Future Learning Spaces: new ways of learning and new digital skills to learn

This article discusses the elements of and requirements for digital competence for learning in a knowledge-based society, where Information and Communication Technologies (ICT) play a key role. Key challenges for future learning are both the need for new digital skills and the provision of new ways for learning and maintaining them. Realising the potential of future ICT-enabled learning requires digital competence from all participants involved in learning. This competence includes both basic tool usage skills and higher order skills for their efficient, critical and innovative application. But it also involves other participants in the learning process as the future ICT-enabled learning spaces in themselves support building and improving this competence with the help of peers and experts.

1. Introduction

There is growing awareness in Europe that learning in a fully digitalised, networked and knowledge-based society will be drastically different from today’s learning, which is based on the requirements of late-industrial societies. The widespread diffusion of Information and Communication Technologies (ICT) together with other socio-economic and demographic changes give rise to new opportunities for learning but also raise the need for acquiring new skills and competences that are necessary for employment, education and training, self-development and participation in society.

A foresight exercise was undertaken by the European Commission Institute for Prospective Technological Studies together with DG Education and Culture to develop a vision of what learning might look like in the future knowledge-based society and what the requirements of such future learning might be. The exercise was based on extrapolation...
tions from ICT technology trends (e.g. broadband internet, web 2.0 applications such as blogs, podcasts, wikis), from socio-economic trends (e.g. globalisation, demographic decline, migration) and institutional/educational trends (e.g. EU investment in education, educational innovations, increased personalization and collaborative approaches) that are all together affecting future learning in Europe. These trends and drivers were discussed and validated with 20 experts. The outcome of this exercise was labelled “learning spaces”, a desirable vision of future learning enabled by ICT in the knowledge-based society. The vision and its underpinnings have been published elsewhere (Punie, 2007; Punie & Cabrera, 2006).

This article builds on the vision and discusses digital competence as possessing the necessary skills to participate in these future learning spaces. Learning to use ICT tools is certainly part of this, but other higher-order skills are needed as well in order to facilitate participation in all the aspects of learning spaces. Skills to search, evaluate, manage and use information and digital resources are essential for working and learning in the digital environment. These include skills to organize knowledge according to one’s personal preferences and the means to build systems to follow and obtain updates on the relevant information as needed. However, in the networked knowledge-based society, interacting with people is also an important asset and skills for benefiting from it are increasingly important. All these skills become part of the necessary digital competence to be acquired, and they also improve by experience when participating in the ICT-enabled learning spaces with peer learners and mentors, as part of the lifelong learning process. Future learning spaces need to be designed to support both these aspects of learning digital competence.

The structure of the paper is as follows. First, section 2 describes the background and motivation for the learning spaces vision and the concept of digital competence. Then, section 3 describes the learning dimensions forming the overall vision of future learning. Section 4 discusses challenges and viewpoints for enabling the building of personal learning and digital competence. Section 5 explores more closely the necessary personal and social digital skills required for participating in the different dimensions of future learning, and section 6 concludes the paper.

2. The Need for Change

It is generally acknowledged by policymakers and other stakeholders in Europe that a fundamental transformation of education and training (E&T) throughout Europe is needed to contribute to important policy objectives such as the Lisbon goals of competitiveness, growth, employment and greater social cohesion (EU 2000; E&T 2010). Education together with research and innovation – the so-called knowledge triangle – are seen as key elements for realising competitive and inclusive knowledge-based societies in Europe. Technologies, especially ICT, have a particular role to play in carrying out these
changes. It is almost impossible to imagine a future learning environment without some sort of ICT, either at the forefront or in the background. Although it is clear that technology alone, however powerful, cannot automatically bring about the necessary changes, the potential of ICT is significant when embedded in a social, economic and organisational context that is open to innovation and supported by a favourable policy environment (Punie & Cabrera 2006).

