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Towards an Integrated Approach for Research on Lifelong Learning

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Abstract

There is little dispute that lifelong learning is essential to the further development of the knowledge society. Nonetheless, lifelong learning is not reaching its full potential because the currently used approaches to lifelong learning are too fragmented and, often, formal approaches to education and learning are simply ‘translated’ from initial secondary and higher education to the field of lifelong learning. This article discusses an integrated framework for carrying out research on lifelong learning. The framework is built on two dimensions: (1) the *specific-generic* dimension; linking contextualized research findings in the field of lifelong learning to generic issues and principles, and (2) the *individual-collective* dimension; linking research findings on the personal and professional development of individual lifelong learners to the level of organizations, cities, and regions. Moreover, three integrative features of research on lifelong learning are identified: developed approaches should be (1) *responsive* to societal and technological changes and associated changes in required competencies; (2) *flexible* in order to serve highly heterogeneous groups of lifelong learners and (3) *sustainable* to be of value across the whole lifespan. Finally, research and practical implications of the presented framework are discussed.

Towards an Integrated Approach for Research on Lifelong Learning

Ensuring that citizens and employees are equipped with the skills and competences needed to live and work in the 21st century is a matter of great urgency. Demographic trends, global competition and technological advances make it imperative to raise the level of skills and ensure that these are synchronized with the rapid evolutions in today's knowledge society. Western industrialized nations go through fundamental changes in their economic, political, cultural and social order, and the citizens of those nations are experiencing job and employment related, social, psychological and even physical effects of those changes. The changes result from various facts, such as an increasing number of people is reaching old and very old age; there are ever quickening changes in required knowledge and competences leading to job obsolescence; the populace is being flooded with information that it needs to understand to properly function in society; and there is an ever increasing move toward globalization, both politically and economically. The consequent changes in patterns of working and/or earning, living, learning and even survival have a clear impact on social institutions including institutions of higher and continuing education, corporations, and cultural institutes.

Lifelong learning as an area of attention is very much allied to the general societal notion of improving and optimizing human potential and human development. If we take this notion seriously and apply it to a whole lifespan, then we must also seriously reconsider the concepts, theories and guidelines that are normally used for developing, implementing and carrying out lifelong education and learning both inside traditional education (i.e., formal learning in schools, training institutes, etc.) and outside of it (i.e. non-formal and informal learning). New *actors* are entering the field of education (both providers and recipients), new *content* is being developed

and implemented for learners (e.g., curricula, diplomas/certification schemes), new *forms of education* are being developed (e.g., open educational resources, web and/or hyperlink based materials, serious games, dual education), and new *methods of assessment* are being introduced (e.g., portfolios, recognition of prior learning), all of which are and/or need to be suited to different age groups, professions and expertise levels.

Research on lifelong learning is of the utmost importance to meet these challenges, because lifelong learning is more than a simple extension of existing educational systems, but also because it is an object of study in its own right, that takes the special features of adult and innovative learning into account. First, we will briefly review the concept of lifelong learning, its importance, and the main threats to realizing it. The remainder of this article will then discuss an integrated framework for carrying out research on lifelong learning.

What is Lifelong Learning?

Lifelong learning is “... all purposeful learning activity, undertaken on an ongoing basis with the aim of improving knowledge, skills and competence” (Commission of the European Communities, 2000, p. 3). This simple statement makes clear lifelong learning is not something external to learners organized by others that they can consume for their benefit as is the case with continuing education (i.e., lifelong education), but rather something in which the locus of control and motivation is within the learners themselves.

Traditionally, lifelong learning is divided into three categories, namely formal learning, non-formal learning, and informal learning. *Formal learning* - as related to lifelong learning - is traditionally an extension of formal schooling which Livingstone (1999) defines as an “age-graded, hierarchically organized, formally constituted system... [with] credentialing programs to

certify one's knowledge competencies for starting one's adult lives” (p. 50). The Cedefop glossary (Tissot, 2000, 2004) notes that it consists of learning that occurs within an “organized and structured context (formal education, in-company training), and that is designed as learning” (Tissot, 2000, p. 22). Formal lifelong learning courses and programs are most often offered by traditional (or new) educational or training institutions and when extended into the adult years are often called *continuing education*. As such, they constitute the universe of formal lifelong learning (actually lifelong education).

Non-formal learning is not provided by an education or training institution and does not typically lead to formal certification (Commission of the European Communities, 2000). It consists of learning embedded in planned activities that are not explicitly designated as learning, but which contain important learning elements. As such it is *structured* in terms of (personal) learning objectives, learning time, or learning support and is *intentional* from the learner’s point of view (Colardyn & Bjornavold, 2005). Somewhat confusing perhaps, Livingstone (1999) has called non-formal learning *explicit informal learning*. This he defines as learning experiences that take place outside of traditional institutions of learning, but involve the learner’s own conscious identification of the activity as ‘significant’ learning, the most important criteria being “the retrospective recognition of both a new significant form of knowledge, understanding or skill acquired on your own initiative and also recognition of the process of acquisition” (p. 53). Non-formal learning (or explicit informal learning) is, thus, “any activity involving the pursuit of understanding, knowledge or skill which occurs outside the curricula of educational institutions, or the courses or workshops offered by educational or social agencies...[and] undertaken on

one's own, either individually or collectively, without either externally imposed criteria or the presence of an institutionally authorized instructor” (p. 3).

