Life Long Learning and the Role of ICT-Innovation

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Abstract:

In this paper, we pose the opinion that current educational institutions are unable to fulfil the requirements of the future. As change is a permanent phenomenon, we link to the statement of Peter Drucker: “The greatest risk of turbulent times is not the turbulence - it is to act with yesterday's logic”. This future orientation implies that it is hard to prove our findings in analysis and quantitative statistics. Our assumption is that the future of education can only be ensured by enriching traditional education with new innovative and co-creational ways of educating by intensive use of IT. In that sense, the character of this paper is a positioning paper, to sketch the base for current and future research.

Keywords: De-linearized learning, e-Learning, Roles approach to learning, learning innovation

I. INTRO: SETTING THE SCENE - OUTLINE OF THE PROBLEM

Compulsory education is financed for children from 4 to 16-19, and most governments in Europe offer further education for young adults up until 22/23. Practice proves that traditional education is not sufficient to facilitate the smooth transition from education to employment. Switching to new jobs, the evolution of educated citizens into employees or self-employed entities is no longer a straightforward process any longer. Besides, due to societal changes, people cannot be “ready with learning”.

Due to developments within modern societies, there is a growing need for permanent and lifelong learning, it is recognized globally, that traditional educational systems and traditional institutions are not prepared for the fulfilment of this task. In Europe, the European Commission1 stressed the importance of lifelong-learning for competitiveness, employability, social inclusion, active citizenship and personal development. Fifteen years ago, in the reports “2001 Communication Making a European Area of Lifelong Learning a Reality” (Commission of the European communities, 2001) and “2002 Council Resolution on lifelong-learning” (The Council of the EU, 2002) initiatives were already taken for filling these gaps. These initiatives will only succeed when institutions can renew to fulfil societal needs. In many cases, the reason for the failure is the inflexibility of policies and regulations. In this article, authors dare to state that traditional educational institutions, from primary school to public university levels, are unprepared to offer satisfying programs, because they cannot meet current educational requirements in an effective way.

Based on the inefficiency of traditional educational, and given the fact that adult learning is a vital component of lifelong-learning, we need to find ways to deal with these problems. It is our firm belief that ICT plays a crucial role in fulfilling the educational needs of the future. This article, as being a positioning paper, tries to develop a new and innovative approach to better understand the role of ICT in the educational processes.

Change as a permanent phenomenon

Based on the assumptions posed in the introduction, we believe that **dynamics is the most sustainable certainty in a contemporary world**. Society faces all kinds of problems, and for some of them easy solutions may be found. But problems originate in a broad range of areas and they can only be solved by using different co-operative actions. It becomes increasingly obvious that single solutions, such as the ones used in traditional education, are no longer applicable. Co-creation, co-evolution, co-production is becoming more usual than exceptional. These developments are accompanied by different approaches to learning. Theories studying this development are gaining interest, for example Peer2Peer Production (M Bauwens & Kostakis, 2017; Michel Bauwens & Niaros, 2017) Virtual Organizations and Breeding Environments (Afsarmanesh, Camarinha-Matos, & Msanjila, 2009; Camarinha-Matos & Afsarmanesh, 2007) and Communities of Practice (Wenger, McDermott, & Snyder, 2002). These theories, often within a context of Complex Adaptive Systems (Esparcia & Argente, 2012; Miller & Page, 2007), are methods for dealing with disruptive changes faced by society in general, at organizational or even individual levels. This leads to the necessity for a new approach to learning. Though abundant in their number and magnitude, co-operation approaches are inadequate in offering up comprehensive solutions because they limit themselves to improve for tomorrow what has been done today.

The increasing importance of Information and IS education

Based on the above assumptions our base supposition is that information is of growing importance in current day life. It is increasingly clear that a new focus has to be found in the ways of organizing IS education. Previous research on eLearning and de-linearization of learning will be used to investigate new approaches for dealing with unforeseen future developments.