Most debates focus on how to adapt formal education and training in Europe to these new requirements. Addressing such instrumental concerns is important and a serious challenge for all stakeholders involved. It is acknowledged that much still needs to be done to make the necessary educational and training changes for the development of the knowledge-based society (SEC 2006/639). This should also include the contribution of learning to people’s emancipation, empowerment and self-fulfilment. It is also becoming increasingly more necessary to pursue learning objectives such as social competence, critical thinking, knowledge-sharing and cooperation techniques. As the role and meaning of information and knowledge are different in the knowledge-based society (compared to late modern industrial societies), the vision of what knowledge and skills people need to acquire and how they can acquire it also needs to change. Knowing where knowledge is located and who has access to various kinds of knowledge and why is becoming more important in the networked society. Social skills and ‘relationship capital’ are part of the digital competence required for living and working in the knowledge economy, which becomes increasingly more obvious through the explosive growth of web2.0 or social computing applications.

Significant efforts are being undertaken by various stakeholders in Europe to identify what kinds of digital competence and skills are needed today and in the near future for people to participate in the digital society and for companies to remain competitive. Therefore, three types of eSkills are identified: skills for ICT-related jobs, ICT user skills and e-business skills (Rand Europe 2005; COM 2007/496). It is argued for instance that by 2008, there would be a shortage of up to half a million people with advanced technical networking skills in Europe (IDC 2005). In addition, such efforts are to be seen within the context of lifelong learning since a dynamic and fast-changing knowledge-based society requires continuous skills updating (e.g. EDUC 2001).

ICT user skills are clearly important today for everyone, and even more so in the future as our society become increasingly more digitalised. Recent Eurostat (2006) data indicate that almost 40% of the EU population have no computer skills whatsoever. Moreover, the percentage of computer illiteracy increases to 61% of people with only lower secondary level education and to 65% of people aged between 55 and 75 years. As younger generations are more familiar with ICT, these data might improve in the future, but it is important to note that it is not enough only to learn about ‘ICT usage’, i.e. learn to operate the technology. Living in a knowledge-based digital society makes it also nec-
necessary to learn to use ICT as a tool for new ways of working and communicating, and for understanding implications of ICT usage. This can be regarded as a group of new skills that are necessary in the knowledge-based society. The European Commission has included digital competence as one of the “key competences” for lifelong learning, i.e. for personal development, active citizenship, social inclusion and the employment of all individuals (COM 2005/548):

*Digital competence* involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet (COM 2005/548).

The following sections of this article discuss the different elements, i.e. skills, which compose the basic digital competence for supporting future learning in the knowledge society.

3. Learning Spaces: a Vision of Future Learning in the Knowledge-based Society

Given the pressure of change on existing learning institutions and learning models, ICT offers broad opportunities for developing a different view of what learning looks like in the future knowledge-based society. The learning spaces are a vision of future learning that is desirable and necessary. This section describes the basic elements of the vision, which raise needs for new skills beyond basic ICT usage.

In the vision, ICT are key enablers for creating future learning spaces, although they are not the sole drivers. However, the spaces are not instructorless, computer-generated spaces. Guidance and interaction continue to be very important, however, with a changing role of teachers and trainers. The vision aims at putting the learners at the centre of learning and at the same time considering learning as a social process where learners are co-producers of the learning experience. Future learning spaces can take many different forms, but they will consist of the following elements.

**Learning Spaces are Personal Digital Spaces**

Every learner (and also every teacher/trainer/tutor) will have a personal, digital learning space where all personally relevant learning resources are accessible anywhere, anytime and via multiple devices and media. This personal space would make it possible to go back and forth, without losing track of what has been learnt in the past. The personal learning space is a virtual work desk, where everything is organised according to one’s needs, in an easily accessible way. This personal learning space supports learning throughout life, without binding resources and experiences to specific institutions or learning programmes.
This personalization of one’s learning resources, processes and results with the means of a personal space supports personal growth and reflection from previous experiences. It both provides for self-esteem and private resources as well as serves to facilitate the public demonstration of skills and learning results. The personal space allows different skills and “partial identities” to be shown for different groups of people, e.g. keeping leisure time activities separate from business activities, being a secure and private space for the digital world (Dascala & Maghiros, 2007; Beslay & Punie, 2002).

