

A Glimpse at the Future of Technology Enhanced-Professional Learning: Trends, Scenarios and Visions

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The paper presents future visions of technology enhanced professional learning as expressed in a pan-European roadmapping activity. A new approach is introduced and employed to develop a roadmap for technology enhanced professional learning. Interesting findings from the first phase, which identified the future visions are presented and their analysis using conceptual mapping is proposed.

Introduction

The aim of this foresight study is to map out the desired future for technology-enhanced professional learning (TEPL) in the form of prevalent visions in the community at large. The study represents the first phase of a larger technology roadmapping activity aiming to provide a 10-year-span technology roadmap for European professional training, an initiative which has been launched within the Prolearn Network of Excellence [23].

The Prolearn Network of Excellence focuses on identifying the emerging future e-Learning scenarios and contexts, in the form of future technology-enhanced professional learning resources, and the use of these learning resources for professional training in Small/Medium Enterprises (SMEs) and larger companies. In pursuing this, the Prolearn Network of Excellence aims to also advance the state-of-the-art in the critical areas of personalized adaptive learning and interactive media, with learning resources connected to real-world settings and reusable in different contexts.

This paper first describes the specific methodology employed in order to compile a roadmap for technology-enhanced professional learning for the mid-term future (the next 10 years). It then follows on to describe in detail the work of the first phase (future visions) and discusses preliminary results. The work has brought together external experts and industry stakeholders in order to synthesize and combine knowledge.

The Roadmapping Processes

The Prolearn roadmapping process aims to provide us with the information of where we are (current state) and where we want to go (vision/foresight/desired future). Once this is achieved we will be in a position to determine how we can get there (action plan). The process includes the following stages (Figure 1):

- *Vision*: tacit idea representing the desired future state
- *Expressed future state*: instantiation of the vision in a formal and systematic way
- *Gap analysis*: between the current state of the art and desired future state (critical capabilities needed to implement one or more vision statements)
- *Actions*: a portfolio of short-, mid- and long-term actions and recommendations, based on the gap analysis

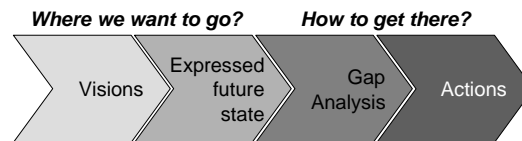


Figure 1. Roadmapping stages

In Figure 1, the first two stages comprise Phase 1 (Where do we want to go? - outputs: Vision statements and Expressed future state) and the last two stages comprise Phase 2 (How can we get there? - outputs: Critical capabilities and recommended actions).

This paper is concerned with the formulation of the future visions (Phase 1). In Phase 1, the future scenarios and the shared visions are identified and a framework is set up for the subsequent gap analysis. A variety of activities, including scenario building, international forums, surveys and workshops with experts, are used to derive and express the visions, in terms of the core concepts (vision statements, goals and influential factors). The main principle is “finding the currents that lead you where you want to go” (proactive), instead of “floating in the currents you are presently in” (reactive).

In the framework of Prolearn, roadmapping is a knowledge creating process (Figure 2) that spirals outwards from the core partners of the Prolearn Network (individuals, groups, the whole Network) via the Network’s associated partners, to the entire scientific community and industry. Therefore, it is both a learning activity and a knowledge creation process for the community building the roadmap. According to Nonaka [13-17], the key to knowledge creation lies in the following four SECI modes of knowledge conversion, which occur when tacit knowledge and explicit knowledge interact with each other:

- *Socialization* (sharing tacit knowledge): The process of sharing experiences (tacit knowledge), thereby creating new tacit knowledge.
- *Externalization* (converting tacit knowledge into explicit knowledge): The process of articulation and conversion of tacit knowledge into explicit knowledge.

- *Combination* (Systematic combining of explicit knowledge): The process of restructuring and aggregating explicit knowledge into new explicit knowledge.
- *Internalization* (Internalizing new knowledge as tacit knowledge by the organization): The process of reflecting on explicit knowledge and embodying explicit knowledge into tacit knowledge.

According to Nonaka, because tacit knowledge includes mental models and beliefs in addition to know-how, moving from tacit to the explicit is really a process of articulating one’s vision of the world - i.e. what it is and what it ought to be. When individuals invent new knowledge, they are also reinventing themselves, their organization and even the world [13-17].

