

Challenges in Technology and Its Influences on Education and Training

Antoinette Darling, Martha Osei-Yaw, and Leonard Sheehy



ABSTRACT – This article, devoted to the examination of education technology trends in Europe, explores the relationship between access gaps and integrative technology offered in K-12, higher education, and corporate settings. Using rich data from reports, experts in the field, and surveys, the researchers estimated that education technology leaders must be at the forefront of promoting creativity and innovation in the field of technology and education. If educators in those three environments expect their students to be trailblazers, then they should be on the cutting edge themselves. Technology education has evolved in past decades and is still experiencing exponential change. The new ways in which people work, communicate, and learn has caused this evolution, and the speed with which new technologies enter the marketplace challenges traditional methods. On a parallel course, institutions with access to highly equipped digital resources are at a greater advantage than those that are less equipped with internet communication and technology access. The implications for technology and education management in Europe are challenging and exciting.

Keywords: educational technology, Europe, EU28, future trends, access gaps, STEM education

Introduction

Europe is currently experiencing a digital divide because of large access gaps across vast geographic regions. Technological resources and the effects of Internet and communication technology are just two of the factors that are impeding the progress of decreasing these access gaps. One of the biggest challenges may well be the cost factors associated with integrating technology into primary and secondary settings as well as university and corporate classrooms. This was a concern for almost 70% of university students across European campuses in the late 1990s (Marchessou, 1999). Other factors are the legal and ethical issues associated with distance learning. It is essential to engage and motivate learners in order to maximize the use of technology throughout all types of learning environments. Faculty, teachers, and administrators have to recognize that if learners are going to use technology in the classroom, educators must find ways to keep the content meaningful and current. As governments and corporations expand and adapt to the ever-changing needs of the society and the economy, they must think globally and act locally.

Figure 1: The European Union (EU28)

Austria	Estonia	Italy	Portugal
Belgium	Finland	Latvia	Romania
Bulgaria	France	Lithuania	Slovakia
Croatia	Germany	Luxembourg	Slovenia
Cyprus	Greece	Malta	Spain
Czech Republic	Hungary	Netherlands	Sweden
Denmark	Ireland	Poland	United Kingdom

Source: European Union, 2014

The Digital Divide in K-12 Education

The digital divide can be viewed as one of the main barriers to the growth of Internet and Communication Technology in academic institutions throughout both developed and developing countries. From a national perspective, the digital divide can be defined as the gap that exists between those countries that have access to advanced technologies and those that



