

Towards University 2.0: A Space where Academic Education Meets Corporate Training

Roumen Nikolov

Faculty of Mathematics and Informatics, Sofia University,
James Bourchier 5, 1164 Sofia, Bulgaria
roumen@fmi.uni-sofia.bg

Abstract

The paper analyses the need of an institutional change of the universities in order to adapt to the current requirements of networked and knowledge economy. The e-Learning phenomenon and the ICT driven global educational reform are analysed as well in parallel with the needs of implementing new pedagogy models. Some university models are briefly described, such as: Research University, Entrepreneurial University, eUniversity and Corporate University. The paper puts its attention also on the Web 2.0 technologies and their influence on the new business models. The emergence of the Enterprise 2.0 model is briefly described. University 2.0 is defined as *a research and entrepreneurial university which integrates Web 2.0 technologies and applications in all university activities, including ones with all knowledge intensive stakeholders, and implements the features of the Enterprise 2.0*. The role of the community of practice and the open innovation is analysed. The case of Sofia University that has developed a new computing curricula and strives to implement the European e-Competence Framework by applying the University 2.0 model has been analyzed and presented as well.

Keywords

Knowledge Society, e-Learning, Web 2.0, Enterprise 2.0, University 2.0, life-long learning, competence development, ICT practitioner

1. Introduction

The recent fast developments of Information and Communication Technology (ICT) and its deep penetration into the society caused a dramatic change in the way people live, learn and work and this process is accompanied by social, industrial, and organisational reconstructions and innovations. The economist Fritz Machlup, who is known as the pioneer who developed the concept of the **Information Society** and discovered the so called *Information Economics* (Machlup 1962), considers university, being a center of knowledge production and teaching, as a *Knowledge Factory*, equated to an industry (Machlup 1980). Clark Kerr, former president of the University of California, Berkeley, cited Machlup's notion of the *Knowledge Industry* in his influential book *The Uses of the University* (Kerr 1963). Kerr laid out his views that **a large modern university had to operate as a part of society, no longer as an ivory tower apart from it**.

The terms *Information Society* and *Knowledge Society* has been matter of interest and analysis for many researchers, politicians, technologists, educators and other stakeholders in the process of global change. Knowledge has been at the heart of economic growth and the gradual rise in levels of social well-being since time immemorial (David and Foray 2003). Knowledge economy is based on the activities of groups of people who produce and exchange (co-produce) new knowledge on a mass scale using ICT. David and Foray analyse the start of the digital era as a revolution in knowledge instruments since ICT influences the technologies used to produce and distribute information and knowledge. Since the beginning of the 20th century we have seen a new characteristic of economic

growth in the form of greater *intangible* capital as compared to *tangible* capital (Abramovitz and David 1996).

The Lisbon strategy and its objective to make Europe “*the most competitive and dynamic knowledge-based economy in the world*” led to a number of important policy initiatives (EC 2000). The Kok’s Report (EC, 2004) re-confirmed that Europe’s future economic development would depend on its ability to create and grow high value, innovative and research-based sectors capable of competing with the best in the world. Among the main measures for achieving the Lisbon goals, the Kok’s report emphasizes that Europe needs to build a “*creative interaction between universities, scientists and researchers on the one hand and industry and commerce on the other, which drives technology transfer and innovation, being necessarily rooted in the close physical location of universities and companies*”.

There are many models of fruitful cooperation between businesses and universities. Tripoli provides several examples of project based learning activities which prove the statement: “*Businesses, after all, need new hires from universities to staff their own sustainability programs. Universities, in turn, can use a good dose of corporate expertise to keep their curricula current*” (Tripoli 2008).