Finally, *informal learning* – according to the Commission of the European Communities (2000) - is learning that “results from daily life activities related to work, family or leisure. It is not structured (in terms of learning objectives, learning time and/or learning support). Typically, it does not lead to certification. Informal learning...is non-intentional (or incidental/random)” (Colardyn & Bjornavold, 2005, p. 22). It can, thus, be regarded as a *tacit* form of learning through everyday activities. Coombs (1985) defined informal learning as "the spontaneous, unstructured learning that goes on daily in the home and neighborhood, behind the school and on the play field, in the workplace, marketplace, library and museum, and through the various mass media, informal learning is by far the most prevalent form of adult learning" (p. 92).

Why is Lifelong Learning Important in Current Society?

Both in work and in daily life, the demand on what one needs to know and needs to do to function adequately (i.e., the demand on one's competences) quickly increases in the course of one's ever-lengthening productive life. At the same time, the knowledge and skills acquired during initial education (i.e., pre-school through graduate school) concomitantly become increasingly quickly obsolete as a result of ever more rapid societal, technological and organizational innovations. The potential problems arising from this are amplified by the proportional increase of the aging of the larger population as a whole due to demographic factors and a continuous increase of life expectancy. Thus, lifelong learning is essential both for

individuals to keep up with the world and for professionals to keep pace with the constantly changing global job market and technology (Borg & Mayo, 2005; Spring, 2008).

Lifelong learning became a worldwide topic of discussion in the 1970s with the publication of a UNESCO report, which called for lifelong education as part of individual, cultural, and personal growth (Faure et al., 1972). The Organisation for Economic Cooperation and Development (OECD) reconceptualized lifelong learning by making it part of human capital theory (Field, 2001). The European Union gave lifelong learning prominence as part of the human capital requirements of the knowledge economy, and presented it as a key factor for the international competitiveness of European business and industry (Commission of the European Communities, 2000). To meet these challenges, we argue that lifelong learning research is needed to develop theories, models, approaches and tools that contribute to the (a) desired increase of the number of employees with a degree from higher education, (b) upgrading and updating the competences of the working population, (c) pro-active schooling of those whose employability is endangered, and, last but not least, (d) creation of learning opportunities that contribute to cultural and personal growth and development of all citizens.

Why is Lifelong Learning so Difficult to Realize?

It is generally accepted that lifelong learning is imperative for individuals and societies in a knowledge intensive society and that it has far-reaching positive effects that go beyond simple economic issues (Groot & Maassen van den Brink, 2007). On the one hand, Levin and McEwan (2002), for example, report on the positive relations between education and the generation of income, tax revenues and savings of public health costs, criminal justice costs, and public assistance costs. On the other hand, the targets for involvement in lifelong learning are nowhere

near being met and there are large discrepancies in participation in lifelong learning between nations (Scandinavian countries with disproportional high involvement), age groups (older citizens are underrepresented), education levels (lower educated are underrepresented), social economic status (poorer citizens are underrepresented), professions (less skilled are underrepresented) and even gender (women are underrepresented) (Desmedt, Groenez, & Van den Broeck, 2006). One could call this a 'self-made' social exclusion.

If there is a general agreement that lifelong learning is necessary and there are proven personal and collective benefits for it, why then is lifelong learning lagging? Though there are many reasons for this, such as lack of knowledge of the possibilities that exist, lack of a sense of urgency by the population, and lack of support by the environment (e.g., family, employers, et cetera) we will concentrate here on two aspects that we, as educational technologists, can most readily approach.

First, as already argued, formal approaches to initial education are often simply "translated" into non-formal approaches to lifelong learning. This cannot work because lifelong learning is *not* lifelong education. The way learning processes are best facilitated is a direct function of the context in which learning takes place, the skills taught, and the characteristics of the learners. Compared to formal education, lifelong learning is very different with regard to contexts, which are not school-based but typically situated in professional or daily life; with regard to skills to be developed, with a strong focus on higher-order skills (e.g., setting own goals, evaluating and planning own learning) and professional skills; and with regard to the learners, who have different motivations, are older and, as a group, are much more heterogeneous.

Second, an integrated approach to lifelong learning is yet missing. Current approaches are too fragmented, and study or promote lifelong learning from only one particular perspective, for instance, from an economic, sociological, psychological, or technological viewpoint. Fields such as management (Graen & Hui, 2001) and medicine (Graham-Pole, 2001) have shown that a multidisciplinary, holistic approach is often necessary to come up with interventions that really make a difference. An integrated approach repeatedly adds small increments of innovation and uses multiple strategies to capitalize on their synergy. Poindexter (2003) compares this approach to a weight-loss program: People who try one diet, one pill, or one exercise usually do not achieve their weight-loss goals. Only when an integrated approach to health is taken, including incremental changes in eating, drinking, life style and exercise, will weight loss and increased fitness occur. In our opinion, one needs to develop a similar integrated approach for lifelong learning.