Similarly, knowledge creation in a roadmapping exercise is a continuous process where individuals and groups transcend their boundaries by acquiring a new context, a new view of the subject domain, and new knowledge. The employed roadmapping process model (Figure 2) is derived from the SECI process by replacing the triplet of social entities {Individual, Group, and Organization} with {Core Partners, Associate Partners, and Scientific Community & Industry} [3,9].

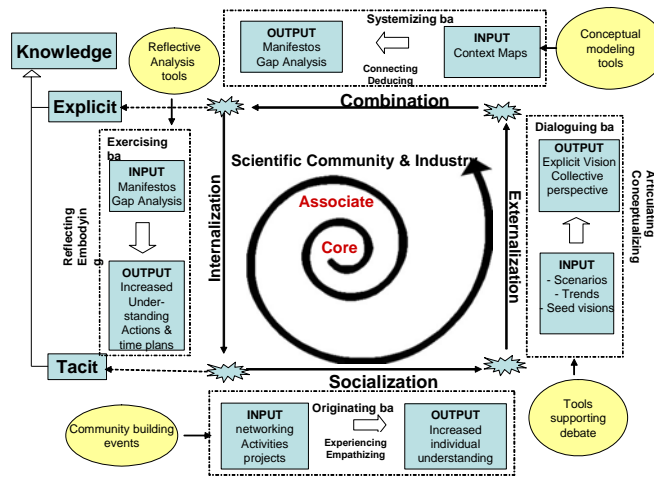


Figure 2. The Prolearn roadmapping process Framework (based on the SECI model)

During the Socialization process, networking activities and community building tools are important. Face to face meetings, various workshops, and virtual meetings have been organized to bring together the wider community of the Prolearn network (both core and associate partners spanning more than 300 organizations) on a common contextual platform and tap into their collective experience and knowledge.

During the Externalization process, awareness was raised of the key issues involved in TEPL, and the implicit concepts and ideas originated during the socialization process were expressed. Individual views and visions were expressed via scenarios produced by Prolearn partners, and by other experts and initiatives, and also through brainstorming sessions where individual visions were discussed and extended. These activities provided with a good indication of what TEPL means to dif-

ferent stakeholders in a variety of Professional situations. Desktop research and online surveys are also used during this phase. The aim was to create seed visions that can be used as input for starting a dialogue with external groups. The next step was to initiate a dialogue with external experts and industry stakeholders in order to synthesize and combine knowledge. In this activity, it is important to bring together people with different expertise and scientific backgrounds. A symposium with researchers, academics, industry experts and policy makers was organized where the seed visions were discussed and extended by others. Interviews with companies, forums and virtual communities are also set up in order to test, validate and update the vision statements.

During the Combination process, the outcomes of the dialogues are analyzed in order to clearly systematize concepts, identify trends and factors influencing those concepts and analyze their relationships. During this phase we use conceptual modeling tools. The different context maps are studied and the final vision statements are derived. The resulting knowledge is formulated and presented using the Conzilla browser tool. [8, 10, 11]. The resulting model is an “electronic document” in the form of a Java applet, which is available at www.conzilla.org/demo/RM.html

During internalization process, this explicit knowledge, in turn, can be reflected upon and internalized into new tacit knowledge. In the later Phase 2, the critical elements for achieving the vision statements will be identified and a gap analysis of what is available and what is missing (needed for the future) will be performed.

Prolearn roadmapping is not a linear process and more cycles of the SECI Spiral will follow. Figure 3 provides a more in depth view of the spiraling ‘express future state’ process which transcends individual views and experiences to form collective knowledge at a macro level (definition of desired future state – shared vision).

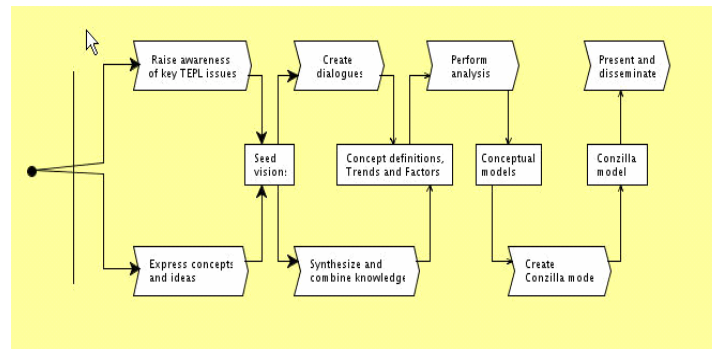


Figure 3. Express future state

Prolearn teams (Workpackages), play a central role in this knowledge creation process of building the roadmap because they provide the shared context where the team members can interact with each other and engage themselves in common projects and activities on which effective reflection depends. This provides a new individual understanding of the relevant concepts and their relationships. This new “know-how” is articulated via a constant dialogue where teams pool their information and examine it from different angles, thus integrating their diverse individual perspectives into a collective perspective. The resulting “seed” knowledge is modeled and

