Learning and skills formation in the new economy: evidence from Greece

Stella Zambarloukos and Anastasia Constantelou

In today’s knowledge-driven economy, education and training are considered major factors affecting a society’s level of economic attainment and growth. Lack of information-related knowledge and skills, in particular, are among the prime factors likely to delay a country’s progress towards the information society. Experience, however, has shown that an educated labour force does not automatically translate into dynamic economic development and technological innovation. The human resource potential is not a simple outcome of the education system but it is a much more complex process that involves tacit knowledge, learning by doing and on-the-job training. This means that skills and knowledge acquired depend not only on the educational system but on firm organisation and culture as well as ties between organisations. The present study examines the relationship between skill supply, firm organisation and learning by means of interviews in 23 firms in Greece. It shows that a major problem faced by SMEs in peripheral European countries is the lack of in-house capabilities and knowledge which limits the amount and type of learning that takes place. Finally, the article argues that policy-makers should institute educational policies and training programmes that will compensate for the inability of Greek firms to provide a learning environment.
Introduction

In today’s knowledge-driven economy, education and training are considered major factors affecting a society’s level of economic attainment and growth. Lack of information-related knowledge and skills in particular are among the prime factors likely to delay a country’s progress towards the information society. Europe is reported to suffer from a shortage of Information and Communication Technology (ICT) skills, which could jeopardise the development of the information society (EITO, 2001). Policy-makers both at the EU and national level emphasise the need to increase ICT formal education so as to ensure the supply of an adequately skilled labour force and to alleviate future mismatches.

However, the emphasis on ICT education and training inhibits other factors that affect learning in this area and does not take sufficiently into account the fact that the traditional classroom setting is not necessarily the best way to learn many skills associated with the information society (Ducatel et al., 2000a, Guile 2001). Ignoring this fact could have particularly negative effects for countries that are designing catch-up strategies to reach the level of information society development achieved by more advanced countries. This is so because firms in these countries are more likely to experience structural factors inhibiting ICT diffusion and learning, which do not receive sufficient attention.

At present, firms in the less advanced regions of Europe are less likely to take advantage of ICT technologies to reach new markets or re-organise their operations to enhance their competitiveness. Moreover, evidence suggests that ICTs are not put into effective use even after being introduced (Cornford et al., 2000). While the supply of the necessary skills is an important factor influencing the uptake of ICTs, the education system is not the only factor affecting skill supply. Firm organisation and structure are very important factors in promoting learning and knowledge acquisition and need to be taken into account in an understanding of the role of skill creation and supply.

This article examines the relationship between skill supply, firm organisation and learning in the adoption of electronic-mediated activity by firms in Greece. In the context of this study, electronic-mediated activity refers to all business transactions occurring, either over proprietary networks or over open networks such as the Internet. The uptake of such activity within business communities and the extent to which this potential is encouraged in different countries depend as much upon purely technological factors (e.g. the expansion and modernisation of the public network), as upon the national, societal and institutional conditions which define the ways in which these activities are being adopted and diffused (Constantelou, 2001).

The rest of this article is divided in four sections. In the following section the theoretical debate surrounding knowledge and learning acquisition in relation to ICT technologies is discussed with an emphasis on the implications for less advanced European countries. The second section presents the research methodology adopted. In-depth interviews with ICT and/or web managers in selected firms were conducted to provide an understanding of the processes by which particular types of specialised ICT-related skills are acquired and formed. The third section analyses the empirical findings and the final section discusses the policy implications of our findings.

Learning and firm organisation

In today’s knowledge-driven economy, learning and skill creation are considered major factors affecting a society’s level of economic attainment and long-term growth. This is in large part the outcome of education and training policies. However, experience from Central and Eastern European countries has shown that an educated labour force does not automatically translate into dynamic economic development and technological innovation (Dyker and Radosевич, 1998). The type of training provided and other factors, outside the formal education system, also contribute to knowledge creation and skill formation.
The literature has shown that the human resource potential is not a simple outcome of the education system but it is a much more complex process that involves tacit knowledge, learning by doing, by using and through cooperation with others. Knowledge is socially embedded and socially created, it resides not only within individuals, but also within groups of people acting together and in organisations. Learning is not only an individual process but also a group process (Arrow, 1994; Foray and Lundvall, 1996; Lundvall 1996; Nonaka, 1994). The above implies that skills and knowledge acquired depend not only on the educational system but also on firm organisation and culture as well as on ties among organisations. The size and organisation of firms in a country as well as the industry structure play a critical role in determining the extent to which firms are in a position to absorb and utilise a trained and educated labour force.