**Learning Spaces are Connecting and Social Spaces**

Learning spaces will offer communication, interaction and community to support learning as a social process. They are places where different participants such as teachers, learners, learning institutions, learning content providers, and also family, friends, colleagues and other peers meet and interconnect for learning purposes or for sharing experiences. Learning spaces are supported by various synchronous and asynchronous communication channels, but the learners, peers and mentors can meet also in the physical world.

Personal digital spaces enable individual knowledge construction, and connectivity supports this with guidance and interaction from peer learners and experts. Learning spaces support organized learning, managed connections inside and between study groups, even on a global scale. At the same time they connect people interested in the same issues also outside organized learning activities. Hence, they support informal learning through interaction and knowledge sharing, providing also possibilities for students to connect with professionals to improve their learning with in-depth knowledge and practical examples.

**Learning Spaces are Trusted Spaces**

An essential element in connecting learners and mentors is trust. The validity and reliability of knowledge to be learned is important as well as the openness for individual expression and personal reflection. Learning communities combine the knowledge and experiences of many people. Validating and collecting knowledge with alternative social systems of trust are established to complement and compensate for the reduced presence of authority, familiarity and physical meeting situations. Private personal spaces provide a possibility for protecting sensitive information while public personal spaces combined with certification systems show the expertise of those offering mentoring.

**Learning Spaces are Creative/Flexible Spaces**

Learning spaces emphasize personalization, creativity and innovation in learning, as opposed to focusing on reproducing knowledge. Different learning modes are often linked to different learning environments, but as the boundaries between private, public,
working and learning life are becoming blurred, learning spaces need to be flexible in order to incorporate these shifts. They allow combining different learning modes and styles, depending on the learning object, learning purpose, the learner, the teacher, the environment, etc. Learning experience can be composed of, for example, traditional elements of face-to-face or video streamed lectures, personalised human-machine interaction, asynchronous and synchronous group work, bilateral interactions, etc. Depending on the learning goals, the learning process can be, for example, problem-oriented, task-oriented or built using more traditional topic-based curricula. The flexibility offered by learning spaces would provide a bridge and more organic links between formal, non-formal and informal learning, as well as between individual and community learning.

**Learning Spaces are Certified Spaces**

Digital spaces, connectivity and trust in the online communities also build a basis for allowing new types of certification systems, allowing certification by social networks, peers, informal mentors and other participants. These new forms of certification complement traditional formal certificates, in order to support the different forms of lifelong learning and to also recognize it in informal forms. As the need for knowledge and skills changes, the evaluation systems can no longer be just based on individual performance, but also take into account connections and links with other learners, learning resources and communities for maintaining skills in the future. Learners can harness parts of their personal learning spaces to serve as portfolios of their learning and skills for different purposes.²

**Learning Spaces are Motivating and Pleasant Spaces**

Personalization through personal digital spaces and flexible forms of learning provide possibilities for building personally relevant and motivating learning paths. Learning is connected to tasks and goals which show and recognize the progression of one’s knowledge and skills. Multimedia possibilities make learning resources attractive and connectivity allows social and informal forms of learning, which are inviting and connect learning to positive emotional aspects. Certified recognition and possibilities for showing one’s learning achievements in communities and digital spaces increase the personal feeling of achievement. Learning is pleasant and desired, and provides both for personal fulfilment and external recognition.

**Learning Spaces are Controllable Spaces**

Future learning spaces will regulate access to and the termination of learning. With an open, module-based system of learning they enable people to plug-in whenever they can or want to. Future learning also enables reflexivity, supporting people to stop for a while, to think and reflect upon their own work, learning and living, hence enabling a connection to learning from one’s personal context. They allow learners to connect to their per-
sonal digital space and, for example, recap work task related instructions when needed. They can also create specific simulated learning environments for purposes of specific task training, when real situations (e.g. flight simulators, safe environments for learning ICT and Internet usage) are not possible.

**Learning Spaces as Knowledge Management Systems**

At the time of connectivity, learning does not always need to mean the acquisition of knowledge, but learning to manage and find knowledge or aids for completing tasks. Connectivity of personal learning spaces supports building and managing inter-personal and inter-institutional knowledge. Hence, learning spaces enhance one’s personal knowledge and work by suggesting and providing easy access to relevant other persons and their public learning spaces. For example, in companies, learning spaces can connect people working on similar tasks to support them with informal knowledge and the exchange of expertise.

