formal CVET interventions were relatively seldom used. Developing technical competencies were seen as vital tools for survival and development in working life, but also in dynamic contexts continuous technical competence development was considered as critical to the growth of new forms of organisational (and inter-organisational) relations based upon mutual consideration, trust and sharing technical expertise.

Competence development was seen as linked to the acquisition not only of specialised knowledge concerning technical aspects of the work processes but also to relational aspects. These were based on the interplay between different roles and activities within organisations and the ability to interact effectively with clients, suppliers, competitors and other people external to the organisation. There was a sense in which the development of a thorough work process knowledge (Boreham, 2002; Boreham, 2004a; Boreham, 2004b) was an important goal of individual learning and sense-making and the platform for further learning and achievement of acknowledged expertise. Work process knowledge is that knowledge of the business production and labour processes in the organisation which is created and circulated through co-operative arrangements at different levels of an organisation, allowing continuous learning and process improvements.

6.6   Creating contexts that facilitate work-related learning for technical workers

So far the emphasis has been upon the variety of individual, contextual and learning factors that influence patterns of participation in CVETL. However, now we need to consider how to create contexts within which the work-related learning of technical workers is likely to be enriched and enhanced.

Responding to the trend for learning and working to move closer together

One clear trend within workplace learning is the extent to which working and learning for technicians are drawing closer together. In particular, there is an increasing awareness that learning and motivation are influenced if activities are embedded in contexts that make sense and are important for the learner (Raizen, 1994). Although there may also be times it is important for the learners that some distance is put between learning and work, so as to generate breadth of perspective. Indeed Eraut (1994) raises the question of whether successful workplace practice can necessarily be equated with a capacity to understand the ideas and concepts that inform such actions or to transfer them successfully to other contexts. For example, experienced practitioners may be seeking broader perspectives,

theoretical understanding and so on. Engeström (1994) also points to the contribution theoretical concepts can make to assist individuals to understand what they are doing and why work practices are subject to change. So while meaning for the learner may often be increased by getting closer to working processes, in other cases putting greater distance between learning and working may be appropriate.

Policy Point: there is often value in promoting learning while working, but it is also vital to acknowledge that there are other circumstances where it is important for the purposes of learning to put some distance between learning and working.

Problematising the link between learning at work and qualifications

Policy Point: is it possible to offer institutional support to a system that looks to develop employees in ways considered to be meaningful by the individuals concerned (rather than necessarily fitting the requirements of formal education and training)?

In such an approach the formative nature to competence development could mean that the focus is upon where does the individual go from here in the light of the competences they (believe they) possess. This could be an inclusive process open to all, whether or not they want to seek formal qualifications, have their existing competences recognised, or undertake formal education or training. The key point here is that the competence review looks forward and focuses upon individual learning and development. It is also important to build a stronger dialogical element into those cases where a link between non-formal learning and formal qualifications is appropriate. Reflective dialogue and evaluation can be used to broaden and deepen learning in the workplace (and in part compensate for the possible narrowness of experience in the work tasks performed by an individual).

In a number of contexts, but particularly in Germany, there was also a feeling that some types of qualifications were not at the right level of aggregation: for example, the proliferation of vendor qualifications could add little value to a clear record of experience and more substantive qualifications. From a policy perspective this riases issues around the use value of qualifications. There was a feeling among many in germany that in order to get back to greater recognition and a wider recognition of certificates it may be necessary to map out higher standards and to introduce more sophisticated assessment of the key aspects that underpin effective performance as an experienced skilled worker.

Responding to issues raised by the differential access to opportunities for learning of different groups in the labour market

The focus of this research has been upon the participation of technical workers in CVETL activities. It should, however, be remembered that this is a relatively privileged group within the workforce and that there are also issues around gaining access to such employment. There is differential access to training of different groups in the labour market: for example, according to employment status, with peripheral workers often getting little access to further education and training. The experiences of Portugal, Spain and Greece all emphasised the need for formal CVET programmes to be designed with issues of social inclusion also in mind.

However, even within the cohort of technical workers there were wide differences in access to opportunities for further learning. Small companies with a commitment to learning and development could be found in all sectors and in all national contexts, but often these were representative of one end of a rather polarised industrial structure, the other end of which contained a large number of small businesses oriented towards production of standard (often relatively low quality) products, mostly competing on price, and who had relatively little interest in learning and development. These processes favoured the emergence of updated types of professionals in the upper stratum, not only technically competent but also holding significant social skills. On the other hand, in the lower stratum employment is often precarious and excludes the possibility of real developmental trajectories, even for skilled workers.

In parallel a significant continuity seems to occur between learning in the working environment and self-learning, especially as far as the up-dating of technical competencies is concerned. Both the questionnaire-based inquiry and the life histories interviews show that individual up-dating (through reading handbooks and specialised journals, navigating websites, and attending newsgroups) is widespread among technicians in the two sectors and is considered as a necessary activity for surviving and developing in fast changing contexts.

One particularly unfortunate side-effect of the polarisation of learning opportunities in jobs is that opportunities for significant learning while working are correlated with encouragement of self-directed learning. The challenge of work seems to drive self-directed learning both within and outside work. In learning-rich jobs competence development is intrinsic to work and supports the emergence of acknowledged professional identities. In contrast, where conditions for learning from others and challenges in work are poor – as in organisations offering low quality jobs in the software sector – then opportunities (and motivation) for self-directed proportionally decline too. Several negative loops are in place within stagnant or declining organisations where the lack of opportunities for professional growth represents a depressing factor inhibiting the formation of strong professional identities within the organisation and at the same time undermining motivation to engage in other self-directed learning outside work, except in those cases where this acts as a spur to get on and get out.