Policy-makers are looking for ways to enhance learning through education and training programmes. However, more investment in training and education will not by definition result in an increase in useful knowledge and skills (Ducatel, 1998). The recent literature on knowledge creation points out the importance of tacit rather than explicit or readily codified forms of knowledge. The former acquire an increasing importance in knowledge-based economies where the pace of change is very fast and the skills demanded cannot be readily codified (Lundvall, 2000). Informal ways of learning, such as learning by doing, by using or through cooperation, are more efficient ways of passing on tacit forms of knowledge.

The literature broadly identifies two ways by which individuals learn and acquire skills: (1) through the formal education system; and (2) by doing, by using and through cooperation with others. The second, more tacit type of knowledge, depends very much on shared knowledge within organisations. Firm organisation, management practices and forms of social interaction within and between organisations play an important role in the accumulation of tacit knowledge and learning. For example, research has shown that decentralised responsibility, team work, and circulation of employees between departments and investment in training promote learning and innovation (Lundvall, 2000; Lundvall and Nielsen, 1999). The ‘learning organisation’ is not one that merely invests in training but socialises workers into the practice of learning. The more the workforce is drawn into a learning network, the more the organisation will benefit (Ducatel, 1998). Moreover, learning will be enhanced where tacit and codified knowledge interact to deal with changing needs and demands. Organising the interaction between different types of knowledge is a key element for effective learning to take place (Ducatel, 1998).

While information society-related knowledge and skills are considered to be skills that can be more readily codified, the introduction of new information technologies creates new forms of knowledge and skill that cannot be transmitted through formal education. Within this context both ‘know-how’, which involves direct experience and ‘know-who’ types of knowledge acquire particular importance. The latter requires direct contact between individuals, the ability to communicate skills and form relations of trust (Lundvall, 1996; Lundvall and Johnson, 1994). Where the pace of change is very rapid, tacit elements of knowledge play a central role both at the individual and firm level and experience-based learning acquires greater significance than before. The fact that many information society skills become so quickly outdated means that employees must be in a position to learn new skills and acquire further knowledge during their working lives. Within this context, the ability to learn new skills is often more important than the actual knowledge acquired. Too narrowly defined skills might prove a hindrance to further growth and development (Lundvall, 2000).

While shared knowledge within an organisation cannot be reduced to the individual knowledge of each of its members, the two are interrelated. For learning to take place there needs to be a minimum of skill and knowledge present, while a more skilled and educated workforce is likely to contribute to more learning taking place. The literature on small and medium-sized enterprises (SMEs) has drawn attention to the skill and training barriers they face in introducing ICTs and innovations.
(Hepworth and Ryan, 2000). Small firms – that are not high tech or highly specialised firms catering for niche markets – are likely to find themselves at a disadvantage in the effective use of ICTs, relative to larger firms, due to lack of accumulated tacit knowledge in the area, which limits opportunities for organisational and individual learning to take place.

While SMEs play an important role in all European economies, their role is even more important in less advanced European regions (Liargovas, 1998). Small firms in these regions might prove to be doubly disadvantaged. These firms tend to have limited resources, cater for local markets and are run by family ownership/management. Outdated management practices, weak organisational structures and lack of human resources have multiplying negative effects on the firm’s ability to learn and put existing technologies into effective use.

In the next section the methodology adopted for the empirical examination of the issues addressed in this section is presented. Our research aimed at gathering empirical evidence regarding the degree and level of learning taking place within Greek firms and the relationship between skill supply, skill creation and the take-up of electronic-mediated activity among Greek firms.

Methodology

A selected number of interviews were carried out with firm representatives in 23 Greek firms. Firms were selected based on whether they exhibited early proactive behaviour and initiatives in electronic-mediated activity. The firms were selected from three sectors: food production and retail, publishing and distribution of books and magazines and the retailing of automotive parts and vehicles.

