FUTURE CHALLENGES AND THE ROLE OF E-LEARNING WHY ELEARNING IS CRUCIAL TO DEAL WITH FUTURE CHALLENGES IN SOCIETY?

Toon Abcouwer
*University of Amsterdam, abcouwer@uva.nl*

Emőke Takács
*ERI Hungary – European Research Institute, t.emoke@eri.net.in*

Follow this and additional works at: [https://aisel.aisnet.org/siged2018](https://aisel.aisnet.org/siged2018)

**Recommended Citation**

This material is brought to you by the SIGED: IAIM Conference at AIS Electronic Library (AISeL). It has been accepted for inclusion in Proceedings of the 2018 AIS SIGED International Conference on Information Systems Education and Research by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.
FUTURE CHALLENGES AND THE ROLE OF E-LEARNING

WHY E-LEARNING IS CRUCIAL TO DEAL WITH FUTURE CHALLENGES IN SOCIETY?

Toon Abcouwer
University of Amsterdam
abcouwer@uva.nl

Emőke Takács
ERI Hungary – European Research Institute
t.emoke@eri.net.in

Abstract:
In contemporary society there is a growing need for highly educated people who are able to deal with various, unforeseen problems. The need for specific eLearning solutions is obvious. Most of the popular environments like Blackboard, Moodle and Canvas lack the functionality of dealing with problems coming from unforeseen future. This paper is meant to initiate a discussion on the requirements of eLearning systems in modern societal settings. It outlines the main characteristics of eLearning systems that are proved to be valuable and also draw attention to the questions and needs of current society. The main conclusion is that the focus should be on knowledge sharing which benefits from insights and contributions of all participants of the educational setting. A flexible mindset is a necessity for being able to develop the requirements for such a new eLearning environment.

Keywords: dynamics in society, eLearning, adaptiveness, resilience

I. INTRODUCTION

In the fast-changing environment of today, the concept of predictability plays an important role, as we face with unforeseen events determining our future. Even though it is a generic finding, this fact has an even higher impact in the world of eLearning Systems. Reaching alignment between supply and demand for the formation of human resources to define the changing requirements for newly developed eLearning systems is far more difficult when we do not know what future may bring. In order to develop the needed future skills/competencies/requirements, focusing on improving the ability of dealing with the not yet known issue is essential. Attention on education therefore is extremely important.

In traditional education the main focus is on transferring existing knowledge to students, although it is explicitly clear that youth need knowledge that will be useful for them in their future. Students normally spend 10-15 years in education. Curricula are based on available knowledge without knowing exactly what future might bring. A recent research in the Netherlands (Deloitte, 2016) points out that 42% of students in mid-level vocational education, study topics that will no longer be relevant when they graduate. On the university of applied science level, this percentage is 19%, while at university level in general, it is around 10%. In the accelerating world we live in, in many cases acquired knowledge is not relevant by the time students would use it in practice. Forecasting is risky, still educators need to think ahead and compare what is taught with what is needed in order to assure the relevance of the topics. Meanwhile, due to informal learning sources, knowledge is easily accessible, and students are able to find answers for their questions for themselves. Initiatives like the Self Organizing Learning Environment of Mitra (Mitra & Dangwal, 2010) form interesting experiments on this field. In many cases students can be better prepared than their teachers, also (or maybe especially) regarding the use of tools and methodologies.

Another changing characteristic of the knowledge economy is that some decades ago we finished our studies at around the age of 20, started to work and stayed at the same place for the rest of
our lives. Today this is no longer true, and we cannot stop developing ourselves in order to be competitive on the labor market. Recent developments (cf. robotics and automatization) threat those who are not marketable enough. Continuous (life-long) learning is a requirement towards everybody.

