IAFeS Edition

Access to Knowledge in the 21st Century

The Interplay of Society, Education, ICT and Philosophy

16th NETTIES Conference
(Network Entities)

Reading Society, Corfu, Greece

May 3 - 4, 2018

International Association for eScience
in collaboration with the Ionian University

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- to promote the development, education and research in the area of eScience: Information and communications technology (ICT), telecommunications, e-learning, emedia, e-commerce, e-government, e-democracy, e-culture, e-health
- promotion of young researchers in these areas
- offering an exchange platform for experts
- offering an international co-operation platform

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Evaluated by:

Erwin Bratengeyer, Danube University Krems, AT
David Evans, JME Associates Ltd, UK
Graham Orange, Leeds, UK

Editors:

Maria BOTTIS
Johann GÜNTHER

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Preface

Johann GÜNTHER

Following a request from Konstantinos Kalemnis, the IAFeS board decided to host the annual scientific conference NETTIES (Network Entities) in Corfu in 2018.
It was the 16th NETTIES conference. As with every NETTIES conference there was a local partner. This year it was the Ionian University.

The lectures took place in the beautiful library of the Reading Society of Corfu. It is the oldest and most prestigious Reading Society in Greece.

The conference theme was "Access to Knowledge in the 21st Century - the Interplay of Society, Education, ICT, and Philosophy" and is also the title of this anthology of lectures from the conference.

One goal of IAFeS is to look at a topic from a variety of perspectives:
Law, Ethics, Philosophy, Psychology, Economy, and Engineering.

So it came to the structure of the present book in:

- PHILOSOPHY & KNOWLEDGE
- COPY RIGHT & OPEN ACCESS
- TECHNOLOGY
- SOCIETY & BUSINESS
- EDUCATION

50 speakers followed this guidline.
This anthology should offer those who could not attend the conference a chance to read it.

Johann Günther
Secretary General of IAFeS

Preface

Radu VASIU

The International Association for eScience (IAFeS) was founded in December 2013 in Vienna by members from Great Britain, Greece, Romania, Finland and Austria. Since that moment, new institutional and individual members joined each year. They are all working together in order to achieve the aims of the association: to promote development, education and research in all areas of eScience and especially to encourage young researchers in these areas by offering an exchange platform for international co-operation.

Each year, the association organizes a conference called NETTIES (Networking Entities). The first edition was organized in 1994 in Vienna, Austria, under the umbrella of EATA (European Association for Telematics Applications). As a continuator of that association, IAFES continued to organise the NETTIES conference.

The 16th edition NETTIES 2018 conference took place between 3 - 5 May 2018, in the beautiful Corfu Island, Greece, being hosted by the Reading Society of Corfu.

The subject of the conference was “Access to Knowledge in the 21st Century. The Interplay of Society, Education, ICT and Philosophy”. The NETTIES conference this year attracted researchers and presenters from Greece, Austria, Romania, United Kingdom, Spain, Finland, Kosovo and China, as well as participants from some other countries. As the addressed subject was quite broad and generous, the presented communications have been grouped in different sections: Philosophy & Knowledge, Copyright & Open Access, Technology, Society & Business and Education.

This book contains the proceedings of the conference in the hope that readers will be inspired to follow up on the research and ideas within.

As usually, at the end of the conference, the Board of IAFeS took into consideration different offers for hosting the next year conference. So, waiting to meet you again for the 17th NETTIES conference in Pristina, Kosovo!

Radu Vasiu, PhD
Professor Politehnica University of Timisoara, Romania
President of IAFeS – International Association for eScience

Preface

Maria BOTTIS

It is a great joy to introduce here the book of proceedings of NETTIES 2018, Access to Knowledge in the 21st century: the interplay of society, education, ICT and philosophy', co-organized by the Ionian University and IAFES.

NETTIES 2018 brought together in the Ionian University, Department of Archives, Library Science and Museology, in Corfu, Greece, a great number of important scholars from many different countries, disciplines and fields, to present their work around the concept of access to knowledge. The interdisciplinary nature of the conference allowed the participants to look at the conference themes from many different scientific angles; we hope that the book will contribute to a wider interpretation of current knowledge on the particular topics explored by our esteemed colleagues.

We thank the Reading Society of Corfu for the wonderful venue in the old city of Corfu, the perfect place to host an access to knowledge conference. We also thank Katerina Tzali, head of the organizing committee, Roubini Oikonomidou, for her constant support, and all students who helped with the organization. We are sure all participants will remember NETTIES 2018 very fondly and look forward to future collaboration with IAFES.

Maria Bottis
Co-Editor and local organizer
Associate Professor Ionian University

PHILOSOPHY
&
KNOWLEDGE

1 MEDIOLOGY: Understanding the Society through its Mediality

Thomas A. BAUER
University of Vienna, Austria

1.1 Misconceptions to Overcome

Along the history of media literacy programs media education typically was understood as intervening education of, for, with or even against media, mostly driven as an instrumental workshop in order to “learn”, what media was, as it was done, how or for what it was used and to get warned how it could effect the personal and the social as well the individual or societal life. The institutional education mostly just reacted defending its hierarchical position, its elitist position and authority to technological developments of the media, to structural changes in media systems, and to the follow-up-phenomena in societal communication supposing (just as thinking of themselves as educational and moral institutions) media were a source of power, influence and intervention – in political as well as in educational context. This kind of media education concept is or was based on a functional-structural concept of media (cf. Luhmann 1987: 3o ff., Luhmann 2004: 169 ff.), moreover, conceptualized in a direct linear-causal understanding of media effects to individuals and to social/societal culture.

Consequently, media education in this tradition focuses on media or media systems as a subject to be learned (media knowledge), to be observed critically (media awareness, media consciousness), and to be used carefully (media habit) in order to get trained in a rational use of media or to avoid - what ever it meant aesthetically and ethically – the “negative effects” to the psychic structure of individuals or of the society. The interest of knowledge in such educational arrangements is or has been to affirm the hierarchical structure of society in frames of education, to prevent a - thus supposed - advance or prominence of media and its economic, political and cultural influence in individual or social execution of people’s everyday life, and finally – scientifically evaluated - induces (just) a compensative, or even more an affirmative understanding of media education: media thought as an ambivalent societal institution or organization, on the one hand promising maximization of power and influence beyond political administration or even potentially against it. On the other hand supposed to be an instrument of influence as it convenes to the really existing structures of distribution and allocation of power (cf. Adorno 1968, Bourdieu 1998, Habermas 1968, Horkheimer/ Adorno 1969/ Huxley 185, Marcuse 1968)

Media education then centred around the consumptive use of media, thus affirming the role-distribution of professionalized producers and consumers to be qualified for a rational use of means of (other’s) power and influence, using “the” media according to their technological mastermind as it is media-inherent: reduction of complexity of social and/or political discourse, rationality of functionality, usability of practicability, standardisation of social practice, repeatability of content, messages, and methods of maintaining influence, and broad circulation of information, knowledge, escape through entertainment and amusement from burdening feelings caused by the labour-dominated culture of everyday life, and - last not last – setting the agenda of opinion building through low-level (also means: trivial) accessibility (cf. Buckingham 2003, Postman 1985).

All those approaches, not questioning the given structures of societal practice, but rather affirming the given societal structures of circulation of power, the practically given dispartment of roles to be identified with as producer or as a consumer (even if later then in context of social media apostrophized as “prosumers”) consider media as an instrument of and for the societal arrangements of communication in forms of discourse or conversation, follow an essential and structural understanding of media, communication, and society, and because of that supposed

to be mutually competitive entities of doing the society (cf. Bauer 2014 : 141 ff.). The alternative is or would be (if not: has to be) a cultural-theoretical approach of interpreting the relationship of society, communication, media and culture, where not structures are in focus of consideration, but the meaning of them. So then the meaning of society is to be considered as communication, the meaning of communication as is its societal culture, the meaning of culture as its social practice of communication, and – last not least, related to the epistemology of media literacy – media as its environment (or reference) of doing the society as an arrangement of communication in a culture of public (societally and politically meant) exchange and sharing (cf. Bauer 2017). This approach tries to be aware of the fact that media characteristics (media code) engraves into the formats of cultural aesthetics of social practice, to be thought even much farer: there is no moment of societal life (means: organizing the sociability of human existence in any cosmological order of society) that would be media-free (cf. Hartmann 2003: 8) Exactly that is the logical approach of mediology in context of conceptualizing a theoretical frame of and for media literacy: considering, interpreting and understanding society – or here: societal arrangements of education – as connectivity of observation of rationality and reasonability of execution of individual and social life under the condition of its medicalization and mediatization. Exactly in that sense there is huge need of doing steps forward in media literacy studies as well as in media literacy education as a now so far understood challenge of and for social, cultural and media change. That is, what the MedLit- project's message tried to be: Media literacy as a program of competence for doing (participating, developing) the society by rational use of media (cf. MedLit 2018)

Based on this explicated criticism there is a lot to do in (for) media education in order to make it a theoretical reference of social/societal development, i.e. social change:

- To deepen the epistemological discourse: how to think the relationship of communication, media, culture and society really scientifically as a model of interdependency of constructs interpreting the meaning (sense) of sociability.
- To enrich the theoretical discourse on media education by cultural- and social-theory-based concepts (contextual theory) of media containing media in reference to its use: the use of media (technological infrastructure, aesthetical performance, ethical implications and system-related concepts of appropriation of reality) then is, what a cultural theory describes as media.
- Following such a theoretical concept of media gives a much broader and at the same time much deeper understanding of media education as a program of and for an education of social intelligence (Piaget 1966, Bourdieu 1997): not focused on media (learn the media), but focused on habitus of personality, sociability, and individuality in the interest and in frames of a media-modus of society (learning program of being a part/partner of/in media society – cf. Bauer 2017)
- Within the framework of such a more differentiated concept of media and media education the terms of literacy and/or competence get based by theoretically more reliable concepts of education, competence building and a sharper practical meaning: emancipation, sovereignty, responsibility
- This implies far reaching consequences of theoretical and educational understanding of digitalisation, digital society, digital education: the break of media-related social and societal communication changes the ontology of social culture (habit, rituals, rules) and, at the moment we are still in pioneer-status in terms of technology, sociability and society building. Media education thus should/could use the development getting an intervening and integrated factor of reflecting the social change in the interest of society performance management (democracy etc.).

1.2 Framing the Phonomena

Any society organizing itself and its development is structurally depending from its communication system and culturally from its communication quality. Or even better to say: a

society is, what its communication structure is like and means what its quality of sociability is like (Bauer 2011: 499). In a media-organized society the communication structure – that means at least attention, traffic, connections, topics etc. - follows the technical and aesthetical logics, the attractions, the facilities and possibilities but also the limitations of communication through its mediatized character. In any case, though it is often said that media reduces the complexity of societal communication (cf. Luhmann 2004), on the other hand also it also gets evident that in a media environment the society and its self-interpretation becomes more complex through this mode of communication- and interaction structure - in manifold perspectives: the increasing amount of information, the variety of aspects, evaluations, opinions and options coming up to public sphere overdrive the capacities of processing of social communication. In order to feel or to realize oneself responsibly as a relevant part or partner within a communication process, one must overlook its social space (frame), its relational structures, its options of meaning and relevance and last but not least its contingence of sense. The reference to a culturally defined social framework might help to come clear with orientation.

There is obviously a structural change ongoing in media. Especially since media technology has entered the “digital age”, not only the modes of production, but much more patterns and attitudes of consumption have changed the traditional ontology of media communication. The key character concerns the role of the consumer now becoming a user – often appealed as “prod-user”, what means: the industrial fragmentation of roles as a producer and a consumer has overcome, the interaction now happens not any more between producer and consumer, but between user and user. This phenomenon – social convergence - is the social dimension of the technical convergence. The former producer professionalism and the appropriate consumer skills have been fallen in one model of use: taking and giving within a generalized and socially shared model of competence, which is a mutually supposed expectation of trust. This convergence can be considered as a horizontalization of a formerly hierarchically ordered relation of trust. A model of dependence (for example: journalism quality – audience media competence) has changed into a model of interdependence of media literacy, which has (to) become the competence motif of a civil society.

The emergence of social-media-communication (many-to-many media interaction) might be seen as one of the areas of media change, enabling social networks or casual communities and giving them opportunity to establish and to structure open systems of publicity, which by far are not, what the concepts of “public sphere” think to observe, but portraying a new mode of system of communicative trust. If this, trust (Luhmann 1968) is taken as the core principle of what publicity (public sphere) is thought to be – which in any case is a normative concept for any structurally public social communication – and if the perception is right that social media configurations are a matter of (spontaneous and casual) trust, then social media communication is about figuring out new relations of trust beyond of any institutionalization of it. A relation of trust within a media environment of communication must on and must engage with the medial performance of communication. In this sense a theory of media obliged to a logical perspective of a metaphor of description must not be at first and not at all a theoretical abstraction of media seen as structures, systems or gadgetry, but could also – or even preferable – be created as a theoretically logical description of the cultural meaning of media (utility, aesthetics, ethics) expressed by usage in contexts of living and social practice, by which people is giving the media the meaning. That includes also the change of meaning by changes of usage.

1.3 Mediology

Even if the theoretical observation is concentrated to the term of media, it is important to be aware of what concept of media is in use. A non-objectivizing theory understands media in relation to its meaning for individual or societal life. Society is a construct to be considered through a (normative, critical, empirical, and pragmatic) concept of communication, when assuming (supposing the noema) that society is, what its communication is (meaning) like. In

that sense a media society is one being constructed as a configuration of doing the society in the modus (habit, usage) of media. The scientific concept funding a theoretically well-based concept of literacy decides by epistemological purpose to shift the view from structural or functional metaphors, transport, transfer, instrument, tool) to cultural metaphors of description: media as a cultural, societal, political, economic, aesthetic environment that gets relevance by use of media, by doing the media.

This contextual view is the reason, why mediology (what means: the theoretical perspective of what ever: society, education, knowledge, politics, culture, religion etc…from a point of view characterizing its meaning in relation to its medialized and mediatized quality) is to be understood as a broad frame of scientification of the connectivity of media and society. In that specific sense mediology is not a structural theory, but is a contextual theory focusing on the cross-links of socially meant media usage as a cultural format of social and/or societal practice. As mediology focuses on the overlappings of mental, cognitive, intellectual, material, structural, social and actional use of media (Debrais 2003), it supposes the usage to be the relevant frame of social culture of a meaningful construction in the way of being related to societal construction of a socially mindful culture. Any use creates a culture or refers to culture. So a cultural theory of media defines the usage of media as media (cf. Bauer 2014: 102 ff.) Media literacy cultural studies and as well media literacy educational practice need a logical frame that is taken from the logics of usage of media in the interest (meaning) of communication, interaction, network-, community - and society building. To decide for a theoretical paradigm of media literacy means to invest complex thinking in a paradigmatic theory of media that frames media as the technical, organizational, aesthetical, ecological and cosmological environment of social practice (social communication). The theoretical concept should not be one that reduces the cultural, political and societal fantasy of an openly structured, multiplex and multi-optional media landscape and one - not theoretically and not practically – that fastens media just to technical skylines, to systematically perfected stages, to market-typical goods, and , of course, not at all to however decorative surfaces of societal interaction, but that is interested to know and to be amazed what phrases of sociability human being is able to and competent for (vgl. Bauer 2017b: 79 f.)

When talking about Media Literacy the question arises: what is the theoretical background of understanding media as a societal phenomenon, and what is or could be accepted as a theoretical legitimacy to build a concept of media education intervening to societal contexts of personal life. It is somehow self-evident that a structural theory of media just focusing to the technical or even aesthetical materiality of media can not be enough framing for an educationally relevant scientification. Media in such an ideological context must be taken as a meaningful term representing the contextual conditions and valuation of social practice (cf. Bauer 2003, Grossberg 1997, Hepp 2009,). When we are talking about media in such a context, we should – so the epistemologically well based advice of Cultural Studies – not just talk about the structurally given facts but rather about the contexts, in which it gets the significance it has, and which always is meant additionally, but hardly respected in analyses. Not to mention the worlds of construction in relation to them it makes logical sense to face up to the questions of value to be focused on in educational contexts. Media is becoming to what it is and how we understand it through the way as we use or we think we should use it as a reference of and for social interaction and communication as well for societal exchange. The culture of usage predominately is determined by the specific and personally relevant contexts of living of people.

The question to start with is: are there idle capacities, silent reservoirs or undisclosed sources of knowledge (models of thinking, ideas) to mobilize the potential of media for individually, socially, societally, and culturally relevant education (teaching-learning environments)? If so, then they must be discovered or even created in (through) the logics of media as we interpret and understand the relevance of media in relation to (the meaning of) communication, community building, individual identity, society and social or cultural change. But, the perspective (interest, experience, mentality, cultural conditions, programs and prescriptions etc.) as we are pleased, used and controlled to each other how to use media and how to take them as a factor oft he construction of relevance and reality. There is a strong reason for:

Logics always is a culturally conditioned and a socially contextualized framing model of knowledge, by which we agree and control mutually the rationality of diverse perspectives.

1.4 Generative Learning

A cultural and social theory perspective of media communication focuses on the interrelation of observation and action and finds its theoretical paradigm in the concept of signification. (cf. Hall 1989, 1999) Both, observation and action – better to say: observation as an action and action as an observation – construct significations, which get generalized through and as symbolic interaction (cf. Blumer 2004, Mead 1934,). The exchange of signification realized in the way of relating action and observation to codes, within a cultural programming development creates generalized configurations of meaning. Culture then is the social interactive and communicative environment to archive those configurations of meaning construction in structures of symbolic and ritual interaction to be used as statement of commitment or as a reference of control for social compliance in case of need. Any style of life is observable as an habitual expression of such commitment and compliance, and that is the reason why it makes sense, when the concept of Cultural Studies observe culture as any "whole way of life" (Williams 1958)
The attitude of a communicative habit has to be seen as the cultural basis of a somehow generative competence (ability, capacity, responsibility, motivation) to produce communicatively meant action even in new or unusual contexts of social practice – similar to what Noam Chomsky has conceptualized with the term of a "generative grammar" (Chomsky 1980, Beckmann 1997). On that level all communication systems are addressed by the same general obligation. A society, in which a critical-reflexive usage of communication and media has become an integrative moment of education, is rich in terms of cultural reserves for every day challenges of a democratic configuration of its social and political development. In that overall context then any specified professional expertise as well gains - at least: functional - credibility.
More analytically and systematically, the term of competence embraces other ones related to what could be called the "communication sense" (cf. Bauer 1981): The sense of communication is the appropriate way (difference) or the appropriate habit (mindfulness) to appropriate (construct) the reality as a meaningful environment for ones own social life concept. Communication sense depends from understanding three factors: Me and myself, you and yourself, the content and its possible meaning. In order to realize communication as a challenge or chance of competence, it needs, as already mentioned, a set of habitual conditions

- Ability (to know what operations and how to do them in case of…)
- Capacity (to have the cognitive, affective and active means and preparedness: soft or hard skills)
- Responsibility (to be conscious of what it means for oneself and/or for others: consequences and possible effects
- Morality (to be aware of the implicated values when making personal decisions)

The concept of competence, stressing so far those conditions habitually given, also is meant to meet different structural frames of acting (language, rhetoric performance, interaction behaviour, media use) build a gradually designed pyramidal model of competence development (cf. Baacke 1980):

- linguistic competence (syntactic and semantic use of language and symbols in order to understand and to make understandable / restricted vs. elaborated code)
- rhetorical competence (pragmatic use of language and behavioural language in order to persuade with believes and to convince with arguments

- communicative competence (be aware of creating a symmetry of mutual participation exchanging meanings)
- media competence (be aware of – and reflect your own standards of ability, capacity, responsibility and morality using media as means of participation in public life).

Any engagement in media literacy education has to face the challenges and the chances for the benefit of an individual and as well for the society beyond the superficial media change - on different levels:

• The competence- goal in first line is not directed – as in conventional media literacy concepts often usual - to just a "better use of media", often just argued morally, not just to a habit of media-awareness, but more to a use of media in the interest and in context of social and societal change, means: social change should not be something to which political, cultural and educational institutions react, but something, that should be driven pro-actively in context of a mindful management of use of media. For that it needs a broad enhancement of political literacy, of social or societal competence awareness and of socio-cultural capacities of use of media. Understanding the society as a more than ever media-made environment and considering that the traditional public institutions of politics, media, culture and education – across the societies - are loosing credibility and authentic leadership, the concept of a civil society realizing and learning to be competent and responsible for itself, needs a wider and a more media-related concept of social change as well as of literacy (self-competence of individuals and civil communities).