**Learning Spaces are Inclusive Spaces**

The final and most important consideration as regards learning spaces is that they favor inclusion. Learning spaces do not exclude anyone. They support the participation of people of all ages with different levels of education, from different cultures and with different languages, regardless of disabilities or other hindrances. The social connectivity aspect, trust systems and the possibility for a specific learning setting allow people with less experience of learning and ICT to join these spaces. Extensive ICT skills are not needed for the commencement of participation, as digital competence is further developed inside the spaces.

### 4. Challenges for Learning Spaces

Learning spaces is a challenging vision of personalized learning paths with an increased role of social connections. Implementing the vision requires major changes for the practices of students, teachers, accreditation systems as well as organizations supporting and enabling learning. For structuring the discussion on challenges related to new skills and digital competence, the learning dimensions of the vision are grouped under 1) Personal and social skills 2) Learning design and 3) Learning framework, as illustrated in Figure 1. These groups of challenges are interrelated, as for example, the learning framework supports building and using personal skills, but on the other hand, active and skilled learners can innovate and improve the learning settings as well. Inclusion is an overall challenge that needs to be considered holistically.

It is important to keep in mind that the vision is based on an assumption that there exist suitable, user-friendly technologies available to support all the learning dimensions. Hence, for realising the vision, developing and providing access to these types of technologies is a prerequisite, although this issue is not developed further in this article. This sec-
tion explores briefly the enabling conditions, i.e. inclusion, learning framework and learning design, for personal involvement in the learning spaces and the next section discusses more closely the elements of digital competence, i.e. personal and social skills.

Figure 1. Different levels of challenges for future learning dimensions

Learning design

It is a major challenge to develop learning opportunities that can support relevant learning for people with different capabilities and interests, accommodate different personal situations and objectives and combine, for example, formal and informal learning. With flexible ICT-enabled learning spaces it is possible to support situated learning (Lave & Wenger, 1991), connecting learning to the context when and where it is most relevant. However, this is only possible if the learning contents, processes and support systems are designed to allow this openness and freedom.

It is of crucial importance to train the teachers, tutors and/or trainers because of their changing role in the learning process. Moreover, school heads should not only support such approaches but also create the necessary atmosphere and attitudes towards a learning environment that is innovative and open to change. On the other hand, it is not feasible to think that just allowing learning opportunities would be enough to support everybody's learning. There are people with less advanced self-management skills for benefiting the possibilities of learning flexibility. Hence, while allowing flexibility and personalization for one's learning for those who are able to benefit from it, the learning design needs to provide sufficient support and scaffolding for those needing it.

With increased flexibility and versatility in the learning process, the role of assessment becomes more important in ensuring the quality of learning results. Assessment can be used as an instrument for guiding studying behaviour and learning (Gibbs, 1999) thus supporting individual participation to the learning spaces. According to Gibbs, assessment helps to capture students’ efforts on relevant issues and to generate appropriate learning activities, it provides feedback on the learning results in order help learners understand the learning targets better, and it supports external recognition and certification of learning.
results. Especially formative assessment during the learning process (as opposed to summative assessment measuring and grading final results) can be used for improving learning (Bloom et al., 1971). In the dynamic learning spaces, assessment provided by oneself, mentors and peers is important for supporting learning quality. In addition to formal education, learners in informal learning communities need to have possibilities for assessing their learning and skills for progressing in their personal development.

**Learning framework**

The requirement for more openness of the learning resources and processes challenges the systems and institutions of education. Enabling overall collaboration and openness (e.g. open educational resources) inside and between organizations is important for supporting developing innovative and open learning approaches. The development of additional certification systems for recognizing learning results and skills acquired outside formal education programmes is another major challenge, which needs attention and actions from high level decision-makers.