An Integrated Approach

The research framework described in the next section offers such an integrated approach, with two dimensions: (1) the *specific-generic* dimension, which links contextualized research findings in the field of lifelong learning to generic issues and principles; and (2) the *individual-collective* dimension which links findings on the personal and professional development of individual lifelong learners to the level of organizations, cities, and regions (see Table 1). The following sections will elaborate on this framework. First, an approach to field research on lifelong learning is discussed, working from the individual level of professional and personal development to the collective level of learning organizations, cities and regions. Second, research into the general principles of lifelong learning is discussed, working from the individual level of

learning and cognition to the collective level of networks of learners. In the Discussion section of this article, the integrative features of the presented framework will be summarised.

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Field Research on Lifelong Learning

Lifelong learning is both an effect *of* internal and external conditions, and has effects *on* an individual's personal and professional's life or on the growth and development of an organization or region. One can ask under what social, political, cultural, economic and psychological conditions individuals and organizations learn during their lives and are motivated to do so and what tools help them do this. At the individual level, one can also ask what the effects of this learning are on their jobs/employment as well as on issues such as personal health, quality of life, stress prevention in the workplace, understanding important policy issues discussed in the media, coping with companies and government, dealing with risks and opportunities of medical and other professional interventions, et cetera. On the organizational or regional level, one can ask what the effects of lifelong organizational/regional learning are on the competitiveness and innovative power of the organization/region, but also on its culture and networking capabilities. Patterns of working, living, and learning must adapt and/or change which leads to increased interest in the achievements and effects of lifelong learning, not only as a means for improving oneself or one's position, but rather as a goal, and as a source of health, development and enrichment of life. Lifelong learning, as such, is about:

- how people and organizations/regions adapt and change to meet present and future challenges,

- how they – as individuals, as groups, and as organizations/regions - can make use of learning opportunities to bring greater fulfillment to their life, and
- under what conditions they have the motivation and disposition to continue to learn throughout their lives and how this can be stimulated and fortified.

Most field research on lifelong learning will be aimed at fact-finding along with the identification, description and analysis of good examples and best practices. Its goal is to reach an understanding of why some individuals and organizations are successful lifelong learners and others are not. Theories that are developed will be largely ‘contextualized theories’ (Design Based Research Collective, 2003), because they describe particular lifelong learners and learning organizations/regions in particular contexts. In a new field such as lifelong learning, these theories are essential for building an integrated framework that can help to understand the complexities of the field. Moreover, they are a first step towards the development of more explanatory theories that aim to identify general principles in the field of lifelong learning. Now, we will first describe important research questions for field research on, in order, professional and personal development and organizational learning.

Research on Professional and Personal Development

Individuals learn and profit from experience in both formal educational settings (e.g., continuing education, in-company training) as well as non-formal and informal settings (e.g., on-the-job/workplace learning and/or learning from media, museums etc.). As such, lifelong learning is an *effect of* conditions external and internal to individuals, and it has *effects on* an individual’s professional and personal life. One can ask under what social, cultural, and especially psychological conditions individuals learn during their lives, and are motivated to do

so. One can also ask what the effects of this learning are on issues such as employment, personal health, feelings of well-being, quality of life, stress prevention in the workplace, understanding media discussions, and coping in daily life. Patterns of working, living, and learning must adapt and/or change leading to increased interest in the achievements and effects of lifelong learning, not only for improving oneself or one's position (i.e., as a means), but rather as a goal and as a source of health, development and enrichment of life.

The responsibility for learning throughout and from life lies with the individual. In this sense, lifelong learning is a process of sustainable explicit and implicit learning, largely relying on self-directed and self-regulated individual initiatives (Baumert, Fend, O'Neill, & Peschar, 1998; Pintrich, 1994; Zimmerman, 2001). If we apply this to a whole lifespan, then we must reconsider the notions, theories, and guidelines traditionally used in adult education, continuing education and lifelong learning with respect to formal learning in schools and/or training institutes and informal learning in the workplace and daily life. In addition, new actors are entering the education field, blurring (Davis & Meyer, 1998) the traditional division between providers and users (e.g., mixes and mashups). They develop and implement new content (e.g., open educational resources, participatory design), use new pedagogies (e.g., serious and persuasive games, self organizing communities of learners) and new forms of media (e.g., social software/Web 2.0 such as blogs and wikis, interactive museums, mobile technologies). Together, this leads to new forms of education (e.g., competence-based curricula, personal diplomas and certification schemes) with new methods of assessment (e.g., portfolios, APL), all of which are or need to be suited to different target groups, different professions and different expertise levels.