• Any media literacy education program has to be dedicated to the idea of new, at least until now not yet enough societally anchored alliances and constellations of interest of societal learning. Across the countries and cultures media education was and is understood as an enhancement of individual competence of use of media, as well of an educational or pedagogical (public) compensation of media-ethical and media-cultural weaknesses of the traditional, classical and network- (digital) media systems – each by its and because of its own socio-esthetical character, but: not as an empowerment of societal learning, not as an enhancement and societal challenge of enlightenment and emancipation. The traditional media- and information literacy concepts all over are thought in frames of individualistic learning theories (competition as paradigm, not social attention or cooperation), are thought in frames of affirmative theories of use of media (socialized use, not social use of media) and are thought in frames of educational theories of qualification or professionalization, not in those of self-realization of individuals, communities or societies.

• Any media literacy education program has to seek by purpose the challenge of trans-cultural and trans-disciplinary responsibility for social and societal development: Under the umbrella of economically driven political, cultural and media globalization the issue of cultural and societal identity comes up with new question marks. I is also a somehow unique-selling-position-factor to concentrate on a trans-cultural, or cross-cultural dimension of media literacy, saying: living in a media made globalized world needs to be literate in handling diversity and variety as a treasure of culture and of all that is connected to meaning of culture: religion, every-day-way of life, societal rituals of social attention and social intelligence.

1.5 Mediality – the paradigmatic signature of context of living

There is a logical demand on a theoretically wide and open concept of media in order to bridge media, society and culture – not by its structures, but – by the cultural and social meaning of communication as the paradigm model of society and culture, following the idea discussed throughout the project: it is not the media as a structural phenomenon, but the mediality as a cultural character of society, communication and culture that hast o be questioned when observing that 'the media always is doing the society' and 'doing the society is always doing the media'.

Indeed, that dictum is related to the idea of the dialectic vicinity of media and society. That means: what we call a society is the observation of a social/societal connection realized by and through its communication. A society id, what its communication is like. And communication is nothing else than what we observe as a connectivity of social practice of society. Since communication is understood as the display of sociability in formations of discourse and dialogue (V. Flusser), the society is understood as the dispositive (M. Foucault) of communication. That says: theorizing media (as an environment of communication) means theorizing society and its culture of managing the resource of sociability as well as theorizing society means theorizing communication as a source of society and of its inherent energy of change. That approach makes society (the social practice) understanding as an (communication, media-) environment of social change. Doing social change means doing communication and vice verse.
For media studies as a program of science it is definitely of general interest to build scientific knowledge (theoretical validity, reliability, credibility) on epistemological legitimation. What counts, is the interests of knowledge in communicological and mediological concepts, especially of media- educational side steps of them: Analysing the history and the development of frames and concepts theorizing communication and media there are too many cases of epistemological carelessness, even logical heedlessness, resuming sociological, psychological or semiotic (semiological) theorems just like as ontologically evidenced structures, not distinguishing models of knowledge from objects (entities) of knowledge or objects (entities) of observation from observation of objects (connections). So for example, the partnership of communication is not a naturally determined format of communication, it is a concept, a model of knowledge of communication, in order to explain the normative implication of what we (in our cultures) consider as a socially well-done communication. It is with concepts like transfer, exchange, effect, function etc. The approach is: communication is an interpretative concept of social existence and for that it needs a hermeneutically based theorization. What communication is, we know – (ideally and practically) from everyday – culturally based – cognition. It is not: what we do. It is: as we do. And: that sense it is a quality of social habit. We do not need a communication science explaining (again, even if in a different taxonomy), what communication is. We need a communication (media) science explaining, why we think (interpret) about communication as we do, why we think (understand) about society as we do, why we think about the connection of media and communication as we do – and: how we could change the models of thinking in order to be able (capable) to change the models of (social) practice.
As long as we think media being a tool, we think in interest of effects or in interests to Even when concentrated to media, it is important to be aware of what concept of media is in use. Such a scientific concept tries to shift the view from structural or functional metaphors, transport, transfer, instrument, tool) to cultural metaphors of description: media as a cultural, societal, political, economic, aesthetic environment that gets relevance by use of media, by doing the media media for creating effects (cf. Bauer 2003). Behind such an approach of thinking there is the interest of using power in order to effect influence. With such an interest of knowledge we would not be able to make the concept of media literacy credible as an educational concept of / for social change.

Social change is a category of observation - observing our existence (maybe: identity concept) in relation to the environment we are living with: the natural, social, cultural and symbolic environment, is not an event outside of what we observe as we observe ourselves. It happens along the observation of social, cultural and symbolic environment. That means: the social and the societal context of living all over the global society is characterized by increasing impact of technology (mediatization of and in modes of networks) as well as the way how people, communities and societies get understood to each other increasingly is overlaid, designed and determined by media-made models of performance (medialization) (cf. Bauer 2014: 319 ff.)
What we experience, especially in context of the increasing presence of internet- and network media environment in all arenas of social and societal life, is that the social life in all areas over the world gets more and more structures, infected and interpreted by media and use of media. That means: the everyday communication context is (technically) mediatized and (culturally)

medialized. Nothing of what happens in every life is media-free. Even our personal conversations are not just infiltrated, but also mostly dominated by what we know from use of media.
That means for the concept of media literacy: we need to learn (to teach), how to use media selectively. We need to distinguish between, what is true, important and necessary and what is abdicable. Having so many options (information flood) we need to learn en ecology of use of media, thinking what could be the long-term effect not knowing or not considering for what options we vote for. Any life, natural, social and cultural life always is confronted with the need of being aware of priorities. To set them or to respect them depends from ability (knowledge, skills) capacity (awareness), motivation (seeing the sense) and responsibility (evaluation of consequences). Media programs, related to the use of anybody at any time for any topic and for any purpose, are exactly because of that so far standardized (reduced the complexity of life), so that it needs the selective intervention by and through a conscious use of it. Exactly there is the place of media literacy and/or media competence.

1.6 References

Adorno, Theodor W. (1968): Fernsehen als Ideologie, IN: Adorno, Th. W. : Eingriffe. Neun kritische Modelle. Frankfurt am Main: Suhrkamp, p. 81-98

Baacke, Dieter (1980): Kommunikation und Kompetenz. Grundlagen einer Didaktik der Kommunikation und ihrer Medien. München: Juventa

Bauer, Thomas A. (1981): Medienpädagogik. Einführung und Grundlegung. Vol1: Theore-Diskussion: Der Kommunikationssinn. Wien – Köln – Graz: Böhlau

Bauer, Thomas A. (2003): Vom Strukturblick zum Kulturblick. Entwürfe zu einem Blended-Theory Modell. IN: Karmasin, Matthias / Winter, Carsten (eds.): Kulturwissenschaft als Kommunikationswissenschaft. Projekte, Probleme, Perspektiven, Potenziale. Wiesbaden: Westdeutscher Verlag, p. 127 – 167

Bauer, Thomas A. (2011): In Zukunft mehr Kommunikation. Gesellschaft im Spiegel des Medienwandels. IN: Koschnick, Wolfgang J. (ed.): Die Zukunft der klassischen elektronischen Medien. FOCUS Jahrbuch 2011. München: FOCUS Magazin Verlag, p. 465 - 547Bauer, Thomas A. (2014): Kommunikation wissenschaftlich denken. Perspektiven einer kontextuellen Theorie gesellschaftlicher Verständigung. Wien: Böhlau

Bauer, Thomas A. (2017): Werden und Wandel der Mediengesellschaft. IN: Growin, Peter / Walzer, Nana (eds.): Die Evolution der Menschlichkeit. Wien: Braumüller, p. 117 – 136

Beckmann, Frank (1997): Untersuchungen zur Grammatik der Adjunkte.Berlin – New York: de Gruyter

Chomsky, Noam (1980): Studies on semantics in generative grammar. The Hague: Mouton

Blumer, Herbert (2004): Der methodologische Standort des Symbolischen Interaktionismus. IN: Burkart, Roland / Hömberg, Walter (eds.): Kommunikationstheorien. Ein Textbuch zur Einführung. Wien: Braumüller, p. 24 – 42

Bourdieu, Pierre (1998): Über das Fernsehen. Frankfurt am Main: Suhrkamp

Bourdieu, Pierre (1997): Zur Genese der Begriffe Habitus und Feld. IN: Steinbrücke, Margareta (ed.): Der Tote packt den Lebenden. Hamburg: VSA, p. 59 – 78

Buckingham, David (2003): Media Education. Literacy, learning and contemporary culture. Polity Press Cambridge.

Debray, Régis (2003): Einführung in die Mediologie. Bern: Haupt

Grossberg, Lawrence (1997): Der Cross Road Blues der Cultural Studies. IN: Hepp, Andreas / Winter, Rainer (eds.): Kultur – Medien – Macht, Cultural Studies und Medienanalyse. Opladen: Westdeutscher Verlag, p. 13 – 30

Habermas, Jürgen (2968): Technik und Wissenschaft als Ideologie. Frankfurt am Main: Suhrkamp

Hartmann, Frank (2003): Mediologie. Ansätze einer Medientheorie der Kulturwissenschaften. Wien: WUV

Hepp, Andreas / Krotz, Friedrich / Thomas, Tanja (2009): Schlüsselwerke der Cultural Studies. Wiesbaden: Verlag für Sozialwissenschaften

Horkheimer, Max / Adorno, Theodor W. (1969): Dialektik der Aufklärung. Frankfurt am Main: Suhrkamp

Huxley, Aldous (19859. Schöne neue Welt. Ein Roman der Zukunft. Frankfurt am Main: Fischer Taschenbuch Verlag

Luhmann, Niklas (1987): Soziale Systeme. Grundriß einer allgemeinen Theorie. Frankfurt am Main: Suhrkamp

Luhmann, Niklas (2004): Die Realität der Massenmedien. Wiesbaden: Verlag für Sozialwissenschaften (3. ed.)

Luhmann, Niklas (1998): Vertrauen. Ein Mechanismus der Reduktion sozialer Komplexität. Stuttgart: Enke

Marcuse, Herbert (1968): Der eindimensionale Mensch. Studien zur Ideologie der fortgeschrittenen Industriegesellschaft. Neuwied: Luchterhand

MedLit: Media literacy as a competence program for social change. Medlitwewbsite: https://medlit.univie.ac.at (May 10, 2018)

Mead, George Herbert (1973): Geist, Identität und Gesellschaft. Aus der Sicht des Sozialbehavioursimus. Frankfurt am Main: Suhrkamp

Piaget, Jean / Inhelder, Bärbel (1969): The Psychology of the Child. New York: Basic Books

Postman, Neil (1985): Amusing <ourselves to Death. Public Discourse in the Age of Show Business. New York: Viking Penguin.

Williams, Raymond (1958): Culture and Society. 1780 – 1950. London: Chatto & Windus

2 Quantum Computing - Will it Change our Society?

Erwin BRATENGEYER
Danube University Krems, Austria

2.1 Abstract

Not longago quantum computers were thought an impossible technology, but recent developments, which are drafted here, have brought the idea to everybody's attention. The potential impacts of quantum computing on our lives in the 21st century are covered from several perspectives. Based on illustrations of the bizarre principles of quantum physics the basic functionalities of quantum computing are outlined. Since we have already learned during the past century that computing effects almost every domain of our life we might not be too surprised that a drastically different approach to computing is again going to transform our society drastically. Harnessing the intricate power of quantum mechanics is exemplified by addressing economic, scientific, and philosophical aspects.

Keywords: quantum computing, quantum bits/qubits, impacts

2.2 Introduction

After a century of dealing with objects that are in different states at the same time (superposition), are connected over distance without any observable interaction (entanglement), and can transit through barriers (tunneling) quantum theory now seems fully established. Today, those peculiar aspects of quantum theory are ready to be used leading to fundamentally new paradigms of computation. Considering how much classical computers revolutionized our world it is hard to imagine how computers with extraordinary capabilities will again revolutionize our world. It is expected that quantum computers will allow us to solve problems that seem impossible to overcome by giving us unimagined power to manipulate matter and energy. The 2012 Nobel Prize in Physics was awarded for manipulation of quantum systems. In the press release it was stated that "*Perhaps the quantum computer will change our everyday lives in this century in the same radical way as the classical computer did in the last century*."[1]
To understand why quantum computing is categorically different, some fundamental aspects are illustrated.

2.3 Fundamentals

Quantum computing is computing based on the principles of quantum theory. Quantum theory provides an explanation for the behavior of energy and matter on the atomic and subatomic level. In the year 1900 German physicist Max Planck (1858–1947) introduced the idea that energy and matter exist in discrete "quantized" form only. His supposition is expressed by

$$E = hf$$
$$h = 6{,}626069\ 10^{-34}\ Js$$

where *h* is the so called Planck's constant. It means that energy like matter only exists as a multiple of an elementary unit, which Planck called "quanta". So this is where the term "quantum" comes from. Much of quantum theory is based on Planck's fundamental findings for which he was awarded the Nobel Prize in Physics for 1918 [2].
Another Nobel laureate, the Danish physicist Niels Bohr (1885–1962) came up with a peculiar interpretation of quantum theory. He asserted that a particle cannot be assumed to have

specific properties, or even to exist, until it is measured, thus denying that objective reality does exist. While this may sound as a subject for debate from a philosophical point of view it is to be considered as hard fact from a quantum-physics point of view, known as superposition. It means that particles can exist in different states, can be in different positions, can have different energies all at the same time, until a measurement is made.
Likewise, quantum entanglement is a phenomenon which is difficult to grasp, but is one of the corner stones of quantum computing. Albert Einstein (1879–1955) and other renowned Nobel Prize laureates were heavily engaged in controversially discussing entanglement. Changes made to one of a pair of entangled particles instantaneously also influence changes to the other, no matter by which distance they are separated, thus violating classical laws of physics.
Yet another process that cannot be perceived directly is quantum tunneling. Max Born (1882–1970), winner of the 1954 Nobel Prize in Physics, recognized the generality of tunneling which was first noticed in 1927. Tunneling means transitioning through a classically-forbidden energy state.
No matter how inconceivable quantum superposition, quantum entanglement or quantum tunneling may appear, for many decades those peculiar effects have been experimentally observed time and time again. They form the foundation of quantum computing.

2.4 Computation based on quantum physics

Quantum computation is inherently different from today's binary digital electronic information processing which is based on transistors (switches), operating according to strict rules of logic [3]. Binary digits (bits) are always in one of two states, either 0 or 1, according to the transistors of the system being off or on. Quantum computation, however, uses quantum bits (qubits) instead of bits. A qubit is the simplest quantum system displaying the weirdness of quantum mechanics. The possible quantum states for a single qubit can be visualized using a Bloch sphere (see Fig. 1). A qubit state can be represented by any point |Ψ> on the surface, other than a classical bit which could only be at the "North Pole" or the "South Pole" [4].

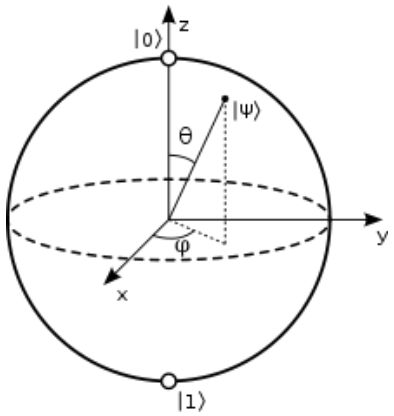

***Figure 1**: Bloch Sphere representation of a qubit.*
Source: https://en.wikipedia.org/wiki/Qubit

Computing based on qubits takes advantage of the abovementioned strange abilities of superposition, entanglement and tunneling. The coherent interaction of multiple qubits allows for processing information in ways that have no equivalent in classical computing. Due to superposition qubits can represent all possible states at the same time. For instance, 64 qubits, representing the very huge number of 2^{64} states (corresponding to about 2 Exabytes), allow for finding a solution theoretically at once. In contrast, it would take a typical modern 64-bit computer many years cycling through all these combinations one by one. Simply speaking, the difference boils down to solving a problem by trying every possibility one by one versus all possibilities at once, rendering quantum computers so much faster than any supercomputer.

But a quantum computer is not just a faster computer. As an analogy, one could say that an aircraft is much faster than a bicycle. However, the real advantage of an aircraft over a bicycle lies in the fact that an aircraft allows for addressing totally different tasks. Likewise, quantum computers allow for solving problems which are principally unsolvable for classical computers.

2.5 Physical implementations of qubits

How to create physical computing devices is a high priority research topic for many IT giants and start-up companies. Several approaches are being explored how to make those qubits [5]. Examples of possible physical implementations of qubits include but are not limited to atomic nuclei [6], trapped ions (see Fig. 2) [7], photons [8], a current in a loop of superconducting metal (see Fig. 3) [9], spin qubits [10] and topological qubits (Majorana particles) [11].
To be useful, those systems will require being in a state of coherence which means superposition and entanglement. Decoherence can be viewed as the loss of information from a system into the environment. Decoherence time tells you how many operations can be run before coherence of qubits is lost due to noise and environmental influence. A qubit behaves capriciously, demanding perfect isolation and operating temperature close to absolute zero. To be truly useful there is also a need for robust error correction which requires many physical qubits. Scalability is a big problem which means that increasing the number of qubits also error rates increase. A sufficiently high number of qubits is key to harness the potential of quantum computing. Supercomputers can compete with about 50-qubits systems. This threshold is also known as quantum supremacy [12]. For initial computing breakthrough achievements at least several hundred qubits are required. Eventually mass-market general-purpose quantum computers will require thousands of logical qubits which translates into some ten thousands physical qubits.

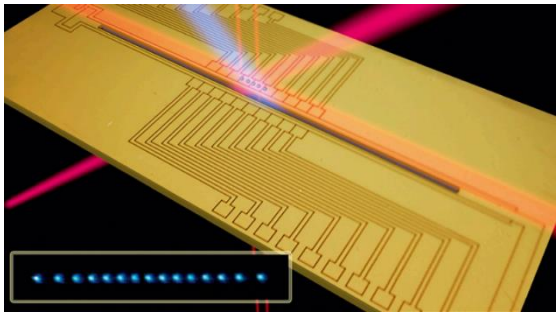

***Figure 2**: A segmented chip trap for ion quantum computing.*
Source: *R.Blatt, IQOQI Innsbruck.*

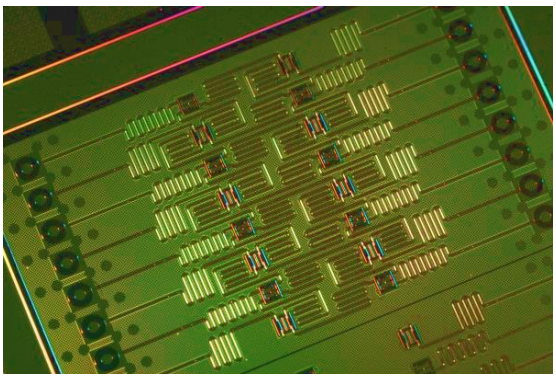

***Figure 3:** A 16-qubit superconducting chip*.
Source: IBM

2.6 State of the art

Many scientists have contributed to the evolution of quantum computing. Famous physicist and Nobel laureate Richard Feynman (1918–1988) was the first to mention the possibility of using quantum effects for computation in his famous talk in 1959 [13]. David Deutsch, British physicist at University of Oxford, laid the foundations of the quantum theory of computation in the mid-1980s. In 1996 David P. DiVincenzo, IBM, proposed a list of minimum requirements for creating a quantum computer. In 2005 the first quantum bit (qubit) was announced to have been created at the University of Innsbruck, Austria. In 2007 D-Wave Systems, Canada, demonstrated a 28-qubit quantum annealing computer. In 2012 the world's first dedicated quantum computing software company, 1QB Information Technologies, Inc., was founded. In 2017 IBM unveiled a 17-qubit quantum computer. In 2018 Intel announced a 49-qubit quantum chip and Google announced a 72-qubit quantum chip.
Obviously quantum computing is currently in a hype phase. IT giants like IBM, Google, Intel, Microsoft, Toshiba, to name a few, are investing substantially, racing to build the first practical quantum computer. More than two thousand scientific institutions across Europe are at present pursuing engagement in quantum technologies [14]. D-Wave Systems Inc. claims to be the first company to build a commercially available quantum computer, although academic experts debate whether the D-Wave system is a "true" quantum computer [15]. IBM offers a 20-qubit quantum computer via the cloud. Currently Google claims to lead the race with its 72-qubit quantum chip and to have cracked supremacy. That's the point at which a quantum computer can do calculations beyond the reach of today's fastest supercomputers [16].
The road map of *2016 European Quantum Manifesto* [17] predicts: within 5 years small quantum processors executing technologically relevant algorithms; within 5 to 10 years solving chemistry and materials science problems with special purpose quantum computer with >100 physical qubits; in about 10 years general purpose quantum computers exceeding computational power of classical computers. Be that as it may, as of today quantum computers don't seem to be anywhere near ready for practical use as engineers are faced with enormous challenges like gaining control of decoherence. However, there is hardly any doubt that this is only a matter of a few years.
Fig. 4 illustrates vividly the current status of quantum computers, putting the first universal computer *Z3* on a level with *D-Wave One* referring to their state of development.