Taken together, the selected sectors cover a wide range of industry types. Sectors were chosen based on their relative weight in the Greek economy and the pervasiveness of electronic-mediated applications in the sector world-wide. The food sector plays a very important role in the Greek economy. It is a sector made up of many small and traditional businesses while at the same time it contains some of the most advanced and competitive firms in the country. The publishing sector was chosen because it was one of the first sectors to have promoted business-to-consumer e-commerce world-wide as well as in the domestic market. Finally, automotive firms are considered forerunners in the adoption of diverse online initiatives that affect the distribution and retailing of vehicles and automotive parts world-wide.

Interviews were carried out with the ICT and/or web manager, or their equivalent in each selected firm.1 A total number of 26 interviews were carried out. The number and type of firms interviewed by sector are presented more analytically in Table 1.

All interviews were carried out by phone and were based on a semi-structured questionnaire. Questions focused on the following issues:

- Types of skills required to perform relevant tasks.
- Extent to which electronic-mediated activities are outsourced.

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<th>Table 1: Number and type of firm interviewed by sector</th>
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• Difficulties found in recruiting people with the right skills and ways in which such problems were resolved.
• Ways in which skills were acquired (through formal education, on-the-job training, learning by doing, by using or through cooperation).
• Relevance of education and training received.
• Previous work experience and relevance to current occupation.
• Forms of cooperation within the firm/department.

The empirical evidence gathered from the interviews provided useful insight on how ICT-related skills are created and learned, the factors influencing the extent and type of learning taking place within Greek firms and the ICT skills and training facing firms.

The demand, supply and learning of ICT skills: some empirical evidence

The demand for ICT-related skills by non-ICT firms is closely related to the structure and organisation of firms. The Greek economy is dominated by SMEs that face numerous problems including low specialisation, confinement to the domestic market and low financial resources. While in 1990 the EU had an average of 49 enterprises per inhabitant, Greece had 67 enterprises per inhabitant, followed by Portugal with 62 (Liargovas, 1998). Because of their limited resources, SMEs often hire inadequately trained personnel and do not invest in training. Moreover, ICT-skilled employees are unwilling to work in SMEs outside core ICT sectors because the work provided is not very interesting and because career prospects are poor. Finally, firms are very often family-run and lack professional management that would enable them to undertake innovative organisational changes and use new technologies to improve performance and expand their markets (Makrydakis et al., 1996). These factors in turn affect the organisational knowledge present within firms and the level of learning that takes place. As a result, even after ICTs are adopted, they are not always put to effective use.

Demand and supply of ICT skills

On the whole, the interviews did not reveal major difficulties in recruiting ICT specialists. This finding could be attributed to two main factors: (1) the fact that many firms outsourced all or part of their Internet-related activities and as a result did not place high demands on ICT skills; and (2) the fact that there is a relatively large supply of skilled labour. Only about half of firm representatives interviewed stated that their department/firm had hired or looked for a person with ICT-related skills during the past two years. Among the firms that did hire or sought to hire an ICT person, only two stated that they had experienced major difficulties. Moreover, where recruitment difficulties were met, it was because firms looked for employees with particular work experience and not due to the limited supply of people with formal training requirements in ICTs.

The extensive use of outsourcing minimised the specialised skill requirements of firms, which explains why so few firms hired new employees in the specified time frame. Three out of five firms interviewed in the food sector and half the firms in the publishing sector outsourced all or part of their web activities to an Application Service Provider (ASP). All automotive firms outsourced the development of their website. In addition, all automotive firms in our sample had established electronic interchange proprietary systems for ordering from suppliers. Applications for this purpose were usually developed in-house but in a couple of cases were provided by the mother company.

The type of skills demanded varied depending both on the extent to which firms outsourced web-based activities as well as the type of applications enforced. Firms
in the food and publishing sectors were mostly concerned with developing business to consumer online applications. Firms that outsourced all or most of these applications were primarily concerned with finding an appropriate ASP. The firm representatives did not report having experienced problems in this respect. On some occasions existing employees were provided with some basic on-the-job training to perform activities that emerged from the introduction of electronic-mediated applications, otherwise they learned the new tasks by themselves.