Research on lifelong learning for professional and personal development focuses on the conditions for and the effects of lifelong learning for and on individuals in their daily lives (e.g., personal growth, health, and well-being), on how they function in their work (e.g., stress prevention, employability maintenance, ensuring career achievement and motivation, and preventing burn-out, premature leave and absenteeism; i.e., topics related to HRD and HRM) and in the communities of which they are a part (e.g., integration, assimilation, social inclusion and exclusion). This learning should preferably take place in non-formal ways, which can either be intentional but not highly structured or in unorganized and not formally defined ways. In the latter, learning will often be implicit (Reber, 1993), tacit, or unconscious and occur naturally during daily activities (also referred to as “life-wide learning”).

Lifelong learning for professional development. Professionals develop heuristics and strategies for learning and carrying out their work (Gigerenzer & Todd, 1999). Because of their backgrounds, they make use of specific domain and profession related characteristics of their situations that influence their own needs when approaching lifelong learning. To this end, the conditions for and the consequences of lifelong learning for professionals need to be determined, stimulated and optimized. With respect to the conditions for lifelong learning for professionals, important research questions include:

- What characteristics of domains/professions and of their development influence the learning needs of those working in a field or profession, including learning-life histories?

- What profession-specific heuristics for learning and performing do professionals have, and how and when are they used, learned and improved in professional situations?
- What psychological (e.g., gender, race, ethnicity) and personal (e.g., time, money, prior education) factors influence lifelong learning for professionals and how can positive factors be optimized and negative factors eliminated or minimized?

With respect to intended and non-intended consequences of lifelong learning for professionals, research questions include:

- How is expertise developed within a specific domain (e.g., law) and/or profession (e.g., lawyer) including tacit knowledge and professional heuristics?
- What are the effects of a professional's acquired knowledge and heuristics/strategies on "unlearning" no longer relevant approaches to work so as to design effective and efficient learning environments for "new" learning (e.g., unlearning procedural programming for learning object-oriented programming) and how can they be offset?
- What guidelines can be discerned from the characteristics of expertise acquisition and development within professions for designing and developing responsive, flexible and sustainable learning environments (e.g., communities of practitioners, open courseware and forms of cooperative education)?

Lifelong learning for personal development. Individuals learn throughout their lifetime immersed in society and its artifacts (i.e., museums, clubs, libraries, media) in ways which affect

their personal development and feelings of well-being. Here, we study the conditions for lifelong learning for individuals with research questions including:

- How do individuals learn and develop in their daily routines including the role played by informal and formal workplace learning, informal and implicit learning in communities, informal and non-formal learning in and for society and its institutions?
- What personal skills need to be acquired and used for lifelong learning?
- What roles do informal daily contacts (i.e., with professionals, government, media, museums) play in lifelong learning and personal development?

With respect to the intended and non-intended consequences of lifelong learning on individuals, research questions include:

- What are the effects of lifelong learning on one's growth and personal deployment with respect to factors such as avoiding obsolescence and/or maintaining employability, and utilizing/exploiting one's personal capital?
- What are the effects of lifelong learning on one's personal development and identity (i.e., the effects of life-wide learning?)
- How does the process of protoprofessionalization (de Swaan, 1990) of individuals based upon contacts and/or preparation for contacts with professionals through media (e.g., television, radio, newspapers, Internet) and independent study proceed, how can it be optimized and what are its effects on the lifelong learning of both those individuals and the professionals they encounter (i.e., the knowledgeable citizen)?

Learning Organizations in the Knowledge Society

Knowledge is a major creative force in current society – not only on the individual level but also on the organizational/regional level. It is well known that in the turbulent and unstable business environment of today individual firms as well as entire supply chains must compete for their survival through continuous learning and innovation (Bessant, Kaplinsky, & Lamming, 2003). The knowledge society realizes the importance of knowledge and proper knowledge distribution, sharing, and building for social and economic development. Success in the knowledge economy at the organizational level is no longer defined by what an organization collectively knows and can achieve at any given moment, but rather by its ability to learn, change, and evolve. This recognition has led to growing emphasis on the concept of “learning organizations” and on the mechanisms through which the ability to learn can be developed (Cohen & Levinthal, 1990; Garvin, 1993; Leonard-Barton, 1995). Learning organizations are “...skilled at creating, acquiring, and transferring knowledge, and at modifying [...] behavior to reflect new knowledge and insights” (Garvin, 1993, p. 80). According to Senge (1990), they are “...organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together” (p. 3). In other words, it is any group of people, large or small, who are collectively responsive and act upon a need and a desire to improve its performance through learning.

The basic rationale for learning organizations qua learning entities is that in situations of rapid change, only those that are responsive, flexible, innovative and productive will excel and survive. Organizations that continuously learn and innovate, that are flexible, that understand

their core competences, are fast becoming the most valuable organizations in our society, from both an economic and a societal perspective. Such organizations not only create the conditions that facilitate lifelong learning amongst their employees or members, but also nourish a culture and structure in which organizational lifelong learning is central. In addition, according to theories of Strategic Niche Management (SNM), intensive networking among social actors or different organizations is a crucial process for the successful incubation of new – sustainable - technologies (Caniëls & Romijn, 2008). Thus, lifelong learning at the organizational and inter-organizational level may be the single most important ingredient for success and sustainability. In this respect, a programme of research must study lifelong learning both with regard to learning organizations and networks of such organizations.