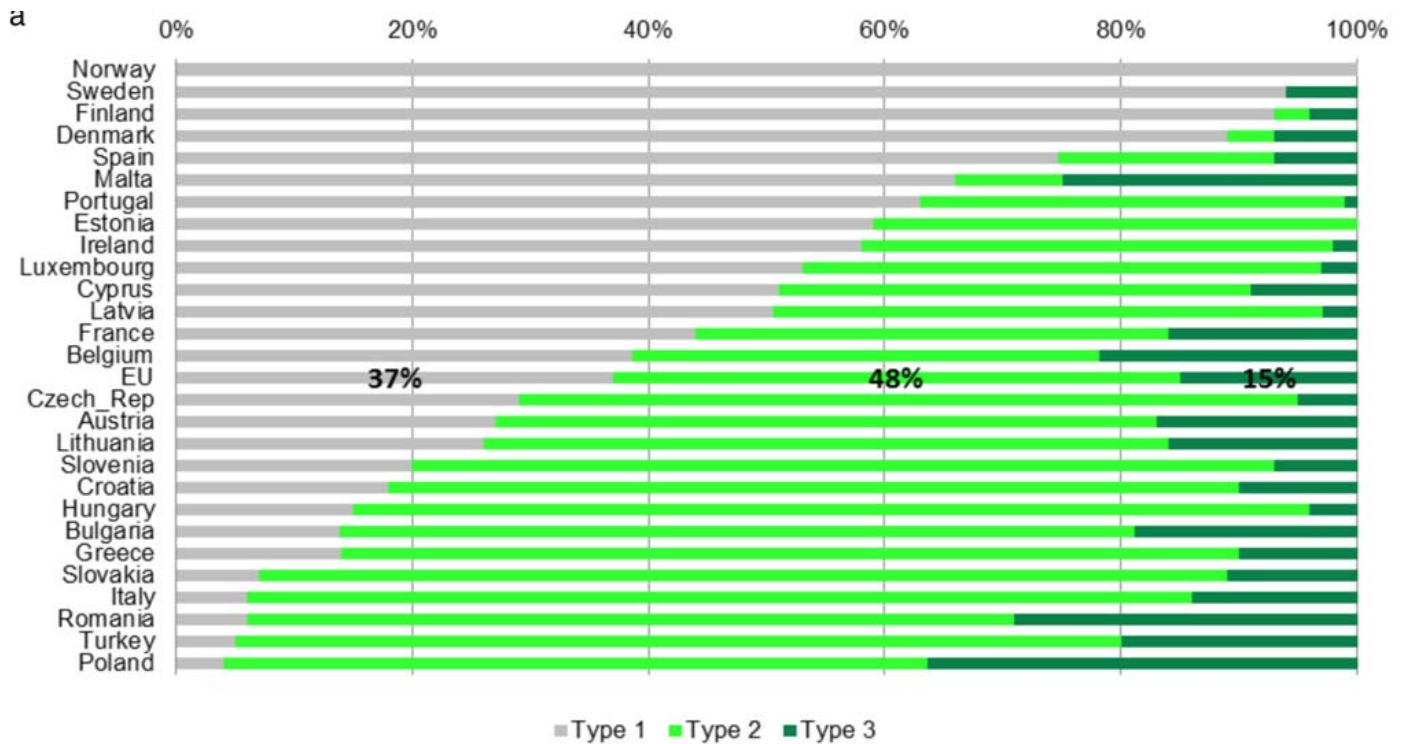
do not (Gasco, 2005, as cited in Afacan et al.). In a synthesis report based on data collected for over two decades, the Study of the Impact of Technology in Primary Schools (STEPS) reported that computers in classrooms are a reality in some European schools while other educational settings rely heavily on computer labs. These findings are based on data gathered from 30 countries and over 270,000 schools which were involved in this study (Balanskat, 2007).

Internet and Communication Technology Structures in Schools

Numerous state-of-the-art tools are being incorporated throughout the European nations. Interactive whiteboards are one of the primary devices being utilized in many schools across Europe, most notably in the United Kingdom, the Netherlands, and Denmark. According to the STEPS report, in some countries such as Finland, the cost factors associated with interactive whiteboards have resulted in limited access to the devices. Research studies from the United Kingdom indicate that interactive whiteboards engage and motivate students while facilitating cross-school use of ICT (Wastiau et al., 2013). However, interactive whiteboards are not the only tools being offered in K-12 academic settings. "There is a clear trend towards laptop purchases in primary schools, probably because of their greater versatility and smaller footprint" (Balanskat, p. 14).

Denmark, Estonia, and Norway have been known for having the highest levels of platform use. Tablets with a wireless network and a wireless data projector that are enabled to move around among the students are found to be the most functional devices for classroom use in schools across the EU28, Iceland, Norway, and Turkey (Wastiau, 2010 as cited in Wastiau et al.). Furthermore, there are nearly twice as many laptop computers per 100 students in secondary schools in the European Union as compared to the data from 2006. Broadband usage is currently at 95%, indicating significant increases compared to 65-75% in 2006 (Wastiau, p. 14). These findings may very well indicate that the EU is continuing to work towards meeting the needs of 21st Century learners.

Figure 2. INTERNET COMMUNICATION AND TECHNOLOGY ACCESS



Source: The Use of Internet and Communication Technology (ICT) in education: A Survey of Schools in Europe, 2013

- Type 1: Highly digitally equipped school, i.e. high equipment level, fast broadband, high connectedness (school website, virtual learning environment, teacher/student email accounts, etc.)
- Type 2: Partially digitally equipped school (slow or no broadband access)
- Type 3: Low digitally equipped school (no connectedness)

In a survey of schools in 2011, ICT in Education was commissioned by the European Commission Directorate General Communications Networks, Content and Technology, to assess and establish a benchmark for the use and attitudes of ICT in educational institutions across the EU28, Iceland, Norway, and Turkey. Data from the 31 countries was collected from primary level education, lower secondary level education, and upper secondary level education. The results demonstrate that in countries such as Denmark, Finland, Norway, and Sweden students have access to highly digitally equipped schools as compared to students in Portugal, Ireland, and Luxembourg. Some of the causes that can be attributed to this disparity include lack of financial resources and limited accessibility to technological infrastructures (see Figure 2).