Small firms were more likely to outsource Internet-related activities and no efforts were made to develop in-house capabilities that would enable the firm to better exploit opportunities opened up by e-practices. Outsourcing was usually chosen because in-house expertise to carry out related tasks was absent. Moreover, because the e-commerce activities of most small firms were very limited, and the web-site was mostly developed for advertising purposes, it was not seen as necessary to hire an ICT specialist to oversee activities in the area. The development of the site, and sometimes also its maintenance and updating, were undertaken by an ASP.

Recruitment difficulties were mainly reported by firms in the automotive sector. These involved workers to perform certain specialised ICT tasks such as network specialists or persons trained in AS/400 Applications. In addition, a couple of firms mentioned the lack of people combining ICT-related skills with more business-related skills. The latter was of greater concern to firms that placed considerable weight on the growth of their business-to-consumer e-commerce activities, such as the supermarket retail firm. As one firm representative put it:

It is very hard to find people that have both technical knowledge and knowledge of the value chain of the firm. Moreover, because technology changes very fast, it is hard to keep up with developments when you are involved in a number of different tasks.

Most managers interviewed, who reported difficulties in recruiting staff, also expressed the view that the educational system was inadequate. This was given as the main reason why they were looking to recruit personnel with work experience. In their opinion, ICT education in the country was insufficiently targeted towards meeting market needs, was too theoretical and was often focused on teaching outdated knowledge and skills. The most commonly expressed concern of e-commerce or IT managers regarding the supply of skills was that most job candidates had theoretical knowledge but not sufficient practical skills and hands-on experience. This was regarded as a handicap particularly because they were not prepared to solve unexpected problems and could only perform routine tasks. As one interviewee put it:

People with no work experience are unable to perform well. Everybody knows things in theory but few have the experience of actually having applied them in practice, in part because many e-commerce tools are applied for the first time.

The problems identified with the education system were on the most part associated with those that had received vocational or college training and less so with university graduates. As one manager explained:

The company is not willing to pay for another engineer. We are looking for a person with vocational or college level training. I have a number of CVs in my drawer that fulfill the formal requirements, but none with prior work experience. I cannot hire them because I know they will be unable to cope with the daily problems.

The above finding was to a large extent reinforced by the personal experiences of the web managers interviewed. While the majority had some formal vocational training, most believed that the skills they had been taught were of little practical use, even though most admitted that they had received some useful background knowledge in performing their work. On the other hand, the personal experiences of managers with ICT-related university degrees suggest that even if what they were taught at university was not directly applicable to their current position, it did provide them with the background knowledge required to learn new skills and expand their knowledge, and was evaluated positively in terms of its usefulness in performing
their current job. As one firm representative stressed: ‘Basic programming principles don’t change, once you know them, you can easily learn new tools.’

In general, skill shortages appeared where work experience was considered a prerequisite for the job. The high value placed on work experience by many of the firm representatives interviewed stemmed, in part, from the fact that they could not provide sufficient opportunities to their employees to learn on the job. The problem was accentuated because managers could not provide training, either because it was considered too time-consuming, or they did not possess skills in the particular area. This problem was more often faced by automotive firms. In two automotive firms in our sample three positions remained vacant because they were unable to find people with the appropriate work experience.

Learning ICT skills

Our interviews point to the importance of non-formal ways of learning in job performance. At the same time interviews revealed the limits of such learning within the context of many Greek firms.

Informal ways of learning include on-the-job training, learning by doing, through reading manuals or trade press and through interaction with peers. Learning by doing and by reading manuals emerged as the most important forms of learning among those interviewed.\(^5\) The extent to which particular forms of learning took place on the job varied considerably among the firms examined. Three closely interrelated factors account for these variations: firm size, organisational structure and the availability of knowledge and skill resources.

Size appeared to be an important factor in determining the presence of ICT-related skills and the type of learning that took place. Smaller firms were less likely to possess the skills and knowledge needed to develop electronic-mediated applications. Indicative of this is that among firms with fewer than 25 employees, only one stated that they had formal training in ICTs. In contrast, in the remaining firms, the majority had at least some formal training. Moreover, the larger the firm, the more likely that more than one person with ICT training was involved in electronic-mediated activities.

