

CREATIVITY AND INNOVATION IN LEARNING: The Changing Roles OF ICT

Mehmet KESIM
Anadolu University
Open Education Faculty
Eskisehir, TURKEY

"Individuals from every corner of the flat world are being empowered. Globalization makes it possible for so many more people to plug and play, and you are going to see every color of the human rainbow take part." Thomas Friedman

(Friedman, 2005)

ABSTRACT

The notions of information, communication and technology constitute the underlying structure of the term ICT. While these elements have instigated change, the use of them has also incited change in a way that the notions of Innovation, Collaboration and Transformation have become keys to the application of ICTs. Similar to this new ICT triangle, the knowledge triangle addresses the issue of innovation as well. The knowledge triangle, consisting of education, research and innovation, is crucial to support personal and organizational development. The critical issue is that innovation intersects with both the new ICT triangle and the knowledge triangle. Any discussion regarding the relationship between the new ICT and knowledge would cover a very broad scope, including the relationships between education and society, and the interaction between knowledge and innovation. Under such circumstances, where such vast areas must be covered simultaneously; creativity, innovation and education will most likely be in the agenda of European education for a long time. As social changes take place towards a digital society, pre-established social connections have also been transferred and somewhat transformed into the digital domain. In this regard, e-learning seems to have a crucial role to succeed in keeping pace with the constant change.

Keywords: Globalization; creativity; innovation; learning ecology; new ICT triangle; knowledge triangle.

INTRODUCTION

Thomas Friedman argues that globalization have flattened the world by reducing barriers among states, individuals and corporations. These words indicate the constant growth and expansion that is taking place, binding every aspect of the world we live in. Friedman (2005) states that globalization began in 1492, and henceforth can be identified in three consecutive yet distinct eras:

Globalization 1.0: 1492-1800

This initial era of globalization reduced the world to a medium scale from the original large and vast state. Countries globalized during this era, in which aspects such as horsepower, wind power and steam power defined the significance and development prospects and methods of countries. Countries and their power were the major players of this era.

Globalization 2.0: 1800-2000

The second era of globalization in Friedman's three step approach reduced the previously achieved 'medium' state to a small size. The shrinking of this age was defined primarily by multinational companies, as they followed the suit of countries in their efforts in globalization.

Considering the timeframe of this era, it can be deduced that developments such as the industrial revolution, development of new technologies and their rapid advancement in accordance with Moore's law as well as social and political restructuring to accommodate such developments made this era one of significant change.

Globalization 3.0: 2000—

The final stage of globalization shrinks the world from 'small' to 'tiny' in that a power shift took place, inducing power on an individual basis. This defining aspect of the final age of globalization can be attributed to the ability of a single person to have their voice heard globally, and in turn follow every aspect of global events.

CREATIVITY

The dictionary definition of the word "creativity" is "the ability to create" or "the ability to produce something new through imaginative skill". Creativity is not only an innate ability or skill, but due to the habitual nature of it as a response to any given situation, it is a lifestyle, or an attitude towards life. While physical and biological similarity infers that everyone is capable of creativity, differences in personality, personal history and experiences as well as socio-cultural context simultaneously influence creativity. Due to these differences, creativity cannot be reduced to a single key element.

The National Advisory Committee on Creative and Cultural Education (NACCCE) presents a definition of creativity as "imaginative activity fashioned so as to produce outcomes that are both original and of value". This definition expresses five characteristics of creativity (Loveless, 2006, p.3):

- **Using imagination**
- **A fashioning process**
- **Pursuing purpose**
- **Being original**
- **Judging value**

These actions and approaches differentiate the problem solving aspects of creative individuals.

INNOVATION

The word 'innovation' comes from the Latin word 'innovare', meaning 'to renew, restore' (Latin and English Dictionary, 1988). Most definitions of innovation can be related to one or more of six dimensions (Dolan, 2008, p.6):

- Newness
- Innovation object
- Stages in the innovation process
- Systemic effect
- Level of analysis
- Outcomes

Pedagogical Innovation

In today's knowledge-based digital society, new and innovative learning approaches must be developed to ensure that both teachers and parents are supported throughout their curriculum via clear and applicable teaching guidelines and continuous teacher training. As such, pedagogically and didactically innovative approaches allow for better employment, self development and participation in the aforementioned transformed society through foreseeing future learning needs, skills and required competences. ICTs take part in this approach by their capability to support individual and personalized learning, in which learners are not merely recipients of knowledge but are knowledge builders as well (SEC 2008, 2629 final, p.11).