conceptualized and thus is easily communicated to external groups in order to synthesize information from many different sources and bring in different perspectives and contexts. In that way, an increased collective understanding is achieved where the actual concepts and their contexts are reinvented and extended by others. To this end, the micro and macro dimensions interact with each other, and changes occur at both the micro and the macro level. Thus the existing visions of the core partners of the Prolearn network (micro) influence and at the same time are influenced by the environment (macro) with which the network interacts.

Figure 4 is a quick summary of the roadmapping activities. We are working at both micro and macro levels: Micro level involves activities that are raising awareness in the relevant foresight issues in TEPL Macro level involves activities that are synthesizing and combining knowledge and expertise. In parallel we are analyzing and presenting the resulted knowledge using conceptual modeling tools and Conzilla browser.

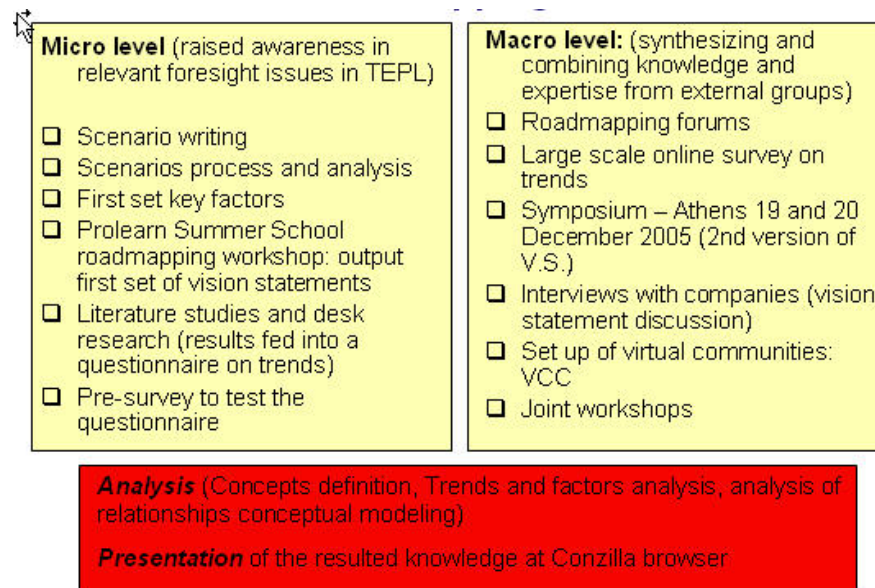


Figure 4. Prolearn roadmapping activities

Formulation of Visions

Initial findings included both the identification of major trends and the articulation of vision statements for the desired future state. A number of instruments have been employed to identify major trends and derive vision statements from stakeholders, including: Scenario analysis, brainstorming sessions, international Roadmapping forums; Interviews with companies (to generate discussion on the vision statements);

Virtual communities on the web and multi-target large scale online survey of current trends.

Scenario Analysis

In order to draw the roadmap between the current state (As-Is) and the desired future state (To-Be), detailed possible future scenarios were developed. The training solutions described in the scenarios represent realistic everyday training ten years from now in various professional situations.

Twenty five scenarios were processed and analyzed and the key drivers and factors per scenario were identified. During the scenario analysis process, we have described the primary focus of each scenario as the scenario training context, the business requirements as the driving forces behind the scenario, and the focus areas, where the focus should be if one wanted to realize the scenario. The sources for the 25 scenarios were the following: 11 scenarios have been independently developed by Prolearn core and associated partners, 7 scenarios were analyzed from the work of Norris et al. [18]; Time2Learn Thematic Network (EU) [31]: 1 scenario; ROCKET project (EU)[27]: 2 scenarios; Ariel Project (EU): 4 scenarios.