II. ADULT EDUCATION AS PART OF LIFE-LONG-LEARNING

As it was seen centuries ago, in a certain moment a single individual was no longer able to know ‘it’ all. Erasmus was supposed to be the last general scientist who knew everything in science. Due to continuous changes, searching for new knowledge and understanding modern developments, continuous needs for further education occur in our lives. Aside from the basic education of youngsters, there is a growing need for adult education.

Definitions of adult learning vary, but it is defined as all forms of learning undertaken by adults after having left initial education, no matter how far this process may have gone (e.g., including tertiary education) (Mezirow, 1981). Our focus is on finding a balance between regular/traditional education and innovative education to deal with current-day educational requirements both for youngsters and adults.

Unfortunately, in current day practice, it is increasingly difficult to organize the learning process toward this permanent education in an appropriate way. The traditional financing structures of current education limit the ability to fulfil today’s educational needs. The same situation arises on an educational-institutional level. It is increasingly difficult to cover all scientific fields within traditional education, from primary up to university level. A tendency can be recognised in higher education towards more specialized institutions. For example, Reykjavik (225.000 inhabitants) has 5 specialized universities; this tendency can also be observed in the Netherlands or in Hungary. Many educational institutions are struggling as to whether they should broaden or deepen their fields of interest. Becoming more and more specialised in one (mono-disciplinary) field implies that these institutions will have problems in offering general and broad curricula to fulfil labour educational requirements in the future.

A recent study by Deloitte (2016) shows that 42.3% of current Dutch students on a lower vocational level are expected to work in a field that will no longer exist by the time of their graduation. On Higher Vocational Education-level it is 19.3% of students and on University level, that percentage is still 10.4%. The report assumes that these figures will be comparable in other countries. It leads to a situation where there is a growing gap between demand and supply for educated personnel.

To exemplify, every year in Hungary labour shortages are increasing. 81% of companies do not find skilled workers while more and more graduates are missing from the labour market. The biggest and most complicated problem is the lack of qualifications. Today, 200.000 people are unemployed in Hungary and about the same number are “public employees”. In addition, 100-150.000 people are not registered, and 400-500.000 intellectuals and skilled workers have left the country in recent years. At
first glance, it seems to be delightful that around half a million job vacancies are associated with 500,000 potential workers, but a large part of them are totally unqualified. In the long term, the solution is to elevate the unemployed and public employees or "upgrade" to a skilled worker level and give them true knowledge instead of alibi jobs. This can only be achieved through education, being not only the traditional avenues. Remote work, part-time work, and temporary employment make the labour market palette more colourful and contribute to the upgrading of the labour market and education.

III. PROBLEM STATEMENT

Based on the assumption as mentioned above, in this article we will sketch the initiation of our research based on the following problem statement:

*What are the educational requirements that may fulfill the societal needs and how do we find a way to bridge the gap between permanent educational requirements of the people and the labour market?*

IV. SUGGESTIONS TO DEAL WITH THESE PROBLEMS: 3 TYPES OF EDUCATION

In this article, we deal with the broad trends in educational structures with a focus on the growth of higher-level jobs, and the expectations for the next 5-10 years, that are likely to be the case given the changes in current times. In varying extents and with differing implications for the scale of future skill/competencies requirements, we focus our research both for current staff as well as for new entrants in the labour market. The dynamics of the development in the current economy leads to a growing gap – both current and in future - between needed and offered competences in many sectors. This development can be characterized along the lines of 3 “fits”:

1. The economy needs to improve the *Person/Job fit* (Carless, 2005) with clear requirements as to how to educate the workforce. Change-requirements are known for the problems societies are facing. In many cases the intervention repertoire is available and adequate for dealing with them. In cases when it isn’t, new interventions can be developed, based on thorough analysis and design, using knowledge and skills available in the actual context of the problem.