2. The e-Learning Phenomenon

The wide penetration of ICT into society catalyses the need a **global educational reform** which will break the monopoly of the print and paper based educational system. The ICT based distance education is considered as “*the most significant development in education in the past quarter century*” (Moore 2003). It is observed a process of globalization of higher education based on ICT, and especially – on Internet. Any higher education institution aims (or - should aim) strengthening its position in the global educational environment by relying on e-learning and life-long education. The pattern of growth in the use of ICT in higher education can be seen through (Price et al 2005):

- increasing computing resources, including web-based technologies, encouraging supplemental instructional activities, growth of academic resources online, and administrative services provided through networked resources;
- organizational changes in policies and approaches;
- increasing emphasis on quality of teaching and the importance of staff development;
- changes in social practice, e.g. a growth in demand for life long learning opportunities, which consequently affect the need to adapt technology into instructional delivery;
- increase in average the age of students.

The observed global educational reform leads to new pedagogy models (Nikolov 1997; Nikolov 2008b). One of the main conclusions related to the ongoing educational reform is that it is based on designing and using different **virtual learning environments** which do not put clear boundary between **physical and virtual worlds**. A key factor for success is to integrate these worlds, not to separate them, and to apply relevant instructional design strategy based on a current learning theory.

A recent analysis shows that “*e-learning is no longer something separate from mainstream learning. e-Learning is taking root in departments, usually but not always with (at least tacit) support from central units, as part of an evolution. The process is steady and irreversible but currently the purpose and usage of e-learning are locally determined. The sometimes difficult task for an higher education institution is to operate as a whole, integrating activities into its Learning and Teaching and related frameworks, modifying both if necessary*” (Slater 2005). A number of tensions within existing thinking in university educational activities are observed, such as: between the benefits for an individual academic and those for the university, between developing more materials and deploying existing material more effectively, and between fundamental educational research and descriptions of monitored development and usage. The **most supported model for deploying e-learning is to “embed” it into all other university educational activities**. This could represent a view that the universities may soon no longer need financial encouragement to engage with e-learning, but rather will need support with structures and models, and with finding appropriate standards and procedures. It is also emphasised that “*the uptake of IT in academia has been research led and it is now very hard to be research active without exploiting computing and networking technology*”. The international research virtual communities are currently the norm but people do not claim to do e-research – they

merely rely on ICT in doing research. Integrating ICT into administration (e-administration) is also in process of mass development although there is a strong opposition from some of the senior faculties who do not like extending the channels for communication with peers, students and other stakeholders and use online university administrative services. The same holds for using library (e-library), campus and global resources. The further e-learning adoption needs also building a culture and developing a complete system for quality assurance procedures. **The global competition in the education market requires development of new strategies and business models which are more known in the business world.** A convincing example for such needs is the failure of the \$113 million UK eUniversity project (Garrett 2004).

3. Current University Models

The colleges and universities are investing in the new technologies mainly for market driven reasons (Dumestre 1999). The students and faculties expect the university to be up to date with the latest technological tools. The universities are looking for ways to attract students beyond their campuses through distance education. In addition, the current employment trends show that the industry needs much more well educated ICT professionals than ever (IFIP 2008). At the same time the universities should be transformed in order to integrate e-learning in their strategies and developments along with adopting new forms of education and training, such as life-long learning, informal learning, professional training, etc. While looking for good models of transformation we can rely on some well-known models, such as: *Research University* (Boyer Commission 98), *Entrepreneurial University* (Clark 1998) and *Digital University* (Bode 2007), which in many points overlap and enrich each other. These models correspond in many points to the Marchup's vision of university as a centre of knowledge production and teaching - *knowledge factory*. In order to fulfil its role and to be competitive (locally and globally), the *university-enterprise* should be managed in an enterprise-like way and implement an integrated *Enterprise Resource Planning* (ERP) system. Other models which should be taken into the consideration are *Science Park* and *Knowledge Park* which could be used as instruments for establishing better links between universities and industry (Kanwar and Daniel 2008). These models have their origin in the model of the early fifties when the Stanford Research Park (1951) and the Cornell Business & Technology Park (1952) were established. These parks ensured that academic institutions could continue to engage in leading edge research as well as to promote technology applications as an entrepreneurial venture to support their operations. Today, the Stanford Research Park has 140 companies in electronics, software, biotechnology and other high-tech fields and employs 23,000 persons.