Analyzing the scenarios, we start from identifying the key business requirements which are considered to be the driving force behind the scenarios. The rationale behind these groups of drivers is primarily economic, centered on the use of TEPL in order to improve competitiveness in EU companies.

Four different sets of business requirements have been identified. Each set has a different focus. The first 3 sets are more focused on the intrinsic business requirements and are differentiated by the intended result of the training: a) TEPL supporting Continuous Improvement in Companies (micro level); b) TEPL supporting Business Process Re-engineering in Companies (medium level); c) TEPL supporting Goal Oriented Change in Companies (macro level). The 4th set is focused more on the market requirements and the emergence of knowledge exchanges and new ways of knowledge management.

TEPL Supporting Continuous Improvement in Companies (micro level)

- Competency development of the current workforce in a short period of time: (e.g. Training on demand, triggered by immediate project needs)
- Training built into the work itself (Workflow learning)
- Solve performance problems related to standard or specialized projects
- Introducing new employees to an organization/project/role
- Support collaborative work on new interdisciplinary topics

TEPL Supporting Business Process Re-engineering in Companies (medium level)

- Changes in management strategies
- Cost accounting for the cost and price of knowledge
- Value on investment drives ICT developments
- Linking training to business processes and re-conceptualize learning processes
- Internal communication problems among different company's departments, branches or within project teams

- Managers and employees as knowledge and learning activists
- Role out of new or improve standard process and maintain it

TEPL Supporting Goal Oriented Change in Companies (macro level)

- Technology enhanced learning driven by changes in corporate strategy, goals, new products
- Introduction of new products/services to the market under stringent timelines (time-to-market)
- New forms of organization, new types of learners, such creating and leading teams across the new ecosystems of suppliers, partners and customers
- Need to align business goals and processes among newly acquired partner companies (fusion of KM, LMS and business processes)

Knowledge Exchanges

- E-Repositories and Knowledge Market places
- Vertical silos of traditional content providers are broken up by the horizontal structures of marketplace exchanges
- Market places set relationships with aggregators of supply and aggregators of demand
- Many sources-publishers, universities, professional societies, and trade associations, and learning management system in companies - in different levels of granularity
- Marketplace pool explicit and tacit knowledge plus performances and experiences
- Added value services: content assessment and review, aggregations of knowledge recommended by experts, training assessment, use search engines, and other user support tools, personalization of learning curricular, consulting services, access to communities of practice and experts networks

The next step was to identify the main priority areas where most of the new challenges are found: the technology area and the socio-cultural area.

- **Technology Area:** Knowledge markets; Content Development, management and delivery (anytime, anywhere); Processes, models and infrastructures; “Ambient Intelligence”.
- **Socio Cultural Area:** Collaboration & Communities of Practice; Informal learning, capture and exchange of tacit knowledge; New University structures (i.e. Corporate University); Universities as providers of learning services adapted to corporate needs; Associations (Professional, Trade Unions) offering access to experts and communities of practice.

Trends Affecting TEPL

From the outputs of the above mentioned instruments a raft of major trends, which are perceived to be highly influential for the future of TEPL, were identified and categorized as follows:

Market

The producers are becoming consumers and vice versa – there are indications that this distinction is now becoming irrelevant. This blending of producing and consuming, gives birth to a new type of consumers, called “prosumers” [32], who become directly involved in the creative process of products design and manufacture. “Prosumers” are part of a proactive market that develops individually tailored products (mass customization).

People

Career paths are changing - rather than being employees, more and more people are now self-employed. There is also a move from national/ethnic identities towards increasing impact of interests and motives. Also Europe faces an undeniable trend of an aging population and workforce.

Skills. In the skills base, there is a move from simpler to more complex skills and from slowly changing to faster changing.

Work patterns. There is a move towards the destandardisation of working hours and lifestyles, gradually shifting from serial (8 hours) to parallel (24/7/365) work patterns and the boundaries between living and working gradually blur.

Companies

The modern economy is becoming increasingly “digital”, as bytes replace bricks and enterprises witness a move from production of goods towards intangible assets, such as media, software, and the provision services.

Organisations become “smart” [1] and “agile”, i.e. are knowledge-driven, internet-worked, dynamically adaptive to new organisational forms and practices.

Company structures move from vertical position-based hierarchies to horizontal project based interdisciplinary teams, stemming out of intra- and inter-organisational collaborations. This shift from rule directed to problem/project based work, results in flatter, leaner organizational structures with increased self regulation and less day to day direction from the top.