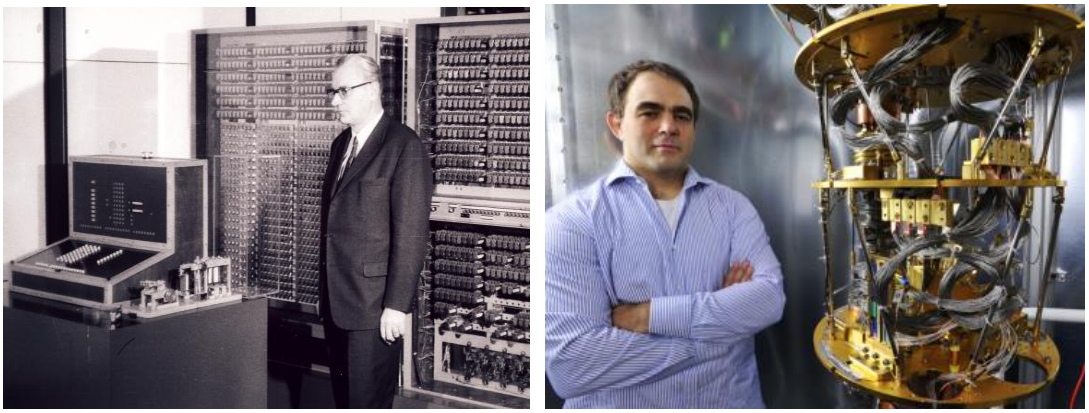

***Figure 4**:* Left*: Konrad Zuse, founder of Zuse KG (DE) with his Z3, the first programmable digital computer, 1941. Source: Stadtarchiv Hünfeld.* Right*: Geordie Rose, co-founder of D-Wave Systems (CA) with his D-Wave One, the first commercially available (non-universal) quantum computer, 2011. Source: D-Wave Systems*

2.7 Impacts

The huge potential impact of quantum computers extends across all domains of our current society including medicine, chemistry, pharmacy, biology, technology, communication, energy,

finance, environment, artificial intelligence, industrial optimization processes and handling big data in all kind of businesses, cosmology and even philosophy. The latter comes up with the multiverse theory some of the experts, like MIT physicist Max Tegmark [18] are holding.
A few examples shall shed some light on these bold claims. Quantum simulation of the behavior of complex molecules can lead to the production of completely new materials [19]. Room temperature superconductors would revolutionize information technology and energy transportation and storage [20]. New drugs for curing diseases can be designed, reducing many years of development time. Personalized medicine by quantum computing genome sequencing allows for tailored treatment plans [21]. Efficiently making fertilizers or efficiently capturing carbon by succeeding in analyzing a specific molecule (nitrogenase) would solve environmental problems [22]. Multi-parameter calculability may enable ultra-efficient logistics and supply chains. New ways to model financial data and isolating key global risk factors to make better investments can be found. Quantum-based cryptographic systems would be much more secure (theoretically unbreakable) than their conventional analogues allowing for perfectly private communication and cloud services [23]. When data sets are very large, such as in pattern recognition tasks, quantum-computer powered machine-learning based artificial intelligence can be much more powerful in helping with predictive modeling, fraud detection, or language translation [24]. Accurate weather forecasting and climate change prediction allows for taking preparation and respond to its impact.
One could imagine that the most disruptive impact will be the one which we can't imagine. John Preskill, Director of the Institute for Quantum Information and Matter at Caltech, says he thinks he will live long enough to see quantum computers have an impact on society in the way the internet and smartphones have — although he cannot predict exactly what that impact will be. He says. "*We know from history that we just don't have the imagination to anticipate where new information technologies can carry us*." [25]

2.8 Conclusion

Computing power, which obeys the laws of quantum mechanics, has enormous scientific, industrial, economic, and commercial applications with manifold implications. Probably the most striking aspect is that with quantum computing we can simulate nature itself. *"If you get to understand nature, which is naturally quantum mechanical, there is no reason to use bits, zeros and ones, but to use other objects that follow the same natural laws - quantum bits. … With quantum computers we have that potential to look for solutions and calculate things which we never thought about before".* Jerry Chow, Manager of Experimental Quantum Computing, IBM Research. [26].

2.9 References

[1] The Nobel Prize in Physics 2012 Press Release. (2012 Oct 09). Retrieved from https://www.nobelprize.org/nobel_prizes/physics/laureates/2012/press.html

[2] Max Planck. (n.d.). In Wikipedia. Retrieved from https://en.wikipedia.org/wiki/Max_Planck

[3] Moret-Bonillo, V. (2017). Adventures in computer science: From classical bits to quantum bits. New York City, New York: Springer.

[4] Qubit. (n.d.). In Wikipedia. Retrieved from https://en.wikipedia.org/wiki/Qubit

[5] DiVincenzo, D. (2008). The Physical Implementation of Quantum Computation, IBM T.J. Watson Research Center. Retrieved from https://arxiv.org/pdf/quant-ph/0002077.pdf

[6] Verduijn J., Tettamanzi C.G., Rogge S. (2013). Wave Function Control over a Single Donor Atom. Nano Letters 13(4), 1476.

[7] Nonospheres. (2018 Feb 07). Retrieved from https://quantumoptics.at/en/10-projects.html

[8] Chapman RJ, et al. (2016 Apr 18). Experimental perfect state transfer of an entangled photonic qubit. Nat Commun.

[9] Introduction to the D-Wave Quantum Hardware (n.d.). Retrieved from https://www.dwavesys.com/tutorials/background-reading-series/introduction-d-wave-quantum-hardware

[10] A blog by QuTech. (n.d.). Making quantum computers with spin qubits. Retrieved from http://blog.qutech.nl/index.php/2018/04/20/making-quantum-computers-with-spin-qubits/

[11] Mike Mcrae (2017 Sep 07). This New Proof of Majorana Fermions Is Going to Be Massive For Quantum Devices. Matter that behaves like its own antimatter. Retrieved from https://www.sciencealert.com/this-new-proof-of-majorana-fermions-is-going-to-be-massive-for-quantum-devices

[12] Neill C. et al. (2018 Apr 13). A blueprint for demonstrating quantum supremacy with superconducting qubits. Science: Vol. 360, Issue 6385, pp. 195-199

[13] Richard P. Feynman. (n.d.). There's Plenty of Room at the Bottom. Retrieved from http://www.zyvex.com/nanotech/feynman.html

[14] QUROPE Quantum Information Processing and Communication in Europe. (n.d.). Retrieved from: http://qurope.eu/manifesto/endorsers

[15] Conway, S., Earl C. Joseph, Sorensen R. (2016 Apr). Quantum Computing in the Real World. Retrieved from https://www.dwavesys.com/sites/default/files/IDC%20Quantum%20Computing%20in%20the%20Real%20World.pdf

[16] Martin Giles and Will Knight. (2018 Mar 09). Google thinks it's close to "quantum supremacy." Here's what that really means. Retrieved from https://www.technologyreview.com/s/610274/google-thinks-its-close-to-quantum-supremacy-heres-what-that-really-means/

[17] Quantum Manifesto, A New Era of Technology. (2016 May). Retrieved from http://qurope.eu/system/files/u7/93056_Quantum%20Manifesto_WEB.pdf

[18] Max Tegmark Serious Science (2014 Aug 08).Evidence for Parallel Universes (video). Retrieved from http://serious-science.org/evidence-parallel-universes-1435

[19] Bob Yirka (2016 July 20). First completely scalable quantum simulation of a molecule. Retrieved from https://phys.org/news/2016-07-scalable-quantum-simulation-molecule.html

[20] Thomas Hornigold (2018 May 13). Why the Discovery of Room-Temperature Superconductors Would Unleash Amazing Technologies. Retrieved from https://singularityhub.com/2018/05/13/the-search-for-high-temperature-superconductors/#sm.00000imufob684d8jz984yaj1di6a

[21] Medical News Bulletin (2017 Oct 18). Are Quantum Computers the Future of Drug Discovery and Development? Retrieved from https://www.medicalnewsbulletin.com/quantum-computers-drug-discovery-development/

[22] Reiher, M., et al. (2016 May 25). Elucidating Reaction Mechanisms on Quantum Computers. Retrieved from https://www.microsoft.com/en-us/research/wp-content/uploads/2016/05/1605.03590-2.pdf

[23] Mavroeidis, V., et al. (2018). The Impact of Quantum Computing on Present Cryptography. (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 9, No. 3.

[24] Dom Galeon (2018 Feb 05). A Quantum Algorithm Could Help Us Bring AI to Life. Retrieved from https://futurism.com/quantum-algorithm-ai/

[25] Neil Savage. (2017 Jul 10). Quantum computers compete for "supremacy". Retrieved from https://www.salon.com/2017/07/09/quantum-computers-compete-for-supremacy_partner

[26] Jerry Chow. (n.d.) Building a Quantum Community with IBM Q (Video). Retrieved from https://www.research.ibm.com/ibm-q/learn/quantum-computing-applications/

3 Virtual Mobilities in Open Education

Diana ANDONE
Politehnica University Timisoara, Romania

3.1 Abstract

The paper presents the design of a Virtual Mobility Learning Hub for Higher Education in Europe, that is part of the Open Virtual Mobility project (OpenVM), which is an Erasmus+ strategic partnership (2017-2020) addressing the need of creating accessible opportunities for achievement of Virtual Mobility (VM) skills to enhance the uptake of Virtual Mobility in higher education in Europe, by supporting institutions, educators and students in acquiring, assessing and recognising VM skills, i. e. key competencies needed to successfully design, implement and participate in VM actions. To achieve this, openVM applies the principles of Open Education (OE) to promote achievement, assessment and recognition of VM skills. Both VM and OE aim to enhance participation in international knowledge flows, use of digital media, improve teaching and learning by setting international benchmarks, attract and keep talents for the economy and research systems, innovate and build capacity.
One of the key outcomes of the OpenVM project is the Virtual Mobility Learning Hub for achievement, assessment and recognition of VM skills as a central reference point for higher education in Europe. The aim of the paper is to investigate how open credentials can be used in virtual mobilities in higher education context. The design of the Virtual Mobility Learning Hub and its components is including OERs, MOOCs, Assessment and Open Badges. The user-centric design is following the principles of OE as laid out in the OpenEdu Framework by the Joint Research Centre of the European Commission.

Keywords: Virtual Mobilities, Open Mobility, digital competences, OpenVM project

3.2 Introduction

Mobility of students and staff has been one of the central objectives and main policy areas of the European Higher Education Area (EHEA). For example, the Communiqué of European Ministers for Higher Education in Europe from 2009 states that: “In 2020, at least 20% of those graduating in the European Higher Education Area should have had a study or training period abroad” [1]. Mobility has been considered an important part of higher education as it supports personal development and employability, fosters respect for diversity, encourages linguistic pluralism underpinning the multilingual tradition of Europe and increases cooperation and competition between higher education institutions [1]. The Erasmus program, superseded by Erasmus+, has been one of the most well-known programs promoting mobility of students and staff.
However, as the mobility statistics show, despite numerous initiatives and programs, the uptake of mobility of students and staff has been very diverse across Europe [2]. Despite acknowledging the social and cultural benefits of mobility for higher education, awareness and exploitation of mobility instruments are still not as extensive as anticipated [3]. The obstacles to the uptake of mobility include socio-cultural background and status, disabilities and chronic diseases, family and parental obligations, financing issues of the mobility period, low language proficiency, availability of information about mobility and recognition of study periods and degrees [4]. However, the main obstacles to mobility can be dramatically reduced by adding the virtual component. Therefore, the concept of virtual mobility has been considered as a non-

discriminatory alternative of mobility bearing a great potential for the internationalisation, innovation and inclusion in higher education. The main obstacles to mobility can be dramatically reduced by adding the virtual component.

3.3 Current challenges for global education

On 25th of September 2015, member countries oft he UN adopted a set of goals to end poverty, protect the planet and ensure prosperity for all as part of a new sustainable development agenda. Each goal has specific targets to be achieved over the next 15 years [5].
For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and people like us. Figure 1 presents those goals. It is easy to see not only that Quality Education is one oft he major goals, but also that good education is part of the solutions for many other goals.

Figure 1. *United Nations goals for sustainable development*

Obtaining a quality education is the foundation to creating sustainable development. In addition to improving quality of life, access to inclusive education can help equip locals with the tools required to develop innovative solutions to the world's greatest problems.
Over 265 million children are currently out of school and 22% of them are of primary school age. Additionally, even the children who are attending schools are lacking basic skills in reading and math. In the past decade, major progress has been made towards increasing access to education at all levels and increasing enrollment rates in schools particularly for women and girls. Basic literacy skills have improved tremendously, yet bolder efforts are needed to make even greater strides for achieving universal education goals. For example, the world has achieved equality in primary education between girls and boys, but few countries have achieved that target at all levels of education.
The reasons for lack of quality education are due to lack of adequately trained teachers, poor conditions of schools and equity issues related to opportunities provided to rural children. For quality education to be provided to the children of impoverished families, investment is needed

in educational scholarships, teacher training workshops, school building and improvement of water and electricity access to schools.
Between the main targets established for this goal:

- By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university
- By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship
- By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations
- By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development
- By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries
- By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing states

Practically, all those targets might be easier reached if implementing Virtual Mobilities.
Between 18-20 September 2017 in Ljubljana, Slovenia, took place the 2nd World Open Educational Resources (OER) Congress with the main goal towards OER for Inclusive and Equitable Quality Education: From Commitment to Action. On this occasion, where delegates from 111 countries participated, the so called Ljubljana OER Action Plan and Ministerial Statement [6] has been adopted.
The 2017 Ljubljana OER Action Plan presents 41 recommended actions to mainstream open-licensed resources to help all Member States to build Knowledge Societies and achieve the 2030 Sustainable Development Goal 4 on "quality and lifelong education."
The 2017 Ljubljana OER Action Plan provides recommendations to stakeholders in five strategic areas, namely: building the capacity of users to find, re-use, create and share OER; language and cultural issues; ensuring inclusive and equitable access to quality OER; developing sustainability models; and developing supportive policy environments.
The accompanying Ministerial Statement called for a "dynamic coalition to expand and consolidate commitments to actions, strategies and legislation" in OER, with a "call on all educational stakeholders to implement the recommendations of the Ljubljana OER Action Plan 2017." The statement is endorsed by 20 Ministers and their designated representatives of Bangladesh, Barbados, Bulgaria, Czech Republic, Costa Rica, Croatia, Kiribati, Lao People's Democratic Republic, Lithuania, Malta, Mauritius, Mauritania, Mozambique, Palestine, Romania, Serbia, Slovakia, Slovenia, South Africa and the United Arab Emirates.
On the other hand, recruiters are having their own expectations from the educational system. In 2015, Bloomberg issued a report called Job Skills Companies Want But Can't Get. This report states that business schools are supposed to produce graduates who have the abilities companies need most, but corporate recruiters say some highly sought-after skills are in short supply among newly minted MBAs. As part of their ranking of 122 top business programs, Bloomberg surveyed 1,320 job recruiters at more than 600 companies to find out which skills employers want but can't find - and which schools are best at meeting the needs of the market. Figure 2 presents a general skills gap chart established when taking into consideration all industries. However, in [7] one can find specific skills asked for in different industries.

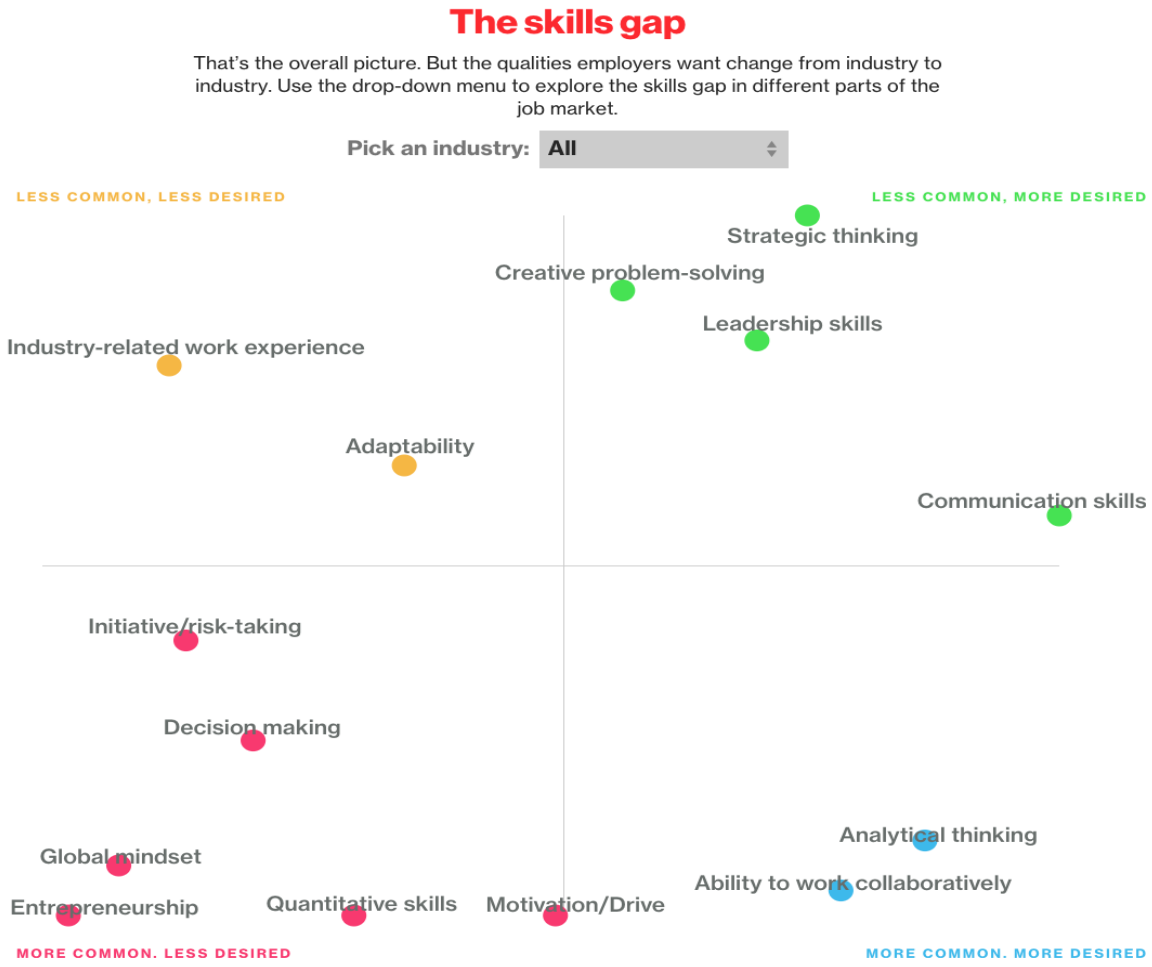

Figure 2. *Bloomberg's findings about skills gap*

In 2015 as well, the World Economic Forum set up some goals on future competencies for the year 2020. They might be found in Figure 3.