Technological Innovation

Together with the shift to a digital society, technological innovation has resulted in the ability to utilize various tools for the establishment of new learning environments. The shift to a digital society also brings the need for new production, distribution and access methods to digital resources. The advanced networking capabilities and personalization options of new technologies allow various tools such as phones, game consoles and media players to act as gateways to new mobile learning environments. The unification and convergence of digital media enable cross-platform interoperability with developments such as podcasts, digital TV and radio (SEC 2008, 2629 final, p.12).

Organizational Innovation

There is a current evolution taking place, in which schools are transforming into learning centers, universities into learning service providers, companies into learning organizations and cities and regions into learning support environments. The uses and impact of ICTs in education and training will also be compounded through organizational change, inciting growing e-maturity. Individuals that play a role in organizational and operational innovation such as learners, teachers and workers must be involved as collaborative approaches require innovative use of ICTs (SEC 2008, 2629 final, p.13).

Innovation is a function of creativity and requires trust, openness and a spirit of experimentation in which seemingly random thoughts are allowed to unify for re-creation (Knowledgesingle, 2006, p.90).

LEARNING ECOLOGY AND LEARNING NETWORKS

While (Brown, 2000, p.19) defines ecology as basically an open, complex, adaptive, dynamic and interdependent environment which evolves and self-organizes, (Siemens, 2006, p.11) defines a learning ecology as follows:

- **An environment that supports / fosters learning**
- **Adaptive, dynamic, responsive**
- **Self-organizing / individuality directed**
- **Structured informality**
- **Diverse**
- **Alive**

Learning / knowledge is a dynamic, living and evolving state. Components of knowledge sharing environments are (Siemens 2003):

- **Informal, not structured**
- **Tool-rich**
- **Consistency and time**
- **Trust**
- **Simplicity**
- **Decentralized, fostered, connected**
- **High tolerance for experimentation and failure**

The connectivist understanding of learning asserts that informal learning is a key element to providing the flow of information in connected societies. Considering that the key element of learning in such societies is the establishment of connections, the available infrastructure and new developments in ICTs provide the technical tools necessary for addressing the changes taking place in learning ecologies. The connectivist approach to these changes provides us with a better understanding of what is changing, why it is changing and how we can keep up with the change (Kesim, 2008, p.5).

Siemens states that the key to network learning is the connections between nodes, and the ecology is the environment in which the network occurs. The health of networks residing within the ecology is also influenced by the ecology in which the learner exists hence the ecology of the learner and the learning ecology in which the network occurs are related. It can be deduced that since the connections between nodes are key elements in network learning, variables that influence these connections and nodes will also have an effect on the network and its ecology. Compromising the components of knowledge sharing environments Siemens states would also result in a disruption in the evolving and dynamic nature of learning and knowledge (Siemens, 2005). The simple definition of a network is connections between entities. Regarding learning ecologies, a network is a way to organize a learning community which in turn results in a personal learning network. A network comprises of two or more nodes which are connected to be able to share resources. Each node acts as a connection point to a larger network. Individuals, information sources and even whole learning communities can be seen as nodes. Each node may act as a gateway to all the other nodes that it has established links with, thereby allowing each node that it is connected to access to other nodes.

In that respect, learning communities also rely on the establishment of new connections for the development and retention of information flow (Marhan, 2006, p.212).

CHANGING ROLE OF ICT FOR CREATIVITY AND INNOVATION

The New ICT Triangle

While the use of ICT in many fields is a development and change itself, ICTs have also been undergoing change in a way that the notions of Information, Communication and Technology are no longer sufficient. While these elements have instigated change, the use of them has also incited change in a way that the notions of Innovation, Collaboration and Transformation have become keys to the application of ICTs. Therefore, the underlying fundamental understanding of ICT is paving the way and laying down the infrastructure to the "New ICT". Previously, ICTs were the changes that justified new infrastructure investment, while it appears that in the future, ICTs will be the infrastructure required for innovation, collaboration, transformation and change (Table: 1). ICT has transformed society and the economy. The challenge is now to achieve equally innovative transformation of the provision of education and training. E-learning has a key role to play in achieving this result (SEC 2008, 2629 final, p.11).