Production and employment structures could be polarised in ways that do not reflect organisational size: with the technical employees of SMEs having access to some of the most learning-rich jobs as well as some of the most learning-poor. That is, on the one side, there are employees engaged in highly innovative work, while, on the other side, there are those in low-level jobs almost completely detached from any sense of innovative dynamics, with the jobs themselves often close to disappearance. This presents a particular challenge for public policy since if it is to align the interests of the individual, company and state it must find a way of engaging the interest of the company in supporting access for employees to learning opportunities.

One policy recommendation could be that financial support for CVET measures and guidance about CVET opportunities could be targeted at employees from SMEs because these employees and their companies often do not have enough financial and time resources to take part in CVET courses. This might pick up some employees who are

willing to engage in further learning in their own time, but this measure alone would be unlikely to galvanise participation from small companies that do not already acknowledge the value of learning and development for improving organisational performance. For these companies a focus on the latter (improving organisational performance) may be more attractive until they begin to appreciate the value of learning and development. Hence a focus upon supporting small companies more generally (aimed at making them more effective) may be more successful for those without a commitment to learning and development. In such cases it may be that learning and development are then seen as a means to an end rather than as an end in itself.

Policy Point: is it possible to offer support to small companies to help them become more effective, where learning and development is seen as a means to achieving a broader goal rather than being viewed as an end in itself?

Three implications flow from this. First, such CVETL has to be high quality – it has to deliver on promise of improving company effectiveness. This will probably involve not just learning new techniques but also expert support in how to apply them in the company. Second, other employees and employers need to become aware of the link between such an approach to CVETL and organisational effectiveness. Third, for those companies that are not interested in enriching learning-poor jobs then it should be clear that the main aim of policy interventions at this level should be in helping people overcome their present situation: that is, it should help them acquire new skills which could allow them to leave their unsatisfactory and precarious jobs and to self-design a new professional future in the same sector or even outside it.

Responding to the challenge of developing new forms of CVETL

In dynamic sectors there are signs of new forms of labour market in which the traditional dynamics of work demand/supply are replaced – although not completely – by knowledge demand/supply dynamics (Burton-Jones, 1999). Certainly within ICT case study companies there was evidence of a logic of protection of their internal intellectual capital when they put in practice policies that – although not in a conscious way – had something to do with the idea of core competencies development, whereby internal resources assuring competitive advantage have to be continuously monitored and rewarded (Pralahad and Hamel, 1990). The high mobility which is typical of the ICT sector is not totally at odds with firm policies aimed at promoting 'internal labour markets' allowing more or less extended opportunities for informal work-based learning and individual competence development.

Such a model of organisational functioning and HR management assures high levels of work flexibility and constitutes some basic conditions for integrating individual experiences within broader-scope organisational learning. Although there are weaknesses too in such a 'spontaneous' model and some risks implicit in its reproduction. As shown in case study companies, weaknesses can emerge in phases of firm consolidation and expansion when competence development is seen as the responsibility of individuals. In such circumstances this may be an inappropriate strategy and one where, on the contrary, more structured models of HR management should be developed in order to accomplish

longer term objectives, and overcome the accumulation of 'skilled incompetence' (Argyris, 1990) effects might be expected in an organisation that does not develop explicit plans for professional growth.

For individuals, 'spontaneous' learning from others and self-learning can represent powerful boosts for the acquisition of some degree of work process knowledge, but both these ways of informal learning cannot be considered as the only ways of competence development. First of all, positive development of informal learning requires that parallel opportunities be put in place for deepening the technical-scientific underpinnings of work activities. "…I feel the need to go back to study. At a certain moment one needs to link experience and informal learning with something more structured…" affirmed one of the interviewees, clearly expressing a way of thinking which is present in many other life histories.

Moreover, work-based learning of individuals and groups requires higher levels of aware management in order to produce sustainable outcomes, but at present such awareness seems to be low. Informal learning processes are felt as crucial by employees but at the same time are not consciously handled or even conceptualised while deeply rooted mental models concerning work, organisation, knowledge acquisition and other important issues still survive. Many of the interviewees tend to consider the acquisition of work process knowledge as just self-generating through experience. Only a few realise that real learning has to overcome serious constraints in terms of time and action and requires the use of reflective skills concerning work activities (Schön, 1986). "Stopping to reflect with other people on what we are doing is a luxury we can hardly ever afford. It would be important to understand things when we are doing them…" stated one of the interviewees, providing an important view on a problem which is at the same time of a cultural and an organisational-managerial nature.

Innovative forms of CVETL, significantly far from the traditional school-based model, could therefore play an important role in relation to the above problems. Such a new role should be based on education-training strategies linked to the emerging characteristics of organisational knowledge and learning development. This seems to imply new choices at different levels regarding in particular: the overall strategic approach and even the fundamental meaning of CVETL in socio-economic processes, the link of CVETL policies with other development policies at the sectoral and regional level, the creation of new intervention frameworks adapted to the reality of adults employed in very different contexts.

In terms of an overall strategic approach CVETL should reflect a broad-scope perspective on the nature of knowledge and competencies, especially in rapidly changing technology-based processes. Knowledge needed within such processes cannot be treated anymore only in terms of know-what (information about the explicit aspects of work activities) as is typical of many initiatives (courses) in this field. Dealing with such processes also requires continuously accrued competencies in terms of know-how (based on awareness of the effects of the tacit cognitive components of work activities), know-why (i.e. continuously updated understanding of the scientific principles underpinning technologies and other aspects of work activities), know-who (regarding the social side of work activities) (Lundvall, 1992; Lundvall and Borras, 1999). This implies a new conception of CVETL

interventions, in which informal learning and the different modes of conversion of explicit knowledge into tacit knowledge and vice versa could also be taken into account (Nonaka, 1994; Tomassini 2003).