Our research focuses on the importance of developing and facilitating people to deal with actual ill-defined challenges, where the role of e-learning is indispensable in today's world. We search for a solution with the ability of identifying future challenges, and with the aspects of the persons, their roles, characteristics and skills in relation to reaching results in finding solutions and their enrolments in problem-solving teams, also considering ethical and social issues like equality, equity and fairness, which must be supported by IS/IT. We analyze the ways for organizing the information and knowledge for the above purposes and recommend a solution on organizing education that satisfies the practical requirements, trying to find the balance between the relevance of the answers of today and the questions that may arise in the future.

II. TYPES OF CHALLENGES

Problem-solving requires us knowing the state of disorder the organization is dealing with when a problem occurs. The solution is not automatically clear and different ways of problem-solving are required. The Cynefin framework of Snowden (Snowden & Boone, 2007) helps to understand the context and nature of a situation. It can be viewed within an ordered context, where analysis gives good insights into the problem at stake, when in general the problems are thus Well-defined. Possible interventions can be based on logical thinking, expertise and the results of these interventions are more or less predictable. In this respect the terms obvious1 and complicated are used. In both circumstances a thorough analysis of the situation may lead to a solution that can help the organization to overcome the problem. In contrast unordered state can be identified as complex or chaotic circumstances, where analysis is helpful but not enough to deal with the challenges, which can be described as ill-defined. In these cases, the causes are unknown, the effects are unpredictable and unstable. Next time when the same intervention will be initiated, the results may be completely different.

To sum up the characterization of well- versus ill-defined challenges in line with a research done within our research group, Pel (2018) defines the concepts as follows:

**Well-defined challenges** have the following characteristics:

- There is an explicit set of criteria for testing the proposed solution (Simon, 1973)
- They present all elements of the problem (Jonassen, 2000)
- There is at least one problem space in which the initial problem state, the goal state and all other states that may be reached are included (Simon, 1973)
- They involve concepts and rules that appear well-structured in a domain of knowledge that is also well-structured and predictable (Jonassen, 1997)
- They have a preferred, prescribed solution process (Jonassen, 1997)

In short, well-structured problems have a well-defined initial state (what is known), a well-defined goal state (the solution is reachable) and a known procedure for solving the problem (solution process). eLearning can handle well-defined challenges easily.

**Ill-defined challenges** are problems for which there are conflicting assumptions, evidences and opinions which may lead to different solutions. (a.o. Kitchner, 1983). They may have a number of different solutions or no solution at all. And there is no guaranteed procedure to reach such solution. They have the following characteristics:

- One or more of the problem elements are unknown (Jonassen, 2000)
- They may have multiple solutions, or no solution at all (Kitchner, 1983)

---

1 In the original article Snowden used the term 'Simple', later he changed it to 'Obvious' which fits better to the intention.
• There are a number of criteria for testing and evaluating the proposed solutions (Jonassen, 1997)
• They present uncertainty about which concepts, rules or principles are necessary for reaching a solution (Jonassen, 1997)

So ill-structured problems lack a clearly defined initial state and their solutions (if any) are neither predictable nor convergent. We believe that adding certain functionalities to eLearning can assist ill-defined problem-solving processes.

III. THE CASE OF PROBABILITY

When dealing with such a challenge a distinction should be made based on the probability (Gigerenzer, 2014) of available alternative solutions. In decision-making, the following descriptions will become relevant:

• **Decision-making under Certainty:**
The condition of certainty exists when the decision-maker knows the available alternatives and their conditions and outcomes with a reasonable confidence. Under these conditions, accurate, measurable and reliable information is available on which the decisions can be based. The cause and effect relationships are known, and the future is highly predictable. Such conditions exist in case of routine and repetitive decisions concerning the day-to-day operations of the business (Rawat, 2018). Current IS/IT education is based on the assumption of certainty.