Learning organizations, innovation, and performance improvement. A learning organization (e.g., companies, professional, governmental, military, and so forth) must find a proper balance between the personal benefits of lifelong learning for its individual employees, and the collective benefits of lifelong learning for the organization as a whole. This is not self-evident, and there is often a tendency to overestimate personal benefits. Furthermore, a learning organization must find ways to combine two types of learning: (a) the acquisition of formal knowledge through more or less formal approaches such as industrial and business training, and (b) the acquisition of dynamic knowledge in non-formal ways such as on-the-job learning (Nevis, Dibella, & Gould, 1995). Organizational learning will only occur insofar these two types of learning strengthen each other (Gijsselaers, Arts, Boshuizen, & Segers, 2006). Research must study how lifelong organizational learning contributes to continuous processes of renewal and innovation to improve an organization's performance. Important research questions here include:

- What are adequate quantitative measures of lifelong organizational learning?
- How does lifelong organizational learning contribute to the innovative power and competitiveness of business and industry?
- What are the core competences of organizations that serve as launch points for new products and services and how can they best be developed through lifelong learning?
- How can knowledge management be organized in such a way that it contributes to organizational learning?
- How can educational institutions be redesigned to become learning organizations and optimally prepare their learners for the knowledge society?

Learning cities, regions, and nations. The paradigm of ‘Education & Training’, which has served us quite well in the latter part of the 20th century, is no longer applicable to the knowledge society. The difference between education and training is no longer relevant because a knowledge society can only be achieved by making learning last a life long, by basing learning on tolerance, and by promoting enlightenment to the number one activity on the planet (Longworth, 2006). Lifelong learning emerges from interactions between educational and non-educational organizations, in highly dynamic networks that may be called learning towns, learning cities, and learning regions (see, e.g., Rutten & Boekema, 2007). A critical element in achieving the benefits of lifelong organizational learning is the ability of companies to learn and innovate across the individual firm’s boundaries, among others in the relationship with the firm’s trading partners (Leavy, 1998). Networks of people and organizations may give rise to processes that drive and sustain lifelong learning (i.e., innovation, knowledge valorization), contribute to

the economic growth and prosperity of a city or region, and to increase the quality of living in this city or region. Research questions include:

- What mechanisms are responsible for an increase in lifelong learning-related activities in successful learning regions?
- What does lifelong learning mean in the context of the city, the community and the region?
- How would cities and regions know that they are ‘learning cities’ or ‘learning regions’ as opposed to cities and regions that just support education and training?
- What are the tools and techniques that can help cities and regions to evolve into ‘learning cities’ and ‘learning regions’ and to reach long-term rather than short-term outcomes?
- How do ‘learning cities’ and ‘learning regions’ contribute to the development of the knowledge society and how are they related to globalization?

In Search of Principles of Lifelong Learning

The more is known about lifelong learning, the more it becomes possible to search for general principles, that is develop theories that describe relationships between relevant issues in the field of lifelong learning that are relatively stable across contexts, learners, contents, et cetera. At the individual level, one can ask which methods that aim at the acquisition of sustainable assessment skills and other self-directed learning skills enable lifelong learning across the lifespan, which organizational principles allow for the flexibility to accommodate the extremely heterogeneous group of lifelong learners (re. age, prior knowledge, culture, work setting etc.), and which assessment methods make it possible to adapt and personalize applied

methods to individual needs of lifelong learners. At the collective level, one can ask which factors affect the sustainability of self-organizing learning networks and communities, which learner support services have the flexibility to be applied across different organizations, and which tools and procedures for the assessment of prior learning (APL) make it possible to adjust learning trajectories to prior experiences of lifelong learners. Thus, research into principles of lifelong learning is about identifying the:

- methods and conditions that help people become and remain lifelong learners,
- methods and conditions that help organizations to become and remain learning organizations, and
- relationships between lifelong learning processes at the individual and the organizational levels.

Research discussed in this section will thus be aimed at the identification of general principles in the field of lifelong learning. Its goal is to develop explanatory, de-contextualized theories that on the one hand synthesize the findings from field research, but on the other hand identify principles that, to a lesser or greater degree, can be generalized to other contexts, target groups and learning contents. Starting points for theory development can be found in cognitive theories of human learning and social theories of networked learning. In the following, we describe important research questions for research originating from cognition and instruction and from learning in networks.

Cognition and Instruction

To facilitate lifelong learning (i.e., expertise development) in complex cognitive domains, we must uncover the underlying cognitive processes that play a role in lifelong learning, such as,

the relationships between aging and cognitive architecture, between expertise and instructional approaches, and between external regulation and self-regulation), and based upon this develop a comprehensive theory of instructional design for lifelong learning.