In terms of development policies, those devoted to CVETL should be connected with other relevant policies aimed at promoting the overall growth of the industrial/service fabric of specific sectors and regions. This means promoting and sustaining through appropriate interventions the managerialisation of SMEs, in particular for the support of entrepreneurial competencies, considering that entrepreneurs having a technical background often lack the abilities and visions needed for carrying through solutions for complex problems at the organisational and HR level.

As far as the creation of new intervention frameworks are concerned, these should be adapted to the reality of adults employed in very different contexts. In general, two different macro-frameworks should be conceived. The first one should address the problems of employees operating in the lower side of the employment reality, even in a sector like ICT. The main aim of the interventions at this level, as argued above, should be to help people acquire the skills which could allow them to leave their unsatisfactory and precarious jobs and to self-design a new professional future in the same sector or even outside it.

The second one should take into account the more or less consciously expressed needs of professionals who are engaged in situations where competence development is linked to concrete opportunities to participate in the creation and exchange of work process knowledge and where the combination of work-based learning and autonomous self-learning assures sound bases for further progress. The main aim of the interventions in these cases should be: (i) to deepen the contents of self-learning through updating activities based on recent disciplinary and quasi-disciplinary advances; and (ii) to increase the employees' reflective abilities through familiarisation with appropriate methodologies ('action methodologies', 'reflective practices') to be applied at both the individual and the organisational level.

In both cases the traditional concept of CVET is significantly challenged. Operating within the above sketched framework implies CVET systems need to overcome the bureaucratic forms through which CVET courses are often at present delivered. Such forms are sometimes considered as dysfunctional even by direct actors (such as VET practitioners and managers of training institutions). In particular, very general courses for those who are seeking to develop new professional prospects may be considered out-dated from a perspective of state of the art continuing development needs. In sectors like those considered in the present inquiry new forms of participation in CVET activities will emerge if new policies are put in place in terms not only for education and training but also for organisational support and professional counselling for companies and for individuals.

A deeper engagement seems indispensable of the involved research communities on these kinds of topics, together with increased levels of co-operation between different institutional actors, in particular at the regional and sub-regional level.

6.7 Implications of project findings for policy and practice in Continuing Vocational Education, Training and Learning

So far the themes have ranged across analysis, portrayal of project findings, and how how to enhance and enrich work-related learning for technical workers, with just an implicit or occasionally explicit consideration of the implications of the research for policy and practice. However, we need to examine more closely the implications of the project findings for policy and practice in CVETL.

6.7.1 Implications for policy from findings from surveys and interviews

Formal CVET for technical workers in our sample could almost always be seen in the context of dynamic and/or uncertain labour markets, where the chance to increase their human capital, for example through updating existing skills or developing new skills via training was important. Skill development in such contexts is often key to maintaining employability over a long period. However, to view participation or non-participation in such training as necessarily decisive overlooks the fact that, certainly in England, Germany and Italy, much skill development for technical workers takes place outside formal training contexts. Much learning and development takes place while working. Additionally, it may be that it is social capital, developed through participation in work-related networks, which help individuals sustain their employability.

Certainly, in a range of contexts those individuals whose work regularly took them to other workplaces, or changed jobs frequently early in their career, developed strong networks as well as experiencing challenging work in a variety of contexts, a process that honed their skills in a number of respects, including the development of tacit skills. In some cases technical workers starting their career had high level qualifications, and what they often needed to become more effective at work was practical experience gained while working rather than formal skills or knowledge updating through formal training programmes.

Individual biographies showed personal networks were important in many contexts over a career, from hearing about job opportunities and gaining initial entry to work through to many aspects of continuing career development, including choices about different ways of updating professional skills, knowledge and experience. These networks often had a pragmatic and informal nature and the functioning of these informal social networks re-emphasised the point Granovetter (1973) about the 'strength of weak ties', with the network spreading out to include help of relatives, friends, colleagues or even through spontaneous relationships embedded in other social environments. Progress in work is often supported by spontaneous forms of learning in which informal work-based learning and self-managed competence development converge and both are often at least partly dependent upon the quality of support from personal networks. Indeed in some contexts in a number of countries work-based learning and competence development appeared largely to compensate – for better of for worse – for the lack of wide-scale formal CVET interventions.

The findings of the Participa investigations, comprising the survey findings and analysis of interview and focus group data, lead to the following conclusions:

- In contexts where technical work itself is challenging, then much continuing vocational learning takes place outside formal training programmes.

- There is a need for employees not only to update their technical skills but also to develop further a range of more generic skills, including planning, problem solving, communication, IT and management skills.

- Learning to become more self-directed in your approach to learning can lead to significant work-related learning.

- Use of personal networks can be an effective way to critically reflect upon work and hence can be an important source of work-related learning.

- Learning how to support the learning of others (especially for those with management and supervision responsibilities) is vital to improve the likelihood of significant learning while working.

- Learning how to organise knowledge effectively and apply it appropriately is vital for technical workers' development.

These were coupled with some ideas for recommendations for CVET policy and practice:

- The focus of strategies for skill development should be upon continuing vocational education, training and learning, rather than just upon participation in CVET per se.

- Greater attention should be given to helping employees become more effective in supporting the learning of others at work.

- There is a need to focus upon the development of hybrid skills rather than just technical skills development. Hybrid skills refer to the ability of people to harness technical skills in support of business development.

- Encouraging the spread and sharing of tacit knowledge, through a combination of individual mobility and formal and informal networks, will increase the competitiveness of companies in particular districts or sectors.

- Public training institutions should design and implement policies to promote participation in training and learning among not only the technical workers but also the owners and managers of SMEs in order to enhance both professional development and company development.

- A policy to promote self-directed learning through e-learning strategies should be developed and implemented.