2. Economy & industry can forecast the future developments regarding skills and competencies. The workforce should be educated to build up flexibility to adapt to developments: *Person/Organisation fit* (Cable & Judge, 1996). We can foresee and forecast the developments as they will take place on a short-to mid-term timeframe. The necessary interventions will not be available on an instant base but in general. A thorough analysis using the available professional capabilities will facilitate the development of new measures to deal with the forecasted problems.

3. In the long run, developments are not predictable, so organisations and workforce have to prepare for unknown futures to deal with unforeseen developments: *Person/Organisation/Society fit*. In an increasing frequency, the disruption of the societal changes will lead to a setting where we don’t know the futures requirements. It means that solutions must be found for a setting where the problem isn’t yet known.
V. FURTHER EXPLANATION ON THE OPERATIONALIZATION: THE 4 ISSUES

Due to the growing need for dedicated education outside regular educational processes, traditional learning no longer fulfils today's requirements. Re-structuring our educational offerings are necessary, facilitated by modern ICT and innovative ways of organizing them. In this respect, ICT plays an incubator role in new approaches to learning and new ways of exchanging but often also building, knowledge and information.

The issues mentioned above can be organised in courses based on building up capabilities for dealing with specific and future oriented challenges. For organisations, there is a growing need to build up these capabilities with their employees and facilitate exchange of information within, but also beyond the boundaries of organisations.

The courses have three different levels of teaching objectives, fitting to the approach as described in the previous paragraph. The objectives can be formulated within different timeframes:

- **Now: Person <-> Job fit:**
  traditional learning fits

- **Foreseeable future: Person <-> Organisation fit:**
  traditional learning needs to be supplemented with fluid and dynamic ways of learning

- **Preparing for unforeseen future(s): Person <-> Society/Future fit:**
  learning has to focus on fulfilling requirements for unforeseen future(s); traditional education fits are only limited

Our objective is to take true measures in bridging the education-to-employment gap, a problem faced worldwide. Our current research is based on identifying the needs of the current job market and building a tool to assist people in becoming more marketable. We assume that this will be achieved by our Adaptive Cycle iSolution:

1. **building up a knowledge base** with youth, citizens, job centres, SMEs, public bodies, NGOs, including their priorities and needs, legal, regional and cultural information and information to support start-ups; self-employed; entrepreneurs, based on best practices throughout the world

2. **facilitating an innovative communication infrastructure**, study and internship opportunities, Marketing and demonstration

3. **providing opportunities to enhance citizens’ marketability via tools and resources** traditional and self-education opportunities, short courses, workshops, public events
4. engaging in active dialogue with companies to identify future needs and help policymakers with recommendations for smoothing the transition process to employment.

As a result, we strive for:

- Build skills to enable our citizens to adapt to our changing world 1, 3
- Promote sustainable and quality employment by empowering citizens 1, 2, 3
- Strengthen transnational cooperation to address challenges 2, 4
- Reduce economic and social disparities by building more inclusive societies, giving chances to all, including less privileged, migrants, minorities, poor, and those with disabilities 1, 3, 4
- Reach gender balance and equality in learning and working in Europe by an open, inclusive, efficient education program 3, 4
- Reach added value by Open Innovation solutions, consistent with sustainable development, long-term economic growth, social cohesion 4

VI. DE-LINEARIZED LEARNING

Learning in the 21st century’s complex and dynamic world is a life-long process. The need for a more informal way of learning is of growing importance. Based on a “roles approach” of different stakeholders (Thijssen & Gijseelaers, 2006; Thijssen, Maes, & Vernooij, 2002) of a learning process, the role of traditional education institutions will change. This role-based approach (Abcouwer, Smit, & Takács, 2016) identifies the roles of student, teacher, researcher and practitioner. It makes it possible to achieve a much closer relationship with market requirements, when someone can play all roles: he/she can play the student role and looks for knowledge and skills on a permanent basis to develop himself/herself; practise the teacher role who educates students about matters he/she studies specifically topics that are relevant for the student to master the specific discipline; the researcher role makes clear that permanent attention to increase the “discipline-specific” knowledge is important and not trivial; and where the teacher is actively involved in building knowledge the practitioner is the one for whom the (new) knowledge should be relevant. In learning environments built along the above lines and identifying the above-mentioned roles, the scientific division between rigor (teacher and researcher) and relevance (student and practitioner) comes into full practice.