Current Challenges

One of the top priorities in Europe is to transform current technological infrastructures in order to compete globally with other countries outside of the European Union. Even though the day-to-day penetration of ICT continues to gain momentum, there is still a disparity between countries within the EU. Even though technology usage has increased globally, the findings have concluded that there is a considerable discrepancy with Internet usage between developed and developing countries. While in developed countries 71.6% of inhabitants are Internet users, in developing countries only 21.1% of the population is using the Internet (ITU, 2010 as cited in Afacan et al., 2013). These findings are significant because Internet usage not only affects such industries as businesses and health, but it also greatly impacts the educational systems that make up the European nations.

The Future of European Higher Education: A Technological Impact

The technological focus in training varies between business and higher education—and this



is significant in a country's development (Birnbach, 2001). Higher education's distinctive combination of goals, tasks, employees, governance structures, values, technologies, and history makes it distinctly stand out from the corporate world (Altbach, Gumport, & Johnstone, 2001; Thelin, 2004). Higher education in Europe differs from the United States. In Europe the educational mission focuses on political, administrative, and economic unification. For example, a country such as Russia faces leadership challenges as it shifts to adjust to changing cultural values of students and the community. In Germany, there are economic and infrastructure differences as the country seeks to balance technology availability and use in what was formerly West Germany and the former communist Eastern federal states (Nistor, Gogus, & Lerche, 2013). It is important to keep in mind that among European countries there are differences in terms of technological and educational infrastructure. In Western Europe, television and technological advancements are molding undergraduate minds, values, and essentially their way of life, which is growing at a startling rate (Nachimuthu, 2012). These undergraduates are changing—from the radical center of education to the mindset that their core values have them taking charge of how they should use technology. The focus is no longer how technology policy-making and planning by governments should influence their lives. An example of this is how undergraduates are using technology in the form of social media to look for truth and value and not rely solely on what their government reports.

Distance Education

Online learning is gaining a firm foothold within universities around the world—and at a rapid pace within Europe. In this regard, higher education in Europe is leveraging global innovations to put education within the reach of more and more individuals around the world (Bolman & Gallos, 2011).

Thanks in part to the success of the British Open University, distance education has found acceptance and success. Well-known European distance education programs are found in Belgium, France, Germany, Italy, the Netherlands, Portugal, and the United Kingdom (Albrechtsen, Mariger & Parker, 2001). Ireland is also making its mark as a leader in the research and development of new and emerging technologies and their incorporation into education (Marchessou, 1999).

In addition, the dissolution of the former Soviet bloc and the development of the European Commission have opened new avenues for expanding knowledge and collaboration among the European countries. This availability of computers and the Internet and the technological savvy of many Europeans are continuing to provide the necessary conditions for a strong distance learning society. In addition, technology may be disruptive in ways not intended, as it results in higher incidences of plagiarism, cheating, and blatant distraction as European students become more mesmerized with easy and ready access to mobile technologies. The higher education environment is both influencing and being influenced by the type of technologies needed to advance educational goals.

Technology on College Campuses and in Society

Technology is having a strong impact on campuses. Just like students, faculty have to adjust to the use of new digital technologies in the university environment. As technology is constantly changing, teaching faculty need regular support to keep up to date. Therefore, greater effort is needed in the area of professional development training for faculty so that they can continue to keep university students engaged. Denmark shares an active tradition of adult education and lifelong training which is naturally technology oriented (Marchessou, 1999). The Norwegian education scene is quite similar. With strong public support, they have had an IT plan established for the same length of time and with the same objectives as Denmark has had while offering interesting initiatives in distance education. In Sweden, the long tradition of public commitment to educational technology remains, but recent purse-tightening as a result of the recession has led to a shift. Moving further south, Italy and Spain present similarities and differences: in both cases, domestic



development of educational multimedia has been ahead of many other countries.

Distance education has bridged geographical boundaries and has leapt across the continent. It remains a key player in alleviating imbalances when it comes to the integration of educational technologies in the college/university environment. Things are quite different in the United Kingdom with its strong, well-established tradition of on-line and distance learning and public initiatives. To this end, several pan-European societies have been created over the decades. While some of these academic institutions originally focused on the traditional book-and-paper media, the development and use of modern technologies has become a major part of these societies' networking (Albrechtsen, Mariger & Parker, 2001).