• **Decision-making under Risk:**
When information is not available or there is an information asymmetry, then risk arises. In a situation of incomplete information about options or alternatives; feelings, impressions, divinations may bring good ideas on the probability of outcomes (Rawat, 2018). Decision-making under a state of risk requires us to determine the probabilities to the different - often known - alternatives, based on the available information and previous experiences (Gigerenzer, 2014). It is uncertain which alternative solution will become actual and what the direct effects are. Depending on the educator who is committed to follow the latest developments, certain IS/IT knowledges can be transferred to the students, but usually not in the form of eLearning, but discussions and seminars. The reconsideration of the role of eLearning within the circumstances of future challenges becomes interesting.

• **Decision-making under Uncertainty:**
The fast-changing circumstances of today’s life led to an unpredictable environment in which decisions have to be formulated. In uncertain conditions the results of the decisions cannot be foreseen, since everything is changing constantly. In such situation we cannot possess complete information about the possible solutions and be aware of all available alternatives, neither their associated risks, nor their consequences or probabilities. Decisions must be made based on uncertain information without being sure if they are completely reliable or not. In these cases, we make assumptions about the situation and try to set a reasonable framework for decision-making. The decisions depend partly on judgments and previous experiences, but in many cases even all these may not lead to acceptable outcomes (Gigerenzer, 2014). For this reason, IS/IT education does not dare to deal with such future assumptions or forecasts, although it is the field of study, where the changes are accelerated to a period of time, which exceeds the time the students spend on learning the topic in education. Considering probabilities becomes important under uncertainty.

To understand which probability is actual and relevant, we need to make a link to the dynamics in organizations. Our approach is based on the adaptive cycle of resilience (ACOR) (A W Abcouwer & Parson, 2011; A. W. Abcouwer & Smit, 2015). It is important to recognize that the probability aspect gives indication on the results for interventions and countermeasures in both well- and ill-defined problems.
IV. DYNAMICS - THE ADAPTIVE CYCLE OF RESILIENCE

The theoretical foundation of our approach of dealing with challenges is highly dependent on knowledge-sharing in order to solve complex problems, therefore it is crucial to cover the fundamentals of dynamics, learning, dealing with challenges, adaptiveness and resilience.

The adaptive cycle of resilience is a model which describes why change is a permanent phenomenon, combining the tensions of organizations in a quadrant model about what they want and what they can achieve. It is based on a.o. Thompson (1967), Gunderson and Holling (2002) and A W Abcouwer and Parson (2011). Quadrant 1. equilibrium from the management point of view is simple: the goals and the way to implement them are clear. External influences or a ‘Black Swan’ (Taleb, 2010) may disturb equilibrium resulting in a situation in what the organization is too far from being able to find a way out. The change in this awareness suddenly moves the organization to quadrant 2, Crisis. Usually there should be a way to develop new options we can choose from. In this phase – identified as the new combinations phase, carrying out pilot studies, scenario analyses, etc. will have to generate new opportunities. Once these opportunities are available, the reaction is no longer defensive to the internal and external threats. They show potential ways to deal with the challenges. Since it is impossible to realize all opportunities, it is necessary to make a choice, and develop that further. The moment of making the final choice for the option to be implemented, marks the change from quadrant 3 to Operationalization phase 4. The actual decision may lead to uncertain results. It may happen that the organization is not yet ready to proceed to implement it, or the experiences acquired in the pilots or the scenario analyses did not lead to scaling up towards actual production circumstances. The switch to a new equilibrium (a new quadrant 1) demands unremitting labor and reorganization, and/or rationalization of the processes before the organization gets back to a relatively stable state of ‘want’ and ‘can’. The cycle continuously starts all over again. This cyclical process induces attention for life-long-learning as a necessity for society.

Our assumption is that solutions for unknown problems can only be found by an appropriate way of knowledge sharing. Because of the fast-changing environment the process of learning and sharing knowledge has to be facilitated by means of modern ICT, playing a different role in educational processes than we are used to in actual e-learning environments, like Blackboard, Moodle or Canvas.