Table 2 indicates whether interviewees had formal training in ICTs and the extent to which different types of informal learning were evaluated as important in their current job performance. As indicated in Table 2, not only were very small firms less likely to have formal education in ICTs but they were also provided with fewer opportunities to learn on the job. In particular, on-the-job learning was restricted to learning through reading manuals and the trade press or by doing. In contrast, in larger firms opportunities for learning were greater and also involved on-the-job training and learning through interaction.

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<th>Firm structure</th>
<th>Type of learning</th>
<th>Formal education</th>
<th>On-the-job training</th>
<th>Learning by doing</th>
<th>Through reading manuals</th>
<th>Through interaction</th>
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<tr>
<td>Very small(^1)</td>
<td>Low</td>
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<td>Medium</td>
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<td>Small(^2)</td>
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<td>Medium/large(^3)</td>
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Notes  
\(^1\)While commonly the definition of very small firms includes those with less than 10 employees, for the purposes of this article it was found more appropriate to include firms with less than 25 employees.  
\(^2\)Small firms defined here as firms with 25–99 employees.  
\(^3\)These are firms with over 100 employees.
In very small firms management did not, for the most part, provide incentives or encourage employees to enhance their ICT-related skills. This can be explained by the fact that the involvement of very small firms in electronic-mediated activities with suppliers or customers was usually of a far more limited scope than that of larger firms. In many cases no electronic transactions were carried out and the website was used mostly for advertising purposes. Internet-related activities were viewed as an additional marketing strategy for the firm and did not affect its traditional commercial activities nor did it transform organisational practices or management style.

The smaller the firm, the more likely that the same person was responsible for several different types of tasks. Employees were forced to cope with problems as they came along rather than trying to search for optimal solutions. This made it more difficult to enhance knowledge in any particular area. Moreover, in very small firms the owner/manager was usually the driving force behind all electronic-mediated applications. The major reasons for introducing such applications were personal interest in the Internet and the belief that it would open up new markets and develop into an important source of revenue. It was the owner that usually undertook the overall management of electronic-mediated applications and had the responsibility to communicate to the contractor firm what to include in the firm’s website. However, he/she usually lacked specialised ICT skills and had no particular marketing or other strategy regarding Internet-related applications. This minimised the use they could make of new technologies and the knowledge that could be acquired through interaction with the contractor firm.

In contrast, larger firms were more likely to have professional management and be in a position to appreciate the opportunities opened up by new technologies and the value of a skilled labour force. At the same time, most managers interviewed stressed the importance of knowledge acquired through work experience and other informal ways of learning. As one manager in an automotive firm explained: ‘If employees are not willing to learn and don’t make an effort to keep up with developments, they are very likely to stay behind technological developments and their employment prospects can diminish.’

The presence of more people with ICT-related skills in larger firms usually meant that employees could build on existing ICT knowledge and skills and had more opportunities to learn through interaction with peers or associates. Moreover, these firms were more likely to encourage their employees to attend seminars and workshops and to provide on-the-job training. Nevertheless, the general view was that not enough was done in this domain and as one interviewee indicated; ‘Companies should do more to train their employees and encourage them to update their skills.’

Size was not the only factor affecting the level of learning that took place. Organisational structure and management style were also important factors. In fact, organisational structure sometimes negated some of the positive effects associated with large firm size. In automotive firms, for example, where hierarchical organisation was more rigid and stricter deadlines had to be met, learning through cooperation was less frequent than in the publishing sector, where flatter organisational structures prevailed. Where the firm was more formally structured, informal learning through interaction was often regarded as too time-consuming. Work overload of IT departments and limited resources also minimised the amount of learning that could take place. As one firm representative explained: ‘There is not enough time to provide on-the-job training. The department [IT] is small and I am the only person that can do the training, but if I undertake this task everything else will be left behind.’ One way firms dealt with the problem was by hiring people with some work experience.