6.7.2 Implications for policy from findings from the case studies

The completion of a case study for each participating region was the culmination of the Participa project on continuing vocational education, training and learning (CVETL). The data collected was analysed using the ISSTAL dimensions as an organising frame, but the focus of the data collection was upon engagement in substantive learning rather than in participation in formal training per se. In this way it was possible to identify a more multi-layered approach to barriers to work-related learning for individuals and to consider a wider range of ways in which effective work-related learning may be promoted, especially for technical workers working in small and medium size enterprises. This also highlighted the interaction between formal and informal approaches to learning, skill development and knowledge creation.

Value of networks being linked to major companies

In a number of contexts, particularly in England, Germany and Italy, SMEs participated in networks that were organised by or around a major manufacturer or supplier. These networks were organised around mutual learning, development and support and could be focused on innovation and development. This presents a significant challenge for CVETL policy – requiring a move away from viewing the organisation as the key unit of analysis and a focus for policy concern.

Recommendation: the focus for policy support for learning, training and development should focus more on networks and clusters rather than individual companies.

The main capabilities sought in suppliers by the lead company included consistent product quality; manufacturing flexibility; continuous improvements in production or service delivery; inter-organisational capabilities to meet increasing pressure for tight integration and co-ordination of production, product design and development. These are, par excellence, learning issues, in which technical workers have a key role to play. Changes are being driven by a desire to improve competitiveness and learning is viewed as a means to achieve this, rather than as an additional burden.

Recommendation: the focus for policy support should be upon improving organisational performance and continuous improvement – from this perspective learning, training and development are outcomes rather than inputs.

Positive response of employees to removing 'problems' in their ways of working

Most technical workers quickly appreciated the value of the new techniques for improving the way they worked and were willing to learn new ways of working. Issues about participation in CVETL can become a non-issue, where the focus is upon improving the job (and the activities may not be viewed as learning or training, but rather simply viewed as part of natural work activities).

Policy issue: there is an important issue here about whether (and why) we need to label explicitly all 'learning' that occurs in other activities.

Typically, it was much more difficult to convince managers of the benefits of continuous improvement activities, simply because they were so busy addressing more pressing issues even if these were of less strategic significance. [This relates to the issue of some managers being locked into a state of 'skilled incompetence' where they focus solely upon the most immediate pressing issues, even if they do this successfully.]

Policy issue: there is an issue here around organisational culture. Managers may be so focused upon a range of relatively short-term targets that it is difficult for them to focus upon learning and development that delivers benefits in the medium term and beyond.

Where individual companies or networks did try to bring about a step change in how they respond to challenges of innovation, continuous and development, the appointment of particular individuals as 'change agents' with responsibility (and time and resources) to lead the change process was successful, provided that there was explicit support too from senior management. The involvement in the 'change agent' training, and the broadening of their subsequent job roles, invariably led to significant personal development for those directly involved.

Policy issue: interestingly it is the combination of different types of learning activities, some of which are grounded in 'project-based work activities' that delivers such a powerful learning environment and seems to have such a direct effect upon motivation and attitudes towards learning. Engagement in these types of activities often whetted the appetite of the participants for engagement in further learning and development.

The training did not just lead to individual development, as one of the key aspects of the training was the need to facilitate the learning of others when cascading the approach within the company.

Policy issue: one important feature of a mix of training and learning was that it did not just lead to individual learning and development, rather the companies now effectively had 'learning champions' who were keen to support the learning of others – indeed that was the raison d'etre behind their role as 'change agents'.

After involvement in training as 'change agents' these individuals sometimes cascaded the training and approach to development to other employees involved in production and/or technical activities. Importantly, this was one way a positive approach to learning and development was spread beyond technical workers.

Supporting learning and innovation in SMEs through participation of technical workers in continuing vocational education, training and learning: interaction between training policies and creating opportunities for significant learning experiences at work

When looking for cultural shifts in attitudes towards learning and development to become fully embedded, it is worth recalling this is a long-term process.

Policy point: Compare how it took decades for Toyota to embed institutionally a continuing commitment to continuous improvement.

The experience of case study companies in England, Germany, Greece and Italy showed how formal CVET was particularly effective when it encouraged both formal and informal learning in the workplace. One way to achieve this was to encourage a decentralised view of the processes of knowledge creation within companies. The focus upon SME skill needs could be the stimulus for organisational and inter-organisational learning and knowledge management across networks, as well as supporting individual learning.

Policy point: One implication of this approach is that it might be worthwhile considering a reshaping of the boundary between higher education (and/or senior secondary vocational education) and continuing education and training and organisational development. The underlying pedagogical idea would be that there is considerable value in attempting to link processes of knowledge creation with approaches to tackling the core problems of manufacturing practice or service delivery as a means of engaging learners (in SMEs) that have traditionally been difficult for formal education and training institutions to reach.

It is also clear that innovation and learning within organisations are essentially social processes. Hence in successful networks particular attention was given to building relationships to support innovation that went across companies in the networks. The development of key individuals or change agents was itself designed so that they would be able to support process innovations within their companies.

Policy point: This means that networks offer not only a mechanism for technology and process transfer and exchange of ideas about development and practice, but also a means of supporting those interested in acting as change agents in support of development and innovation.

Policy point: Networks, such as those exemplified in the case studies, have the potential to grow as a general means of innovation transfer in supply chains.

Networks sought to give people not only access to innovative ideas, but also to give learners opportunities to shape these ideas in ways that were directly useful to them in their work. This applied particularly to the work with company change agents.

Policy point: A major concern with the development of much learning in continuing vocational education and training that is supposed to support practice is that the knowledge generated is often decontextualised. This problem was overcome in networks that focused upon the key problems of manufacturing practice or service delivery. Attention is given to problems and dilemmas that are central to the challenges that technical (and other) workers face in the workplace.