A *Corporate University* is “an educational entity that is a strategic tool designed to assist its parent organization in achieving its mission by conducting activities that cultivate individual and organizational learning, knowledge and wisdom” (Allen 2002). It was reported that by the early 1980s there were 400 corporate universities in the U.S. while in the 1990s that number increased to 1,600 and 40% of Fortune 500 companies established their universities. It is predicted that the number of corporate universities will exceed the number of traditional universities in the USA by 2010 (Corporate University Xchange 1999). Many traditional colleges and universities feel threatened by the corporate university phenomenon (Dumestre 1999). This phenomenon occurred because the American higher education does not meet the needs of workers in a changing economy. Kleingartner and Jiang stated that “*Because of its anyone, anytime, anywhere capabilities, Online training is a significant component of the training strategy for an increasing number of corporations. Since about 1995 there has been a virtual explosion in the use of Online training*” (Kleingartner and Jiang 2001). As a result, the employer paid programs to train their employees became a big business in the U.S. Since the demand for training increases while the budget is limited, many companies adopted web-based training and started looking for online courses from training suppliers, consulting firms and universities. For instance, Motorola University, in addition to the content provided by commercial web-based training providers, obtains a lot of content from individual faculty members and research laboratories around the world that are not connected to Motorola.

4. Web 2.0 and Enterprise 2.0

The emergence of the so called *Web 2.0 revolution* is widely recognized (O'Reilly 2005). O'Reilly and his collaborators consider Web 2.0 as a synonym of a new generation Web: "*The central principle behind the success of the giants born in the Web 1.0 era who have survived to lead the Web 2.0 era appears to be this, that they have embraced the power of the web to harness collective intelligence...*". He defines the core competencies of Web 2.0 companies:

- Services, not packaged software, with cost-effective scalability;
- Control over unique, hard-to-recreate data sources that get richer as more people use them;
- Trusting users as co-developers;
- Harnessing collective intelligence;
- Leveraging the long tail through customer self-service;
- Software above the level of a single device;
- Lightweight user interfaces, development models, AND business models.

Such companies are: Google, Yahoo, Amazon, eBay, etc.

According Gardner "*Although Web 2.0 is now entering the Trough of Disillusionment, it will emerge within two years to have transformational impact, as companies steadily gain more experience and success with both the technologies and the cultural implications*" (Gartner 2008). The Web 2.0 technologies influence the business world and the notion *Enterprise 2.0* has been introduced (McAfee 2006). McAfee gave the most cited definition: "*Enterprise 2.0 is the use of emergent social software platforms within companies, or between companies and their partners or customers.*" The Enterprise 2.0 model provides opportunities for company improvements in the area of innovation, collaboration, knowledge sharing, using collective intelligence and searching and discovering. This model is gradually adopted not only by many small companies, but also by a large number of big companies as well, such as IBM, Oracle, British Telecom and McKinsey. From the business perspective of Oracle "*Enterprise 2.0 is the creation of competitive advantage through interactive, collaborative business models*" and this leads to "*...an integrative business strategy that combines multiple disciplines, technologies, and experiences. Businesses can no longer wonder if they will have an Enterprise 2.0 strategy; they must determine how to have such a strategy*" (Buytendijk et al 2008).

The main differences in the enterprise models are given in Table 1.

Enterprise 1.0	Enterprise 2.0
<ul style="list-style-type: none"> • Hierarchy • Friction • Bureaucracy • Inflexibility • IT-driven technology/Lack of user control • Top down • Centralized • Teams are in one building / one time zone • Silos and boundaries • Need to know • Information systems are structured and dictated • Taxonomies • Overly complex • Closed/ proprietary standards • Scheduled • Long time-to-market cycles 	<ul style="list-style-type: none"> • Flat Organization • Ease of Organization Flow • Agility • Flexibility • User-driven technology • Bottom up • Distributed • Teams are global • Fuzzy boundaries, open borders • Transparency • Information systems are emergent • Folksonomies • Simple • Open • On Demand • Short time-to-market cycles