Business processes. There is a move from low capital costs to customer perceived values, as the customer becomes the reference point of all activities.

Employees. At the workplace there is a move from close supervision to more independence and responsibility. This implies leadership qualities. Employees are expected to form networks within and outside their organizations, master the skills of creative collaboration, respond to frequently changing priorities, and assume personal responsibility for setting their own direction. This increased autonomy is a new source of stress in the workplace.

Products and Services. There is a move from standardized forms of production and delivery to customized forms and from in-house operations to more flexible outsourced forms. Traditional companies are loosening up, moving from value chains to value nets.

Findings of the European Experts' Symposium on Future and Emerging Issues in TEPL

The objectives of this symposium [1] were to identify, record, discuss and analyze the emerging issues of technology enhanced professional learning and to pave the way for common future actions. The symposium had a unique focus on the future of technology enhanced professional learning and was a two-day-event involving 67 distinguished experts representing various sectors of the European Education and Training Community. The symposium participants were engaged in highly interactive, structured sessions that have been formed around six main themes.

The working method employed in the symposium is known as "learning discussion forum" or "Learning Café which involved expert's introductions and group discussions. The unique composition of the symposium together, with its pioneering methodology of synergy and interaction, provided and documented new ideas and concerns, which were crystallized in a series of observations, important for future planning in this field.

The dialogue resulted in the articulation of the following interesting points:

- The vision for the future Knowledge Workers focuses on three main axes: (i) promotion of innovation, creativity, proficiency and flexibility in learning and work, (ii) maximum employability of the European labor force, and (iii) equal opportunities in education and career.
- The management of human resources has to change and learning has to be integrated in the working and business processes.
- Time-to-proficiency becomes increasingly important in order for the European companies to stay competitive. Therefore, there is a need to improve the conditions for individual and organizational learning significantly and systematically in order to increase the learning speed and the ability of individual workers as well as companies to change rapidly.
- The training programmes have to be aligned with the strategic goals of the enterprise.

- A tendency of convergence between work and personal life is observed, where the lines between learning and work, work and leisure, and also formal, informal, non formal forms of learning, are becoming more and more blurred.
- The need of greater flexibility in professional development is a stress-inducing factor for the employees, as it creates intense feelings of insecurity towards work.
- Greater understanding is needed on what the knowledge worker needs are and what the skills and competencies in the new knowledge society and knowledge work should be. There is also a need to identify the underlying factors that have a major impact on knowledge worker productivity, some of them being very difficult to measure, such as values, self-image, traits and motives.
- An important change relating to the organization of jobs and company structures is emerging, which tends towards the demise of hierarchy as well as of specific titles and job descriptions, with a strong tendency towards flexible types of jobs defined by the particular “project” assignments.
- An increased imbalance of education was identified between higher ranked and lower ranked employees, as well as between small and large enterprises. In reality, “the future is already here but unequally distributed”.
- The most-likely-to-succeed future type of training will be the “personalized learning”, which offers to the specific person the right skills, at the right time within the specific context (work, social, technical, cognitive etc).
- There is also evidence of increasing convergence between official and unofficial training

The Athens High-Level Symposium with International Experts [2] refined the output and articulated an overarching, condensed statement of the Future Vision, emphasizing “the promotion of innovation, creativity, flexibility in learning and work, employability, and equal opportunities”.

Core Vision for TEPL in 2015

The Prolearn Summer School Roadmapping Workshop [25] integrated the results from the various Prolearn foresight activities and came up with the following core vision for the future TEPL: *“To support knowledge workers with technology-enhanced learning by promoting motivation, performance, collaboration, innovation and commitment to lifelong learning.”* In this context, a knowledge worker is defined as someone who doesn’t just consume knowledge but who is able to create it and who reflects critically on every level of activity in the organization and contributes back.

The Six Vision Statements

The Core vision is broken into 6 individual vision statements that synthesize and explain the core vision. Each vision statement has its distinct overall perspectives and focus. They represent different and complementary views of the core vision i.e. IST view, industry views, learner view, market and societal dimensions.