Decontextualised knowledge may be of relatively little use to employees in coping with many of the problems they face in practice. The focus upon key problems faced in the workplace is, however, not simply linked to technical issues. The problems are likely to contain combinations of practical concerns, organisational issues and socio-cultural problems. Adopting this approach also means that employees are directly involved in processes of active knowledge creation. Additionally as much of the learning is grounded in improving processes and practice there is little doubt that this approach can contribute to improvements in efficiency and the competitiveness of SMEs.

Where networks were organised around major companies, for example in supply chain networks, there is a premium upon smaller companies showing that not only do they produce quality price competitive products, but also that they are able to operate effectively and relatively independently within integrated supply chains (Abreu *et al.*, 2000). Participation in learning and continuous improvement is not an additional activity to be promoted but one that is fundamental to how the company presents itself to others.

Policy point: More generally, what is of particular interest is the way that training policies operate within supply chain networks. That is, formal training in process improvement techniques for technical workers are being combined with creating opportunities for the application of these processes in a collaborative manner which in turn generates significant learning experiences at work.

In many cases the roles of those undergoing training were broadened, for example through participation in improvement teams, and the organisation of work itself was often changed as a direct consequence of participation in these activities.

Policy point: This is important as the creation of learning-enriched jobs leads to more embedded learning and is sustainable, compared to training that is going against the grain of what is happening at work.

The approach to learning through networking could be seen as an example of an active model of learning whereby learners are engaged in the creation of 'new contextualised' knowledge, not recipients of a largely passive process of knowledge transmission. This is in line with the theoretical framework developed to explain processes of organisational knowledge creation by Nonaka and colleagues (Nonaka & Takeuchi 1995; Nonaka & Konno 1998). This approach makes use of a social model of knowledge creation and transformation. The key process for genuine knowledge transformation to occur is that knowledge has to move from the individual level into wider communities of interaction that cross organisational boundaries as happened in networks. Learning communities, based either on multi-organisational or professional networks, worked well when they possessed the dynamism continually to create new knowledge.

Policy point: This approach to the development of practice is reflective, forward-looking and dynamic and works best within a culture that acknowledges the importance of developing practice, expertise and analytical capabilities in an inter-related way so as to be able to support the generation of new forms of knowledge.

The network approach outlined also fits well with the idea that those engaged in particular work practices and processes have a key role to play in how new knowledge is generated and applied in practice (Engeström 1994). An individual's knowledge of practice can itself regarded as a personal synthesis of received occupational knowledge and situational understandings, derived from experimental learning, which are capable of being further transformed through a process of critical reflection. As expertise develops, and new contexts are utilised in the performance of practice, so the processes of analysis, review and reflection can lead to the creation of new forms of knowledge (Engeström 1994).

Policy point: Approaches such as those adopted in networks therefore constitute an important way in which to develop contextualised knowledge of how to affect continuing practice and process improvements. These practices and processes are dependent upon the active participation of a full range of employees, with technical workers having a particularly important contribution to make.

The role of individual agency in participating in training, learning and knowledge development at work

The benefits of participation in networks focused on improvement, learning and development to companies were evident in improved organisational effectiveness. However, what personal advantages might an individual gain from participation in networks? In relation to participation it was interesting that after participating in networks many individuals expressed an increased interest in investigating ways in which they could continue their learning.

Policy point: involvement in networks could represent a different type of learning to that previously on offer and participation in substantive programmes of CVETL could act to change the attitudes of the participants towards learning.

Policy point: Note by addressing structural factors associated with the nature of the particular provision of the combination of formal CVET and opportunities for learning at work then issues associated with individual agency as to whether or not to participate in CVET assume less significance.

Although some aspects of formal learning in networks could be formally acknowledged and/or accredited, other aspects of involvement in activities designed to bring about improvements in company performance and in their own individual learning were often not recognised. Learning could be evidenced, however, through reflections upon learning at work in portfolios. This process could be evidence of the ability to communicate effectively in writing, to be self-reflective and so on. There is value in portfolio building being coupled with active reflection upon what has been achieved with others too, rather than being a passive individual process of just documenting what you have achieved.

Supporting learning in SMEs

It is worthwhile drawing out four lessons for supporting learning in SMEs. **First, it is clear that a focus upon improving organisational performance can contribute to improving commitment to learning at work of both companies and individuals that**

have traditionally been hard to reach. Examples of demonstrable improvements in quality, cost and delivery can make the link between learning and performance transparent. The support of large companies as lead organisations in a network can be significant too. The participation of large organisations in networks proved to be powerful 'hooks' to engage SMEs in learning activities.

Second, once committed and after overcoming initial suspicions of learning and working with staff from other companies, there were considerable benefits from collaborative learning. The networks involving change agents from different companies working together meant that, in addition to transfer of 'good practice', they could get a 'feel' for the capabilities of the other companies and this opened up possibilities for greater collaboration. In networks there was also value in learning as a member of a group, including from others with a variety of backgrounds - with mutual learning across hierarchical levels as well as horizontally between departments and companies.

Third, learning in networks was most effective when there was a formal learning framework in the initial stages and a continuing structure of learning support - it was not just a question of bringing people together. The use of a wide range of learning methods helped improve commitment towards learning. These methods could include: participation in process improvement reviews and implementation; workshops focused on key problems of manufacturing practice or service delivery; group discussions; formal assignments; portfolio-building; and discussions with tutors. There could also be a key role for a mentor, coach or learning support tutor in helping learners build and then sustain commitment towards their learning goals.

Fourth, the final stage for companies is to attempt to move towards still more expansive learning beyond the immediate context and thus overcome the problem of 'skilled incompetence'. Many of the technical staff who had engaged in substantive learning though working in process improvement or project teams recognised the value (and potential transferability) of the skills they were developing and this contributed to their commitment towards learning. For example, the skills required in coping with the challenges of trying to implement change involved compromise and dialogue and helped people hone their communication skills. Working in teams and on projects often gave people support to help them engage in patterns of thought conducive to learning. However, both for individuals and companies there was also the need to have time and space to engage in critical thought, self-reflection and personal development, including opportunities for both collaborative and self-directed learning, in order to overcome the possible limitations of a focus just upon improving current processes and practices. There is also a need to consider longer-term issues.