Table 1: Main differences between Enterprise 1.0 and Enterprise 2.0 models

Source: <http://www.enterprise2conf.com/about/what-is-enterprise2.0.php>

In addition, the industrial economy knowledge monopolies are breaking down and the innovation is becoming more collaborative, distributed and open (Tapscott 2006). The Web 2.0 technologies give rise to company's business and innovation webs. Even the largest companies can not anymore afford to invest in all research activities that give birth of new products on the market. Tapscott states that "*in most industries, innovation increasingly depends on dense networks of public and private actors and large pools of intellectual property that routinely combine to create end products*". Tapscott and Williams put in the focus the opportunities for the new mass collaboration model to change "*how companies and societies harness knowledge and capability to innovate and create value*" (Tapscott

and Williams 2006). The four principles of *Wikinomics*, namely: **openness, peering, sharing, and acting globally**, define the new features of the companies that wish to be competitive, which differ a lot from the ones of a “traditional” company (see also Table 1.). The so called “*ideagoras*” emerged, i.e. Web 2.0 based environments where researchers and developers can collaboratively develop innovations. Companies are *innovation seekers* when they face some difficult problems, and they could globally challenge the experts – the *innovation providers* (Nambisan and Sawhney 2008). The companies could also provide solutions and look for appropriate problems to be solved. An example of such “ideagora” is InnoCentive (<http://www.innocentive.com/>) – a portal which provides a marketplace for innovations based on a community of companies and researchers. An independent innovation platform could also enhance the organizational innovation processes and thus contribute to better exploitation and use of the organizational knowledge management portals by improving the innovation and knowledge management processes within an organization (Antonova and Nikolov 2008).

As it was stated above, the **Web 2.0 technologies and tools provide new avenues for cooperation between university and industry** both in the area of training and research and innovation, which is a solid ground for joint ICT professional competency development.

5. University 2.0

On the way to a knowledge society in a dynamic ICT environment the universities should catalyse a process of **deep institutional change**. As Unsworth states, one of the major challenges facing the universities in the next decade is to **reinvent themselves as information organizations**. He emphasizes that the “*universities are, at their core, organizations that cultivate knowledge, seeking both to create knowledge and to preserve and convey knowledge, but they are remarkably inefficient and therefore ineffective in the way that they leverage their own information resources to advance that core activity*”(Unsworth, J. (2008). The **model of University 2.0** naturally emerged as a framework for universities to adapt to the social computing phenomena and to the networked information economy. We define University 2.0 as *a research and entrepreneurial university which integrates Web 2.0 technologies and applications in all university activities, including ones with all knowledge intensive stakeholders, and implements the features of the Enterprise 2.0*. The Web 2.0 based virtual learning environments provide opportunities for students, professors, companies and other stakeholders to cooperate in a 24/7 fashion. The virtual space of a University 2.0 is a natural place, where the **two worlds** – the academic and the corporate ones, **could establish solid bridges and naturally integrate**, especially if the university adopts most of the principles of the Enterprise 2.0 model.

A basic concept in bridging the university and industry is **Community of Practice (CoP)**, which is defined as “*groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis*” (Wenger, McDermott and Snyder 2003). Cambridge, Kaplan and Suter provide a guide for designing and developing CoPs based on experiences with corporations, nonprofit organizations, associations, government organizations, and educational institutions (Cambridge, Kaplan and Suter 2005). They identified the following phases in the CoP’s lifecycle:

- **Inquire:** Through a process of exploration and inquiry, identify the audience, purpose, goals, and vision for the community;
- **Design:** Define the activities, technologies, group processes, and roles that will support the community’s goals;
- **Prototype:** Pilot the community with a select group of key stakeholders to gain commitment, test assumptions, refine the strategy, and establish a success story;
- **Launch:** Roll out the community to a broader audience over a period of time in ways that engage newcomers and deliver immediate benefits;
- **Grow:** Engage members in collaborative learning and knowledge sharing activities, group projects, and networking events that meet individual, group, and organizational goals while creating an increasing cycle of participation and contribution;

- **Sustain:** Cultivate and assess the knowledge and “products” created by the community to inform new strategies, goals, activities, roles, technologies, and business models for the future.