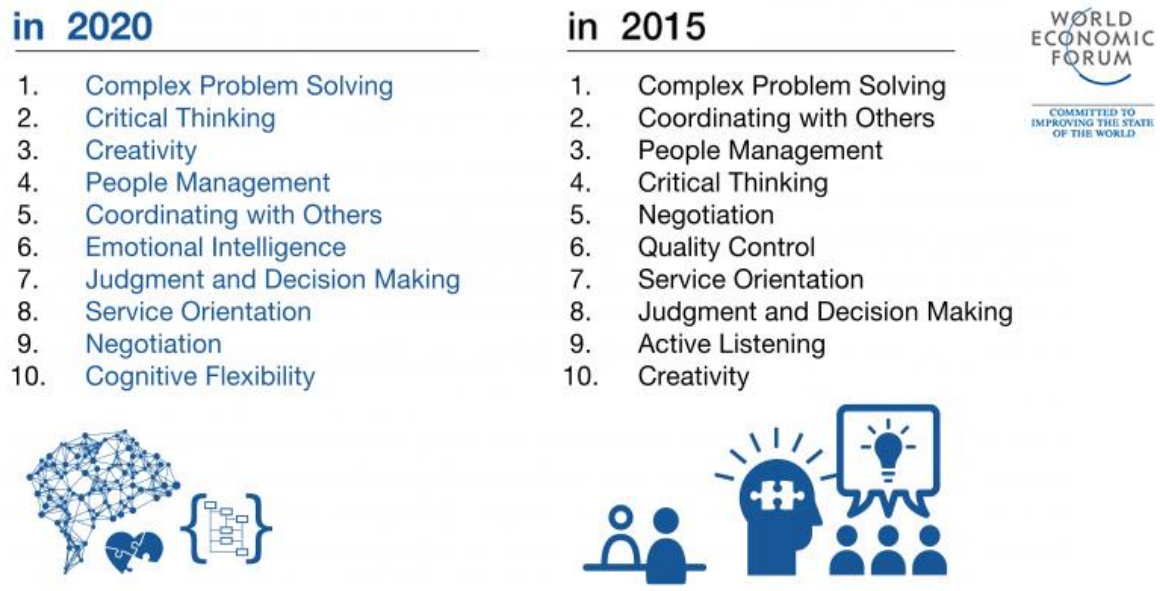

Figure 3*. World Economic Forum – Future competencies*

All those documents are proving that global education is facing a new challenge worldwide. The 21st century workplace requires well-educated, imaginative, collaborative, confident

people who take personal responsibility and will go the extra mile - ‘creative creators’, as Tom Friedman [8] calls them.

3.4 21st Century Students and their Skills

The concept used to modernize education and teaching, to make them appropriate to the 21st century challenges and expectations is Open Education. Open Education is an umbrella term under with many different understandings. In Europe, particularly in higher education, Open Education has been discussed as an important element of the European policy agenda. The key perspectives on open, higher education in Europe include [9]:
(a) reducing or removing access barriers such as financial, geographical, time and entry requirements barriers,
(b) modernising higher education in Europe by means of digital technologies,
(c) bridging non-formal and formal education, by making it easier to recognise learning achievements.
Today students will learn independent and digital all their life. But, are they ready to identify, access, learn, analyse, apply and practice new knowledge across different media, information, communication, tools as to enhance their skills and develop their careers?
Some replies on those questions and on how to develop Open life-long learning students for the 21st century society might be given by a combination of tools (Figure 4).

Figure 4. *Tools fort he 21st Century Education*

A Massive Open Online Course (MOOC) is an online course aimed at unlimited participation and open access via the web [10]. In addition to traditional course materials such as filmed lectures, readings, and problem sets, MOOCs provide interactive courses with user forums to support community interactions among students, professors, and teaching assistants, as well as immediate feedback to quick quizzes and assignments. MOOCs are a recent and widely researched development in distance education which were first introduced in 2006 and emerged as a popular mode of learning in 2012.
Open Educational Resources (OER) are freely accessible, openly licensed text, media, and other digital assets that are useful for teaching, learning, and assessing as well as for research purposes. There is no universal usage of open file formats in OER. The term OER describes publicly accessible materials and resources for any user to use, remix, improve and redistribute

under some licenses [11]. The development and promotion of open educational resources is often motivated by a desire to provide an alternate or enhanced educational paradigm.
Usually, into the higher education system, the OER are implemented through virtual education campuses platforms, such as the Virtual Campus developed by the Politehnica University of Timisoara, Romania [12] [13].
Virtual Mobility (VM) refers to students and teachers in higher education using another institution outside their own country to study or teach for a limited time, without physically leaving their home. It complements physical mobility in which students travel to study abroad, such as within the Erasmus Programme. The two forms of mobility together constitute academic mobility. Student and teacher mobility are perceived as important quality issues in higher education [14]. Virtual mobility has been defined as an activity that offers access to courses and study schemes in a foreign country and allows for communication activities with teachers and fellow students abroad via the new information and communication technologies. Striving for a European educational space, the European ministers of Education consider virtual mobility as a necessary addition to the traditional ways of studying abroad, that required travelling. In Europe, databases like Educontact provide students with an overview of available courses. The public policy background is to be found, e.g. in the Leuven-declaration on Mobility, by 46 European Higher education ministers [15].
Both virtual mobility and open education aim to enhance participation in international knowledge flows, use of digital media, improve teaching and learning, attract and keep talents through internationalisation, but also innovate and build capacity.

3.5 Open Virtual Mobility Project

The Open Virtual Mobility (openVM) project (see Figure 5) is a recently granted Erasmus+ strategic partnership which aims at promoting and scaling-up Virtual Mobility in higher education in Europe through achievement, assessment and recognition of virtual mobility skills of educators and students in line with Open Education principles.

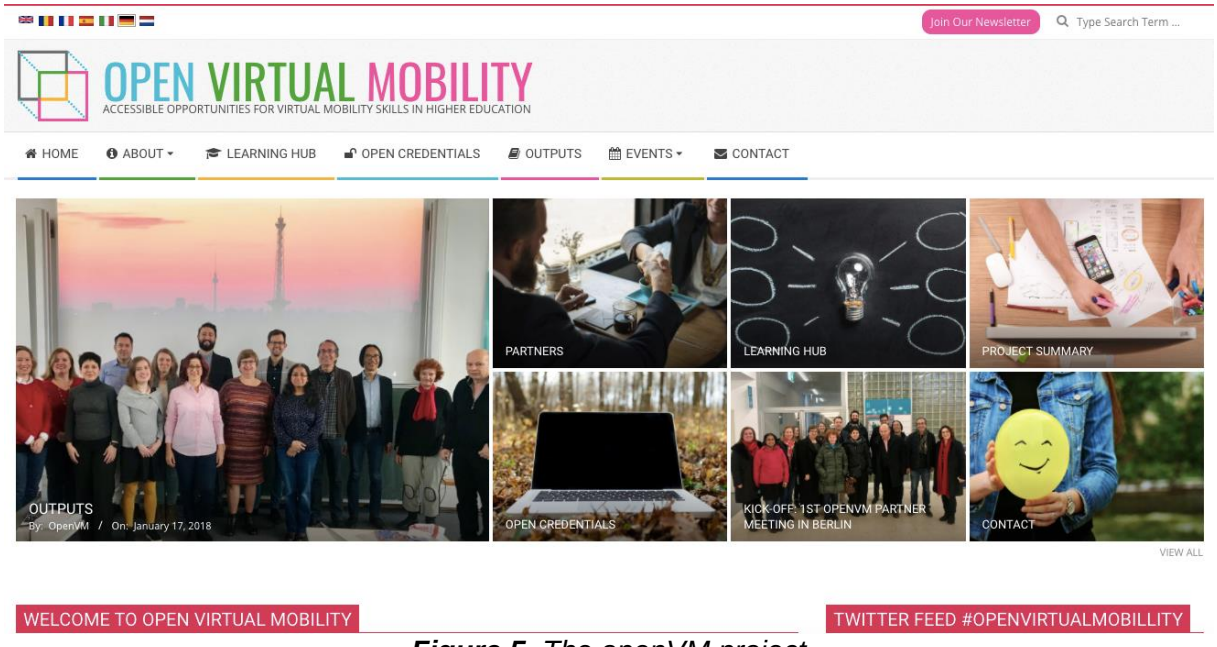

***Figure 5**. The openVM project*

"Virtual mobility stands for the set of ICT supported activities, organized at institutional level, that realise or facilitate international, collaborative experiences in a context of teaching and/or learning" (Erasmus+ programme guide).

“Open Education is seen as a way of carrying out education, often using digital technologies. Its aim is to widen access and participation to everyone by removing barriers and making learning accessible, abundant, and customisable for all. It offers multiple ways of teaching and learning, building and sharing knowledge. It also provides a variety of access routes to formal and non-formal education, and connects the two.” (JRC, Opening-up education, 2016)
The partnership is composed of nine European partner organisations from higher education, aiming at enhancing the uptake of virtual mobility in higher education by improving VM skills and in consequence VM readiness of teachers and students: Beuth University of Applied Sciences Berlin Germany, University of Roma TRE Italy, Open University – Welten Institute, the Netherlands, Politehnica University of Timisoara, Romania, L’Université Numérique Économie Gestion – AUNEGE, France, University of the Balearic Islands, Spain, CINECA, Italy, KU Leuven, Belgium, European Association for Distance Teaching Universities – EADTU.
The project Open Virtual Mobility addresses the challenges and aims to create the European Virtual Mobility Learning Hub for achievement, assessment and recognition of VM skills. The VM Learning Hub is envisaged to become a central reference point for educators and students wishing to learn about the different possibilities and forms of virtual mobility, collaborate on designing VM activities, assess and recognise VM skills, i. e. skills acquire from and/or relevant for the implementation and/or participation in VM actions. The project aims to develop a set of tools, methods and guidelines to enhance achievement, assessment and recognition of skills, provide support on pedagogy and technology for the design and implementation of virtual mobility, and enhance collaborations of participating organisations, educators and students. The VM Learning Hub aims to provide engaging and effective learning experience and to provide evidence about how achievement, assessment and credentialing of VM skills contributes to the uptake virtual mobility.

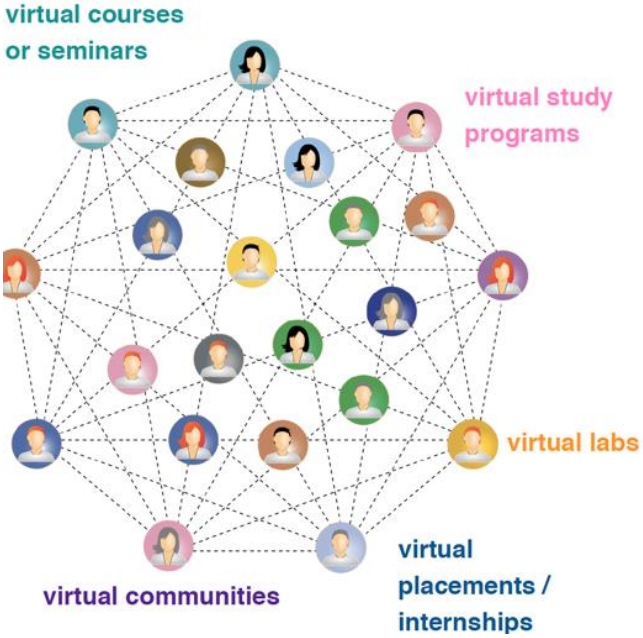

Figure 6. *Tools to achieve Virtual Mobility*

The premise of the openVM project is that virtual mobility can develop its potential, provided higher education leaders, educators, students and other relevant stakeholders, such as International Offices, know about and know how to use the opportunities of virtual mobility. This means higher education staff, educators and students need the necessary skills, confidence and readiness to initiate and implement VM activities in their own organisations. The openVM project intends to enhance the readiness for virtual mobility against the backdrop with Open Education (OE) and addresses the need of creating accessible opportunities for achievement of skills, needed to design, implement and participate in VM activities in line with the principles of Open Education.

OpenVM builds a European Virtual Mobility Learning Hub for achievement, assessment and recognition of virtual mobility skills using a set of innovative digital learning tools such as Open Credentials (Open Badges, Blockcerts), semantic Competency Directory, evidence-based E-Assessment, algorithm-based matching tool for collaborative learning groups, and pedagogical methods such as Open Learning by Design and Crowd Creation of OERs and MOOCs.

OpenVM will introduce innovative elements:

- OpenVM OER will provide an accessible collection of learning resources about Virtual Mobility and Open Education including practical hands-on guidelines for higher education teachers and students;
- OpenVM MOOC in the VM Learning Hub will provide accessible learning opportunities about Virtual Mobility and Open Education for higher education teachers, students, international officers and companies offering or planning to offer virtual placements;
- OpenVM Credentials will provide accessible opportunities for teachers and students for recognising, validating and communicating virtual mobility skill sets inside and outside higher education;
- OpenVM Competency Directory will provide an accessible tool for cross-referencing virtual mobility skills to existing competency frameworks in an automated way;
- OpenVM Assessment will provide accessible opportunities for teachers and students to assess selected virtual mobility skill sets adding evidence to make the assessment process and outcome transparent and traceable.

For more information, please visit the Open Virtual Mobility Learning Hub at: https://hub.openvirtualmobility.eu/.

The Open Virtual Mobility Learning Hub (OVM LH) is based on several applications and technologies: Learning Management System – Moodle 3.5, Interactive Content H5P, e-portfolio Mahara, Bestr Open Badges, matching tool for building learning groups and a semantic competency directory.

The Open Virtual Mobility Learning Hub structure comprises:

(1) VM Skills - a description of virtual mobility skills including alignment to existing competency frameworks in a competency directory (O3); this includes VM e-assessment - different forms of digital self-/assessment including digital evidence (such as testimonials, digital assets, e-portfolios, crowd evidencing) applied as elements of open credentials and supporting open, evidence-based assessment (O4);

(2) VM Open Credentials - digital recognition of VM skills based on current forms of open digital credentials such as Open Badges and Blockcerts (O5);

(3) VM Learning - User Generated Content, Open Educational Resources and other forms of Open Content to support learning about VM and developing VM Skills (O6); this includes also the VM Activities - Open Learning Activities including learning in and through MOOCs, peer-to-peer activities, virtual/blended collaborations (O6);

(4) VM Market / Connections - finding cooperation partners for VM activities supported by such tools as the Matching Tool including matching for collaboration of groups (O3);

The VM LH Functionalities are visualised in the diagram shown in Figure 7.

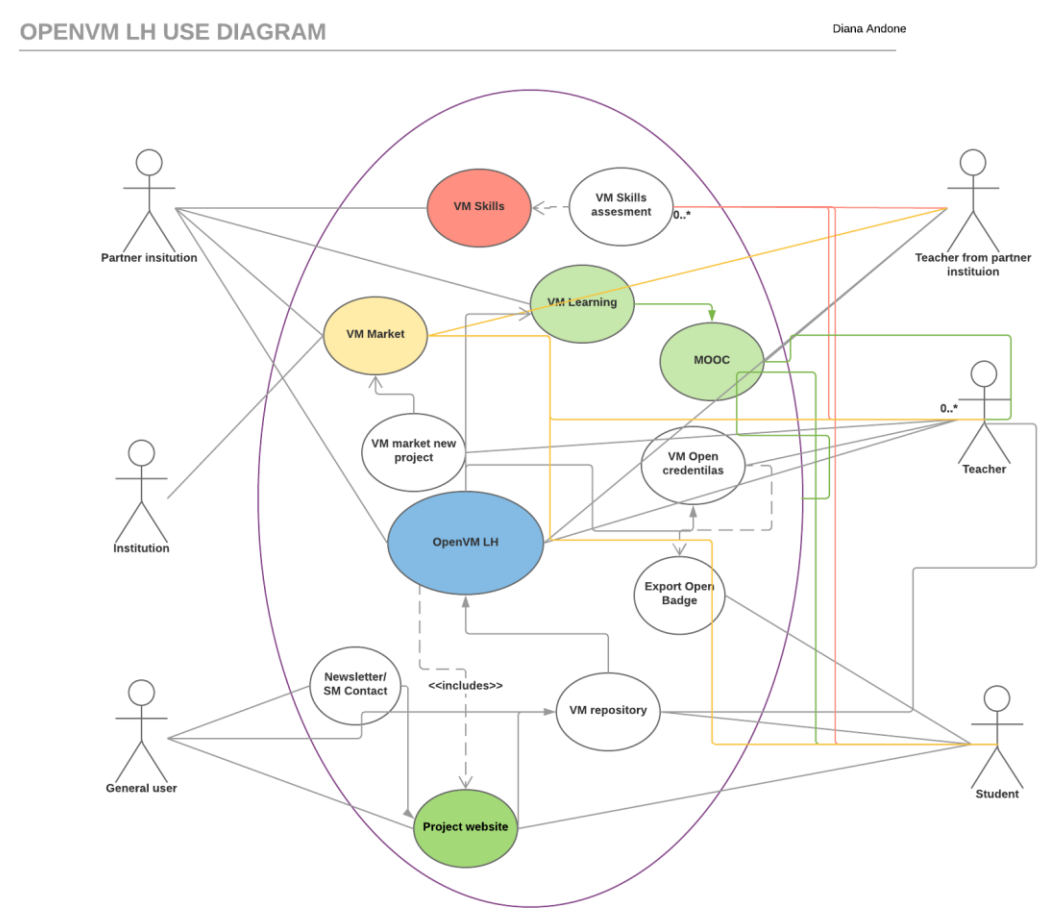

Figure 7. *Functionalities of the OpenVM Learning Hub*

More information on the OpenVM project can be found by visiting the project's website at: https://www.openvirtualmobility.eu

3.6 Conclusions

The context and requirements of education have changed dramatically in the 21st century, both in terms of competences and skill required as well as in the way those skills might be delivered. The education ecosystem became open and had to take into consideration both the expectations of the companies recruiting qualified personnel and from the perspective of the learner that tends to use a sort of puzzle to gain the necessary skills and competences, independently of the time and location constrains imposed by classical education institutions. Self-based learning, recognition of informal learning have become part of the actual educational systems characteristics. Virtual knowledge acquire is part of that process.
This paper presents the concept, approaches, considerations and first study results relevant for designing a collaborative learning hub for promoting VM Skills of educators and students in the European Higher Education Area. While the development of the VM Learning Hub to enhance the Virtual Mobility readiness through achievement, assessment and recognition of VM skills is still at an early stage, the participants to the OpenVM project aimed to demonstrate the complexity of designing such a collaborative learning hub with the view of helping in planning and decision-making in similar projects. The considerations presented here may be interesting for other projects and contexts which aim to apply technologies for collaborative forms of skill attainment, skill assessment and skill recognition.

3.7 References

[1] European Commission: Communiqué of the Conference of European Ministers Responsible for Higher Education, Leuven and Louvain-la-Neuve (2009), http://europa.eu/rapid/press-release_IP-09-675_en.htm, last accessed 25 January 2018

[2] Eurostat: Learning Mobility statistics, Eurostat Homepage (2017), http://ec.europa.eu/eurostat/statistics-explained/index.php/Learning_mobility_statistics, last accessed 25 January 2018

[3] Dauksiene E., Tereseviciene M., Volungeviciene A.: Virtual Mobility Creates Opportunities. Application of ICT in Education 2010: experience, issues and perspectives of e-studies, Conference Proceedings, Kaunas, Lithuania, pp. 30–35, (2010), available at https://www.researchgate.net/publication/317549367_VIRTUAL_MOBILITY_CREATES_OPPORTUNITIES, last accessed 25 January 2018

[4] Bruns S., Scholz, C.: Promoting mobility-study on obstacles to student mobility. ESIB-The National Unions of Students in Europe (2007), available at http://media.ehea.info/file/ESU/85/9/ESIB_study_mobiity_582859.pdf, last accessed 25 January 2018

[5] United Nations: About the Sustainable Development Goals (2015), available at https://www.un.org/sustainabledevelopment/sustainable-development-goals/, last accessed 25 January 2018

[6] Ljubljana OER Action Plan and Ministerial Statement (2017), available at https://www.oercongress.org/woerc-actionplan/ , last accessed 25 January 2018

[7] The Bloomberg Recruiter Report (2015), available at https://www.bloomberg.com/graphics/2015-job-skills-report/, last accessed 25 January 2018

[8] Friedman T., Mandelbaum M.: That Used to Be Us: How America Fell Behind in the World It Invented and How we Can Come Back (2011), Picador, New York, USA

[9] Inamorato dos Santos A., Punie Y., Castaño-Muñoz J.(2016): Opening up Education: A Support Framework for Higher Education Institutions. JRC Science for Policy Report, JRC Homepage, available at http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101436/jrc101436.pdf, last accessed 25 January 2018

[10] Kaplan A. M., Haenlein M. (2016), Higher education and the digital revolution: About MOOCs, SPOCs, social media, and the Cookie Monster, Business Horizons, Vol. 59, Issue 4, pp. 441-450, Elsevier

[11] Bell S.: Research Guides: Discovering Open Educational Resources (OER), Temple University, retrieved from http://guides.temple.edu/OER, last accessed 25 January 2018

[12] UPT Virtual Campus, available at https://cv.upt.ro/login/index.php and https://elearning.upt.ro/, last accessed on 25 January 2018

[13] Andone D., Ternauciuc A.: A Continuous Development Strategy for a Higher Education Virtual Campus, (2015), 10th International Conference on Virtual Learning, ICVL 2015, 31 October 2015, Timisoara, Romania, pp. 359-362

[14] Damme D.: Quality issues in the internationalisation of higher education (2001), in Higher Education, Vol. 41, Issue 4, pp. 415-441

[15] The Bologna Process 2020 – The European Higher Education Area in the new decade: Communiqué of the Conference of European Ministers Responsible for Higher Education, Leuven and Louvain-la-Neuve, 28-29 April 2009, available at https://www.eurashe.eu/library/bologna_2009_leuven-communique-pdf/, last accessed on 25 January 2018

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4 Re-shaping creativity: Proposals for classification of works and flexible opt-in mechanisms

George BOUCHAGIAR
Ionian University, Corfu, Greece

4.1 Abstract

An unprecedented number of works circulate on the Internet. Users not only share this "artistic and scientific pandemonium" but also play a key-role in present-day participatory procedures of culture production. Some authors call it "bastard" culture, while others speak of an "amateur" culture capable of wakening users from their sleep of ages. User-generated content has become the driving force of the internet informational revolution, which brings back to the discussion table some good-old-fashioned academic opinions related to non-economic incentives for creation and a "direct and immediate causal link" between the unimpeded use of works and the promotion of arts and science. Given that competent cultural bodies aim at promoting education, the former could look out of the window and undertake initiatives so as to innovatively classify works and activate flexible mechanisms, so that users would be enabled to take maximum advantage of present-day possibilities of accessing culture and science. This would allow people to experiment on previous artistic and scientific knowledge and would, thus, guarantee the prerequisite for the rise of new intellectual movements. Each user might, then, have the capacity to submit her unique proposals and ideas, not only to support informational revolution but, to declare informational democratization as well.