Currently, the distance between learning institutions and real practice in organizations leads to a situation where a gap can be recognized between learning requirements and teaching. This can be covered by allowing everyone who ‘owns’ specific sources of knowledge to start a course. It means that the importance of ownership and Intellectual property will grow, as well as that of quality assurance regarding knowledge included in the learning process.

The necessity of this development is partly based on the fact that education needs to bring us the future that we cannot grasp yet. Based on this view of reality, we see an important development in today’s and the future’s learning:
Given the unpredictability of future life, the role of being a student, as a temporary phase in someone's life, has changed completely up to today: from birth until death we all keep on learning via many different channels;

Nobody will any longer play the single role of being a student any longer in its traditional sense of being a receiver of knowledge and information. More often new roles will be added to that as active formulator of information and knowledge. This will allow him/her - based on experiences - to transform into an active formulator of curricula, offering transfer of knowledge others may use in their active life;

The traditional distinction between teachers and students is currently of declining interest; interaction between people is one of the most efficient ways to study, making use of the rich sources of experiences everyone brings into that cooperation, therefore the role and importance of new communication technologies such as social media and networks have risen both enormously and rapidly;

A result of this development is that the formal educational system is no longer able to keep pace with the fast, ever-changing developments in current society, along with its profound impact on living and learning environments.

All in all, a completely different approach to roles in learning and learning institutions should be facilitated by new forms of learning and via eLearning solutions. In our view the newly proposed eLearning environment and the general (open source) availability of it, will make it possible to deal with educational issues over a broad field of study. This approach has a focus on the de-linearizing learning approach that was developed (Abcouwer & Dömölki, 2016; Abcouwer, Smit, & Takács, 2016; Abcouwer & Takács, 2016). According to this approach a course should help students to overcome the challenges to learning they are facing:

1. **The process of acquiring, making accessible, and where necessary, developing new knowledge and skills.**
   The traditional assumption that all knowledge has to be available in a setting where learning takes place is no longer relevant in our rapidly changing world. The process of finding appropriate knowledge is essential, and is to be studied in full detail, in order to define the requirements for a collaboration system facilitating this process.

2. **Assessment and quality assurance.**
   The approach taken in our research leads to an extra aspect to be considered. Given the fact that every person involved in the learning process can play the role of supplier of knowledge (teacher- or researcher-role), the quality of the knowledge itself should be assessed. Where a broader range of stakeholders will be able to add knowledge to the used knowledge base, we will also develop mechanisms to remove knowledge that appears to be irrelevant in the working context. In traditional approaches, the process of choosing which knowledge is relevant is solely assigned to the teacher in cooperation with the researcher/specialist.

3. **Integrating in the worldview / The actual teaching process.**
   As a consequence, a growing number of specialists will be involved in the teaching process. This results in a challenge of integrating the insights of the specialist into the existing worldview/system of values and norms. Thinking in terms of the roles an individual plays, makes it possible to introduce different levels of involvement at an individual, organizational or societal level.
   The above description of the principles behind De-linearized learning will be used to build a bridge between the three types of fit and the aspects important for defining the eLearning facilities of the future. We introduce this relationship in more detail in the following paragraph.

**VII. BRIDGING THE GAP**

Another aspect we may consider in our reasoning is iBehaviour (iB) as it is referred to in literature (Bailey, 2012; Munoz, 2012). iB fills in the characteristics people need to develop to be able to function at a high level in De-linearized learning. Following this reasoning, the iB elements lead to specific requirements IT will have to bridge the gap between the three types of education and the
solution base. The interaction between educational requirements and individual behaviour is a central issue which we initiate our research on we only mention here the characteristics of iBehaviour.