The new Web makes us **rethinking the industry-university partnership**. Based on the Intel’s Open University Network experience, Tapskott and Williams recommend adopting the following principles:

- Use industry-university partnerships to shake-up product road maps. Incremental movement is a powerful and important feature of innovation;
- Make sure collaboration is a win-win;
- Deepen and broaden collaboration across research communities;
- Keep the science open and the application proprietary;
- Learn from “proxy” customers – early and often. One of the missing elements in exploratory is the customer perspective.

The emerging Web 2.0 based platforms and tools for the company **creation net** become “...powerful engines of learning and capability building on multiple levels” (Hagel and Brown 2006). The main advantages of the open innovation creation nets are that they:

- effectively connect distributed and highly motivated people and amplify the potential for learning by exposing participants to a much greater diversity of experience and perspectives;
- allow greater scalability, connecting more participants together and create opportunities for dynamic specialization.
- give chance larger number of participants to get more rapid feedback and quickly learn from the experiences of others which makes it easier to support parallel problem-solving;
- integrate the contributions of more distributed participants thus generate additional insight and learning;
- rely on reuse of the knowledge, products or services created and establish feedback loops and platforms for cumulative creation so that participants can rapidly build on the contributions of others and extend them in new directions;
- integrate into creation nets larger number of novices who are motivated and willing to invest in upgrading their competence with the support of professionals.

For researchers and innovators at industry and academia the whole Web becomes an “*R&D department*” and the *arrival* of Science 2.0 is expected (Tapscott and Williams 2006). Tapscott and Williams emphasize that the new Web technologies and tools “...will forever change the way scientists publish, manage data, and collaborate across institutional boundaries. The walls dividing institutions will crumble, and open scientific networks will emerge in their place. All of the world’s scientific data and research will at least be available to every single researcher – gratis – without prejudice or burdens.”

6. Implementing European e-Competence Framework at Sofia University

In September 2008 the European e-Competence Framework (e-CF) and the user guidelines for its application were published (CWA 2008). The initiative of development of e-CF has been launched as a **multi-stakeholder partnership** and it is focused on the ICT practitioner skills and makes possible **creation of a long-term human resources and competence development strategies** for the European ICT community.

Few years ago a process of opening Sofia University towards life-long learning provision started (Nikolov 2008a). Some organizational changes were driven towards implementing a new model of university - “*eUniversity: a research and entrepreneurial university which integrates ICT in all university activities, including the ones related to the outside knowledge intensive organizations*” (Nikolov 2008b). The university has developed bachelor programs in Computer Science, Software Engineering and Information Systems according to the ACM/IEEE CC2005 series recommendations (ACM/IEEE 2005) and several European ICT curricula recommendations (Nikolov and Ilieva 2007). A set of ICT master degree programs have been developed as well. The programs were oriented mostly **towards the needs of global ICT industry**. The academic programs were enhanced with courses provided by some big vendors. A number of academic courses were customized and opened to

external clients, coming from industry, government and other organizations. e-Learning methods and tools have been applied for more than 10 years. The **cooperation with the local ICT industry** was considered as a strategic goal. Several bi-lateral programs for carrying out **student internship programs** with some local ICT companies were launched.

A process of upgrading the computing curricula with competences included in the e-CF has been initiated (Nikolov 2008a). The e-CF provides an opportunity to **bridge academic education with the student internship program** in companies for further e-competence development in a systematic way. The e-CF is used for supporting students to develop their own ICT carrier and **become real practitioners** in the companies they work. They can use the framework for defining their own learning path. On the other side, the companies that are included in the internship program, could use the framework for:

- preparing job descriptions by combining elements from different areas and recruiting people who better match their needs;
- analysing the skills gaps and developing training plans for their employees;
- further supporting development of skills in order to meet the changing demand of skills, etc.