V. THE ROLE OF KNOWLEDGE-SHARING PLATFORMS IN DIFFERENT TIMEFRAMES

Knowledge management is intensively studied in scientific literature. Many attempts have been made to define and develop knowledge-management (eLearning) environments. The objective of many of these systems is to make knowledge available within an organization or develop new knowledge when necessary. In many cases these experiments were not successful. According to Wilson (2002) ‘The conclusion is reached that “knowledge-management” is an umbrella term for a variety of organizational activities, none of which are concerned with the management of knowledge.’

According to us, the attention is not only on knowledge-management in the sense of assuring availability, but on organizing the process of managing the access to knowledge available anywhere in the World. The process is way more about sharing knowledge coming from inside or outside the organization than assuring the processes of capturing, storing, unlocking and safeguarding it.

In line with this reasoning a Digital collaborative platform (the iSolution environment) should play a...
broader role than the traditional knowledge-management approaches. The following main features should be included in such an environment:

1. **Knowledge/skills base (KSB)** to be created with societal partners, discovering their priorities and needs, legal, regional and cultural information and information to support the society, based on best practices throughout the world.
2. **Marketability tool for individuals (MI)** to provide opportunities to enhance citizens' marketability via tools and resources for traditional and self-education, aiming at digital innovation methodologies to facilitate co-creation.
3. **Communication infrastructure (CI)** to facilitate the exchange of knowledge between partners.
4. **Co-creation facilities (CC)** to enhance the engagement of active dialogues with organizations to identify future needs and facilitate co-creation to develop new insights and future requirements.

As a result, we can reach at improving the role of eLearning to deal with future challenges by:

- Building skills to enable people to adapt to changes 1, 3
- Promoting sustainable and quality employment by empowering people 1, 2, 3
- Strengthening border-crossing cooperation to address challenges 2, 4
- Reducing 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
- Reaching gender balance and equality in learning and working by an open, inclusive, efficient education program 3, 4
- Adding value by Open Innovation solutions, consistent with sustainable development, long-term economic growth, social cohesion 4

In current practice and in line with the probability that solutions are available, different sequences of applying the different functions of the iSolutions environment can be identified.

The aspects of knowledge-sharing/management can be used in different sequences, regarding the nature of the problem to be solved and the necessary knowledge to be shared. In line with the probability thinking, we have identified the following processes of problem-solving in relation to knowledge-sharing (eLearning).

**Certainty**

The objectives are clear in the setting where we opt for dealing with certainty and the knowledge we are looking for is (more or less) clear but have to be found and the quality and integration need to be assured (1). This requires communication (2) between specialists to facilitate co-creation (3). Forecasting may be necessary for identifying the problem-setting. Realizing the nature of the problem, categorizing characteristics and applying appropriate countermeasures are recommended. The objective is to reach a new equilibrium state as quickly as possible.

**Risk**

When we are unaware of the outcomes, it is necessary to agree on the analyzation of the actual situation. The dynamics of the developments require different types of knowledge usage. Via communication (1) agreement can be reached on what knowledge (2) is necessary for facilitating the co-creation process (3), generating solutions for foreseeable future problems (Person/Organization fit). Because of the fact that
the nature of the problem may not be known completely, a solution might not be available right away. By trying to identify analogies, we can take advantage of solutions that were previously successful. The approach is based on the ability of entrepreneurship and the analysis can lead to co-create a solution for the problem.

**Uncertainty**

When we do not know the nature of the problem we are facing, the problem-setting can be called a crisis, a state when traditional ways of problem-solving do not work anymore. Finding new countermeasures are the key for being able to solve problems and requires scenario analysis to set up opportunities that can facilitate a contingency approach (linked to a Person/Future fit). In this setting the required knowledge is not known yet and being experimental might be the only way to deal with the situation (1). Monitoring and communication (2) will be crucial to identify the necessary knowledge to solve problems (3).

The above approaches dealing with the different timeframes and certainties form a base for research on how people deal with challenges.