Overall, models of learning in networks with an emphasis upon networking, knowledge creation, linking an initial focus upon performance with a progressive broadening of ideas about learning and development are particularly well suited to the development of technical workers in small companies. For the companies to engage in organisational learning, however, they need to look to beyond the stage of 'skilled incompetence' and consider more strategic issues of learning and development as well.

One implication of this approach is that it might be worthwhile considering a reshaping of the boundary between higher education, continuing education and training and organisational development. The underlying pedagogical idea is that there is considerable value in attempting to link processes of knowledge creation with approaches to tackling the core problems of manufacturing practice as a means of engaging learners (in SMEs) that have traditionally been difficult for formal education and training institutions to reach.

One key lesson from the Participa project is perhaps that well-designed provision that integrates CVET and opportunities for substantive learning in the workplace can overcome the potential reluctance of individuals in SMEs to participate in CVETL. On the other hand, such provision does require whole-hearted commitment of the company to a process of organisational development: that too represents a substantial challenge.

6.7.3 Implications for policy from the experience of the project more generally

The policy implications arising from the particular research processes outlined above are grounded in practice. Indeed, one of our findings concerns the value of thinking about CVETL in specific contexts grounded in a deep understanding of typical patterns of organisation of work, learning while working, challenges inherent in work, relationships at work, knowledge development and utilisation, career development and so on. Notwithstanding this, however, it is also possible to draw out some additional general lessons from the experience of the PARTICIPA project in the six European regions as follows:

- The focus on participation in formal CVET activities should be broadened so as to consider participation in work-related learning as a whole. This should be taken into consideration by policies across Europe, trying to tackle the special problems that result from a deficit in participation in CVET among technical workers in SMEs. Policies for increasing participation of SMEs' employees in CVET should be broadened towards policies for enhancing continuous learning. This is to say that the focus of strategies for employees' skill and competence development should be upon continuing vocational education, training and learning, rather than just upon participation in CVET per se. In addition, greater attention should be given to helping employees become more effective in supporting the learning of others at work. That is, we need to support more learning and development, but this may or may not require more formal training.

- For this reason, policies directed to opening up opportunities for the assessment, recognition and certification of the competences acquired via non-formal learning, learning at work, learning in networks and self-learning should be promoted and developed throughout European Union. That is not to say, however, that such competences always need to be certified. Often recognition as a skilled worker with particular forms of expertise carries more weight. It is just that the worker needs the option of getting her or his competences officially recognised at a time of her or his own choosing. That is, we need to support more learning and development, but this may or may not result in more people acquiring additional qualifications.

- Further research should be promoted (possibly using the ISSTAL model adapted with the conclusions from the present research) into what influences participation in learning outside formal training settings and the requirements of technical workers to develop further a range of more generic competences such as planning, problem solving, communication, IT and management skills. That is, there is a need for research and policies to focus upon development of individuals' transversal skills (including learning how to learn) rather than just upon the development of their technical skills.

- Research findings show the original ISSTAL model works well in the Portuguese and the Spanish contexts. In addition to images of learning, intellectual flexibility, psychological functioning, retained information, and attitudinal dispositions, experience has been identified in all the different contexts investigated as a dimension of particular importance for participation in CVET. Experience as a factor points to the importance work can play as a learning catalyst. This is true of the utilisation of the learning potential of communities of practice, the incidental acquisition of 'tacit' knowledge or the learning conducive character of particular work tasks. In addition, research has shown that there is only a weak relationship between the technical workers' actual advancement after participation in training and their expected advancement (as a possible source of motivation for working and continuing participation in training). These findings lead to a recommendation that public training institutions should design and implement policies to promote participation in training and learning among not only the technical workers but also the owners and managers of SMEs in order to enhance both professional development and company development. In particular, a policy for self-learning through e-learning strategies should be developed and implemented.

- It was also clear that the needs of individual learners concerning the content and forms of learning should be also taken into consideration in policy design if participation in training and learning is to be enhanced. On one hand, employers are demanding more and more competences instead of qualifications. Those demanded competences are made up of a set of hybrid skills which refer to the ability of people to harness technical skills in support of business development, as is stressed in the German study, and even more strongly by the Italian and the British studies. On the other hand, encouraging the spread and sharing of tacit knowledge, through the combination of individual mobility and formal and informal networks, will increase the competitiveness of companies in particular districts or sectors. In addition, the direct effect of retained information and attitudinal dispositions on situational aspects and participation in CVET, as found in the Portuguese settings, points in this direction. For this reason, the need for those hybrid skills or competences should also be reflected in modern occupational profiles as well as in policies and measures of accreditation which could improve the quality of training programmes as recommended in the Greek study.

- Information on CVET offerings and possibilities for continuous learning available to technical workers in SMEs has been found as a very important factor influencing participation in CVET. One way of tackling this problem would be to

implement a policy and/or a strategy aiming at equipping workers and managers with some kind of learning awareness so that they can become more effective in supporting the learning of others at work. In addition, policies should integrate measures in order to have companies making efforts not only to reduce participation barriers but also to implement incentive strategies emphasising the role of learning and development in improving job performance and company effectiveness.

- 'Loci' of learning should be clearly focused by policies upon what can be learnt most effectively in practical work and what can be learnt most effectively through utilising other forms of organised learning support. Co-operation can then be based on the respective strengths and weaknesses with regard to learning at different sites or through different forms (such as e-learning, etc). The pre-condition for this is a close dialogue between SMEs and CVET providers.