Educational systems are difficult to change. People and institutions are not by definition hostile to change, but change and innovative learning often conflict with prevailing interests and existing institutional arrangements. The entire learning system and all its stakeholders need to be involved to realise the change: educators, trainers, teachers and their institutions; learners, students and their families; organisations, employees and employers; technology and content providers; researchers, academics and innovators; and policymakers and governmental institutions at all levels. The incentives for each group need to be brought clearly out and sufficient time, space, energy and resources need to be dedicated for implementing ICT-enabled learning spaces. As educational institutions are facing the demands of the knowledge-based society, it is important to understand where, exactly, the sources of inertia in educational systems are. To develop better educational systems, it is important to understand how educational institutions learn and why this learning is difficult (Punie & Cabrera, 2006).

**Inclusion**

The major challenge for the overall vision is enabling access to learning spaces for everyone. Basic access and usage of computers and communication tools are a prerequisite for more advanced uses. The so-called innovation dilemma (Rogers, 1995) implies that the privileged and well-informed are reaping the benefits of technological innovation, thus leaving already disadvantaged people further behind. In Europe, older age groups and less educated people are reporting much lower computer and internet usage skills, as well as participation in lifelong learning. This is a major obstacle for an inclusive learning spaces vision, but there is also a strong potential for ICT-enabled learning to be very inclusive, embracing disadvantaged people, families and groups. It can offer new oppor-
tunities for those who want to learn again and for those who were not able to benefit from traditional compulsory education and training, or who were not able to perform well at school. However, people will only be motivated to learn again if the ICT in question is embedded into their everyday lives, social contexts and social networks. Lack of motivation and social support are major reasons for the failure of new learning, with or without ICT. Hence, ICT-enabled lifelong learning initiatives need to be associated with other social inclusion policies (Punie & Cabrera, 2006).

5. Requirements for digital competence

A key challenge for individuals is to obtain and maintain the necessary skills for participating in the learning spaces. In addition to basic computer and application usage skills, skills relating to online work, socializing and learning are essential. The Commission communication or key competences for lifelong learning (COM 2005/548) defines the elements of digital competence as knowledge (of ICT tools and the opportunities they provide for working), skills (for using tools for work, assessing information) and critical and reflective attitude (for media, communities). Hence, digital competence is not only about usage of the tools, but using them to support creativity and innovation.

This section explores further the elements of digital competence according to the different dimensions of learning spaces. Moreover, in the knowledge society, most competences are linked to ICT-related skills. The seven other key competences defined in the Communication for lifelong learning, i.e. Communication in mother tongue, Communication in foreign languages, Mathematical and science and technology competence, Learning to learn, Social competences, Entrepreneurship, Cultural expression, also need digital competence. And vice versa, benefiting from ICT for the purposes of lifelong learning requires these other skills as well. Basic education needs to provide the basic competences for young people, and the learning spaces need to support updating and improving these skills for people during and after their formal education.

Also in the case of digital competence, it is important to note that after acquiring the basic elements, further learning of these digital skills is supported in the learning spaces themselves, hence reducing the initial threshold for starting participation. Already now European statistics are showing that people aged 25 and above (hence, most of those outside formal education) obtain their ICT skills more often through self-study and informal assistance rather than through organised education and training (Eurostat 2006). Hence, supporting easy access to informal knowledge sharing and learning with ICT-enabled spaces has the potential to also support eInclusion and the further learning of digital skills.

The social support system provided by technologies for interpersonal and intercommunity knowledge management is important as a means for building personal and social skills and resources. For example, new web2.0 technologies and applications (shared
bookmarks, RSS feeds, automatic storing of tacit knowledge; see Pascu et al., 2007) provide new ways to collaborate with peer learners and colleagues, hence preparing people to utilize these new opportunities can greatly benefit the productivity of the workforce and empower people for personal lifelong learning. This includes further building of digital competence, providing possibilities for formal and informal demonstration, assessment and certification of digital skills.

In flexible and personally motivating learning spaces, informal learning and lifelong learning are becoming more at the centre of activity. Learning spaces can provide pleasant and personally tailored experiences if the learning designers and providing organizations have made such opportunities available. This requires both innovative approaches from the teachers, but also skills from the learners for using the tools and opportunities available to enhance their learning. Learners also need to learn how to effectively enhance the learning approaches provided by, for example, formal learning institutions, with personally relevant informal learning resources and connections.