A basic assumption is that effective and efficient learning can only commence if the instructional methods are aligned with the learner's cognitive system. Therefore, an important research focus is on uncovering the cognitive processes that sustain lifelong learning. The results of this research can be used to develop and investigate guidelines for the design of learning tasks, arrangements, and assessments. These should stimulate lifelong learners to integrate the knowledge, skills, and attitudes that underly effective task performance. The guidelines must take the properties of the cognitive system and individual differences such as current level of expertise and age into account. The level of expertise mediates the effectiveness of instruction. Instructional interventions that are effective for low-expertise learners are not necessarily effective for high-expertise learners and vice versa (Kalyuga, Ayres, Chandler, & Sweller, 2003). Age is a learner characteristic that is known to impact on the knowledge structures that underly the cognitive architecture (Paas, Van Gerven, & Tabbers, 2005). A general and robust effect of cognitive aging research is that age-related declines in cognitive performance are most likely to emerge in complex cognitive tasks that require effortful processing or in multimedia tasks that require multimodal processing (e.g., Paas, Camp, & Rikers, 2001; Perfect & Maylor, 2000). However, it is important to realize that higher levels of expertise are associated with more evolved and complex cognitive schemas, which on the one hand might ease load while on the other hand need to be accommodated due to updated and upgraded new knowledge. In other words, the effects of aging may primarily become evident in learning novel tasks or information,

and not when older individuals can build on their expertise and are able to compensate for their cognitive declines.

Learning is experience and all experience leads to learning. But what distinguishes incidental, accidental and unplanned learning (i.e., informal) that happens every moment of our conscious existence from intentional, purposeful and planned learning (in formal or non-formal settings) is that there is: (a) a planned, professional thus domain-specific task to be learned, (b) some form of explicitly planned arrangement for the person or group of persons learning from a set of tasks and (c) some form of organized assessment of the processes and products of learning the tasks to promote learning. These three elements are necessary features of 'instruction' and thus are relevant for each of the three themes that need to be studied.

Complex learning. Complex learning aims at the application and the transfer of knowledge, meta/cognitive skills, and attitudes. This poses special requirements for the design of learning tasks, arrangements and assessments (van Merriënboer & Sweller, 2005). Research indicates that many instructional methods that work well for simple tasks do not work at all for complex tasks, and vice versa. However, in general, the tasks used to examine how different variables affect complex learning have been relatively simple, placing relatively modest demands on the cognitive system. This raises the question of whether complex learning was really investigated here. Research here aims at providing recommendations for complex learning using relatively complex tasks that pose greater challenges to the cognitive capacity of individual learners or groups of learners. Important questions to be addressed here include:

- How do learning tasks affect processes of prior knowledge activation in lifelong learners?

- How can support and guidance for lifelong learners be arranged in learning environments in such a way that it is useful for low-expertise learners without distracting high-expertise learners?
- How do effective assessment strategies for the development of complex learning differ from strategies for the development of simple procedural skills?

Multimedia learning. In multimedia learning, learners must select incoming verbal information to yield a text base and incoming pictorial information to yield an image base. Then, they have to organize the text base and the image base in order to create a verbal model and a visual model of the system to-be-explained. Finally, they have to integrate the two models by building connections between corresponding events in the verbal model and the visual model. Those cognitive processes need to be understood before multimedia learning tasks, learning arrangements, and assessments of the learning can be designed in accordance with the learner's cognitive architecture which is a condition for effective and efficient learning. Important research questions include:

- How can learning tasks be designed that support the cross modal integration of verbal and pictorial information?
- What effects do different sequences of media in learning arrangements have on learning during expertise development for students with very different levels of expertise?
- Which combinations of media can be used to design effective assessments of multimedia learning?

Self-regulated learning. Self-regulated learning requires students to make adequate study decisions that rest on accurate monitoring of ongoing learning, thus creating a realistic model of how one's own learning occurs, and developing and appropriately using study strategies. A basic assumption is that the ability to effectively manage unsupervised learning can be promoted by gradually decreasing control of the learning process by others (e.g., a teacher or a computer program). Such a process goes from almost exclusive control by others, via shared control by others and learners, to almost exclusive control by lifelong learners themselves, whilst supporting the learners' acquisition of skills required for taking control. Assessments – traditionally used to assign grades to learners – play an important formative role in this process. They allow learners and teachers to evaluate their own or learner's progress towards the goal and if necessary to adjust or adapt the learning activities based on that assessment. Important research questions here include:

- Which types of learning tasks can be used to enhance self-regulation skills for lifelong learners at different levels of expertise?
- How should fixed or adaptive arrangements of learning tasks be designed to support the transition from exclusive control of the learning process by others to exclusive control by lifelong learners themselves?
- How can assessments be exploited to enhance self-regulated learning?

Networked Learning

Along with studying the specific aspects of lifelong learning at the individual level, there is also a need to carry out research on tools and guidelines for learning at a collective level. This is particularly important if the majority of lifelong learning is non-formal and/or in the workplace

or home, in the vicinity of others or with them. Lifelong learning will take place in the context of networks, either job-related or personal. This means that research on such learner/learning networks and on their role in lifelong learning is imperative. A learning network is defined as a social network specifically designed to support lifelong learning (Koper et al., 2005; Sloep, 2008). Such networks are primarily online networks set up to meet the challenges posed by lifelong learning. Their design is informed by several assumptions, some of which are well underpinned by extant theories, others less so.