4.2 Introduction

An ever-increasing number of young artists "upload" astonishing works, which users share without any costs[1]. More and more scientists publish their articles free of charge in several digital academic repositories[2]. Countless platforms encourage this "artistic and scientific pandemonium", while users play a key-role in the participatory[3] process of cultural production[4]. Some scholars speak of a new "bastard"[5] culture, where multiple participants and practices blend together. Others welcome new genres of works that users create ("amateur culture")[6] as the (latter's) first breath after their deep "consumerist coma"[7] and argue that user-generated content has become the driving force of the internet informational revolution[8].

[1] Sharing is a fundamental activity among digital natives. Winston Jin Song Teo & Chei Sian Lee, Sharing Brings Happiness? Effects of Sharing in Social Media Among Adult Users, in A. Morishima et al. (eds), Digital Libraries: Knowledge, Information, and Data in an Open Access Society, 18th International Conference on Asia-Pacific Digital Libraries, ICADL 2016, Springer, pp. 351-365.
[2] See e.g. http://www.oapen.org/home.
[3] The term "participatory culture" was introduced by Henry Jenkins (Henry Jenkins, "Textual Poachers. Television fans and participatory culture", London, New York, 1991).
[4] See e.g. http://blog.europeana.eu/2017/10/playing-with-colours-make-your-first-gif-it-up-entry/.
[5] Mirko Tobias Schäfer, Bastard Culture! How user participation transforms cultural production, 2011, Amsterdam University Press, pp. 1-256, at p. 11.
[6] Lawrence Lessig, Code, Version 2.0, 2006, Basic Books (New York), pp. 192-196.
[7] J.D. Lasica, Darknet: Hollywood's War Against the Digital Generation, 2005, Wiley & Sons, pp. 1-320, at p. 78
[8] Giancarlo Frosio, Communia and the European Public Domain Project: A Politics of the Public Domain, in Melanie Dulong de Rosnay & Juan Carlos De Martin (eds), The Digital Public Domain: Foundations for an Open Culture, Open Book Publishers, 2012, p. 31.

How does the law treat such pandemonium? Under the European Intellectual Property (IP) regime, almost everything appears to be protected. Software, computer programs, pharmaceutical products[9], plant varieties[10] or even "animals"[11] are capable of being the subject-matter of IP rights. One could argue that only a human falls outside this protection zone, albeit, only with regard to her "physical substance and natural status", given that items of our "digital personality"[12] could perhaps be considered as parts of a database protected by a sui generis IP right[13].

Given the contradictions between current norms and laws, this article investigates several factors which encourage creativity and explores the various incentives of creators. Moreover, it argues that each work's purpose and nature are different and, thus, law should not treat all products of human mind in the same way. Furthermore, it suggests that temporary rights of authors over their intangible works should not be treated as rights to physical property. Finally, given the uniqueness and dissimilar economic function of each kind of works, it examines whether flexible solutions could be implemented, so as to achieve the right balance between conflicting interests.

4.3 Debating on creativity and incentives (and experimenting on databases)

Birds did sing before the "invention" of Intellectual Property rights. Indeed, creativity is a phenomenon much broader than that of commercial transactions. Given that it appeared earlier than commerce[14], its study demands the understanding both of the creative procedure

[9] See ECLI:EU:C:2013:520, Judgment of the Court of Justice (Grand Chamber), 18 July 2013, (Common commercial policy | Article 207 TFEU | Commercial aspects of intellectual property | Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) | Article 27 | Patentable subject-matter | Article 70 | Protection of existing subject-matter), in Case C-414/11, Daiichi Sankyo Co. Ltd and Sanofi-Aventis Deutschland GmbH v DEMO Anonimos Viomikhaniki kai Emporiki Etairia Farmakon, ("[…] the Court (Grand Chamber) hereby rules: […] 2. Article 27 of the Agreement on Trade-Related Aspects of Intellectual Property Rights must be interpreted as meaning that the invention of a pharmaceutical product such as the active chemical compound of a medicinal product is, in the absence of a derogation in accordance with Article 27(2) or (3), capable of being the subject-matter of a patent, under the conditions set out in Article 27(1) […]". http://curia.europa.eu/juris/document/document.jsf?text=&docid=139744&pageIndex=0&doclang=EN&mode=lst&dir=&occ=first&part=1&cid=79630.

[10] See Council Regulation (EC) No 2100/94 of 27 July 1994 on Community plant variety rights.

[11] See Kevles Daniel, A history of patenting life in the US with comparative attention to Europe and Canada, European Group on Ethics in Science and new technologies in the European Commission, 2002. Available at https://scholarworks.iupui.edu/bitstream/handle/1805/757/Patenting%20Life%20-%20Comparative%20Study%20US%2c%20CN%2c%20EU%202002.pdf?sequence=1&isAllowed=y. See also: European Patent Office, Press Release 3/92, European Patent for Harvard's Transgenic Mouse.

[12] A "digital personality" refers to an online personal electronic identity. It describes one's self as others see her, when they find personal digital information left behind. See Adam Blackie, Your Digital Personality, 2011, LuLu.com, p. 3.

[13] See the Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases. Sui generis rights over contents of databases, such as data and facts that are in the public domain, are an old but still interesting subject of legal discussion. See Maria Bottis, The Law of Information, 2004, Nomiki Bibliothiki, p. 69 (In Greek); James Boyle, Foreword: The Opposite of Property?, 66 Law and Contemporary Problems, pp. 1-32 (Winter 2003), p. 25; Giancarlo Frosio, Communia and the European Public Domain Project, id, p. 25; Mark Davison, Database Protection: The Commodification of Information, in L. Guibault and P.B. Hugenholtz (eds), The Future of the Public Domain, Identifying the Commons in Information Law, 2006 Kluwer Law International, pp. 167–189.

[14] See Julie E. Cohen, Copyright, Commodification, and Culture: Locating the Public Domain, in L. Guibault and P.B. Hugenholtz (eds), The Future of the Public Domain, id, p. 137.

and the development of an artistic and scientific culture[15]. The latter, as some commentators put it, is different from several "economic models' culture"[16] and is, thus, treated as a network of sources and activities, where multiple persons participate[17].
Magnificent works have been created due to an opportunity of unimpeded use of and experimentation on previous works[18]. For instance, in the field of arts, great musical movements, such as Jazz, Blues or Folk, were born thanks to the opportunity for authors to freely use previous works[19]. Moreover, free use of works constituted the foundation for audiovisual arts[20]. Such practices of "borrowing without license" were treated as a "cultural dialogue", rather than having been condemned as "illegal deeds"[21]. Examples of creating important works due to free-use and without-license-experiments are numerous[22] and, as such, one could mention present-day works (e.g. movie "Kill Bill"[23]) or older ones (e.g. William Shakespeare's[24]).
Setting aside the fields of arts, unimpeded access to existing works and their use without license used to be and are still fundamental for the progress of science[25]. This is something that many scientists have claimed. Namely, in 1675 Isaac Newton famously wrote to Robert Hooke "if I have seen further [than others] it is by standing upon the shoulders of giants"[26]. Furthermore, an open access environment with regard to academic works is strongly supported by old[27] and present-day authors. More precisely, some demand "open access to knowledge", where "knowledge" stands for any document, data, image, multimedia et cetera, and "open" means this kind of access that allows anyone to freely (re)use and (re)distribute

[15] See Pamela Samuelson, Mapping the Digital Public Domain: Threats and Opportunities, 66 Law & Contemp. Probs (Winter/Spring 2003), pp. 170-171.
[16] See E. A. Salitskaya, The Development of the Institution of Copyright in European Countries, Herald of the Russian Academy of Sciences, Pleiades Publishing, Ltd., 2015; Julian Rodriguez Pardo, Copyright and Multimedia, 2003, Kluwer Law International.
[17] See Julie E. Cohen, Copyright, Commodification, and Culture, id, pp. 137-138, 141.
[18] As some scholars argue, unimpeded use and circulation of information is an important input to culture, science and democratic discourse. Thus, intellectual property should serve information rather than be its master. Pamela Samuelson, Mapping the Digital Public Domain, id.
[19] Keith Aoki, James Boyle, Jennifer Jenkins, Tales from the public domain, Theft! A history of music, 2017; Bound by Law, 2006, Duke Centre for the Study of The Public Domain.
[20] O.B. Arewa, From J.C. Bach to Hip Hop: Musical Borrowing, Copyright and Cultural Context, 84 N.C.L. Rev. 547-645, J.P. Burkholder, A. Giger & D.C. Birchler, eds, Musical Borrowing: An Annotated Bibliography, Negativland, Two Relations to a Cultural Public Domain, 66 L. & Contemp. Probs. 239-262 (2003).
[21] C.J. Homburg, The Copy Turns Original, Amsterdam, Banjamins, 1996.
[22] James Boyle Foreword: The Opposite of Property?, id, p. 17.
[23] Kill Bill DVD (Volume 1) contains a short documentary, where Quentin Tarantino discusses to what extent his movie was influenced by many previous works (such as Japanese anime and spaghetti westerns).
[24] Shakespeare "borrowed" multiple preexisting works. See Julie E. Cohen, Copyright, Commodification, and Culture, id, pp. 144, 145.
[25] See Lawrence Lessig, Copyright And Science: A plea for skeptics, Tokyo University, October 5, 2009, where Lessig argues that copyright for scientific works makes no sense and that distribution model for such works must be based on sharing. Lessig finds it unthinkable that any protection model applied to commercialized goods should apply to science.
[26] The Columbia World of Quotations No. 41418 (1996) – Quoting Isaac Newton's Feb. 5, 1675 Letter to Robert Hooke. See also Graeme B. Dinwoodie, Rochelle Cooper Dreyfuss, Patenting Science: Protecting the Domain of Accessible Knowledge, in L. Guibault and P.B. Hugenholtz (eds), The Future of the Public Domain, id, p. 195.
[27] See for instance R.K. Merton, The Normative Structure of Science, in The Sociology of Science, Theoretical and Empirical Investigations, Chicago, University of Chicago Press, 1973, pp. 267, 273.

works[28]. Some academics argue that copyright for academic works is unreasonable, given that scientists aim at reputation rather than royalties and, thus, money[29].
Given the above opinions, one could argue that unimpeded use of works promotes creativity and, thus, arts and science. However, Intellectual Property theories generally recognize that works shall be protected so as to offer authors financial incentives to create. This is absolutely reasonable, given that no one could ask, for instance, a songwriter to publish her song free of charge. These generally accepted theories are strongly supported by private enterprises, which tend to put pressure on the legislator to secure their economic interests[30]. The firms claim that it is rigorous protection of works that offers the financial incentives to creators to produce more works of better quality.
Nevertheless, some academics argue that private enterprises hold such opinions in order to promote their own economic interests rather than the authors'. Furthermore, commentators note that creators' incentives have always been intrinsic. As some scholars put it, it is the very knowledge and communication between scientists or artists that motivates them to produce their works[31]. Besides, as humans, all authors have the need to create[32]. Moreover, some believe that the unique incentive is "love" for science[33] or art[34], while others claim that people create because they are inspired or because they have an idea or a concern[35] and not for

[28] Rufus Pollock & Jo Walsh, Open Knowledge Foundation Open Knowledge: Promises and Challenges, in Melanie Dulong de Rosnay and Juan Carlos De Martin (eds), The Digital Public Domain, id, p. 125.
[29] Marc Scheufen, Copyright Versus Open Access, On the organization and International Political Economy of Access to Scientific Knowledge, Springer International Publishing Switzerland, 2015, pp. 47-51
[30] Many scholars comment that private enterprises play a leading role during the law-making process. For instance, several academics argue that Disney put pressure on Congress to pass the Sonny Bono Copyright Term Extension Act. See Marc Scheufen, Copyright Versus Open Access, id, p. 20, Leveque F. & Meniere Y., The economics of patents and copyright, 2004, p. 68, Corigan R. & Rogers M., The economics of copyright, World Economics, 2005, p. 164. Moreover, the Act mentioned above was renamed by academics "Mickey Mouse Copyright Extension Act". See Richard Stallman, Free software Free society, Selected Essays of Richard M. Stallman, (ed. Joshua Gay), Free Software Foundation Inc., 2002, p. 141. In other cases, some mention that law was treated as a kind of contract between firms and note that industries were literally asked to draft the rules by which "they would live", James Boyle, The Public Domain, Enclosing the Commons of the Mind, 2008, Yale University Press, p. 56. See also Jessica Litman, Digital Copyright (Amherst: Prometheus, 2001), pp. 22–69, Neil W. Netanel, "Why Has Copyright Expanded? Analysis and Critique", in New Directions in Copyright Law, vol. 6, ed. by Fiona Macmillan (Cheltenham: Edward Elgar, 2008), pp. 3–34.
[31] D. J. Finch, Accessibility, sustainability, excellence: how to expand access to research publications, Report of the Working Group on Expanding Access to Published Research Findings, 2012, p. 14
[32] Yochai Benkler, From Anarchist Software to P2P Culture - Conference on the Public Domain, 2001, Duke University School of Law.
[33] With regard to software production, scholars note that the main incentive is programmers' need and wish to produce rather than financial benefits derived from exploitation. See E. Moglen, Anarchist Triumphant: Free Software and the Death of Copyright, in Elkin Koren & N. Weinstock Netanel (eds), The Commodification of Information, The Hague, Kluwer Law International 2002, pp. 107-131. See also Maurice Schellekens, Free and Open Source Software: An Answer to Commodification?, in L. Guibault and P.B. Hugenholtz (eds), The Future of the Public Domain, id, p. 309.
[34] James Boyle Foreword: The Opposite of Property?, id, p. 17.
[35] For instance see Julie E. Cohen, Creativity and Culture in Copyright Theory, 40 U.C. Davis L. Rev., p. 1151 (2007); Jeanne C. Fromer, A Psychology of Intellectual Property, 104 Nw. U. L. Rev., p. 1441, pp. 1443-44 (2010); Eric E. Johnson, Intellectual Property and the Incentive Fallacy, 39 Fla. St. U. L. Rev. p. 623, p. 627 (2012); Gregory N. Mandel, Left-Brain Versus Right-Brain: Competing Conceptions of Creativity in Intellectual Property Law, 44 U.C. Davis L. Rev., p. 283, pp. 285-286 (2010); Jessica Sibley, Harvesting Intellectual Property: Inspired Beginnings and "Work-Makes-Work": Two Stages in the Creative Process of Artists and Innovators, 86 Notre Dame L. Rev., p. 2091 (2011); Diane Leenheer Zimmerman, Copyright as Incentives: Did We Just Imagine That?, 12 Theoretical Inquiries in Law (12.1), 2011, p. 29.

money[36]. As some observe, works created "under (firms') orders" are "less original" or -to some- not creative at all[37]. Thus, in this context, it is companies[38] rather than authors the ones interested in financial benefits derived from the exploitation of works[39].
All the opinions mentioned above are just trying to (theoretically) approach artists' and scientists' "mental world". One must accept that creation is indeed a personal matter and, hence, each author creates her works for different reasons and due to her own motives. Thus, incentives may be either intrinsic or financial.
So how could one conclude whether it is rigorous protection of works or their unimpeded use that encourages creativity and promotes arts and science? An experiment could be a scientific way to examine this. In two different countries, two dissimilar systems could be applied; one of strict protection of works and another of no protection. After many years, one could study the results and examine in which country more works of better quality would have been produced.
However, this experiment has already been conducted. Under Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases, European unoriginal databases were protected. On the other hand, the US legislator did not grant such sui generis rights, while the Supreme Court was clear; unoriginal collections of facts shall not be protected[40].
Studying the results of the US-EU "experiment", we see that the European databases' production increased for a short (one-year) period, after which it returned to its previous level. On the other hand, the American databases' production showed a steady increasing trend[41].

Furthermore, the European overprotection led to production of "bad-quality" databases, such as assortment of advertisement or collections of hyper-links to parenting resources. Thus, some authors questioned whether these collections were the ones, the stronger protection of which the European legislator had wished to encourage[42].
Moreover, the introduction of sui generis rights brought new management and transaction costs, given that database owners and users had to incorporate these new rights into their agreements[43]. Such costs were absent in the US.
Sui generis rights led to commercialization of information and severely damaged the public domain[44].
To sum up, European sui generis protection did not increase database production, led to protection of unworthy collections, introduced new costs and commercialized parts of the public domain[45].

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[36] Mihaly Csikszentmihalyi, Creativity, Flow and the Psychology of Discovery and Invention, New York, Harper Collins, 1996. See also Jessica Silbey, The Eureka Myth: Creators, Innovators, and Everyday Intellectual Property. Lessig distinguishes between "professionals" and "creators", where the former create works for economic purposes, while the latter are motivated by love for their works. See Lawrence Lessig, Copyright And Science: A plea for skeptics, id.
[37] Teresa M. Amabile, Creativity in Context, Boulder, Westview Press, 1996.
[38] Richard Stallman, Free Software Free Society, id, p. 87.
[39] See Michael W. Carroll, Whose Music Is It Anyway? How We Came to View Musical Expression as a Form of Property, University of Cincinnati Law Review, Vol. 72, 2004, pp. 1405-1496.
[40] Feist v. Rural Telephone Service, 499 U.S. 340 (1991).
[41] James Boyle & Jennifer Jenkins, Intellectual Property: Law & The Information Society, Cases and Materials, 3rd Edition, 2016, pp. 316-319. See also S. Maurer, Across Two Worlds: Database Protection in the US and Europe, Industry Canada's Conference on Intellectual Property and Innovation in the Knowledge-Based Economy, Ottawa, 23-24 May 2001; M. Davison, The Legal Protection of Databases, Cambridge University Press, 2003, pp. 259-263.
[42] James Boyle & Jennifer Jenkins, Intellectual Property, id, p. 319.
[43] Mark Davison, Database Protection, id, p. 179.
[44] Mark Davison, Database Protection, ibid.
[45] As some authors have aptly put it, for the first time in intellectual property history rights were established on ideas and facts, such as our names or our streets' names. See Maria Bottis, The Law of Information, id, 2004, p. 69 (in Greek).

Setting aside experiments and regardless of opinions on creativity and incentives, it is worth examining several protection rules and scenarios, so as to highlight the need for classification of works.

4.4 What if each work was treated as such?

Under the European copyright regime, all products of human mind are treated in the same way[46]. But is there anything really in common between a recipe, an academic essay and a song?

A recipe aims at creating a decent meal. Is it reasonable to forbid modification or use of such work (without the chef's license) for "author's" life plus a 70-year period after chef's death? Perhaps people should have the right to modify a simple recipe. The exchange of recipes is an old practice, which has been and is still encouraged in families or students in general. This free-use concept could "apply" to works that aim at just inspiring people to only create something decent. This category could include encyclopedias or even software[47]. In fact, free software could be used in schools and universities, as it would enable students to create new software by "experimenting" on such works and by proposing their innovative ideas in a fast-moving world[48]. Norms on the distribution of free software would very likely enable students to adopt some very important ideas, such as that of sharing of scientific thoughts for the benefit of technological development.

An academic essay, on the other hand, is something different. It aims at expressing ideas, opinions or knowledge. The modification of this work might distort author's thoughts and beliefs. Thus, works of this kind could be freely used, either verbatim or in a wording that would truly express author's opinions. An obligation to quote the initial author could be included, given that this is the practice that today's (and old) academics follow when publishing their essays, in which they mention and credit the author to whom their references are related.