- Policies for promoting quality in CVETL should be developed and supplemented by integrated incentives to make employers and employees aware of the role of learning and development in improving job performance and organisational effectiveness and of the need for self-directed learning in work processes in addition to participation in CVET courses. A new CVETL policy perspective should be based on new forms of reciprocal recognition between the training world and the productive world. It has to be based on lifelong learning attitudes, which have to be carefully built through learning and education policies and practices. These kinds of policies acknowledge the close relationship between innovation in companies, learning and more effective learning support.

- Innovative forms of CVETL, significantly far from the traditional school-based model, could play an important role in promoting participation in training. Such a new role should be based on education-training strategies linked to the emerging characteristics of organisational knowledge and learning development. This seems to imply new choices at different levels regarding in particular: the overall strategic approach and the fundamental role for CVETL in socio-economic processes, the link of CVET policies with other development policies at the sectoral and regional level, and the creation of new intervention frameworks adapted to the reality of adults employed in very different contexts.

- In terms of an overall strategic approach CVETL should reflect a broad-scope perspective on the nature of knowledge and competencies, especially in rapidly changing technology-based processes. Knowledge needed within such processes cannot be treated anymore only in terms of know-what (information about the explicit aspects of work activities) as is typical of many initiatives (courses) in this field. Dealing with such processes also requires continuously accrued competencies in terms of know-how (based on awareness of the effects of the tacit cognitive components of work activities), know-why (i.e. continuously updated understanding of the scientific principles underpinning technologies and other aspects of work activities), and know-who (regarding the social side of work activities) (Lundvall, 1992; Lundvall and Borras, 1999). This implies a new conception of CVETL interventions, in which informal learning and the different

modes of conversion of explicit knowledge into tacit knowledge and vice versa could also be taken into account (Nonaka, 1994; Tomassini 2003).

- In terms of development policies, those devoted to CVET should be connected with other relevant policies aimed at promoting the overall growth of the industrial/service fabric of specific sectors and regions. This means promoting and sustaining through appropriate interventions the managerialisation of SMEs, in particular for the support of entrepreneurial competencies, considering that entrepreneurs having a technical background often lack the abilities and visions needed for carrying out complex problems at the organisational and HR level.

- As far as the creation of new intervention frameworks are concerned, these should be adapted to the reality of adults employed in very different contexts. In general, two different macro-frameworks should be conceived. The first one should address the problems of employees operating in learning-poor jobs. The main aim of the interventions at this level should be to help people acquire the skills which could allow them to leave their unsatisfactory and precarious jobs and to self-design a new professional future in the same sector or even outside it. The second one should take into account the more or less consciously expressed needs of professionals who are engaged in situations where competence development is linked to concrete opportunities to participate in the creation and exchange of work process knowledge and where the combination of work-based learning and autonomous self-learning assures sound bases for further progress. The main aim of the interventions in these cases should be: (i) to deepen the contents of self-learning through updating activities based on recent disciplinary and quasi-disciplinary advances; and (ii) to increase the employees' reflective abilities through familiarisation with appropriate methodologies ('action methodologies', 'reflective practices') to be applied at both the individual and the organisational level.

- A deeper engagement seems indispensable of the involved research communities on these kinds of topics, together with increased levels of co-operation between different institutional actors, in particular at the regional and sub-regional level.

- As results in the different sectors pointed out self-directed learning and learning through interaction with others are important for professional development and performance improvement. For this reason, the educational system, at all levels, should take into consideration the students' need for developing learn how to learn skills from early school years and continue to develop these skills as they continue their educational path. In addition, the educational system should also promote (or at least monitor) students' development of generic skills such as team work, communication skills and problem solving. Furthermore, greater horizontal and hierarchical flexibility in the educational system is required in order to enable employees who have finished their educational path at some point to go back to formal education so they can improve their credentials if they wish. This is important for regions in countries like Portugal, Greece and Spain where the labour market is characterized by very low occupational mobility and since higher occupational mobility and in general labour market mobility is expected, the

educational system should facilitate the wish/need of employees for getting higher educational credentials.

- For European regions where the economy is segmented into at least two parts, one consisting of a large number of very small family-organized businesses and another consisting of large competitive firms, it is necessary to develop different training policies for the different segments. One of the differences between the two segments is the lack of 'learning culture' in the first segment of small businesses which is attributed to situational factors (operational difficulties, lack of time and money, etc); in the end, these barriers to training become institutional characteristics of these businesses and their employees. On the other hand, in the other segment of large competitive businesses, the existence of a 'learning philosophy' results in having learning practices embedded into working duties. In these environments, learning is 'part of the job' and little resistance is allowed to this practice. Therefore, the great challenge is to cultivate a 'learning culture' or the introduction of more learning and development into small businesses. Two orientations may help: (1) First, institutionalizing formal training participation in these environments would give strong incentives for both employers and employees for participation in training. The offer of training programmes obviously is not enough. Flexible training programmes fitting the needs to these companies and the obligation of employees to renew their credentials would be a great help; (2) Second, since in these companies a great amount of learning is happening through work experience and informal learning, there should be a way so that those employees can go through an accreditation process for the skills they have developed in this way. This would enable labour market mobility and perhaps provide an additional initiative for further training participation.

6.8 Value added of a comparative perspective from research on Continuing Vocational Education, Training and Learning

So far the themes have ranged across analysis, a consideration of how to create contexts within which the work-related learning of technical workers is likely to be enriched and enhanced, portrayal of project findings and broad recommendations for policy and practice. This final sub-section will be used to consider the value added to our analysis from a comparative perspective. What have we learned from examining patterns of CVETL for technical workers in a variety of contexts in England, Germany, Greece, Italy, Portugal and Spain?