For the purpose of the further work the **Personal Competence Manager** – PCM (Kew 2007) - a tool developed in the frames of the TENCompetence project, will be used (Koper and Specht 2008). PCM gathers competence related information drawn from sources at multiple levels, and presents this information in a context, structure and format, which are determined by the user. The PCM users can initiate or join a **virtual professional community**, support development of its competence profile, design competence development plans for each competence profile. Each plan may contain several learning paths, comprised by different learning activities and supported by specific knowledge resources. The users can choose their own competence development plans, follow them and thus built the desired competences. They can rate any existing plan, activity or resource in relation to achieving specific competence profile. The learners can share their plans, ratings, resources and ideas using the embedded communication tools. There exist a self-assessment instrument and a *best way* map that help learners to find the most efficient for them learning path through any competence development plan.

7. Conclusions

The European e-CF provides a framework for a multi-stakeholder partnership between universities and companies since it represents the competence needs of the ICT industry which could reflect on designing and refining the academic programs (CWA 2008). A process of matching the developed computing curricula at Sofia University towards the European e-CF has been initiated. This process will further reflect the alignment and enhancement at all four e-CF dimensions for the bachelor, master and doctoral level of education. By using some Web 2.0 tools and methods Sofia University gradually adopts the University 2.0 model.

Acknowledgments

The work has been sponsored by the TENCompetence Integrated Project funded by the EC 6th Framework Program

References

- Abramovitz, M. and P. David (1996). Technological Change and the Rise of Intangible Investments: The US Economy's Growth-path in the Twentieth Century, in: *Employment and Growth in the Knowledge-based Economy*, Paris, OCDE
- ACM/IEEE (2005), Computing Curricula 2005 - The Overview Report, ACM and the IEEE Computer Society
- Allen, M. (2002). The Corporate University Handbook. AMACOM, American Management Association, ISBN 9780814407110.
- Antonova, A. and R. Nikolov (2008), Modelling Concept Design of Innovation Platform: Knowledge Management Approach, KMO2008, Vaasa, Finland, pp. 283-294

- Bode, A., R. Borgeest, H. Pongratz (2007). The ICT Strategy of the Technische Universität München, EUNIS 2007 *Innovation for a European ERA*, June 26-29th
- Boyer Commission (1998). Reinventing Undergraduate Education: A Blueprint of America's Research Universities, Technical Report, <http://naples.cc.sunysb.edu/Pres/boyer.nsf/>
- Buytendijk, F., B. Cripe, R. Henson, K. Pulverman (2008), Business Management in the Age of Enterprise 2.0: Why Business Model 1.0 Will Obsolete You, Oracle Corporation, December
- Cambridge, D., S. Kaplan, V. Suter (2005), Community of Practice Design Guide: A Step-by-Step Guide for Designing & Cultivating Communities of Practice in Higher Education, Educause, <http://connect.educause.edu/Library/ELI/CommunityofPracticeDesign/42639>
- Corporate University Xchange (1999), 1999 Survey of Corporate University Future Directions, Corporate University Xchange, Inc.
- CWA (2008), European e-Competence Framework v.1.0, www.ecompetences.eu, September
- David, P. and D. Foray (2003). Economic Fundamentals of the Knowledge Society, Policy Futures, *Education.An e-Journal*, 1(1) : Special Issue: Education and the Knowledge Economy
- Dumestre, M. (1999). "The Impact of Technology on U. S. Higher Education: A Philosophical Approach", *Journal of Information Technology Impact*, Vol. 1, No. 2, pp. 63-72
- EC (2000). Lisbon European Council, Presidency Conclusions, <http://ue.eu.int/Newsroom/>
- EC (2004). Facing the challenge, The Lisbon strategy for growth and employment, Report from the High Level Group chaired by Wim Kok, ISBN 92-894-7054-2, http://europa.eu.int/comm/lisbon_strategy/index_en.html
- Garrett, R. (2004). The Real Story behind the Failure of UK eUniversity, Educause Quarterly, No. 2.
- Gartner (2008). Gartner Highlights 27 Technologies in the 2008 Hype Cycle for Emerging Technologies, <http://www.gartner.com/it/page.jsp?id=739613>
- Hagel, J. and J. Brown (2006), Creation Nets: Harnessing the Potential of Open Innovation, John Hagel and John Seely Brown, April
- Kanwar, A., J. Daniel (2008)., Knowledge Parks: Hype or Hope for the Developing World, UNESCO International Conference and Exhibition on Knowledge Parks, Doha, Qatar, March 29-31.
- Kerr C. (1963). The uses of the university, Cambridge, Mass: Harvard University Press
- Kleingartner, A. and R. Jiang (2001), Performance and Web-Based Learning, University of California Institute for Labor and Employment, The State of California Labor, 2001, <http://repositories.cdlib.org/file/scl2001/Section11>
- IFIP (2008). IFIP Declaration on the Decline in Computing Graduates: An International Threat to the Knowledge Society and the Global Economy, IFIP Technical Committee on Education 6th September.
- Kew, C. (2007). The TENCompetence Personal Competence Manager, 2nd European Conference on Technology Enhanced Learning, CEUR Workshop Proceedings, CEUR-WS.org/Vol-280, Crete, Greece, September
- Koper, R. and M. Specht (2008). Ten-Competence: Life-Long Competence Development and Learning. In M-A. Cicilia (Ed.), *Competencies in organizational e-learning: concepts and tools* (pp. 234-252). Hershey: IGI-Global8
- Machlup, F. (1962). The Production and Distribution of Knowledge in the United States, Princeton University Press
- Machlup F.(1980). Knowledge: its creation, distribution, and economic significance: v. 1. knowledge and knowledge production. Princeton, NJ: Princeton University Press
- McAfee, A. (2006). Enterprise 2.0: The Dawn of Emergent Collaboration, *Sloan Management Review*, Spring 2006, Vol. 47, No. 3, pp. 21-28
- Moore, M.G. (2003). Preface, in: Moore, M.G. and W. Anderson Eds. (2003). *Handbook of distance education*. Lawrence Erlbaum Associates, Inc.
- Nambisan S. and M. Sawhney (2008), The Global Brain, Roadmap for Innovating Faster and Smarter in a Networked World, Pearson Education, New Jersey
- Nikolov, R.(2008a). A Model for European e-Competence Framework Development in a University Environment, TENCompetence Workshop, Sofia, October
- Nikolov, R (2008b). From eLearning to eUniversity, CompSysTech'2008, Gabrovo, Bulgaria, June