Finally, a song's purpose is to entertain people or -sometimes- to provide an opportunity to think in depth. It has an aesthetic value and, hence, could be sorted into a group, to which a painting or a novel could be added. These works are truly sensitive as that they illustrate author's personality and constitute her expression. In this case, works could be further sorted into sub-groups and, hence, be protected with regard to their "commercial life". For instance, books, which readers usually are interested to buy for short periods of time that -to some- do not exceed five years following publication[49], could be protected for such limited times[50].

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[46] See article 2(1) of Berne Convention for the Protection of Literary and Artistic Works ("[…] The expression "literary and artistic works" shall include every production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression, such as books, pamphlets and other writings; lectures, addresses, sermons and other works of the same nature; dramatic or dramaticomusical works; choreographic works and entertainments in dumb show; musical compositions with or without words; cinematographic works to which are assimilated works expressed by a process analogous to cinematography; works of drawing, painting, architecture, sculpture, engraving and lithography; photographic works to which are assimilated works expressed by a process analogous to photography; works of applied art; illustrations, maps, plans, sketches and three-dimensional works relative to geography, topography, architecture or science […]").

[47] Stallman argues that users of free software shall be free to execute the program for any purpose, study its modus operandi and adapt it to their needs, redistribute copies of such software in order to "help their neighbor", improve the program, and distribute new improved software for the benefit of users' community. Richard Stallman, Free Software Free Society, id, pp. 43, 165.

[48] As some authors put it, teaching non-free and proprietary software equals to teaching dependence and addiction, Richard Stallman, For a free digital society, University of Bern, 2016.

[49] As some commentators argue, commercial life of certain books or songs or movies does not exceed a one-year-period. Lawrence Lessig, Free Culture, How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity, The Penguin Press, 2004, p. 225.

[50] Other authors allege that in case of books a ten-year-period protection could be granted (starting from publication). Not because commercial life is that long, but due to "safety reasons". Richard Stallman, Free Software Free Society, id, p. 87.

Thereafter, each sub-group's commercial life could be measured and an author's right could be granted, so that the creator would be enabled to protect her work for truly limited times. The kinds of works are countless. However, they could be classified on the basis of their nature and purpose[51] to guarantee a specific protection for limited times[52] that would not exceed a "some-years-period". After the expiry of that period, any work, whatever its purpose would be, shall enter the public domain and enable people to freely use it[53] and, hence, promote arts and science.

4.5 What if Intellectual Property was not treated as (physical) property?

In many cases, term "theft" is used to express copyright infringement. However, temporary rights of authors to protect their intangible works are not the same as unlimited individual rights (in rem) that deal with property[54]. Such equal treatment of different rights is misleading, given that the economic function (and nature) of goods is totally different. Moreover, it is dangerous, as the equal treatment may lead decision-makers to wrong decisions.
Rules that govern property are based on a physical reality, in which a landlord, for instance, must be protected against potential deprivation by the state, or possible infringement by individuals. Namely, the very tangible form and "physical substance/status" of property, which is subject to the rules of nature, constitutes the object of protection. The risk that has to be avoided relates to potential damages to the object (e.g. breaking down a wall) or (to) possible deprivation, such as violation of possessory rights or forced expropriation in favor of the state. Furthermore, if one person owns a tangible good, e.g. a pencil, she will be the one and only person able to use it. All others will be excluded from using or "consuming" this pencil. Besides, production and reproduction of tangible goods cost and, thus, it is reasonable to speak of theft. Rules that govern tangible goods should not apply on certain kinds of intangible information[55], given present-day cheap or inexpensive creation and reproduction techniques, which have radically changed art and science industry[56]. Objects, as intangible information, are non-rivalrous and non-excludable[57]. Their consumption by one person does not lessen another person's use of the good and does not exclude others from accessing the same information.

[51] See also Tassos Sakellaropoulos, Researchers and "Closed" Archives: Restrictions and Fluency in Access, Workshop on Archives and Copyright (Proceedings 15.05.2013), p. 28. In Greek. Available: https://www.eae.org.gr/images/ekdoseis_eae/pneymatika.pdf.
[52] James Boyle, referring to Sonny Bono Copyright Term Extension Act, speaks of Congress's most stupid policy choice. See James Boyle, The Crime of the (20th) Century, How we threw away our cultural heritage for no good reason (and whether Google Books will bring it back), Duke University School of Law, 2009.
[53] See also Lawrence Lessig, Google books search settlement – Static goods, Dynamic bads, 2009, Berkman Klein Center for Internet and Society.
[54] See also Prodromos Tsiavos, Technological and Legal Aspects of Copyright Protection of Audiovisual Archives: Beyond Copyright Law, (Re)appearance of user-author, Workshop on Archives and Copyright, Proceedings 15.05.2013, id, p. 53. In Greek.
[55] See Rebecca MacKinnon & James Boyle, Consent of the Networked: A Conversation about Internet Freedom, Human Rights Law Society, Duke Law University, 5.04.2012, where Boyle argues that property rules make no sense at all.
[56] Mark A. Lemley, IP in a world without scarcity, New York University Law Review [Vol. 90:460], 2015, pp. 460-515.
[57] See Lawrence Lessig, Code, Version 2.0, id, pp. 180-185; Lawrence Summers & J. Bradford DeLong, The 'New Economy': Background, Historical Perspective, Questions and Speculations, Economic Policy for the Information Economy, 2001. As Thomas Jefferson put it, "[…] He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me […]" Thomas Jefferson, letter to Isaac Mcpherson, August 13, 1813, Writings of Thomas Jefferson, 1790-1826, vol. 6, edited by H.A. Washington, 1854, pp. 180-81

For instance, when one copies an mp3 file, everyone else may as well copy this same file, which may be simultaneously used by a global audience[58].
Moreover, some works' economic value depends on use. Namely, the more the uses of a software, the greater the value it is worth. Thus, rules that restrict accessing such works contrast with their economic function, while it is extremely doubtful whether such rules are capable of motivating authors to produce e.g. more software.
For reasons mentioned above, some authors suggest that such "internet works" could be governed by laws, to which public goods are subject[59].

4.6 Proposals for flexible solutions

Classifying works and treating intangible information as such by amending current laws that govern Intellectual Property would take a long time. Potential radical legislative amendments might be in contrast not only with international acquis, but also with existing laws that effectively apply to traditional works.
However, one could, logically, not deny the different nature and dissimilar economic function of each kind of works. Hence, flexible solutions could be implemented to achieve the right balance between conflicting authors' and users' interests. Opt-in mechanisms could be activated to enable authors to express their wish by a clear "affirmative action" with regard to the specific rights, which they would wish to enjoy, and the sorts of uses, which they would wish to allow. In such case, there could be different kinds of protection standards depending on the author's wishes, which would, at some point, ensure full and unimpeded access, while leaving the "door open" to those who would "applaud" strict protection of their works and perhaps commodification of their ideas.
To better understand the need for flexible mechanisms and classification of works, let us mention an example emerged from a Greek reality. Suppose that ten students need to study for university exams. The test will cover a number of subjects included in a book freely available at the university library. However, there may be only one copy of the book in the library. Hence, it would not be a good idea for these ten students to study at the library by simultaneously reading this very same copy of the book. As is often the case in Greece, students would very likely borrow the book, visit a copy-shop and make copies of the book. Then all ten students would study at their homes. Under Greek Law, the penalty for the copy-shop business owner, if she would have copied the book just once, is heavier[60] than the penalty provided for unintentional killing[61]. Moreover, the penalty for this business owner, if she would have copied the book multiple times and, thus, have engaged commercially in copying and committed a felony[62], is as heavy as the penalty for the mother who intentionally killed her baby during childbirth[63].
Some would condemn the example mentioned above. It is true that copying books without the author's license, even for educational purposes, is illegal. However, it should be noted that above penalties could as well apply to minors, who download music and videos from the web on a daily basis, or to our children that run software without license. We do not propose legitimizing piracy, but we suggest that our children should not be treated as dangerous criminals.
Some might argue that the potential adoption of such opt-in mechanisms would be in stark contrast with authors' rights, for the protection of which intellectual property law fights. It could

[58] Dematerialization technologies have radically changed economics and industries. For revolutionary changes and coming information economics in cases of 3D printing, robotics, synthetic biology and bioprinting see Mark A. Lemley, IP in a world without scarcity, id, pp. 471-481.
[59] James Boyle, Science 2.0: What if the Web really worked for Science? Open Minds, Science Gallery, Dublin, 2011.
[60] See Article 66(1) of Greek Law 2121/1993.
[61] See Article 302 of Greek Criminal Code.
[62] See Article 66(3) of Greek Law 2121/1993.
[63] See Article 303 of Greek Criminal Code.

be argued that these mechanisms would introduce new risks; if creators were obliged to express their wish by a clear affirmative action, some might not wish to publish their works under such conditions and, hence, works would end up in author's drawer. Moreover, in case of no "clear affirmative expression", works might be freely used by global audiences. In the first case, as some might put it, we would face an unprecedented lack of publications, while the second scenario as some might claim would automatically turn authors into "servants of the public good". But we do not propose legislative amendments and, thus, copyright laws would normally apply in cases of no "clear-expression". Besides, an author could, in any case, opt-in and express her wish for strict protection.

Moreover, some could argue that opt-in mechanisms would violate intellectual property law, since the latter may confer rights on authors for the benefit of arts and science, albeit "first of all" grants rights to creators. Under the Universal Declaration of Human Rights, the right to participate in the cultural life is established[64] and authors' rights are mentioned as second[65]. Regardless of sequence in which Universal Declaration's provisions appear, the value of works and authors' rights are, indeed, very important. This is the exact reason why it would be preferable to classify works and, thus, highlight their value and to manage creations through flexible mechanisms and, hence, respect authors' true wishes. Although intellectual property rights might be one of legislator's greatest challenges, given that it is intellect that distinguishes between humans and other species, as some authors argue, the amendment of the law is not the only way in which problems may be solved, while, as commentators have aptly put it, the more laws we have, the greater the injustice[66].

4.7 Conclusion

Legal scholarship aims, among others, to submit opinions and proposals in order to study rules that should or could govern any decision-making process. Although such proposals could be understood as prescriptions addressed to the legislative or judicial bodies[67], the latter -as some authors argue- are not always listening to academic advice that "they are not prepared to believe"[68]. Hence, many academics in the field of copyright law address their opinions, not so much to relevant decision-makers but, to the public. The latter may then hold the relevant authority accountable for making or applying undesirable, or as some have put it "bad"[69] laws. If some flexible solutions proposed above were desirable, they could constitute a prescription for the management of works addressed not to decision-makers but to the public or even better to the competent bodies active in the field of culture. Such bodies, being responsible for "providing services" with the overriding objective of people's education, could look out of the window[70] and undertake such initiatives so as to classify works and activate opt-in mechanisms. This would enable users' unimpeded access to knowledge, which should be

[64] See Article 27(1) of Universal Declaration of Human Rights ("[…] Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits […]").

[65] See Article 27(2) of Universal Declaration of Human Rights ("[…] Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author […]").

[66] Dionisia Kallinikou, Archives, Libraries and Intellectual Property, Proceedings – Conference on "Archives, Libraries and Law in Information Society", National Library of Greece, 2008, p. 79. In Greek.

[67] Edward Rubin, On Beyond Truth: A Theory for Evaluating Legal Scholarship, 1982, 80 Cal L Rev, 889-963, pp. 903-904, with further references

[68] Pierre Schlag, Pre-figuration and Evaluation, 1992, 80 Cal L Rev, 965-977, p. 972.

[69] Patrick R. Goold, The Evolution of Normative Legal Scholarship: The Case of Copyright Discourse, European Journal of Legal Studies, Vol. 4, No. 2, p. 22.

[70] For the need for cultural bodies to take into account users' needs while designing digital libraries, see P. Ngimwa, A. Adams, J. Underwood, Collaborative Ownership in Cross-Cultural Educational Digital Library Design, in M. Agosti et al. (eds), Research and Advanced Technology for Digital Libraries, 13th European Conference, ECDL 2009, Corfu, Greece, Springer, pp. 239-249.

promoted by new technologies so as to guarantee users' active participation in and, thus, awareness of decision-making process[71].
Besides, experience and knowledge, when shared, constitute foundations upon which democracy[72] can be built[73]. The latter can be understood as a "negotiation process", in which all interested parties actively participate in order to make final decisions dependent on public's wish[74]. Thus, implementation of flexible solutions that would guarantee unimpeded access to and experiments in knowledge would enable each user not only to contribute in her own unique way to creating new intellectual movements but also to submit her own special proposals and ideas, as the initiator of information revolution and democratization.
Would it be that unreasonable to distinguish between books and computer programs, or between songs and academic scholarship? Why should users be restricted and not be able to use recipes or software for a seventy-year-period after the chef's or the programmer's death? If it is true that multiple art movements, such as Jazz or Drama[75], or important scientific works, like GNU, were created due to unimpeded access to previous works, then we have already been denied "many jazz movements". And if some are not interested in "a-new-Jazz", then it should be noted that information, upon which one has to stand so as to create this "new-Jazz", is imprisoned in same place, where items of information, which could be used for the creation of a drug that would treat cancer or even aging[76], are enclosed.

[71] Iordanis Kavathatzopoulos, Information technology, democratic societies and competitive markets, in Maria Bottis, An Information Law for the 21st Century (Third International Seminar on Information Law 2010), Ionian University, Corfu, Greece, Nomiki Bibliothiki, 2011, p. 114.
[72] Democracy is a political system made by citizens and for citizens themselves. See Ioannis Mpoitsis & Nikos Koutsoupias, Freedom of Information: An interdependent relationship and the role that Internet can play, in Bottis Maria – Alexandropoulou Eugenia – Ioannis Iglezakis (eds), 6th International Conference on Information Law and Ethics, Lifting the Barriers to Empower the Future of Information Law and Ethics, University of Macedonia, 2014, p. 26.
[73] Eli Pariser, The Filter Bubble, How the New Personalized Web Is Changing What We Read and How We Think, Penguin Group, 2011, p. 50.
[74] Iordanis Kavathatzopoulos, id, pp. 109-110.
[75] See Richard Stallman, Free Software Free Society, id, p. 83.
[76] Aubrey de Grey studies techniques for "treating aging". See for instance: http://www.sens.org/search/node/aubrey.

5 Open Access policies on information. New trends and perspectives through open cultural data

Paraskevi GANATSIOU
Ionian University, Corfu, Greece

5.1 Abstract

Institutes and universities apply Open Access (OA) policies to academic texts, articles, researches and evidence, creating new conditions in academic communication and access to knowledge, developing the global intelligentsia and in parallel, contrasting the tendencies of competition and prestige between institutes. From the Budapest Open Access Initiative, in 2002, Open Access, either through self – archiving road (green OA) or through publication in open access journals (golden OA), had to deal with multiple issues such as copyright, offering gradations to open access and choices to both, the user and the creator / beneficiary, about how “open” the work will be. Consequently, open content licenses are consistent with the concept of open access. The World Wide Web has developed a remarkable bargaining power between suppliers (academics, publishers, financiers, libraries, governments and others), consumers and researchers/creators. But how open access perspectives are defined nowadays? How finding information could be achieved at the least cost? What happens if institutes do not want open access to their data (primary information field) but they wish to communicate with users and gain benefits of public display as could be noticed, in cases of museums and exhibitions? Since February 2017, the New York City Metropolitan Museum, adopting the principles of Open Access, has "liberated" thousands of works by calling them "public domain" to which everyone has the right of access. Moreover, what happens with metadata, as secondary field of open access and also, how their needs to interconnect and interoperate are secured? Can the use of open data/metadata maximize the benefits and the intended values, resolving the concerns of institutions in general? In 2016, official European guidelines on data management gave the advice: “data as open as possible, as close as necessary”. In addition, we could wonder how can someone use user-generated material and all the above, in open access philosophy. A need for qualitative organizational changes on open access strategy is emerged, in purpose to improve access to Knowledge. People and media interact and new different perspectives are revealed in such a degree as we can talk about second generation on open access which is the subject of this study. Despite of objections and problems open access to information is a strong trend and philosophy of modern times.

Keywords: Open Access, open cultural data, metadata, copyright, second generation on open access

5.2 A short introduction in Open Access as a contemporary policy

The creation of the World Wide Web and its capabilities is not just a new technological achievement that was offered to humanity. This fact reflects an ideology, the enthusiasm of a vision and the charm of a new fact that may cause overturning. "It's the unexpected re-use of information, which is the value added by the web," says Sir Tim Berners-Lee, founder of the World Wide Web, in 2006, talking about Linked data[77]. Information Society offered new

[77] Retrieved April 10, 2018 from https://www.w3.org/DesignIssues/LinkedData.html

possibilities and caused new problems at the same time. In the bottomless and vast field of information in web, the finding of information by the user is being proved to be an increasingly time consuming procedure that costs a lot. Man and machine for one more time shared roles that are under continuous negotiation.

The Open Access to data, as an organized campaign was launched in 2002 with the Open Access Initiative of Budapest for the development of sciences and academic research through Internet. This BOAI Declaration was the first organized effort to establish Open Access as a term and as a policy for universities and was complemented by the Bethesda Declaration and the Berlin Declaration in 2003, on the same subject. The results of the works in Berlin clearly identifies the usefulness of the Internet and open access to the dissemination of cultural heritage, stating in particular that: "For the first time ever, the Internet now offers the opportunity to create a global and interactive representation of human knowledge, including cultural heritage and the guarantee of worldwide access"[78]. At the same declaration archives, libraries and museums are mentioned as cultural entities that should be interested in open access policy: "for a global scientific knowledge base and human reflection and to specify measures which research policy makers, research institutions, funding agencies, libraries, archives and museums need to consider".

By targeting an "unprecedented public good," according the official statements of the Open Access Announcement in 2012 in Budapest, the experience in open access that already has been acquired contributes to new ways and strategies for using open access, confirming its original definition[79]. What is emphasized is not just the value of accessibility but the value of information reuse. The unrestricted distribution of research is a very serious issue for authors, readers and funders. More and more people will have access to these works and even more to recent scientific works. In addition funders will see the impact of the work they fund to obtain a wide community of users[80].

The two main Open Access (OA) methods, named gold and green road or gold OA and green OA, as set out from the very beginning, continue to exist. According the gold road, open access is achieved by publishing in scientific journals in web that offer open access to the articles for anyone who interested of (by charging authors or their foundations or just making these articles free for everyone). According to the green road, authors archive their works themselves (self-archiving) in specific web sites like an institutional repository[81]. Some of gold road benefits are the increased citation and usage, the easy compliance with institutional and funder mandates, the retention of copyright, the faster impact, the greater public engagement, the participation to international debates and users communities[82].As Peter Suber refers “green open access is less expensive than gold open access and can accommodate the full research output of a university, funding agency, or nation” (Suber, 2012).

[78] Retrieved January 15, 2018 from https://openaccess.mpg.de/Berlin-Declaration

[79] *By “open access” to [peer-reviewed research literature], we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited. Retrieved February* 9, 2018 from http://www.budapestopenaccessinitiative.org/boai-10-recommendations

[80] Springer (website) “What is open access?”. Retrieved January 20, 2018 from: https://www.springer.com/gp/authors-editors/authorandreviewertutorials/open-access/what-is-open-access/10286522

[81] February3, 2018 from http://www.openaccess.nl/en/what-is-open-access

[82] Retrieved April, 11, 2018 from: https://www.springer.com/gp/authors-editors/authorandreviewertutorials/open-access/benefits-of-gold-open-access/10286524

5.3 Open Access (OA) and Copyright – Open access licenses

If someone briefly identified what open access works is and how they relate to copyright, it would say that "*Open-access (OA) literature is digital, online, free of charge, and free of most copyright and licensing restrictions. What make it possible is the internet and the consent of the author or copyright-holder*" (Suber, 2004). But who finally retains the copyright and what licenses are identified? Generally with Gold OA the author retains copyright but policy of the publisher must be controlled for safety. For example, Creative Commons (CC)[83] licenses and copyright tools operate as a balance to the traditional "full-right" copyright as it relates to copyright law. The creator's moral right to his work as intellectual property remains. There is a variety of CC types of licenses like types that permit or forbid commercial use, permit only educational use, impose the same terms/licenses of sharing and use, permit or no derivative works etc.
When articles are published in subscription titles usually the copyright is transferred to the publisher. Authors can use the right to place a version of their work in an institutional or another repository often after an embargo period (green OA)[84]. Since February 2017, the New York City Metropolitan Museum, adopting the principles of Open Access, has "liberated" thousands of works by calling them "public domain". (Creative Commons Zero). "More than 375.000 images of artworks from the Met collection can bet used, shared, and remixed without restriction" [85]. Everyone has the right of access in these works. Another way to open the web doors to public is by rejecting all property rights to specific works and generally data which are included in the collection of a cultural organization.