**Digital skills in personal digital spaces**

Although the possibility to construct and maintain personal digital spaces throughout life and accessing them from anywhere gives them great potential, it also requires many skills to realise the promise. The learner needs to be competent with different tools and media formats, both for using them and for expressing own knowledge, creativity and learning results with them. Basic skills for information searching are essential and quick evaluation skills of information become increasingly important, as there are a lot of information and resources available. These are essential basics for finding good resources, acquiring and learning relevant knowledge, for connecting with other relevant people and for being able to build new knowledge together with them.

Personal digital space is related both to the dynamic aspects of creating and using knowledge and to the static aspects of managing knowledge. As the objective of the vision is to have a personal lifelong learning space, skills for building, maintaining and continuously expanding this repository of existing and potential learning play a key role. Skills for organizing knowledge for later use are important as the amount of information in digital form is increasing. Skills for both hierarchical taxonomies and tagging systems are necessary in order to support each learner in building their personally relevant knowledge organizing scheme. This includes both knowledge received from external sources and the knowledge created by oneself. This supports flexible learning, where effective personal knowledge management supports changing between tasks and later finding relevant information and points for continuing the process.

Connectivity to repositories, communities and other personal digital spaces provides new tools for linking and utilizing resources and interests of other people (e.g. shared tags), and for maintaining and refining skills. Hence, building a personal digital space also
means building a collection of connections. In the era of connectivism (Siemens, 2006) learning is not only building internal knowledge, but also finding, using and managing connections for knowledge and further learning. Communities of practice (Wenger, 1998) are important resources that are utilized increasingly with the rise of social computing. Basic skills for staying updated with information sources and supporting mechanisms (e.g. RSS feeds) need to be learned as well as effective means of utilizing them.

Finally, skills for building and managing ICT resources for personal development need to be built with the perspective that in the knowledge society the location, organization, means of access and types of content for knowledge are continuously changing. Managing mechanisms need to be relevant and functional, but also flexible. Connectivity to other learners, resources and communities is essential for keeping up-to-date with the most important advancements, for recognizing new learning needs and for maintaining one’s personal skills and competitiveness.

**Digital skills in Connecting and Social Spaces**

On the level of ICT usage skills, connecting learning spaces requires knowledge of the basic tools and norms of online communication. Knowledge of behavioural norms for socializing in online environments is important for effective interaction, and rich interaction with other people and communities helps each learner to refine these skills by experience. Also communication skills in written form are important, and their development is supported by active participation in these spaces.

As learning spaces are not only defined as online spaces, it is important to note that connecting learners and experts also takes place in the physical spaces. Hence connecting space provides entry points for those with less experience of computers to enter ICT-enabled learning with the help of others and to start learning their basic digital skills. For acquiring digital competences, the availability of digital learning resources enables self-directed learning of skills while connectivity to other people provides formal and/or informal help and assistance when needed.

Another important point is the attitude towards collaboration, which needs to be learned and practiced already in the first steps of entering the learning spaces. However, as already mentioned, these skills become refined when working and learning in the spaces. Of particular importance are skills for expressing and sharing knowledge in digital form, respecting others and deriving benefit from different viewpoints available from different people. Many communities based on collective intelligence are based on different contributions from different people and all the members need to be allowed to have their say. Disagreements need to be negotiated, with each person aiming to achieve good working results, not just promoting their personal benefits in collaborative efforts. Skills and an open attitude to collaboration are essential for allowing trust in the connected communities and making them pleasant environments to work and learn in.
In order to build connected communities where also personal reflection is encouraged and allowed, there needs to be an overall ambiance of acceptance of different viewpoints, professions, cultures, religions or any other differentiating factors. These communities are becoming increasingly more versatile, hence an ability to understand different viewpoints is important and contributes to the overall work and learning results. Preferably, already early on during their education, students should work in online groups with people from other environments in order to improve their ability to express themselves and listen to others. This is one of the most important skills in the ICT supported connected spaces where working and lifelong learning are increasingly taking place.