Table 3 indicates the type of learning that interviewees considered as being most important in job performance. In general, firms that had formal and hierarchical organisational structures seemed to place more emphasis on formal education, something that is revealed by the fact that managers in these firms were more likely to possess ICT-related formal education. Likewise, they tended to look for employees
with formal qualifications and work experience. On the other hand, in firms with less formal hierarchical structures, informal learning, and particularly learning through interaction with peers, were more appreciated and encouraged. This is how the head of the e-commerce department of a small publishing house described her experience: ‘When I took over the e-commerce department I had limited knowledge on the matter. I learned mostly by discussing options with associates, gathering information through the Internet and the related press.’ An exception to this trend were very small firms that, while informally structured, usually lacked the human resources to provide a learning environment.

It was also found that in firms with more rigid hierarchies learning was more likely to take place among department managers than among their staff. This was the case because the work of managers demanded greater intra-departmental and inter-departmental interaction with other employees and/or managers and because they tended to be more motivated to learn on their own.

While the availability of skill resources is very often associated with size, the two are not always related. For example, in a very small electronic bookstore interviewed, the presence of skilled personnel allowed learning to take place. Moreover, it benefited from the fact that it was a subsidiary of a technology-based firm. As pointed out in our interview, where in-house knowledge on a particular matter was absent, the research department of the mother company was consulted. Thus, despite the very small size of the firm, the presence of skill resources and access to relevant knowledge enhanced the learning process.

In general, firms that did not possess human resources in ICTs tended to undertake fewer tasks in-house and have less interaction with the contractor firm. Communication with the ASP was often carried out by the owner/manager who did not possess any particular ICT-related skills. In contrast, firms that either began to invest in ICTs from early on, or had human resources they could utilise and build on, were more likely to develop their web-site in-house. This, for example, was the case with a publishing firm, which had a multimedia department that gradually also undertook the development of the company’s site and e-commerce applications. The person who acted as web manager had previously been engaged in developing CD-ROMs but was able to learn the new skills required on the job. In his view, ‘the technology changes very quickly and one needs to learn new things all the time. This can be achieved as long as the basic knowledge needed is there.’ Moreover, as he explained, a team of eight people had been set up, that provided support for the company’s e-commerce applications. Five of them had ICT-related backgrounds and acted as useful resources of information and learning.

Firms that had organised IT departments had a relative advantage in so far as a pool of ICT experts and accumulated knowledge in new technologies was present. It was usually the case that electronic-mediated activities were assigned to IT departments or otherwise there was cooperation between newly established e-commerce departments and IT departments. The fact that there was greater concentration of ICT-related skills and knowledge in these firms provided more opportunities for learning through peer interaction and on-the-job training. Moreover, the presence of accumulated knowledge facilitated the quick resolution of problems. On the other hand, while many small firms, particularly in the publishing sector, were quite open

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<td>Formal</td>
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to learning on the job and through interaction with others, they often lacked the necessary critical mass of skilled people that would allow learning on e-commerce-related activities to take place. The lack of prior skills and knowledge and limited opportunity for interaction with peers minimised the extent to which learning could take place.

Even firms that outsourced their web-site construction and other Internet-related applications benefited from the presence of ICT-related skills within the firm. As one manager explained: ‘Communication skills are not enough. You need to be aware of the technologies otherwise they [i.e ASPs] can sell you anything.’ Where the person interviewed was familiar with ICTs, he/she was able to communicate the firm’s needs to the contractor firm and to choose between alternative strategies/technologies. This made it more likely that the best solution for the firm’s needs was chosen. Where marketing or sales skills were present, communication with the ASP centred on matters concerning the content and structure of the site. Moreover, the interviews revealed that where close cooperation was established with the ASP and between related departments within the firm, interaction between employees with different skills and backgrounds was enhanced, which allowed learning to take place. In such cases it was more likely for the firm to gradually take on some web-related activities, such as web updating and improvement of the site.

The presence of skills and knowledge within firms allowed them to develop a closer relationship of cooperation with the contractor firm and knowledge transfer was enhanced. On the other hand, firms that had no in-house ICT capabilities were less likely to develop a close relationship of cooperation with the outsourcing firm and employees had limited opportunities to learn through interaction. In general, no or very little transfer of knowledge took place, which shows that for this to occur there needs to be some in-house prior knowledge. This often resulted in ICT applications being under-utilised.