Based on the reasoning above we will summarize our view on education in the table below by analysing the requirements and the offered solutions using the following criteria. This forms the base on which we started the research.

1. Finding knowledge: FK
2. Quality assurance: QA
3. Integrating in worldview / actual teaching: IW

In a separate row, we will also make a link to the concept of iBehaviour.

| iB-1. Checking for accuracy and precision: not letting speed surpass your desire for craftsmanship | training management support |
| iB-2. Persistence: not giving up when the answer to a problem is not immediately obvious | training management support |
| iB-3. Creativity: using ingenuity, originality and insight: developing capacity to generate original, clever or ingenious products, solutions and techniques | training management support; tools and methodologies knowledge base |
| iB-4. Overcoming impulsiveness: planning, clarifying goals, exploring alternative strategies and considering consequences before beginning | tools and methodologies knowledge base |
| iB-5. Using all the senses: feeling, seeing, hearing and tasting for more effective problem solving | tools and methodologies |
| iB-6. Metacognition: awareness of our thinking | tools and methodologies knowledge base |
| iB-7. Living with a sense of wonderment, inquisitiveness and curiosity: openness to beauty, intricacy, complexity and simplicity | training management support; tools and methodologies; Case studies knowledge base |
| iB-8. Listening and understanding other people | Cooperation facility |
| iB-9. Flexibility in thinking: considering other points of view rather than running with the first possibility | Cooperation facility |
| iB-10. Questioning and problem posing: asking questions and unearthing problems for ourselves | Cooperation facility |
| iB-11. Cooperation: taking advantage of the thinking and learning resulting of social relationships | Cooperation facility |
| iB-12. Sense of humour: able to look at situations, opportunities, problems and relationships with nonchalance and fun | Cooperation facility |
| iB-13. Applying past knowledge to new situations: use of knowledge and experience as sources of data, theories to explain, or processes to solve each new challenge | Case studies knowledge base; internal and external (cultural) differences |
| iB-14. Precision of language and thought: using more descriptive terms to distinguish objects, and providing criteria for value judgments | Vocabulary knowledge base |
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<table>
<thead>
<tr>
<th>Knowledge and skill base</th>
<th>Communication infrastructure</th>
<th>Enhance marketability</th>
<th>Enabling active dialogue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known knowledge: Role; traditional educational institutions KB: registering</td>
<td>Communication within the boundaries of responsible organisations or departments</td>
<td>Spreading insight in competencies and capabilities fitting to known labour market requirements</td>
<td>Focusing on convincing stakeholders on the ideas and insights</td>
</tr>
<tr>
<td>Responsibility of educational institutions and researchers KB curators</td>
<td>Communication lines are short. Misinformation/ knowledge will be recognised and solved easily</td>
<td>QA for the organisation searching for employees Quality of employees</td>
<td>Ensuring that no big mistakes are made in spreading the ideas in the network</td>
</tr>
<tr>
<td>Worldview is shared between colleagues, KB of common knowledge</td>
<td>Known and fixed worldview Known topics to discuss on</td>
<td>Worldview of the organization</td>
<td>Transferring the insights of stakeholders for organisational gain</td>
</tr>
<tr>
<td>Unknown knowledge but foreseeable requirements KB: storage</td>
<td>Focus on information exchange within organisations Inbound knowledge and information flow</td>
<td>Preparing labour-force for unforeseen future requirements</td>
<td>Focusing on grabbing the insights of the organisation to other stakeholders</td>
</tr>
<tr>
<td>Responsibility of scientists and researchers KB curators with developers</td>
<td>Monitoring quality of imported information and knowledge</td>
<td>Improving flexibility future employees known future requirements. Move with labour market</td>
<td>Building a reference set for measuring quality of the topics discussed in the dialogue</td>
</tr>
<tr>
<td>Future-oriented worldview Structured KB for open knowledge exchange</td>
<td>Communication for building new insights based on known building blocks</td>
<td>Initiation of a new worldview by organisations</td>
<td>QA for new insights within the organisations is not easy. Predictable future Resistance High quality from all stakeholders</td>
</tr>
<tr>
<td>Unknown future-oriented knowledge Need for flexible storage structure</td>
<td>Flexible and open Communication infrastructure for access and share, In- and outbound knowledge and information flow</td>
<td>QA of quality of information exchange, and trustworthiness of networking partners</td>
<td>QA for unknown futures is extremely difficult Quality of partners Defining measures</td>
</tr>
<tr>
<td>KB knowledge enables mind expanding facilities: Divergent thinking, creativity</td>
<td>Facilitating out-of-the-box thinking, rich in character and content. All kinds of Social media like functionality</td>
<td>Flexibility, openness to future developments and for mini-breaking initiatives of employees</td>
<td>Finding a balance and openness to the inputs on the developments</td>
</tr>
</tbody>
</table>