**Digital skills in Trusted Spaces**

Online communities need to be based on common rules and behavioural norms in order to support individual learning, effective working and quality outputs. One needs to learn the rules of each community in order to become a full and trusted member of it. In general, skills and knowledge of the risks in terms of privacy, security and identity when using digital technologies are among the basic skills necessary for understanding and managing the use of ICT in personal and professional lives (Wright et al. 2008). Also basic ethical skills and attitudes for discussion and peer evaluation are required for effective collaboration and knowledge.

To support collaboration and trust among peer learners and experts it is important to adequately acknowledge the source of ideas and knowledge. Knowledge of intellectual property rights, referencing practices and commonly used licenses need to be learned when starting to use the web as a resource of knowledge. This enhances the possibilities for collaboration and opening of individuals and communities, encouraging everyone to be creative, while knowing that by appropriate licensing, the work can be shared and will obtain the recognition it deserves.

Trusted spaces provide new means for building and accessing knowledge resources, e.g. built as collaborative efforts. Especially in the rapidly changing area of ICT, these better updated knowledge and learning resources are very valuable for maintaining digital competence. Certification systems for people and institutions as well as peer reputation systems provide a basis for evaluating the value and quality of the information, from the abundance of digital resources available.

**Digital skills in Controllable Spaces**

Learning spaces can provide personally relevant and timely learning opportunities, but the learner needs to learn to manage, control and utilize this potential effectively. After acquiring sufficient skills, the learner can adapt the learning according to his interests, to best serve the personal learning goals in the situation. Confidence in oneself and in one's personal learning skills grows in practice and fostering them with the different types of
learning approaches available can build the personal skills, resources and motivation for lifelong learning. Increasing needs for personal learning paths are also leading to personal learning results and projects. Especially skills for reflection as supported by ICT-enabled media are important for analyzing and managing one's learning and for being able to consider the comments received from others.

Also digital skills are acquired throughout life, whenever needed and wherever needed, in ways that are not only based on formal education and training. This is important as technologies develop continuously and means are needed to address learning needs quickly before significant skills gaps can arise. Structured learning processes as well as informal communities and different certification systems support updating and maintaining relevant digital competence.

Self-management skills in terms of timing and concentration for the most relevant learning topics among the abundance of information and opportunities available in learning spaces are skills that need continuous development. Learning-to-learn and self-management skills are required for using the freedom of learning spaces for enhancing the efficiency of one's personal learning and for not becoming distracted by the flexibility provided. Learning-to-learn skills both in general and related to the ICT tools available need to be specifically addressed when preparing people for lifelong learning either in formal education or in the later learning phases of life.

6. Conclusion
As modern societies are evolving towards fully digitalised, networked and knowledge-based societies, the views on learning, on what needs to be learned and on how to learn need to evolve as well. Digital competence is one of the key competences needed in a digital society. In addition to basic ICT usage skills, needs for new digital skills are arising as new technologies are becoming widespread, as demonstrated, for example, by the recent growth in social computing applications. Continuous learning of digital skills thus becomes part of lifelong learning as the requirements for these skills are continuously changing. In addition, and maybe even more crucially, higher-order skills such as knowledge management, interaction, collaboration and critical reflections need to be learned as well.

This article has discussed the vision for ICT-enabled future learning, exploring the different skills required for participating efficiently in the different learning dimensions. These skills are already relevant today and more so in the future. People will need to acquire and continuously develop these digital skills but the full realisation of ICT-enabled learning spaces involves all participants in learning, thus not only learners, as well as requires changes at the level of the design of learning and of its framework conditions.
A major challenge is to make sure that learning spaces are inclusive. There is a risk that disadvantaged groups and marginalized people will not be able to benefit fully from the ICT-enabled opportunities for learning, either as competent users of ICT in general or as learners and trainees in particular. But as the vision for future learning emphasizes the social connectivity and flexible learning opportunities, they also support learning further digital skills via ICT-enabled learning, hence reducing the threshold for starting participation in learning.

Notes
1. The views expressed in this article are the authors' and do not necessarily reflect those of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of the following information.
2. See, for example the ePortfolio initiative, building personal digital collections of information describing and illustrating a person's learning, career, experience and achievements.

References