Conclusion: the relationship between skill supply, firm organisation and learning

The interviews confirmed the importance of informal ways of learning and particularly the importance of hands-on experience in performing ICT-related tasks. At the same time they also revealed the limits of such learning within the context of many Greek firms. This is particularly the case in small firms that account for the large majority of Greek employment. In most small firms, Internet-related applications were outsourced, while interaction between the ASP and the contractor firm was very restricted. Moreover, firms had very limited knowledge of electronic-mediated activities, which did not provide a basis for learning to take place.

Our interviews have shown that firm size, organisational structure and the skill resources present within the firm influenced the amount of learning that took place. While in general within the same sector larger firms were more likely to invest in training and provided more opportunities for learning to take place than smaller firms, this was not necessarily found to be the case when comparisons were made across sectors, where different organisational structures prevailed. Other factors related to the type of e-commerce activities the firm is involved in, the benefits that firms expect to gain from such activities, the way such activities were organised, and the type of skills demanded by each sector.

The main problem facing many small firms interviewed was that they did not possess a minimum know-how in ICTs which they could rely on to absorb further knowledge. The lack of prior knowledge minimised the amount of learning that took place. Moreover, in small firms employees were often expected to perform numerous tasks for which they had no prior experience and the firm possessed no in-house capabilities. The communication of tacit knowledge through informal learning appears to be the major missing link in many small Greek firms. Learning by doing, by using or by reading manuals and other trade press were most frequently cited as a means by which web-based activities were learned. In contrast, learning through
cooperation and interaction with peers was rarely pointed out as a major source of learning.

Our research indicates that firms were on many occasions unwilling to hire employees with no work experience because they could not provide them with the necessary training. This reinforces our finding that most firms were unable to provide a learning environment to new employees and were lacking a critical mass of skilled employees who could facilitate learning through cooperation. This forces firms to rely to a greater extent on formal ways of learning and on explicit knowledge learned through manuals. These conditions tend to disadvantage small traditional firms when compared with other larger or more technology-oriented firms that have more skill resources and accumulated knowledge.

The interviews conducted suggest that Greek firms engaged in electronic-mediated activities did not experience difficulties in recruiting staff with formal training in ICTs. In those instances where firms reported skill shortages, it was because they wanted to hire employees with practical experience in the area. The answers provided by firm representatives reveal the importance of having had hands-on experience and suggest that formal education in ICTs cannot be a substitute for such experience. As pointed out by Ducatel: ‘training that is abstracted from the working environment is a lot less effective than training that takes place in a hands-on environment’ (Ducatel et al., 2000b: 148). Our research confirms that exclusive dependence on formal training handicaps firms and makes them less capable of responding to problems.

**Policy implications for education and training in ICT-related skills**

There is widespread belief across Europe and the USA that the growth of the information society will result in a substantial rise in the demand for ICT-related occupations. This has raised concern that at the current rate at which ICT skills are being generated, increasing demand for such skills, particularly by firms in non-ICT sectors, will not be met (EITO, 2001). This, it is feared, will hinder the further development of the information society.

The European Commission urges the introduction of policy initiatives that centre on enhancing ICT training at all educational levels, updating ICT education to meet market needs and promoting life-long learning schemes (Commission of the European Communities, 2000). While less developed countries in Europe currently suffer less from skill shortages than more developed countries, the assumption is that if they are to enter the information society, they will need to make a greater effort to increase the supply of an ICT skilled labour force than more advanced countries. Otherwise the gap between North and South is likely to widen further (EITO, 2001).

The Greek Ministry of Education has responded to existing concerns regarding ICT skill shortages by increasing the number of courses offered in ICT-related subjects in tertiary level educational institutions. Particular emphasis has been placed on increasing the number of students who acquire technological training in ICTs. During the past five years there has been systematic effort to increase official training provided in ICT-related subjects. Since 1998, 16 new departments have been created in Greek universities and three-year technical colleges, providing ICT-related training and bringing the total number of departments to 35. Ten of the new departments created were in technical colleges. Moreover, the total number of students enrolled in ICT-related courses almost doubled during the same period (Zambarloukos, 2001).