Regarding technology and its educational use, Germany displays high technology diffusion, while Turkey and Romania make efforts to intensify their use of educational technology. While distance education is a necessity for Turkey, it comprises a relatively small part of higher education in Germany—and it is still operating as an experiment in Romania (Nistor, Gogus, & Lerche, 2013). It is well-known that the technology gap is widening between developed and developing countries.

If distance education is to spread across campuses and through Europe, then consideration must be given to the particular needs of European countries with lesser means. This may mean that the very technology that is part of widening the gap can also be used to close it. Over the next decade, advanced technologies will put education within the reach of many more students; therefore, teaching methodology will have to be restructured as well, to support the growth of technology on college campuses.

Implications for STEM Educators

It seems to be an accepted idea that college programs in the domains of STEM promptly adopt top technologies and their related educational applications, promoting them in creative new ways (Wang, 2010). Presumably, the fast technology diffusion within universities is because STEM professionals possess more related knowledge and skills which, in turn, can affect change in higher education throughout European classrooms, communities, and the corporate world. The goal for university educators should be to provide meaningful opportunities for their undergraduate students to engage in cultural discussions and realize that culture will always surround their lives: personal, educational, technological, and professional.

There are at least three innovations that come to mind in the higher education environments which have achieved so much momentum through

wide implementation in the university culture at large and which cannot be ignored by educators in Europe. These are social networking, mobile and handheld computing devices, and gaming. These are almost guaranteed to have permanent roles in higher education.

Social networking and Web 2.0 applications have been spectacularly successful in Europe on a large scale (Maddux & Johnson, 2011). However, true integration of technology will require solving the problem of differential access to technology-related, effective learning experiences.

Whether it is a business, a public entity, or a non-profit association, it is now impossible for an organization to function without using digital technology in its external and internal communications. The digital organization needs to coordinate communications and instruction with its key groups—its staff and administrators—and the best avenue for this to happen will have to be through corporate training efforts.

Technology and Corporate Training

The manner in which workers learn requires that companies become more flexible and responsive in their training. The current workforce has more information available to them at faster speeds and the nature of their jobs requires that they collaborate and share information. Employees learn best by doing their jobs. Studies have shown that skills in the workplace are gained from trying new solutions, making mistakes, and asking questions of colleagues and friends (Simmons, 2014). Employees now gain knowledge by participating in personal and professional networks and communities. Informal conversations and group meetings are more likely to supply knowledge than traditional training sessions. Google, external blogs, and news feeds are resources for employees today. Managers need to recognize this and use technology as a training tool, allowing their employees to learn from networking, not top-down structured instruction (Hart, 2012).

Developing a culture of collaboration is the foundation of propagating knowledge today. The keystone to creating this philosophy is trust. European corporations are slower to grant trust; however, once it is bestowed, the relationship lasts longer than in the United States (Fitzpatrick, 2014).



This collaborative culture is less of a geographical issue than a generational one. Younger workers are more likely to share and build social networks than older ones because they have been exposed to this environment most of their lives. All members of the workforce, however, can develop confidence in this system if management provides a motivating atmosphere by creating a collaborative infrastructure (Cross, 2013).

This collaborative infrastructure is based on the theory that learning depends on the different perspectives among co-participants (Lave & Wenger, 1991). Learning, understanding, and meaning are not self-contained structures, but depend on a team of individual contributions. The final outcome should not be focused on the knowledge level of one person but the aggregate value of participation of the entire group (Lave & Wenger, 1991). Collaborative infrastructure is the network that links workers with workplace learning activities: information, customers, news, models, plans, directives, gossip, and other colleagues (Cross, 2013). Corporate training officers need to develop a culture that takes advantage of all these areas. Expertise locators, content management systems, blogs, feeds, search tags, and indexes are some of the tools in which workers require training in today's world. These provide employees with the ability to share solutions to problems and come up with new ideas.

Leaders need to recognize that learning now takes place every day at the workplace. Organizations need to create cultures that foster this environment by removing obstacles, developing communities, encouraging networking, and stimulating conservation. Learning must take place at work because the pace of progress is faster than ever before and organizations that fail to recognize this will die (Simmons, 2014).