The requirements towards the competencies of the current staff, as well as for the new entrants of the labor market, make it clear that attention has to be paid to bridging the existing gap between future requirements and current competencies. In many sectors, the gap between the demanded and supplied skills both for now and in the future, is growing rapidly. This gap in essence shows the need for defining the requirements regarding learning and the support of modern eLearning environments, like the iSolution environment.

**VI. THE ISSUE OF FIT**

Bridging the gap on competencies necessary for dealing with current and future challenges is highly dependent on the capabilities/competencies of individuals in relation to the challenges they are facing. Mismatches may occur and there is a growing need for education to bridge that gap. Working on bridging it may be defined along the lines of three types of “fits”.

1. **Person/Job fit**: More clarity is needed regarding the workforce/knowledge requirements of the economy. Change-requirements are known for the problems, society faces. In most cases, the intervention repertoire is available and sufficient to deal with the problems. Therefore the focus is on building well-defined competencies of the staff for today (Carless, 2005).

2. **Person/Organization fit**: Economy and industry can forecast some of the future developments regarding skills and competencies, but the final outcome is unsure. The workforce should have flexibility to adapt to developments of the organization (Cable & Judge, 1996). We can foresee and forecast the developments if they take place in a short-to mid-term timeframe. By building up new competencies, the staff will be able to deal with the current challenges as well as with the mostly known or foreseen future requirements.

3. **Person/future fit**: When long run developments are not predictable, organizations need to be prepared for an unknown future and to be able to deal with unforeseen developments. In this case flexibility is not enough, building up resilience is an absolute necessity. It means that competencies will have to be built for a situation that is not known yet. (A W Abcouwer & Takács, 2018)

Education has to facilitate the individuals to build the necessary knowledge and competencies. It is the task of the management to show leadership in this respect to stimulate the learner to fulfil a valuable role in current society.
VII. DEALING WITH CHALLENGES REQUIRES DIFFERENT APPROACHES

The effect of any intervention in case of a challenge is often unpredictable and diverse. In many cases the real nature of a dynamic change and their impacts are only recognized and known afterwards: if we had known where to look, we could have foreseen the future. In line with the approach developed regarding different states of disorder, Tsoukas (Tsoukas & Shepherd, 2004) set techniques that can be used as guidelines for problem-solving. He identifies these techniques as follows:

- **Forecasting techniques** are helpful when the initiation of change is reasonably predictable and the way to deal with it is clear too. In terms of the Cynefin approach (Snowden & Boone, 2007), the setting can be categorized as being obvious. In many cases forecasting follows the style of reasoning as suggested by Snowden for the obvious form of disorder: sense – categorize – respond, that is actual in the equilibrium state of ACOR.

- **Analogical reasoning** works well in situations when future developments are known but nobody knows how to deal with them. Sensing the incidences is crucial, analyzing and comparing the settings with previous experiences and then responding appropriately appears to work best. This is in line with the Cynefin complicated type of disorder: sense – analyze - respond. In ACOR this state is identified as operationalization.

- **Scenario based learning** is the suggested approach in case the future is relatively unpredictable and the way to deal with it is also unknown. Predicting the effects of an intervention is impossible. The Cynefin chaos characterization is relevant here and suggest: act – sense – respond. ACOR describes this situation as the crisis quadrant.

- **Contingency planning** is the proposed approach in case of unforeseen future developments but with high capabilities for dealing with it. Trying potential actions will lead to insights to identify the right course of action. Cynefin suggests in this complex type of disorder: probe – sense – respond. In ACOR we use the term *new combinations* for this state.

These approaches also show the necessity for building up competencies and abilities for people to be able to participate in the problem-solving exercise. Management will have to facilitate integration of the aspects as mentioned above. But what kind of impact does the organization have regarding the ability of surviving? We need to focus on the concepts of adaptivity and resilience.

VIII. ADAPTIVENESS AND RESILIENCE

In very different problem areas the concept of *resilience* has become increasingly central during the last decade and it is relevant to changes that society faces.