Table: 1
Components of old and new ICT (Trilling, 2005, p.40)

Old ICT	New ICT
Information	Innovation
Communication	Collaboration
Technology	Transformation

The New ICT triangle consisting of transformation, collaboration and innovation is provided in Figure: 1 below:

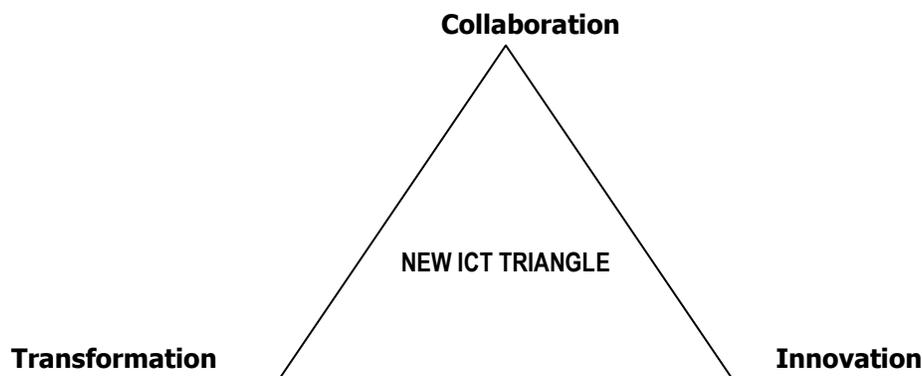


Figure: 1
The new ICT Triangle

The Knowledge Triangle

The knowledge triangle, consisting of education, research and innovation, is paramount in supporting the development of jobs and growth (COM, 2007, 703 final, p.2). The education aspect of the triangle is in need of development, with strengthening beginning in early stages: schools (Figure: 2). Schools provide new competences and learning habits which provide the opportunity for further development of established skills as well as the development of new skills. This in turn increases job opportunities. The European Council has constantly stressed the importance of education and training in the long term plans of the Union. The achievement of such goals depends on the acceleration of reforms, further excellence in higher education and the promotion of creativity and innovation in all aspects of education and training.

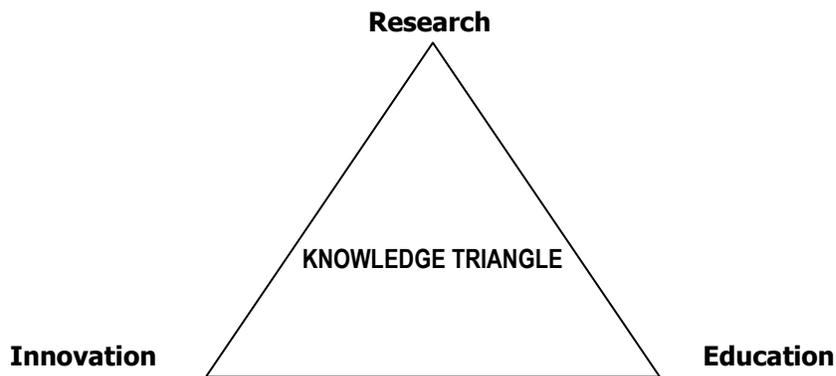


Figure: 2 Knowledge Triangle

The following diagram displays how innovation intersects with the knowledge triangle and the new ICT triangle (Figure 3).