5.4 New perspectives and open cultural data

As already mentioned at the 10-year festive meeting since the first open access initiative and declaration, in 2012, then, are laid the principles and the goals for the future to promote this policy and belief that it will help knowledge, science, cultural memory, the progress of the life and humanity itself. According to the official recommendations of this meeting of the leaders of open access movement the interest is focused on […*the development of Open Access policies in institutions of higher education and funding agencies, the open licensing of scholarly projects, the development of infrastructure such as Open Access repositories and the creation of standards of professional conduct for Open Access publishing. The recommendations also set a new goal of achieving Open Access as the default method for distributing new peer-reviewed research in every field and every country within ten years*][86].
There is also interest of sustainability of open access, advocacy and coordination of it[87].
Ultimately, the strong tendency for openness in data/metadata cannot hide fears. There are organizations and institutions which collect and distribute data and metadata but have serious reservations about open access policy while at the same time they want to communicate with the public and gain the benefits that flow from it (Tsiavos, 2010). Peter Doorn claims about research data that they must be "open if possible, protected if necessary"[88].This motto are

[83] CC is a non-profit organization, a very popular type of open access publishing. Creative Commons are licenses that permit free and unrestricted use of data, Licenses that give to the public the right to share, use, and even build upon an author's creative work with only a possible limitation of the reference to the source and the maintenance of the same terms of openness upon further use. e.g. OA articles under a Creative Commons (CC) license has evolved as the standard for OA publishing. CC is a non-profit organization, a very popular type of open access publishing.
[84] "Copyright and license". Retrieved April 11, 2018 from: https://www.springer.com/gp/authors-editors/authorandreviewertutorials/open-access/copyright-and-license/10286528
[85] Retrieved April, 17, 2018 https://www.metmuseum.org/about-the-met/policies-and-documents/open-access
[86]Retrieved February 2, 2018 from http://www.budapestopenaccessinitiative.org/
[87] February 9, 2018 from: http://www.budapestopenaccessinitiative.org/boai-10-recommendations
[88] Peter Doorn is director of Data Archiving and Networked Services (DANS), Dutch institute for permanent access to digital research data. DANS is an institute of the KNAW and NWO. Retrieved February 2, 2018 from http://www.openaccess.nl/en/references/testimonials/dr-peter-doorn

included to the official guidelines from European Commission about using open access and data management in 2016[89].
Nowadays, Cultural Heritage is an important field of attention from academic and industry community. Stakeholders like researchers, cultural organizations, associations, museums, even schools are seeking ways for “accessing, integrating, sharing, annotating, visualizing, analyzing the mine of cultural collections by considering profiles and preferences of end users” (Stonor, 2015). Undoubtedly, data need to be interoperable and to be interconnected so that user can easily retrieve and exploit the information. For Leiden University data management serves those principles that will characterize data as 'Findable, Accessible, Interoperable and Re-usable'. These F.A.I.R. principles[90] can be applied to open cultural data as well as other open web data.
It should be mentioned that cultural data link very different types of information. Because of this characteristic it is difficult to be interconnected and interoperated. Moreover is referred the distinction between data/metadata and the digitization of cultural elements. Also, in some ways metadata may be confused with data. There are cases in which intellectual property issues are not clear. For example, the date (metadata description) of an artistic work, e.g. a sculpture may be intellectual property of an individual or a team of scientists as the result of research.

5.5 Cultural data and semantic web

Most cultural information systems do not sufficiently exploit the capabilities of the semantic web that offer major possibilities. A necessary requirement is the interoperability between different data through international models and open licenses use. Through semantic web we obtain to linked data with other sources of structured information, we achieve the interconnection of different sources and types of cultural information, the expansion of research surfing through meanings, senses and their semantic links with other senses. Linked Data is a set of design principles for sharing machine-readable interlinked data on the Web and is “one of the core pillars of the Semantic Web, also known as the Web of Data”[91]. When the data is not interconnected, it is the user who has to search and find the information paying great effort, but if there is interconnection between them this hard work is done by computer. The more data is connected together, the more powerful it is.
Cultural data is one of the most appropriate data for the evolution of the semantic web (W3C) as they are already based on semantic relationships. By semantic web, relationships we did not know before are emerged maximizing the value of the internet (Tim Berners Lee). One of the revolution points of W3C is that it can link a small data unit, even a single data point (e.g. a specific painting) with other data or metadata and not a whole webpage.
Except the significant role of metadata specific interest has the exploitation of material derived from users. This material named users generated content constitute another perspective in the world of cultural data and metadata with regard to openness, accessibility to information and cultural management (Tsiavos, 2010).

5.6 Deeper open access policy. The role of metadata

Data and metadata interconnection of different sources presupposes the acceptance of intervention by third members. This fact is one of the greatest fears of cultural institutions. In a new open access philosophy, data and metadata information breaks the narrow boundaries of an organization without losing its value. The open interconnected data are autonomous tiles in a large cultural mosaic. Each element retains its autonomy but is also connected to others, completely different elements (data/metadata) so that they can be retrieved together through

[89] Retrieved February 7, 2018 from http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf
[90] February 9, 2018 from https://www.library.universiteitleiden.nl/research-and-publishing/datamanagement
[91]Retrieved April 19, 2018 from https://ontotext.com/knowledgehub/fundamentals/linked-data-linked-open-data/

use of semantic web. Simultaneously, unexpected uses and knowledge are derived through interconnection. Since rich enough metadata can describe content at element level, it is possible to re-compose the content dynamically at any place on internet.
At other times it would be inconceivable for experts to exploit users' generated content as already are referred. This second generation on open access (Tsiavos, 2010) demand a deeper level of open access with derivative works, focusing on reuse of information (data, metadata or users generated content) providing a leading role in metadata, while at the same time the liberation from any restricts is demanded as well as a larger spread of the semantic web to cultural data. Because of the over-inflating of online information, the difficulties are not only about managing it, but also about use / re-use it. There is a risk to lose in the multiple references and links. Any restrictions are an obstacle to the dissemination of knowledge. Nevertheless experts must constantly negotiate terms seeking the golden ratio between the moral and the right, the necessary and the desirable.

5.7 Conclusions

Paraphrasing Bacon's[92] principle that the value of an idea derives from its usefulness (Burns, 2006), someone could argue that the value of information on the web lies in the fact that one can find it, retrieve it and use/reuse it. That's why "free access" is not an identical term to "open access". Open access is much more than just being able to access to online content. The concept of reuse is what makes the difference and can lead to unexpected results and new works, expanding internet value and its capabilities.
Despite the high expectations and the admitted increase in open access journals (open access publishing), academic text production remains locked behind barriers and pay walls. At the same time academics want to broaden their audience that could have access to their works but mostly they want control, tenure and promotion. A proposal to make research works more accessible is to "separate the review and dissemination processes" (Satlow, 2016).
Interest causes the prospects of open access through the management of cultural data. The new generation on open access aims to exploit the possibilities of open linked data, enforcing metadata role and human value as user, as content producer in web and as one who manages but also benefits from what we call cultural heritage through open and linked cultural data/metadata. Cultural institutions are afraid to lose the control of their collections and the value of their brand name by linking their data with other data. Open linked data and semantic web is a key tool in seeking to advance sustainable development and to retrieve information by low cost.
Open access is a philosophy and a trend of contemporary times. It is imposed by the inability of institutions to cope with the high costs of journals and the need for rapid diffusion and sharing of the achievements of spirit and art. Cultural heritage is a fundamental stone of our existence and complements our professional identity. It helps us to understand who we are and how to register properly in our society.
The volume of web information and the heterogeneity of cultural data imply their need of interconnection and the widest possible access to them. The value of the data is not lost due to the facility of access, but instead it is maximized and elevated to the highest good. Open access requires constant identification and redefinition of terms and usage possibilities, legal facilities and simplifications in general.
Despite the complexity and vertiginous changes of the contemporary world, deep values remain the same, and man will always need to approach, to communicate to enjoy and utilize what we call cultural good, enlarging the importance of cultural heritage, regardless of whether the information is on the Internet or not. Nowadays, machine and human being interact anyway trying to confirm good qualities of their "relationship" without eliminating the Aristotelian meaning of "ethos" which is the word key that will ensure credibility among the parties involved.

[92] Bacon was a philosopher of 17th century whose conclusions influenced modern thinking. His perception that an idea, the knowledge has value only when it can be used has also had an impact on scientific discoveries which, in order to have value, should be practicable (Burns, 2006).

5.8 References

Berners–Lee, T. (2006) “Linked Data”. Retrieved April 10, 2018 from https://www.w3.org/DesignIssues/LinkedData.html

Budapest Open Access Initiative February, 2018 from http://www.budapestopenaccessinitiative.org/ (CC BY 3.0)

Budapest Open Access Initiative “Ten years on from the Budapest Open Access Initiative: setting the default to open”. Retrieved February 9, 2018 from http://www.budapestopenaccessinitiative.org/boai-10-recommendations (CC BY 3.0)

Burns, E.M. *European History. Western culture: newer times.* (2006). In Greek translation by Tassos Derveris. Thessaloniki: Epikentro

European Commission. (2016). H2020 *Programme Guidelines on FAIR Data Management in Horizon 2020* Retrieved February 7, 2018 from http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

Ontotext “What are Linked Data and Linked Open Data?” Retrieved April 19, 2018 from https://ontotext.com/knowledgehub/fundamentals/linked-data-linked-open-data/

Open Access - Max Planck Gesellschaft. “Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities”. Retrieved January 15, 2018 from https://openaccess.mpg.de/Berlin-Declaration

Open Access. nl “What is open access?” Retrieved February 3, 2018 from http://www.openaccess.nl/en/what-is-open-access

Satlow, M. (2016) “Academic Publishing: Toward a New Model” Retrieved March 3, 2018 from https://www.chronicle.com/article/Academic-Publishing-Toward-a/236526

Springer “What is open access?” Retrieved January 20, 2018 from: https://www.springer.com/gp/authors-editors/authorandreviewertutorials/open-access/what-is-open-access/10286522 / “Benefits of Gold Open Access” Retrieved January 20, 2018 from: https://www.springer.com/gp/authors-editors/authorandreviewertutorials/open-access/benefits-of-gold-open-access/10286524 / “Copyright and license” Retrieved January 20, 2018 from: https://www.springer.com/gp/authors-editors/authorandreviewertutorials/open-access/copyright-and-license/10286528

Stonor, K. (2015). “SW4CH 2015: First Semantic Web for Cultural Heritage workshop”. *International Institute for Conservation of Historic and Artistic works.* Retrieved april 3, 2018 from https://www.iiconservation.org/node/5514

Suber, P. (2012) “Ensuring open access for publicly funded research” Retrieved March 3, 2018 from https://www.bmj.com/content/345/bmj.e5184 (CC BY-NC 2.0)

Suber P. (2004). “A Very Brief Introduction to Open Access” Retrieved January 15, 2018 from https://legacy.earlham.edu/~peters/fos/brief.htm (CC BY 3.0 US)

The MET “Open Access at Met” Retrieved April 17, 2018 from https://www.metmuseum.org/about-the-met/policies-and-documents/open-access

Tsiavos, P. (2010). “Second Generation Open Access: Cultivating Open Data Infrastructures for Organizations of Memory and Art”. *3rd Conference of Art Libraries.* February 5, 2010. Benaki Museum, Athens

Univesiteit Lieden Library “Data Management” February 9, 2018 from https://www.library.universiteitleiden.nl/research-and-publishing/datamanagement

6 Access to Knowledge through the Classicity of Manuscripts at the Beginning of the 16th Century in the West – Some Thoughts on Modernity

Vichelmina ZACHOU
Ionian University, Corfu, Greece

Concerning changes in writing in the early 15th century in the West. An especially important period since the fundamental principles of the science of Palaeography originate from the period of humanism. The Humanists, despite the different views of the graphical features and the dating of the scriptures, were aware that littera antiqua had been attributed to an ancient writing but was in use during the Middle Ages. In Florence, at the end of the 14th and the beginning of the 15th century, the Greek script, the Greek alphabet, other than the Latin, not only extended the writing program that tends to return to the ancient script, and at that time embodies the Byzantine world of the late Middle Ages, but disrupts a dialectical scripture born in Latin writing.
The 16th century humanists refuse to recognize in the letters of their time a bond, any similarity to the letters of the ancient, and in addition accept next to the monumental, the presence, during the Roman times, of a writing, of cursive, known during the Renaissance, which appears in the many ancient ruins scattered in the cities and in the countryside. Although in the ancient inscriptions we find majuscule scripture, there were certainly other types of letters. This historical consciousness that stems from the view that writing cannot remain unchanged but depends on the functional and practical ability to reform and re-interpret the graphic instrument, matured in private libraries and fueled by daily friction with books.

Keywords: humanism, scripture, *littera antiqua*, graphic Greek-Latin

6.1 Introduction

The 14th and 15th centuries present a contradictory picture in the West, as in the same period in which Europe is tested by a multidimensional crisis, ecclesiastical, demographic, economic, moral, political, two interlinked movements manifested that have positively marked European historical course, Renaissance and Humanism. In the second half of the 14th century, the crisis will largely be overcome, and an instinctive need to balance the past suffering of material life would be the logical reaction of people if circumstances permit it. As the European urban population is beginning to grow creating conditions for increasing demand for products, a class of people is emerging in urban centers that is increasingly involved in trade and services. To thrive in these activities a prerequisite is education, a need which leads to the increase of schools and the number of literate. This class of people with high incomes, for which the problem of livelihood and survival does not exist, now has more time for higher level education and fun than in the past, while it considers children's education to be essential.
As the need for reading in everyday language increases, they begin to form the conditions that will lead to the development of national literatures. This, of course, does not mean that the Latin language preserved by the church, is abandoned; on the contrary, its knowledge offers access to the classical works whose authors are moving within the new values and interests of society. The book, originally manuscript and after the middle of the 15th century printed form, will allow this wider public to come into contact with the spiritual production of antiquity and its ideas in the field of science, politics, philosophy, administration, art and be influenced by them. Under these circumstances and given the demand for cultural products of high quality from

various Maecenas of the time, the conditions are formed for spiritual and cultural renewal that puts man and nature at its centre.

6.2 Influence of manuscripts from antiquity

Humanism of the first half of the 15th century is generally characterized by a dynamic in the propagation of the new culture, a dynamic expressed through various directions: from the recovery of manuscripts in libraries to the dissemination of new discoveries thanks to translations of works from Greek into Latin and from the promotion of the humanitarian message to the local centres of power until the creation of private academies, where the supporters of humanism gathered and exchanged information. [1]
The humanist educational program provided for the direct study of the classics. Latin was taught directly by the text, not by "exaggerated" medieval grammatical theory, while Greek was taught by the Erotimata [2] (Ερωτήματα) of Manuel Chrysoloras [3]. Then they entered the literary area and studia humanitatis, history, moral philosophy (based on Aristotle's Ethical Nicomachy- Ηθικά Νικομάχεια), literature, historiography and rhetoric.[4]
The real source of classical beauty was ancient Greek literature and the knowledge of the Greek language that was a basic prerequisite. The "fugue" of the Byzantine scholars to the West had begun some decades before the Fall, as the danger of the fall of Constantinople had begun to be predicted from the end of the 14th century. However, the exit was accelerated and increased, as was normal, immediately after the Fall (1453). Greek scholars teach the Greek language in Italian cities, as in Florence, while the Humanists organize missions for the purchase and transport of Greek codes in the West, such as Aurispa, who in 1423 transported 238 manuscripts to Italy. The first among the scholars, Manuel Chrysoloras [5] taught ancient Greek language and literature at the University of Florence from 1396 to 1399. His presence in Florence was a catalyst for the course of Greek studies in the West. His lecturing was held in front of a large audience, including well-known humanitarians and Florentine personalities, and arriving from neighboring cities to attend his lessons. From time to time, Chrysoloras taught in other cities in Italy, such as Pagia, Milan, Rome, but in Florence, a known Renaissance centre, began to systematically teach Greek letters. The Florentine Maecenas Palla Strozzi, [6] had invited Chrysoloras in Florence, when he was there as a diplomatic envoy of the Emperor Manuel II Palaiologos in the West, to search for bases and help against the Ottomans in order to create a center for humanities in Florence. Chrysoloras taught his students using Greek manuscripts.
In 1406, Guarino Veronez (1374-1460) [7] bought in Constantinople a copy of the comedies of Aristophanes and Erotimata of Chrysoloras. The code (Vaticano Palatino greco 116) served in Guarino for his apprenticeship in Greek, for an exercise that at that time was mostly lexical, citing Greek words or idioms with the corresponding Latin form, and sometimes not due to lack of memory, but to make clearer the concept, choosing the common language. The code is an important testimony to the history of Guarino's studies and the reconstruction of a humanist library.
Guarino was in Constantinople for three years, where he remained until 1408, invited by Emmanuel Chrysoloras. At the time of his arrival, he was close to the age of 30 years and it seems that he had not, until that time, contacts with Florence: his education (including writing) took place in Verona, Padua and Venice. In 1397, Emmanuel Chrysoloras was hosted by Guarino when he was invited to Florence by a consortium of citizens to conduct Greek courses which constituted a fundamental station of studia humanitatis. Possibly, Guarino had heard from his teacher Chrysoloras about the graphic change in Florence and without knowing the Florentine rule, he wanted to write in littera antiqua.
The period in which Guarino was in Constantinople is the same that in Florence a program of radical reformation of writing was completed. A program that at that time did not involve any kind of writing but only copying books; and mostly classical works [8], Latins and Greeks in Latin translation, and sometimes in modern works, for example De Verecundia [9] of Salutati. Essentially, the writers we would call today "medieval" were excluded, and then called "modern". Strictly excluding popular literature.

Changes in writing in the early 15th century are accompanied by an awareness, a theoretical effort that cannot be compared to any other event in the history of writing. And it is no accident that the conceptual bases and terminology of science dealing with the history of writing, palaeography, come from the period of humanism.
The Florence program aimed at almost completely recovering a type of "ancient" book of the 11th or 12th century that imitates writing, decoration and even some structural practices (the use of parchment instead of paper, full layout of the text on the page and so on). This recovery was driven by literary, spelling and graphological motives.
In the handwritten note of Guarino, the ancient press is attained with the help of the Byzantine forms and based on a common root. It is worth noting that in Latin scripture such freedom of forms was not entirely foreign: in the late Roman period, maiuscule script and byzantine writing systems were observed in inscriptions, mosaics and codes in some centers of southern Italy, in areas of great Greek influence, or where Constantinopolitan writers were active. During the 13th and 14th centuries the use of mixed maiuscule is confirmed in the Veneto region.[10] Guarino could be described as the heir of a graphic tradition with ancient roots, and possibly had himself come in contact with some of these types and in Costantinople to recognize them. It appears that the use of Greek-Byzantine types by Guarino reveals a conscious recovery of ancient forms.
The presence of Greek or Hellenized letters, mainly in the use of capitals, titles or even in the text itself, is beginning to spread widely following the example of Guarino (Palatino greco 116). Many copyists in northern Italy consider it sufficient to use the maiuscule of Greek scripture to give the mark of ancient writing to a production that still remains deeply connected with the medieval tradition. Like, for example, a small Terenzio code [11] written in 1431 in littera textualis, but with a maiuscule Greek script and decorated with elaborate initials of Byzantine root.
It is a period in which the personal and indirect contacts are of particular importance. The level of writing knowledge is so high that the writers do not only capture their imitative graphic experience but a graphic model that almost takes the value of biographical features. [12]
It seems that with Guarino, initially in Veneto and then in Lombardy, starts a period of transcription of classics, in which writing tends towards to "old" scriptures (ad modum antiquorum) with a differentation from the type of Florentine scripture. In Florence, the ideal type is represented by the code of the 11th and 12th centuries, while in the Veneto region return the models of the 8th and 9th century, that is the most ancient minuscule writing, which was interpreted with great freedom and this is the reason for the presence of elements which are not historically founded, but are peculiar with archaic complexion.
In the revitalization of litterae antiquae formae two voices coexist, the Florentine and that of the Veneto region: the first, balanced and practical, essentially continues to have ties to the late Middle Ages and provides professional scribes an excellent tool; the second, behind the myth of the ancient, will never be able to discipline a rule, but will continue to express very different scriptures. So, on the one hand, we are talking about a disciplined voice that feeds on the philological, grammatical and spelling needs of the Florentines, and on the other hand for an artistic, utopian voice. This different way of studying the scriptures of the past may be linked to contact with Greek culture and writing. This is a contact (through direct knowledge of the place and people) that has expanded the graphic perspective and opened the way to diversity and, at the same time, to the realization of a substantial continuity of writing.
Characteristic is the example of Kyriakos from Ancona (Ciriaco d'Ancona, 1391-1452). Palaeographers and historians consider Kyriakos' writing a historical stage in the evolution of writing based on a personal inclination. Unlike many other contemporaries, Kyriakos employs Greek-Byzantine models of writing, but at the same time he inherits and enriches a set of ideas and forms that he began to assemble based on Guarino's graphic experience in 1406. Recent studies have brought to light many copyists and notaries [13] who themselves moved in the same direction at the same time and used the same forms: Greek letters, special connections, letters maiuscule and minuscule together, grids, unusual shades.
The main thrust for returning to ancient writing was the restoration of classical Roman maiuscule scripture, both in inscriptions (engraved or painted) and in codes. Artists, scriptores

and antiquarii collaborate on a research that combines the reflection of artists and their literary and archaic studies.
At that time in the Veneto region a littera antiqua is born, which is distracted by the tradition of Florence. Special cases of graphic Greek-Latin mimetization thus bloom, more obvius stylistic than the use of Greek-style letters (alternation of Greek and Latin symbols).
This recovery of ancient maiuscule scripture is the principle of the return of litterae antiquae formae and is evidenced by the fact that already Petrarca and Bocaccio, in a context that remained costantly "modern" - Gothic, had already restored some maiuscule variants letters in the space of the corresponding "Gothic" types. Obviously, further research into the type of writing of other scribes or manuscript production centers would complete our knowledge of the sources of writing history.