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VIII. LOGIC BEHIND NEW DEVELOPMENTS SUMMARIZED

Any form of learning support can be implemented in every environment. The objective of our development is to strive for the following objectives:

- **Logical structure for the environment**
  in the form of a conceptual eLearning canvas

- **Describing the aspects of our goals**
  a logical level to easily formulate requirements easily for an in-house eLearning environment, necessary functionalities for facilitating the courses

- **Facilitating aspects for today and exchange information for future**
  aiming at sustainability of target organisations, facilitating future cooperation between students, formulating shared vocabulary

- **Checking pilots for different cases**
  facilitating the exchange of information derived from the assignments of the courses.

IX. LINKING TO TARGET AUDIENCES

The basis is a typology of change and requirements. Our view is presented as an alternative approach to fill in the concept of life-long-learning. Lifelong-learning also means that we focus on different target audiences. Traditional education in many cases means that focus is on learning the knowledge of yesterday. Our basis assumption was that change is the most permanent certainty of current life.

We aim at aiding youngsters in the acquisition of innovative and entrepreneurial skills to make it easier for them to find a place within the labour market, via a blended learning (in a non-traditional use of this term) program, making use of both traditional educational strategies along with a new set of alternatives focusing on co-creation by all stakeholders in a different time-frame for:

- now for NEET (Not in Employment, Education or Training) of age 25-29,
- short and medium term for NEET between 20-24,
- long(er) term for students between 15-19,
- lifelong -learning adult education for all.

X. PRACTICAL EVIDENCE

The necessity of lifelong-learning is an accepted paradigm but not yet a key objective for traditional education, though it has a crucial role for innovation, in all areas of (general and specialised) knowledge, from humanities to advanced science, and in all sectors of society, public and private. Innovation is based on co-creation and transfer of knowledge, and ICT provides unprecedented opportunities for building and sharing it. Without education as a core policy, employment and innovation will remain unsupported.

Education and training are crucial for both economic and social progress, and aligning skills with labour market needs plays a key role. Many countries suffer from the lack of skilled workers, and systemic problems make it difficult to fill vacant positions. Engineering, construction, and IT are some of the sectors in which finding the right workforce can be particularly challenging. For STEM-related (science, technology, engineering, maths) jobs, it is very difficult for employers to recruit new workers, or re-fill vacant positions; because of the lack of skills and experience. In addition, there is a significant difference between the way of thinking and expectations of employers and entrepreneurs, so the root of the problem is the different aims and expectations of
the two parties. For jobseekers, the most important is the ability to develop skills through interesting projects, good working community, and flexibility in reconciling work and private life, or teleworking. A competitive benefit package has less priority. Most employers think that financial benefits are the most important for job applicants. The importance of opportunities within the company is also overestimated by organizations, and the potential for developing skills important for jobseekers is neglected. Translating this to a practical setting, there are hundreds of vacancies big companies struggle to fill, as fresh graduates often lack the knowledge and expertise these companies are so keen on finding.