While these measures are likely to benefit the ICT sector, this article argues that alone they are not sufficient in helping the majority of Greek firms in other sectors to utilise existing human resources and ICT technologies more effectively. Our research suggests that reforming vocational training and education related to ICTs might be more urgently needed rather than a simple expansion of ICT education and training. As many firms in less advanced regions are unable to provide the kind of learning environment needed for their employees to develop their skills, the education system...
and training policies should try to fill this gap. This could be achieved by combining formal education in ICTs with more hands-on experience, which is currently lacking among those that are being employed for the first time.

Certain measures targeting specifically very small firms have been initiated during the past two years by the Ministry of Development. For example the programme ‘Go-Digital’ subsidises firms with under 20 employees to connect to the Internet and provides training to enable them to use it.6 These kinds of initiatives could help small firms to become familiar with information technologies. It is important that more initiatives are taken both at the regional and national level that will help firms overcome the various barriers they face in taking up ICTs and utilising them effectively. These policies should involve training and educational reforms that take into account the needs of SMEs and provide opportunities for more hands-on experience. The effectiveness of such efforts could be greatly enhanced if intermediary organisations, such as sectoral or trade associations, take an active role in the design and implementation of training programmes. Joint programmes between such associations and the state are more likely to succeed in delivering the kinds of skills needed by SMEs.

Given the fact that ICT skills become quickly outdated, institutions of lifelong learning that will ensure the continuous re-skilling of the labour force need to be established. Joint programmes between educational institutions and firms could provide a solution where particular skill gaps are encountered but cannot provide a solution to the problems faced by most small and medium-sized firms. Moreover, there has to be a balance between the needs of firms and the interests of employees. While firms often point to the absence of people with particular technical skills, too much emphasis on providing hot or specialised skills runs the risk of making employees very quickly redundant. It is thus important for educational institutions to achieve a balance between teaching specialised skills and more generic skills, which will enable employees to quickly learn new skills.

Outsourcing of Internet-related tasks is one way by which firms overcome their lack of skills in the area. Moreover, the ASP model provides SMEs with important economies of scale. It is expected that outsourcing will continue to be used for specialised tasks that need technological expertise. However, even if firms outsource such activities, they will be unable to take full advantage of the benefits that new technologies can provide unless management is aware of the existing technological options, the benefits that they can derive from them and the best way of applying them. Moreover, they need to be in a position to communicate their needs to the ASP. If these conditions are present, interaction between the firm and the ASP could result in learning taking place on both sides and would ensure that the optimal solutions are chosen.

Small and medium-sized firms are more likely not to employ highly specialised staff in ICTs and are more likely to need employees who will perform a number of different tasks related to the new e-business environment. On the other hand, ASPs are more likely to employ ICT specialists. However, there is a danger that the lack of interface between ASPs and firms will lead to technologically sophisticated solutions that do not take into account the firm’s needs and are not customer-friendly. This danger could be overcome if basic knowledge regarding ICTs and e-business is provided to non-ICT specialists. At the same time it might prove useful to provide ICT specialists with more business and marketing-oriented skills and knowledge. This would enhance communication between SMEs and ASPs and facilitate learning and transfer of knowledge.

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Notes

1 In certain small firms where neither was available, we spoke to the director/owner of the firm. In three firms interviews were carried out with both the ICT and the web manager.
2 SMEs refer to enterprises with less than 250 employees.
3 Indicative of this is the fact that in Greece unemployment among young tertiary education graduates is higher than among those with non-tertiary education, while in the OECD the trend is the opposite. Specifically, while in 1998 the unemployment rate in Greece for the age group 25–29, with tertiary education, was about 22 per cent, the OECD average for the same category was approximately 7.5 per cent (OECD, 2000).
4 An ASP makes computer-based applications available to customers through the Internet.
5 In contrast, a similar study carried out on web managers in Britain revealed that more web managers relied on ‘non-formal, deliberate and reactive learning from peers’ (Millar, 2001).
6 More particularly the programme subsidises the purchase of basic terminal equipment, Internet connection for two years and technical support for three years for eligible firms that have no access to information technologies. In addition, it subsidises Internet-ready firms to develop a simple commercial web-page, as well as the maintenance and virtual hosting in an ISP for two years. All firms participating in the programme are provided with free training (www.go-online.gr).

References