- *Vision statement I*: “Everyone should be able to learn anything at anytime at any-place.” The main goal is to provide the right learning experiences at the right time for the right person. The statement is closely linked to the IST challenge. It embraces issues of digital convergence of communication networks, media, content and devices. The new capabilities offered by recent advances in mobile and internet communications can support and facilitate mobility towards a lifelong learning environment, enabling the creation, storage, management and access to knowledge everywhere and every time. The aim is to create and deliver a personalized learning experience to everyone.
- *Vision statement II (Industry Challenge)*: “Learning as a means to support and enhance work performance.” The main goals are to support human performance improvements and to provide links between business processes, competencies and learning processes; and use TEPL to design high quality work-based learning activities so that learning and working becomes interlocked. The statement is related to specific industry challenges, such as performance support and performance improvements at the work place.
- *Vision statement III (Industry Challenge)*: “Promote innovation, creativity, and entrepreneurship at work.” This vision encompasses a variety of goals such as: a) Learning supporting radical change in an organization and improving ability to change; and b) Competency development (including thinking out of the box, creativity, asking the right questions, leadership). The statement is related to industry challenges such as investment and development of the company’s human capital and use of learning to support ability to change in organization
- *Vision statement IV*: “Learning as a means to increase employability.” This statement focuses on the Learner’s perspective, the employees’ continuous professional development, and the need to increase employability. The goals in this vision include resilience, employability, getting skilled faster and personal growth. Enhanced mobility, employability and competency of the European workforce. Portability of learning achievements is one of the key-issues to be addressed.
- *Vision statement V: Market take-up*. “Professional e-learning will be a commodity market in 2015.” This statement focuses on market take up of TEPL and the ability to purchase content and learning services regardless of type and country of the learner supplier in a unified transparent market. The main goals in this vision include market transparency, consumer driven market, one-stop-shopping, wider choice at all levels, and selection optimization. Development of both segments of the market: from the low end commodity market to the high end upscale, high value added segment. There are two alternative ways to achieving this vision. One is about the commodity market being based on the “canned courses” concept, while the other is based on communities of practice and collaborative creation and sharing of professional know-how.
- *Vision statement VI: Socially inclusion*. “High quality learning for all”. This statement addresses social inclusion issues, such as digital divide, the gap between poor and rich etc. The goal will be to democratize knowledge provision and to support the so-called e-Inclusion and equal opportunities for all in the workplace.

As depicted in Figure 5, the PROLEARN vision statements provide a holistic picture of the desired future of TEPL in an outwards spiraling way that highlights the aspira-

tions of all stakeholders : the individual (VS I & IV), the enterprise (VS II & III), the market (VS V) and the European society as a whole (VS VI).

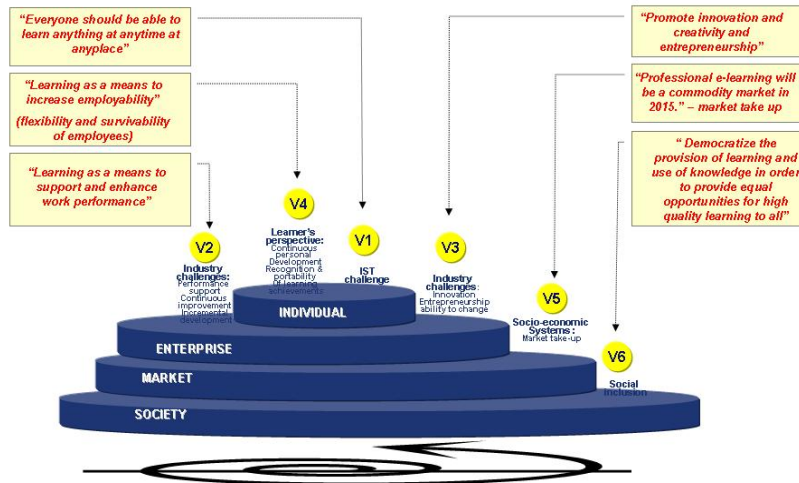


Figure 5. The six vision statements address a variety of challenges in professional learning embracing all levels of the socio-economic system.

Conclusion

Recent findings from a pan-European roadmapping exercise on the future of technology-enhanced professional training have been presented in terms of visions describing the desired future state. A new approach to roadmapping was employed, while the task of identifying the prevalent future visions involved a series of consensus building activities including scenario building and a number of community-based surveys and forums. The prevalent visions for the next 10 years seem to be centered on leveraging technology to promote (a) high performance for businesses through innovation, creativity, and flexibility, and (b) increased security for individuals in the form of employability and assuredness of equal opportunity.

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