But does this mean that future is doomed to fail? There are good examples of cooperation between universities and industry. The main focus in this cooperation is to comb graduates and find the most talented ones, who fit in the company profile the best. They hardly ever set up cooperation, where universities organise special courses for students to be trained for specific and certainly not for un-specific needs (present or future) of the company.

At larger companies, there are a number of courses (online and classroom) available for employees. The range covers both hard and soft skills. It’s quite usual to hire a young graduate and set up a training plan in the first couple of months of the employment (junior training). After this period, employees are offered in-house online courses regularly, and classroom trainings held by outside experts or colleagues. This is a strong motivation for employees to stay and work for the particular firm offering continuous opportunity for updating and broadening one’s skill. But in general, these in-house courses are focusing on fulfilling known requirements of the organizations, and are thus characterized as incremental improvement based education. A focus on unknown future(s) – mind the use of plural - is needed to be able to fulfil the requirements that nobody knows yet. In a setting like this radical innovation based education is needed. In the latter case the attitude of learners should be on “I come to develop myself” instead of on “I come to work”.

These differences make a clear break in the labour market: companies looking for labour are unable to assess the needs of potential candidates accurately, making motivation more difficult and the jobs less attractive, resulting in fluctuation and dissatisfaction. It is suggested that companies emphasize personal development or the job/project as an experience. The credible employer's picture should be enhanced through the development of corporate culture and working environment. Luckily new developments are initiated that indicate that the awareness of this development is arising:

Educational institutions – as said earlier – take part in these issues. In Hungary for example the University of public service besides offering BA, BSC, MA and PhD programmes, continuously cares for further training of civil servants. For entrants, they have obligatory general courses and exams, then they provide vocational training and specialization training programs for deepening and maintaining their knowledge for their positions.

Another example: for the University of Amsterdam a development towards a higher level of flexibility in their educational offering is initiated. Whereas in the past students were supposed to enrol for a full year, nowadays it is allowed to enrol only for a limited number of courses with an accompanying lower ‘entry fee’. It is the student who determines what courses to follow and he/she only supposed to pay for the chosen course. This development can be seen as a first step towards facilitating Life-Long-Learning.

XI. ICT IN EDUCATION: CURRENT DEVELOPMENTS

It is clear, that intelligent use of ICT for learning and teaching can greatly enhance new skills required for new jobs and is the base of capacity for innovation. The all-encompassing learning environment requested by the knowledge society cannot become true without high-quality education; just as the all-encompassing learning environment requested by the knowledge society cannot become true without ICT.

The impact of ICT on education and training has not yet been as great as expected, the transformation of business and public services through ICT has not yet reached education
systems deeply, especially not traditional teachers. The tendency seems to be that students bring innovation to learning. Embedding ICT in education and training systems requires further technological, organisational, pedagogical, legal and cultural changes at classrooms, workplaces, and informal learning settings, and it must promote talent and creativity from an early stage.

We have to state, that not only the impact of ICT on education is important. It also requires innovations on the field of traditional IS education. It is quite clear that here we identify rooms for improvement. IT retraining, coding boot camps, and similar programs are growing everywhere. These developments stress a growing attention for the role IT has in guiding society towards a growing attention for Life-long learning. Completely new approaches are under development, but it’s also clear that we will have to go a long road for finding effective mechanisms to facilitating future developments.

A quality learning infrastructure, that is user-oriented and widely accessible can be built with ICT but it requires new business models for co-creation (IPR issues), new access and delivery models, new teaching and learning services models, social acceptance of radical changes and pedagogy, interoperability and technological research. It all requires further research.