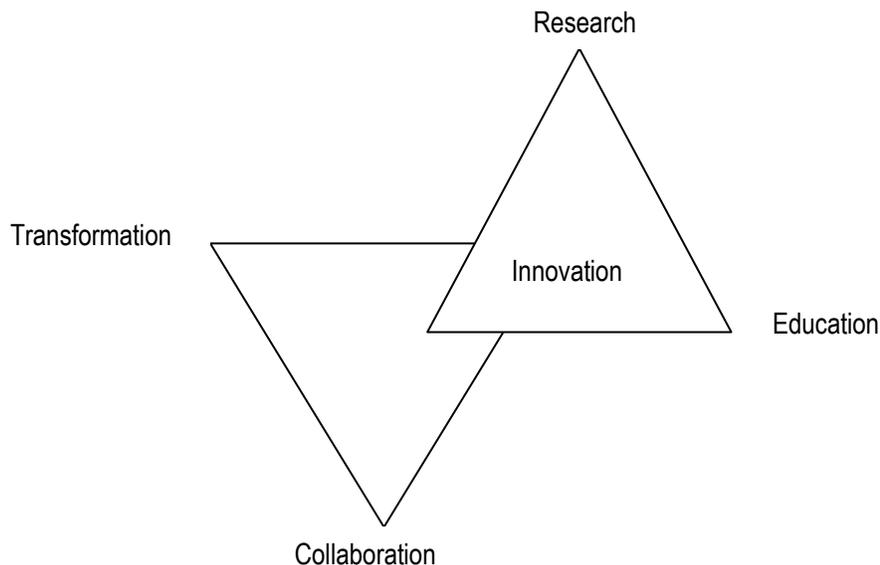


Figure: 3 Intersection of the New ICT and Knowledge Triangle

Any discussion regarding the relationship between the new ICT and knowledge would cover a very broad scope, including the relationships between education and society, and the interaction between knowledge and innovation. Under such circumstances, where such vast areas must be covered simultaneously; creativity, innovation and education will most likely be in the agenda of European education for a long time. Such long-term debates and discussions are understandable, considering the scope of the subject.

CONCLUSION

The development of ICTs has resulted in a dramatic change in the society and the global economy. A similar change is necessary in education and training to comply with the social and economic change. In this regard, e-learning has an important role to succeed in keeping pace with constant change. The changes required involve integrating ICT tools and applications to all aspects of education systems (e.g. teaching, learning, management, administration). While investment in infrastructure is of necessity to provide the platform required for ICTs, lifelong learning endeavors will also make the best use of similar investments. More specifically, ICTs provide easy access to learning resources, individualized learning experiences and cover innovative learning tools and resources, which in turn enables lifelong learning.

As such, infrastructure investments are further utilized through the development and initiation of lifelong learning. In this regard, innovation and change must be integral parts of education. To keep up with the constantly changing society, educational systems must provide innovative content and services that allow the development of required knowledge and skills in an innovative society. ICTs can be used innovatively in education on a very broad scale, with the capability to provide necessary tools and content for educational systems to meet the needs of the society. As social changes take place towards a digital society, pre-established social connections have also been transferred and somewhat transformed into the digital domain. Society has been shifted into virtual communities by these technologies, and has managed to expand and develop even further by doing so.

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BIODATA and CONTACT ADDRESSES of AUTHOR



Mehmet KESIM received his MSc.Degree from Karadeniz Technical University, Trabzon-Turkey in 1974 as an Electronic Engineer and received his Ph.D. Degree in the field of Cinema and Television from Anadolu University, Eskisehir in 1985. He trained as an Video Engineer in Ampex Corporation, Reading/UK and Bosch Fernseh, Darmstadt / Germany. He was the chair of the Television Technical Projects by Germany for Anadolu University, Eskisehir. He has extensive experience in the field of digital television projects, with various accomplishments regarding the establishment of television studios.

His focus is on the application of New Communication Technologies in Distance Learning. He is currently full Professor and Vice Dean of the Open Education Faculty of Anadolu University, member of EDEN (European Distance and E-Learning Network) and Editorial Board Member of EURODL (European Journal of Open, Distance and E-Learning). He has various publications on new communication technologies and their use in distance learning. He teaches undergraduate and graduate courses on Television Techniques and Distance Learning Technologies.

Prof.Dr. Mehmet Kesim
Anadolu University
Vice Dean of Open Education Faculty
26470 Eskisehir, Turkey
Tel : +90-222-3307444
Fax : +90-222-3350639
Email : mkesim@andolu.edu.tr

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