- Nikolov, R. and S. Ilieva (2007). Building a Research University Ecosystem: the Case of Software Engineering Education at Sofia University, ESEC/FSE 2007 Conference, Widened Software Engineering track, Dubrovnik, 3-7 September
- Nikolov, R. (1997). Distance Education via Internet – Education without Borders, invited paper, *Proceedings of the Twenty Sixth Spring Conference of Bulgarian Mathematicians, Plovdiv, 22-25 April*, pp. 53-66
- Price, S., M. Oliver, M. Fartunova, C. Jones, C., H. van der Meij, S. Mjelstad, F. Mohammad, R. Nikolov, J. Wake, B. Wasson (2005). Review of the impact of technology-enhanced learning on roles and practices in Higher Education, Kaleidoscope project deliverable 30-02-01-F.
- O'Reilly, T (2005), *What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software*, O'Reily Net
- Slater, J. (2005). Spent Force or Revolution in Progress? eLearning after eUniversity, Higher Education Policy Institute, February, <http://www.hepi.ac.uk/downloads/16eLearning.doc>
- Tapscott, D. (2006). Winning with the Enterprise 2.0, New Paradigm Learning Corporation
- Tapscott, D. and A. Williams (2006), *Wikinomics. How Mass Collaboration Changes Everything*, Penguin Group (USA), December
- Tripoli, L. (2008). Corporate/University Partnerships. Business Teams with Academia on Sustainable projects, Mary Ann Liebert, Inc, Vol. 1, No. 6, pp. 369-372
- Unsworth, J. (2008). University 2.0, in: R.N. Katz (Ed.) *The Tower and the Cloud: Higher Education in the Age of Cloud Computing* (pp. 227-237), Educause, 2008
- Wenger, E., R. McDermott, W. Snyder (2003), *Cultivating Communities of Practice*, Harvard Business School Press, Boston