XII. SUMMARIZING KEY ISSUES

1. Traditional education needs to catch up with developments, prepare for the future and adapt to our changing world:
   - the development of skills and competences should begin in early childhood and primary education
   - teachers need to acquire the most effective methods and practices to help the development of children's creative and innovative skills and competences

2. Expectations of employees and employers do not match; individual development is crucial but barely satisfied
   - Co-creation and co-construction is the most efficient way for the sharing of knowledge but is hardly used in education
   - Difficulties in involving the various players in the co-creation process; we need to develop ways to bridge gaps in the interests of all stakeholders and make use of the obvious efficiency of knowledge exchange, even via social media tools
   - Reduce economic and social disparities by building more inclusive societies, giving chances to all
   - Reach gender balance along with equality in learning and working by an open, inclusive, efficient education program
   - Provision of good self-development/training opportunities is of high value for employees, as it has a retaining power

3. Traditional education does not consider widening its spectrum and care about life-long learning
   - Having all resources to provide adult trainings and courses for organisations, traditional education also needs to look ahead and provide formation services besides educational programmes
   - Traditional education needs to be open for co-creating programmes for students, adults and organisations; otherwise they will miss this opportunity. The competition is already great so time is of the essence
   - Strengthen transnational cooperation to address challenges
   - Employees are really motivated to develop their knowledge and skills, which makes the job of those teaching in traditional education on the one hand easier and enjoyable, however on the other hand these “students” are the ones who already own valuable knowledge, so by applying the “roles approach” they can also act as “teachers” or “practitioners”

4. Education and organisations are not prepared for unknown future(s)
   - Promote sustainable and quality employment by empowering citizens
   - Reach added value by Open Innovation solutions, consistent with sustainable development, long-term economic growth, social cohesion
Society benefits from better educated citizens

5. Financial resources required
   - Raising financial resources for co-created education is in the interest of the whole society as a whole and each of the sectors, just as the individuals themselves

We will have to strive to find a solution for the above problems through the development of a framework for citizens, both young and old(er) and of various backgrounds. In different phases of their development we will have to bridge the gap between education and the job market.

XIII. CONCLUSION

As mentioned in the introduction this is a positioning paper to indicate research we initiate. It sketched insights on future developments that will have to be underpinned and proven by quantitative research and statistical analysis. We opt in our research for providing an innovative solution to the more heavily technology and systems oriented approaches, to create spaces for public engagement and citizens’ involvement for the co-creation of knowledge; an umbrella for various types of projects with benchmarking and comparisons (cultural, societal, economic and regulatory aspects). In short, we believe this is a rich area for research for which we really search for cooperation with other researchers.

The co-construction and design should start at an early stage, and at the same time the outcomes should integrate the society of science (implementable integration), with a special focus on the role of science communication for better interactions among stakeholders, higher efficiency and involvement, and improving the quality of results.

XIV. ABOUT THE AUTHORS

Emőke Takács has started her career as a researcher at the Hungarian Public Administration, where she was involved in training civil servants. She then has worked on the EU accession of Hungary and Romania, getting close to EU policies. She is an expert on EU funds and project management, delivered trainings, tutored eLearning courses, directed several scientific and research projects. Her interest is in efficient knowledge acquisition and management.

Toon Abcouwer works at the University of Amsterdam. His research interest is on how organizations deal with crisis situations. Especially the different roles that information and information systems play in the various phases of crisis handling has his special interest. It is crucial for management to learn to deal with the problem to integrate that roles in one single Information systems infrastructure. It is his believe that traditional governance approaches only offer a partial solution for that.

Judit Dömölki is an economist having extensive experience in the development and usage of ICT systems within both business and education. She is an expert on EU funding and has been involved in several R&D projects as a researcher. Being a mother of three children, and having been on the board of the School Foundation for 10 years organizing and managing projects for primary schools, she has experience of the challenges faced from both sides of the fence. Her interests lie in the informal ways of learning, so as to preserve the inborn creativity and innovative nature of children.
XV. REFERENCES