According to Chandler (2014) there are three important aspects that make resilience important. First, there is a tendency to focus on intractable and complex problems. Second, resilience does not start at the top level but traces processes back where they started, at the...
level of the root causes. Third, resilience seeks to work with existing capabilities and practices to make them work more effectively and efficiently.

The rise of the resilience concept is based on the insight that the difference between ‘internal’ and ‘external’ is declining. The focus of traditional risk management theory was internal disruptions, while now the attention is on external disturbances. The capacity to withstand pressure and stress can be generated both internally and externally. ‘Resilience’ means understanding the non-linearity of the world that we are currently living in, and a growing awareness in which contingency and complexity play a crucial role. Chandler defines it as the discursive field through which we are dealing with the emerging problem of governing complexity.

Holling (1996) makes a difference between two faces of resilience: Engineering resilience concentrates on stability near an equilibrium: a steady state where resistance to disturbances and speed of returning to the equilibrium are used to measure this type of resilience. Ecological resilience emphasizes conditions far from any equilibrium or steady state, where instabilities can flip a system into another regime of behavior to another stability domain. According to him ‘the measure of resilience is the magnitude of disturbances that can be absorbed before the system changes its structure by changing the variables and processes that control behavior’.

The concept of resilience in organizations attracts more and more attention. Growing dynamics that organizations are facing with, requires the management to deal with complex adaptive systems (CAS) settings (Kauffman, 1995). The decisions made by the management in specific part of the organization as CAS influences the developments in the rest of the organization, makes it impossible to take full responsibility for the overall functioning of the organization. In an overview article of Westley (2002), he states that current developments in an organization can be categorized by its level of diversity, continuous change and learning complex interactions that make them unpredictable. The different solutions that are suggested are improvisation (Ciborra, 2002), storytelling (Snowden, 1999), humor (Karl E Weick & Westley, 1999) discovery of harmony (Coveney & Highfield, 1992) and sense-making (Karl E. Weick, 1995). The role of resilience focuses on the actions and changes to be done to overcome obstacles like lack of understanding, unwillingness to change, lack of adaptive capacity. (Gallopín, 2001). Solutions are meant to influence the outcome of the change. Resilience in that respect has a different role: to influence the ability of finding a new state of equilibrium. To distinguish this aspect Ensor (2011) introduces a third kind of resilience: Social Resilience. Together with the continuous interaction between partners of co-operation, setting this type of resilience leads to a situation where permanent attention is needed from management, to deal not only with one single disturbance, but leading the organization through dynamic times of continuous disturbances.

To summarize: Resilience is the ability of an organization (and its systems) to withstand, recover and adjust to changes in its environment while keep functioning.

A modern society cannot afford to impair this delicate balance by not dealing with the known and unknown causes of risk and failure. Therefore, we illustrate the issue of predictability and the role of the managers and other members of an organization dealing with unpredictable changes.