6.8.1 Comparative perspective: characteristics of companies with a commitment to learning and development

From a comparative perspective, the findings from all six countries show that successful companies with an explicit commitment to learning and development (for technical workers) exhibit a number of common characteristics:

- Significant learning is embedded in everyday activities because of the structuring and organisation of work

- Significant learning occurs as a result of systematic reviews of everyday performance and the problems encountered and through a commitment to collaborative resolution of those problems

- There is an expectation that technical workers will engage in self-directed learning (learning from the Internet and e-learning are becoming important in this respect)

- The focus upon embedded learning is complemented by allowing access to formal training provision too

- Workers recognise that they have a responsibility to keep professionally up-to-date (and not to do so would have negative consequences for them as well as the company)

- Learning from colleagues is explicitly encouraged and facilitated.

6.8.2 Comparative perspective: influences on technical workers' desire for learning and development

The comparative findings, drawing particularly on behaviour in the English, German and Italian case studies, highlight the following influences on technical workers' desire for learning and development:

- In all three countries 'learning by interacting' through interacting within communities and networks is a fundamental way for constantly re-building personal cognitive approaches both to specific issues and re-constructing the sense of the whole work experience. Technical workers were often engaged in a wide range of networks that helped with different aspects of their work-related learning and development, only some of which were explicitly linked to the organisation for which they worked. On the other hand, in some settings access to a broad set of interactions was restricted to a particular group of technicians, whose opportunities for learning as part of their everyday were consequently much richer than those whose work and contacts were more restrcited.

- It was noticeable that in both personal and explicit company-linked work activities the search for knowledge was broad, going well beyond just development of technical skills. The search did incorporate aspects of technical know-how (how to apply technologies), but also involved know-what (where and when technologies and knowledge could be applied), know-who (not just in relation to customers but also an active search for people who would be valuable as members of a personal network), and know-why (a fuller understanding of phenomena and processes, including in some cases a deeper scientific understanding). This desire for sense-making could be driven by one, or a combination, of **an individual search for undestanding, be embedded in occupational identities** (thereby influencing attitudes and behaviour) **or a function of participation in networks with an explicit learning dimension**.

- Technical workers seemed to be well aware that learning does not grow only 'by doing' (i.e. accumulating experience in repetitive processes) or 'by using' (i.e. gaining incremental abilities in using machines and devices of different kinds), but

there were also advantages to a more systematic approach to learning and development, whether this utilised some or all of the following: the systematic exploitation of the web, participation in specialist networks, relationships with technologically advanced customers or colleagues, more general participation in the local innovation system, or using opportunities for formal education and training.

- learning from others with acknowledged expertise is sometimes faciltated through particular activities (e.g. work shadowing), sometimes through explicit knowledge development and sharing activities and at other times is built into the organisation of work activities (e.g. in the construction of project teams). In some settings learning from others was built into the fabric of formal training arrangements, for example through apprenticeship, advanced training seminars or Master Engineering workshops.

- Collaboration was deemed to be a support in a wide range of situations, a natural environment for informal exchanges of information and knowledge, and a stimulus to enrich one's competencies. Being a member of a team and/or of a wider community of practice was almost universally valued. Indeed in the instances where individuals were trapped in low quality jobs one of their major grievances was that they had few opportunities to collaborate and this restricted further their opportunities for personal development.

- Much learning undertaken by technical workers is concerned with 'sense making' (both in relation to technical processes and work process knowledge more generally). That is, developing a 'vision' of how work process knowledge fits in their work activities and those of the company more generally is an important driver of learning. Technical workers often want to make sense of their experience of work as a whole.

- Recognising the importance of work process knowledge, many workers recognised both the importance and the limitations of informal learning and looked for a 'methodology for knowledge development' that would help them achieve a more coherent and comprehensive understanding of company activities and their own practice. This often linked to more formal education and training provision and was seen as helpful in giving a basis for continuing learning and development.

- The above could be interpreted as a desire for learning through working and interacting and self-directed learning leading to contextual understanding to be interpersed with periods of more formal learning and development that allow for more considered reflection, a linking (and integration) of what has been learned by experience and informal means, and more rounded professional and personal development.

- Guidance services might be of great help to technical workers making their way through (or even out of) their chosen field. Time and again it became clear that individuals would have appreciated some guidance and support when making decisions that were often strategically important for their own career development.

- The need of an acknowledgement of acquired competencies, even at an informal level, was strong. In some cases this was seen as a signal for evaluating how much interest the company had in your development. In this way, the offer of participation in some formal education and training offerings was appreciated (even if the provision was not necessarily that good) because it was a tangible sign of the company's health and that it valued you as an employee.

- The extent to which the work environment offered substantive opportunities for learning and development. This phenomenon can be visualised as a continuum. The 'haves' are technicians working in organisations that in some ways are 'learning organisations' where competence development is intrinsic in the functioning of work relations and supports the emergence of acknowledged professional identities and/or they have regular access to opportunities for learning and development in formal CVET provision. The 'have-nots' are operating within a low quality work environment, at risk not only in terms of job security but also exposed to more or less radical isolation from competence development and from possibilities of self-promotion through self-learning. Somewhere in between are those technical workers working in organisations where opportunities for learning and development, either through work, interaction or CVET, are unevenly distributed. In these cases managerial judgements on your organisational commitment can be critical to your opportunities for further learning and development.

- At the individual level three distinct approaches to learning and development, according to whether greatest use was made of formal CVET provision; opportunities for learning while working; or self-directed learning.

- When learning experiences were very rich it was striking the range of learning opportunities that could be undertaken. They included learning while working in a job with considerable challenges; learning through working with someone with acknowledged expertise; learning through working in multi-disciplinary teams; learning through organised reflection and review; learning through the application of knowledge learned in CVT to work activities; learning through working with suppliers; learning through exposure to other working environments; learning by doing without any formal training (e.g. through giving presentations).

- Individuals learn what type of learning will be useful to share with colleagues, and they also learn about where and from whom further knowledge could be gained.

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