The main challenge that the organization of lifelong learning in learning networks seeks to address is posed by the gulf that seems to divide learning and working. Introducing a term such as 'professional training' is at best an attempt to bridge this gulf, at worst a terminological play to hide its existence. Young people learn at school, there they complete their initial, largely compulsory education. As already argued, having become professionals in our modern society, the need to continue to learn or to develop oneself only increases (Borg & Mayo, 2005; Sloep & Jochems, 2007; Spring, 2008). Education, i.e. lifelong learning has become post-initial and non-compulsory, but no less necessary. Learning networks are the devices that should make it possible to bridge the gap between learning and working. In learning networks, the notions of communities of learning and communities of practice remain conceptually different but become perceptively identical. The denizens of a learning network discuss various issues with each other and thus learn from each other. Sometimes, the relation may be less symmetrical and some act as learners, others as teachers; in yet other situations, education providers may address learning needs that have arisen out of such interactions. The discussion may be fully job related, have to do with personal development only, or anything in between. To foster these kinds of interactions,

learning networks need to be designed and equipped appropriately. The three themes discussed below all develop such design guidelines and tools.

Competence development. The notion of competence development provides a common language for analyzing and describing competences that can be used throughout all kinds of education and all stages of a learner's career. It serves the purpose of making lifelong learning a flexible and responsive yet sustainable option in two different ways. First, competence descriptions and their mapping onto hierarchical systems (competence maps) allows one to describe a person's competence development ambitions, to honour competences acquired previously through education, at the workplace or otherwise and track the development of someone's competences from their current position to the position strived for. Only this way, lifelong learners are sufficiently empowered qua *individual* learner to set out and follow their own ambitions. Second, competence descriptions and mappings also allow providers of competence development opportunities to describe those opportunities in interoperable ways. Only this way, lifelong learning can choose in an informed way between the offerings of such providers. The research questions to be addressed address the matter of maximizing the competence notion's use for learning in learning networks from the two perspectives described.

They include:

- What competence descriptions and maps are robust enough to support diverse interest groups and sustain a learner over his or her full life span?
- What does this mean for the way specific competence ontologies for specific learning networks are devised? Such ontologies should be domain specific and detailed enough to serve their descriptive purposes. However, they should be

generic and abstract enough to serve a wide range of users over a sufficiently long span of time.

- How should sets of learning opportunities be defined and described in order to map them to a specific competence map (learning routes)? Here links with questions asked about learning and cognition, complex learning and, particularly, self-regulated learning will need to be explored.

Learner support. The second theme considers what kinds of support inhabitants of a learning network need and how such support may best be provided to them. If non-formal learning is the overriding learning mode for lifelong learners, not the support that institutions are willing to provide, but the support that individual learners need is at the heart of the matter. Where in familiar school settings the roles of expert, mentor coach, and assessor are all combined in the person of the teacher, such roles may well be fulfilled by different persons in a learning network. Indeed, one may even wonder to what extent or on what occasions such roles had better be fulfilled by peers rather than professionals. To say the least, adopting a peer-model better fits with the egalitarian model that dominates communities of practice than it befits the hierarchical model of traditional, school-based learning communities. In summary, learner support services need to be sensitive to the wishes and characteristics of individual learners and accommodate those through their ability to be flexibly configured. For this to be possible, whatever policies and instruments – political, social, organizational, technological – we have come to rely on in traditional educational settings, both in schools and the workplaces, they all need to be rethought. In this sense, learning in a learning network might well constitute a

paradigm shift. If so, only a rethinking from the ground on up suffices, with new tools and guidelines based on novel insights. Questions to be addressed include:

- What profiling data on learners need to be stored in a specific learning network to allow learner support services to operate adequately? What privacy constraints are operative, both seen from a legal, ethical, sound entrepreneurial perspective.
- What incentive structures, if any, are needed in a learning network to fire off and maintain learner support services in the long term? Are these structures dependent on domains, professions, or cultures?
- What technology is most suited to underpin what learner services in a learning network: semantic web technologies that demand explicit ontologies, statistical techniques based on language technologies, mixed methods, yet others?
- What architectural designs best suit learning networks, closed or open community designs? Where closed community designs probably suit the interests of corporate learners and hence the notion of the learning organization best, open designs would probably be most attractive to independent learners.

Emergent communities. The third theme focuses on the community level proper and addresses the question of how the emergence of communities within a learning network and their maintenance may be facilitated. It assumes that learning and working in social settings is going to be a crucial part of the answer. It assumes that ultimately, communities of learning and communities of practices will merge, with learning and practice being time-shifted rather than community bound activities. By mingling learning and working this way, a sustainable approach to lifelong leaning can be achieved. In this approach work, learner-support tools will feature

large, as they will allow learners to get in touch with fellow learners in natural ways, that is, in ways that serve their immediate needs yet at the same time contribute to network sociability through the seeding and growth of communities within the network at large. Questions include:

- How should learner support services be configured so as to maximally contribute to the emergence of sociability and the maintenance of social capital in a learning network?
- How can desirable network structures be attained and maintained? To what extent are they bound by profession, domain, culture, age?
- How, if at all, can a balance be achieved between a learning network that is self-organizing on the one hand and plays host to a variety of for-profit support service providers on the other hand? What business models are most suitable?