IX. THE IMPORTANCE OF MANAGEMENT / LEADERSHIP

In a setting of certainty, we know what and how to do. Risk is quite low and when everyone works in compliance with objectives, challenges can be dealt relatively easily. Predictability of the outcomes are crucial. Predictability is defined as a consistent repetition of a state, course of action, behavior, or the wish to make it possible to know in advance what to expect. In reality it is more complicated. Designing a strategy of an organization is about planning, in order to deal and to forecast predictable and unpredictable events in teamwork and advanced ways of cooperation. Implementing such a cooperation requires strong leadership from the management and an organizational culture of trust. But, rapid change and technological innovation requires us to be resilient and flexible. Organizations can no longer forecast what will happen, they growingly face the problems of uncertainty. As said before, Gigerenzer uses the term Risk. This is a gliding scale and wrong forecast can be an increasing risk. Certainty could turn into uncertainty where
traditional cause-effect relations are no longer valid. Organizations in these cases need real guidance from leaders. They face risk that enforces them from certainty to uncertainty. The challenge in this development is to manage the balance between stability and flexibility and build resilience. In terms of our approach, the role of knowledge sharing has to facilitate two opposing lines of thinking. One assumes the availability of cognitive qualities of individuals, such as Mindfulness. The key qualities of a mindful state are openness to novelty, alertness to distinction, sensitivity to different contexts, implicit, if not explicit, awareness of multiple perspectives and orientation in the present (Sternberg, 1990). In case of uncertainty when it is not clear what and how to adapt, getting lost in our activities is a sort of mindlessness. In a setting of unforeseen future this is the most typical state of mind. Although mindlessness does not sound to be right, still, there are circumstances of high uncertainty in which mindlessness may be adaptive, and therefore may constitute a reasonable course of action. It leads to the difference in ‘thinking first’ versus ‘doing first’ (Mintzberg, 2009).

X. THEORY IN PRACTICE

Our research group has performed an exploratory research to check the validity of our insights (Pel, 2018). We asked managers to fill in a questionnaire, to elaborate upon the question how they deal with well- and ill-defined problems. The starting assumption in this approach was that managers can be categorized as creative or rational managers. Within the ACoR model these characteristics come forward in left-side (rational) and right-side (creative) behavior to which a manager feels most attracted to. Based on simple case descriptions with explicit well- and ill-defined characteristics, we asked the managers to identify their problem-solving approach in the different settings. The accompanying table taken from the research of Pel (2018) shows that it is relevant to distinguish between approaches to dealing with challenges. As expected, rational managers deal with well-defined problems within certain settings. When knowing or recognizing the problem area, a majority of the rational managers uses that certainty approach. Creative managers always look for new insights and alternative approaches, with a basic attitude to deal with uncertainty, also when the main characteristics of the challenges are characterized as well-defined.

In case of an ill-structured challenge, all managers have to deal with the issue in an uncertain approach of thinking. In general education the focus is on transferring knowledge to ensure that the students have the ability to deal with (in many cases well-defined) challenges.

As stated in the introduction contemporary society increasingly faces disruptive and un-structured problems. Within this setting the ability of dealing with these types of challenges will have to be central in our future based educational approaches.

XI. LEARNING IN UNCERTAINTY - DE-LINEARIZED LEARNING

Learning in our complex and dynamic world is a life-long process and the need for a more informal way of learning has a growing importance. Based on the “roles approach” of different stakeholders (Thijssen & Gijselaers, 2006; Thijssen, Maes, & Vernooij, 2002) of the learning process, the transfer of knowledge approach of traditional education institutions must change. The role-based approach identifies students (looking for knowledge), teachers (delivering knowledge), researchers (developing knowledge) and practitioners (using knowledge). It is also possible to achieve a much closer relationship with market requirements when someone can play all these roles and in this learning environment the scientific division between rigor (teacher and researcher) and relevance (student and practitioner) comes into full practice. The relevance of this
approach is partly based on that education needs to provide knowledge for the future that we cannot grasp yet. All in all, a completely different approach to learning is necessary where educational institutions facilitate knowledge sharing by practicing all the roles. This approach is called the de-linearizing learning approach (A W Abcouwer & Dömölki, 2016; A W Abcouwer, Smit, & Takács, 2016; A W Abcouwer & Takács, 2016). According to this approach people overcome the challenges they are facing with in three steps:

1. **The process of acquiring, making accessible, and where it’s necessary developing new knowledge and skills**: finding appropriate knowledge is essential and has to be studied in full detail in order to define the requirements for a collaboration system as a facilitator.

2. **Assessment and quality assurance**: the approach of our research leads to a new aspect. Given the fact that every person involved in the learning process can play the role of supplier of knowledge, the quality of the knowledge itself should be assessed. This is exactly the contrary to the traditional approach where teachers/researchers are responsible for this.