The CEO and Chief Learning Officer of Internet Time Alliance suggests implementation of the following steps to create a collaborative culture:

1. Focus on all workers, not just those that are new or need the most help.
2. Don't punish failed experiments; if you never fail, you are not innovating.
3. Create a directory that enables people to locate information from the correct individual.
4. Encourage people to present their work to others.
5. Root out information hoarding; make sharing the norm.
6. Reduce cycle time with instant messaging, Twitter, and podcasts; the world is not going any slower.
7. When feasible, substitute self-service and peer learning for workshops (Cross, 2013)

At the same time corporations and countries must find a way to narrow the digital divide. The new collaborative culture cited above would impact individuals who do not have access to the current knowledge base and will not have the same opportunities for collaboration as employed people. Second, smaller companies with fewer employees will have less of a community of information from which to draw information.

Recommendations

- Develop the infrastructure for the network of public Internet access points (PIAPs) throughout Europe.
- Create a plan to narrow the gaps in performance between the countries within the European Union.
- Create common policies for ICT development and teacher professional training across the European Union.
- Create programs to address inter-European synergies so that student mobility and community learning can be achieved.
- Invest funding and offer teacher training so that language barriers can be addressed through linguistic instruction either through international conferences and workshops or through video and multimedia avenues.



Conclusion

The relationship between technology and learning is one of the most important topics in higher education in Europe—and increasing in importance. While there are many areas of concern related to this topic, Van Dusen (2000) has alluded to three primary areas that should be addressed: issues of access and equity, issues of cost and affordability, and issues of quality and effectiveness. Not surprisingly, these represent the same three areas of critical challenge to the success of colleges and universities in other regions, as the struggle to make higher education more accessible, more affordable, and more effective is examined in European academic institutions.

This article provides a brief analysis of the major challenges to enhance teaching and learning with technology in European schools, institutions of higher education, and corporate institutions.

It also highlights those areas that can be further improved or developed especially in cases where technology carries a significant amount of risk and when its implementation does not meet specified goals or outcomes. The basic issues that can cripple technology usage in K-12 settings are also the items that are needed to support technological functions in higher education. This is not to say that technology cannot serve as a fertile source of management ideas and innovations—but not at the expense of the cultural values of the human capital and the need to bring about progress within academic institutions and the corporate world.

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About the Authors

Antoinette Darling was born and raised in Nassau, Bahamas and currently serves as the Electronic Resources Librarian at The College of The Bahamas. She also teaches education, communication, and first-year seminar classes on a part-time basis. In 2007, she graduated with a Bachelor's Degree in Communication with Applied Technology, then with a Master's Degree in Library and Information Science from Drexel University. Research and lifelong learning have become a passion and her most recent accomplishments have been the acquisition of a second Master's in Adult Education from the University of the West Indies and enrollment in the Educational Technology Leadership Doctoral Program at New Jersey City

University. Antoinette Darling is married to Stephen Darling. apinderdarling@njcu.edu

Martha Osei-Yaw is currently an Adjunct Professor at New Jersey City University. She is also an Assistant Principal at Alexander D. Sullivan School in Jersey City, New Jersey. The majority of her career has been dedicated to urban education in elementary school settings. She began her career as a bilingual education teacher and later shifted gears as a Spanish teacher for a pilot program at Ezra Nolan Middle School. Mrs. Osei-Yaw completed a Master's Degree in Bilingual and Bicultural Education from Seton Hall University as well as a Master's Degree in Administration and Supervision from Saint Peter's University. At the present time she is pursuing a Doctoral degree in Educational Technology Leadership from NJCU. msosa@njcu.edu

Leonard Sheehy is a technology teacher at Randolph Middle School in Randolph, New Jersey. He currently teaches robotics, computer programming, and crime scene investigation classes. Mr. Sheehy is also employed by the United States Army as a STEM instructor. He works with scientists and engineers to develop and implement hands-on, state-of-the-art lessons and activities for the camp located on the base at Picatinny Arsenal. He is also the robotics club advisor and head of the sixth grade ski club. Prior to this position Mr. Sheehy taught physics and chemistry at Randolph Middle School. Mr. Sheehy is currently enrolled in the Educational Technology Leadership Doctoral Program at New Jersey City University. nedley@optonline.net