Discussion

Whereas there is consensus that lifelong learning is essential to the further development of the knowledge society, it is difficult to realize its potential because formal instructional and instructional design approaches to education and training cannot simply be translated to lifelong learning and the current approaches available to us are too fragmented to have an impact. This understanding led us to present the integrated framework for doing research on lifelong learning described in the above. The framework was built on two dimensions delineating four research areas: (1) the specific-generic dimension which linked contextualized research findings in the field of lifelong learning to general issues and principles, and (2) the individual-collective dimension which linked findings on personal and professional development of lifelong learners to the level of organizations, cities, and regions. The description of the four interrelated research

areas also revealed a number of integrative features that are characteristic for the framework as a whole, namely, responsiveness, flexibility, and sustainability.

Responsiveness pertains to the ability to react to external changes. The population in general needs to become aware of, on the one hand, the need to continue to learn and, on the other hand, the formal and informal possibilities to do so. In addition to a broad repertoire of skills and knowledge, lifelong learners need to know when to do what, that is, they need well-developed self-directed learning skills to set their learning goals and to evaluate, monitor, and plan their learning activities to reach those goals. For instructional methods and educational systems, responsiveness refers to the ability to continuously assess needs of lifelong learners and monitor their progress, so that adaptation, personalization, and forms of on-demand education become possible. At the collective level, it also pertains to the required ability of organizations, networks and regions to identify pertinent technological and societal trends and new developments in order to be able to accommodate to them. Responsiveness is thus a ‘*conditio sine qua non*’ for making best use of flexibility.

Such *flexibility* is the second integrative feature of the presented framework. With regard to the outcomes of lifelong learning, at the individual level it pertains to the ability to apply knowledge, skills, and attitudes in different contexts and professional situations, such as indicated by the terms ‘transfer of learning’ and employability; at the collective level it pertains to the ability of organizations to innovate and participate in a continuous process of renewal in order to improve performance. For instructional methods and educational systems, flexibility is typically used to refer to desirable independence of time, place, and predetermined pedagogy, giving lifelong learners the opportunity to participate in learning activities whenever and

wherever they want in a way that is maximally tailored to their needs and desires. In addition, organizational methods should make it possible to construct learning contents and experiences on the fly, without the limitations of pre-designed, fixed courses and programs.

The third and final feature is *sustainability*, which refers to humanity's investment in processes and systems that are viable on an ongoing basis and last indefinitely, that provide increased quality of life for both individuals and society as a whole, and that preserve natural ecosystems. The skills, knowledge and attitudes (or, competences) critical to lifelong learning should be sustainable in the sense that they enable learning across the lifespan. Examples are 'sustainable assessment' (Boud, 2000) as well as other self-directed learning skills, which allow learners to self-assess their own performance, identify points of improvement, and plan future learning. Equally important, instructional methods and educational systems should aim at sustainability too, meaning that they are viable on an ongoing basis, for instance, by applying principles of sustainable development and self-organized systems.

To conclude, we hope that the presented framework will act as an impetus to strengthen research in the field of lifelong learning. Such research should help us to understand, facilitate, and realize lifelong learning. To this end, the research that needs to be carried out must not only be theory-driven, as argued in this article, but also application-oriented and praxis-inspired.

Application-oriented indicates that research should have an impact on the practical field of lifelong learning. For instance, research conducted by the authors already yielded models to help implement on-the-job training and lifelong learning programs in business and industry (Sloep, 2008; van Merriënboer & Kirschner, 2007), design guidelines for improving multimedia learning materials for lifelong learners and the elderly (van Gerven, Paas, & Tabbers, 2006), and learning-

technology standards for open educational resources in the field of lifelong learning (Jochems, van Merriënboer, & Koper, 2004; Van der Baaren, Schuwer, Kirschner, & Hendriks, 2008). Such applications can only occur when the research is *praxis-inspired* to begin with, that is, it should start from concrete phenomena, interventions and problems in the field of lifelong learning.

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Table 1

An Integrated Framework for Research on Lifelong Learning

An Integrated Framework for Research on Lifelong Learning		
	Specific Issues:	Generic Issues:
	Field Research on Lifelong Learning	Principles of Lifelong Learning
Individual Perspective	<i>Professional and Personal Development</i> <ul style="list-style-type: none"> • Lifelong learning for professional development • Lifelong learning for personal development 	<i>Cognition and Instruction</i> <ul style="list-style-type: none"> • Complex learning • Multimedia learning • Self-regulated learning
Collective Perspective	<i>Learning Organizations in the Knowledge Society</i> <ul style="list-style-type: none"> • Learning organizations, innovation, and performance improvement • Learning cities, regions, and nations 	<i>Tools and Guidelines for Learning Networks</i> <ul style="list-style-type: none"> • Competence development • Learner support • Emergent communities