3. **Integrating in the worldview / The actual teaching process**: when other parties are involved as source of knowledge, a growing number of specialists will be involved in the knowledge gaining process, which challenges the integrations of the insights into the existing values and norms.

The above description of the principles behind De-linearized learning will further colorize the way how we look at education in current society. It will be used to build a bridge between the three types of fit and the aspects of the probability and importance to define the way of knowledge-sharing (via the iSolution environment). By focusing on this approach of learning we head for improving the level of resilience in organizations.

**XII. INTELLIGENT SOLUTIONS IN PRACTICE**

Finding intelligent solutions for actual challenges we recall that we do not only focus on revolutionary changes this far. Many major developments can be characterized in an evolutionary context. The revolutionary character of any change comes mainly from the fact that managers do not recognize the evolution and suddenly become aware of the real character of the problem which they are facing with. This highly correlates with the thinking in terms of probability, dynamics and management competence of employees. Considering the concept of fit, we can develop a different interrelation between the level of analysis (individual, organizational and societal) versus the requirements for education.

**The individual level and traditional education**

In general, the traditional educational setting assumes that a challenge is well-defined, and it may be easy to find a solution. The teacher has the knowledge to analyze the problem and teach students how to find the set of requirements and focus afterwards on operationalization, knowing that implementation is far from easy. Students will have to realize that the solution is not based on defining the logic, but on availability, realization and implementation of the solutions for the challenge under study. The solution can be described as certain, there is a right answer available. Realization might be an issue but not the logic. Knowledge sharing can be organized in line with the person/job approach. The requirements for the eLearning environment are clear and traditional eLearning environments support well this way of learning.

**The organizational level and life-long learning**

Challenges that organizations are facing are neither static nor predictable. In this environment we have to analyze the setting of the organization. Many options for the future may be available, leading to different sets of requirements in terms of finding a solution for the challenge under study, but also – as we have seen - for the way how eLearning supports this process.
Aside of that, the impacts of the interventions are unclear, because they were based on a deeper involvement of employees. And the growing need for cooperation automatically introduced a higher risk of failure. This risk is not based on a lack of insight in the effects, but merely that individuals may not be willing to cooperate. So, the issue is the right estimation of the actual risks. In terms of knowledge sharing, insights and searching for knowledge sources appears to be the appropriate approach. Identifying the set of requirements for eLearning needs a continuous development in the insights of the people working with it, leading to a need for life-long learning in order to be able to deal with the challenges better. In this setting the focus will be on knowledge sharing and exchange.

**Disruptive change in society and learning in uncertainty**

Unforeseen changes find their origins merely in the uncertainty of future developments. While in the past we could estimate where the threats probably came from, today it is clear that societal developments forcing organizations to be cautious and prepared to act when it necessary. The need for adequate eLearning requires different type of learning employees apply, able to formulate answers in a setting where the question is not yet foreseen. In general, future can be unpredictable, therefore the knowledge sharing approach of doing first and sharply sensing the effect of the countermeasure might help. The uncertain way of using the iSolution environment fits well in this setting.

**XIII. CONCLUSIONS AND FURTHER RESEARCH**

Through the above described reasoning, we developed a logical approach for knowledge sharing to solve different problems. The need for adaptivity and the logic of knowledge sharing in relation to problem-solving approaches are based on a broad range of knowledge. The multidisciplinary approach we are suggesting gives room for new insights, new approaches and clearly indicates the need for permanent development for individual development. The growing complexity when moving from certainty via risk to uncertainty makes it impossible to develop a one-size-fits-all approach for requirement analysis. Our suggestion for knowledge sharing gives opportunities to facilitate problem-solving in different settings. Societal circumstances of growing uncertainty also make it clear that “proving the truth” is almost impossible and general solutions do not exist. Resilience, adaptive capability and flexibility of modern eLearning systems is crucial. Further research in this respect is an extreme necessity.

**REFERENCES**