6.3 Conclusions

Through the history of scripture from the past to the present, we find that it is essentially a product that is influenced by the educational and social habits of the scribes and is associated with the great moments of history. Graphic choices are driven by the historical necessity of time and place where a graphic development will take place.

6.4 References

[1] S.Gugliemino – H. Grosser, “Dal Duecento al Cinquecento”, *Il sistema letterario, 1.Storia*, Milano, Principato 2000, pp. 248-249.

[2] His work “Τα ερωτήματα” based on the form of questionnaires, was translated into Latin and was printed in 1471 in a Greek-Latin epitome by his student, Guarino, and was highly appreciated.

[3] N.G, Wilson, “Από το Βυζάντιο στην Αναγέννηση”, ed. Λιβάνης, trad. Πρεβερούδου – Γεωργίνη Φωτεινή, Athens 1994.

[4] S.Gugliemino – H. Grosser, “Dal Duecento al Cinquecento”, p.277.

[5] Εμμανουήλ Χρυσολωρά, “Ερωτήματα”, Vicenza, 1475-1476, Βιβλιοθήκη της Βουλής των Ελλήνων - È. Legrand, “Notice biographique sur Manuel Chrysoloras”, Paris 1894 – G. Gammelli, “I dotti Bizantini e le origini dell’ umanesimo I. Manuele Crisolora”, Firenze 1941-1954 – I. Thomson, “Manuel Chrysoloras and the early Italian Renaissance”, *Greek, Roman and Byzantine Studies* (1966) – N. G. Wilson, “From Byzantium to Italy”, *Greek Studies in the Italian Renaissance*, London 1999.

[6] M. Vannucci, “Le grandi famiglie di Firenze”, Roma, Newton Compton Editori, 2006.

[7] C. de' Rosmini, “Vita e disciplina di Guarino di Verona e de' suoi discepoli”, Brescia, 1805 – G. Fiesoli, “La biblioteca greca dei Guarini”, in L. Avellini e N. D'Antuono (eds.), “Custodi della tradizione e avanguardie del nuovo sulle sponde dell'Adriatico. Libri e biblioteche, collezionismo, scambi culturali e scientifici, scritture di viaggio tra Quattrocento e Novecento”, *Atti del convegno* (Pescara, Univ. degli Studi, 25-28 mag. 2005), Bologna, 2006, pp. 41-102 – R. Sabbadini, “Guarino Veronese e il suo epistolario edito e inedito”, Roma, 1885 – M. Pade, L. Waage Petersen, D. Quarta, “La Corte di Ferrara e il suo mecenatismo 1441-1598”, Ferrara, 1990.

[8] In the broad sense of classicity as they fall into the category and works of Augustine (354-430 AD) and Lactantius (250-317 AD).

[9] A letter of 1390 addressed to Antonio Baruffaldi on the positive or negative character of verecundia (respect).

[10] E. Barile,” Littera antiqua e scritture alla greca. Notai e cancellieri copisti a Venezia nei primi decenni del quattrocento”, Istituto Veneto di Scienze, Lettere ed Arti, 1994, pp. 69-86 - A. Petrucci, “Scrivere alla greca nell’Italia del Quattrocento”, in G. Cavallo, G. De Gregorio, M. Maniaci (ed.), “Scritture, libri e testi nelle aree provinciali di Bisanzio”, *Atti del seminario di Erice* (18-25 settembre 1988), II, Spoleto, Centro italiano di studi sull’Alto Medioevo 1991 («Biblioteca del Centro per il collegamento degli studi medievali e umanistici nell’Università di Perugia», 5), pp. 511-514.

[11] Biblioteca Apostolica Vaticana, Vaticano latino 3226 – S. Prete, Il codice di Terenzio Vaticano latino 3226. Saggio critico e riproduzione del manoscritto, Città del Vaticano 1970 (Studi e Testi 262).

[12] Suffice it to think of the likeness of the littera antiqua of Niccoli and the littera antiqua of the young Poggio, Niccoli's reworked writing and Traversari's counterpart. It seems that the combination of littera antiqua and Greek maiuscule script belongs to Guarino: S. Zamponi, “I manoscritti petrarcheschi della Civica di Trieste Library. Storia e Catalogo”, Padova 1984, pp. 99, 102 and tav. XXVII.

[13] Barile, “Littera antiqua e scritture alla greca”, pp. 69-86 passim.

7 Access to knowledge and Archives

Alexandra KAVVADIA
Ionian University, Corfu, Greece.

7.1 Abstract

Archives and fonds are a reflection of the activity of either a legal entity or a natural person and perform a double role: a) as active records with functional usefulness and b) as historical archives with research and scientific value, which is an important element of cultural heritage. The process of information with the use of archives leads to proper documentation and to documented, secure and reliable knowledge. Information Science, Computer Science and News Technologies are important factors of archives and records management as they can support and reinforce in a systematic way the diffusion of archival information of every kind. Due to these sciences, everyone is able to find a sufficient number of archival information digitally, through an open archival information system without being obliged to spend extra financial resources and time during the preparation of a scientific research with relevant reference use. Every user has to respect and follow archival legislation, legal status and access conditions for each archive. This open access to archives and the review of archival information by scientists offer knowledge of primary value and promote scientific research and cooperation in national and international level. In this way a more creative international feature can be created.

Keywords: Archives, archival information, research, news technologies, documentation.

7.2 Introduction

Archives and fonds are the most official written proof and natural reflection of activities of legal entities or natural persons. [1] They constitute the basic material for research of personal and collective past and they are also considered raw material for the present and future user. Proper observation and preservation of archives protect the past activity of a corporate body, an institution, an association, the public sector as well as the historic past of people and families. Archives connect the past with the present and the future. Their role is fulfilled by processing documented findings, increasing the interest and leading to a cohesive and reliable knowledge. By cultivating such knowledge in conjunction with critical thinking and reviewing, the researcher is being able to support excellent education in any scientific field and level of studies.

7.3 The role of Archives

Archives (in other words fonds) due to their authentic character, their primary material and diversity, are related with: a) the administration and b) the scientific research. As a result they perform a double role: a) administrative and b) researching.

1. The administrative role of fonds: There are active fonds called Records with official value and functional usefulness. [2] They are produced from initial creators and are basically deployed for the needs of current administration or individual activity, especially in an administrative, economic, legal and functional aspect. These fonds as stored information facilitate the decision-making process on relevant to fonds subjects. The frequency of their use depends on the needs of each institution. It is generally accepted that the proper and adequate operation of public services depend on the proper functionality of their archives. The reason is the fact that

knowing and understanding past policies and former decisions, institutions can deal with their future subjects with greater coordination, security and success rate.

2. The research role of archives: There are the historical fonds with probative value, which justify their permanent preservation, as scheduling information. In this case the archives give answers to scientific questions of researchers and other people. Researches concerned with the past commonly base their research on relevant archival sources. When the official use of this kind of resources expires, they have outlived the current usefulness and their functional value disappears. Then the fonds are considered inactive and after selection and appraisal they become historical archives. The main public archival service is National Archives in many countries of the world. [3]. In Greece this service is called General State Archives, which were created in 1914 by Eleftherios Venizelos' government.

The historical fonds have probative value as documents of proof, that is to say they can offer a scientific reasoning of events and attitudes of the past. The study and treatment of archives lead the researcher to reliable scientific conclusions. Their special value justifies the operation of keeping them perpetually for research purposes and this is an innovation we inherited from the 19th century.

7.4 The Archives Science

Archives, due to their primary material, mainly constitute: a) the most reliable research sources for the scientific knowledge in all sectors of Science and Art and b) a vital element of social, economic, political, and cultural heritage.

The management of archival information is a complex and valuable process, as it constitutes genuine proof for the people, events, situations, conditions and structures that led to the initial creation of an archive. [4] It is obvious that the archives sometimes were given birth and functioned as active fonds.

The archivists practice intellectual and physical work for the successful processing and promotion of archival material. It is necessary to be familiarized with special meanings and archival terms. [5] Archivists use the term "processing" to refer to all the intermediate steps that are taken to prepare archival materials for access and reference use. Arrangement and description are the two main steps of this procession. They are closely linked together as each one depends on the other. Arrangement refers to the physical and intellectual order of archives: which papers are grouped together and what is the order in which papers, folders, boxes and bound volumes are placed. Description refers to creating finding aids in use for researchers in locating materials in such a suitable way that their questions can be answered. Processing also includes some preservation and appraisal. [6]

7.5 The valuable Aid of Technology

Apart from this the archivists must use the widest possibilities of new technology for the processing, long-term preservation and dissemination of archival information through digital systems in national and international level. In consequence, it is appropriate to facilitate exchange of information between archival services based on international standards, which have been accepted by the science of archives nowadays. International Standards in combination with modern encoded information systems have been developed for the processing of knowledge in several sectors of science. The application of the main International Standards includes: a) ISAD(G): General International Standard Archival Description, b) ISAAR (CPF): International Standard Archival Authority Record For Corporate Bodies, Persons and Families, c) ISDIAH: International Standard for Describing Institutions with Archival Holdings d) DiPPeL: International Standard For Describing Functions.

The main challenge is: the simultaneous and coordinated service of public administration, individual activity and scientific research. The material of archives constitute a primary

probative material and therefore is considered as societal property and should be accessible by the administration and the research community. [7]

7.6 The respect to legislation referring to Archives

In any case the diffusion of archival information is not uncontrolled. On the contrary it is protected by special legislation. Access to files by researchers is controlled by several legal restrictions, mainly about data protection, sensitive information, access dates and all of them are based on respect for human and individual rights. The protection of the citizen's legal right for his private life and personality is clearly overridden against any right of free access to the archives, especially when having to do with confidential information and personal data. Moreover information law includes fundamental principles such as the principle of respect for privacy, the principle of respect for personal autonomy, the protection of intellectual property. [8]. For some special legal reasons some Archives are protected by special access control systems.

7.7 The very closed relationship between Archives and knowledge

Concretely with the utilization and evaluation of archival information, made dependent from previous information [9] and applying the suitable scientific criteria the following issues are ensured: a) the knowledge aiming at the comprehension of objective reality and b) the knowledge management for making future decisions in order to promote progress and development. In this manner, knowledge is built and scientific research is progressed.
The knowledge, in order to be useful and effective, must be composed of original information. The archival information is original and authentic, because it derives directly from the source and thus provides with safety for the researcher or the user.
Consequently the knowledge, supplied from the archival information, makes a circle of production, concentration, scheduling, disposal to the user and the final recipient, as does every other product of human intellectual creation and so it becomes useful and valued.
Archival as documented information must be widely published and available to the society. It should be supported by the international scientific community because of its public faith. The International Council of Archives defines the historical archives as the part of information that is estimated to have perpetual value beyond the reason, for which it was created. [10]

7.8 Conclusions

- The concentration of archives is not due to the chance or arbitrary action of a person, but stems from the daily activities of public administration services, institutions, industrial or commercial enterprises, families or individuals. By the processing of archival information, which precedes a circle of localization, intellectual control, description, arrangement, accumulation, both through the traditional and the digital way, the supply of knowledge is achieved and in particular the specialized knowledge. In this way scientific research is developed.
- The archival material today, as documented proof for corporate bodies, people, conditions and structures that led to its birth, is considered as primary property of the society and therefore the special rights of citizens who are interested in the archives must be protected.
- However for the further progress and wider efficacy of an advanced society, the access to the archives has to be promoted with the assistance of technology, both in individual and collective activities and also in scientific research. With the use of new technologies, knowledge is spread worldwide and the diffusion of knowledge is

achieved with unique experiences and results. As society is evolving and modernizing rapidly, the world changes, access to knowledge is being facilitated rapidly as well.

- Archives, as creative memory organizations, are disposed of the primary sources seen with a critical scientific approach. The archival experience and conscience are essential to increase the interest of higher education in combination with the study of books, which should follow. However, books without fonds constitute insufficient, incomplete and sometimes precarious knowledge. The collaboration between every kind of educational centers with regional departments of the General State Archives is necessary. [11]
- The appropriate institutional and legal framework for the protection of archival information and scientific research leads to acquisition of a wide and elaborate knowledge and its systematic, and not symptomatic, development.
- This is the big question and on the same time the pursuing aim: the acquisition of skilled, specialized, documented, original knowledge as an evolution of the recorded information in the human history. The constant aim is always the same: a) on one hand, the settlement or resolution of problems and errors of the past and b) on the other hand the most successful and effective activity in the future for the sake of understanding the unknown reality until today. The archives' role is fulfilled especially in exporting documented findings leading to continuity, consistency, promotion and expansion of knowledge.
- As a direct result of archives comes the creation of spiritual benefit, substantial practice and a whole progress for a society with a high level of prosperity and growth, based on reliable knowledge of the past.
- The dissemination of evidence-based information leads and should lead to greater cooperation and creation of a significant and wide network of European and international collaborations, having in mind the renewal of scientific knowledge and the relevant developments on a more creative world future.
- Finally the archives do not provide an absolute and static knowledge, which stops somewhere, but provide a documented and verified knowledge with primary value, which is evolving continually as a constant prospect. This knowledge expands and strengthens the global co-operation between science, research and society.

7.9 References

[1] Μαριάννα Κολυβά, «Αρχειονομία. Φορείς παραγωγής αρχείων. Ιστορική αναδρομή», ed. Πατάκη, 3rd. ed. Athens, 2016, p. 18.

[2] Judith Ellis: „Η διαχείριση των αρχείων», Ελληνική Αρχειακή Εταιρία τυπωθήτω-Γιώργος Δάρδανος», Athens, 2000, p. 564.

[3] Μαριάννα Κολυβά, id, p. 22, Μαριάννα Κολυβά: «Σχεδίασμα-Οδηγός των Γενικών Αρχείων του Κράτους», Athens, 1991, p.p. 409-454.

[4] Ανδρέας Μπάγιας: «Αρχειονομία. Βασικές έννοιες και αρχές. Η οργάνωση των αρχείων για τη διοίκηση και την έρευνα», ed. Κριτική, Athens, 1999, p.p. 323-35.

[5] Μαριάννα Κολυβά: «Εγχειρίδιο Αρχειονομίας, Θεωρητικές προσεγγίσεις. Οργάνωση και σκοποί. Σύγχρονες προκλήσεις», ed. Πατάκη, 2nd ed., Athens, 2015, p. 24.

[6] Society of American Archivists, "Museum Archives: an introduction", 2nd ed., Chicago, 2004, p. 35.

[7] Γιώργος Γιαννακόπουλος-Βασιλική Μπουντούρη: «Εισαγωγή στην Αρχειονομία», Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών, https://creativecommons.org/licenses/by-nc-nd/3.0/gr/, Athens, Copyright 2015, p.p. 6-7.

[8] Bottis Maria, “law and information. A “love-hate” relationship”, Τεκμήριον, τχ. 10, Department of Archives, Library Science and Museology of the Ionian University, Corfu, 2012, p. 194-197.

[9] Δάφνη Κυριάκη-Μάνεση: «Κέντρα Τεκμηρίωσης και Πληροφόρησης. Ρόλος, Λειτουργίες, Οργάνωση», ed. ΙΩΝ, 1999, Athens, p.p. 20-21.

[10] Gracy II. Dsavid B, “Archives begin at “a” but where do they end?”, Αρχειακά Νέα της Ελληνικής Αρχειακής Εταιρίας, τχ. 23/Δεκέμβριος 2006, Athens p.p. 45.

[11] Χρήστος Ζαμπακόλας: «Παιδί, αρχειακή συνείδηση και εκπαιδευτική πολιτική, Σκέψεις και προοπτικές», Αναζητήσεις Ιστορίας, Δικαίου, Δεοντολογίας και Πολιτισμού”, Curator Bottis Maria, Athens, 2018, p. 359.

[12] J. Favier, “Les Archives”, Παρίσι , 2001.

[13] Gracy II, David B., «Archives begin at “a” but where do they end?», Αρχειακά Νέα της Ελληνικής Αρχειακής Εταιρίας, τ. 23, Athens, Δεκέμβριος 2006.

8 Developing Skills through Historical Knowledge. New Perspectives and Contributions to History Education

Maria KONTOGIORGI
Ionian University, Corfu, Greece

8.1 Abstract

This paper attempts to investigate the effect of the historical knowledge on the creative process of building cognitive skills and critical thinking and consciousness, through the role played by the school historical education. As knowledge constitutes the economic, political and cultural asset of our society, this article seeks to highlight the importance of learning history in defending social skills, by analyzing modern educational politics, focusing in history teaching. Specifically, the purpose of this announcement is to present the innovative educational method of historical empathy and rational understanding, in line with the basic methodological aspects of didactic science and the requirements of modern society, in which the student evolves.

Keywords: rational understanding, critical thinking/consciousness, historical empathy

8.2 Introduction

The development of intellectual skills is at the heart of the pedagogical interest of the history educator's research of the 21st century. History education carries an intense ideological, political and social burden, in addition to its gnostic substance. The new history lesson framework contains learning models and strategies that are interwoven with the values acquired through experience. We will be dealing with new contributions to history teaching, according to British Curriculum for History and the assessment's purpose in the historical teaching and learning, after we have a theoretical approach to the educational goals that govern the history education. The current scientific issues unfold around the emancipation of the teaching process from traditional practices. The new rationale for school history bring to the fore a declarative knowledge, with an emphasis on constructing history as an important part in historical knowledge and understanding.

8.3 Basic teaching objectives of history education

The general purpose of teaching history is to gain the awareness that the modern world is in unbroken continuity with the past. Historical knowledge has a specific purpose and orientation, incorporating the information that occurs in the student's pre-existing knowledge. The main concern of the educator is the enlargement, enrichment and processing of the pupils' mini-theories, so that, in full awareness of historical understanding, they become producers of historical knowledge. To achieve this expectation, the history teacher is required to perform his educational work through active participation in the learning process. In a context of guided cognitive discovery, the pupil and the teacher participate in a process of communicative exchange and reflection on the concept of change and continuity, aiming at the cultivation of a wide range of cognitive skills and historical culture.

History teaching is organized on the basis of the transition from the present to the past, fact which is reflected in the three individual objectives of British history education.
A) Knowledge and understanding of History: Knowledge includes awareness of change, of the continuity of time, the causes and consequences of different situations and events. Learning

the ways of instruction and the conceptual code is one of the demands of the educational process. Getting historical knowledge cannot be done without linguistic mediation. Particular emphasis is placed on organizational historical concepts. Linguistic competence is an integral part of historical skills. Structural historical concepts contribute significantly to the historical understanding and formulation of new interpretative reports of the past, as they have comprehensive interpretations of events. Students create knowledge through word search. A key element in the production of knowledge and the development of historical thinking is the original speech of educators and students, in the form of historical questions, assumptions and conclusions. B) Historical interpretations: In the modern epistemological environment, knowledge is understood as a metacognitive and social skill of historical interpretation and comprehension. The new approach to the history lesson include the development of a wider research framework of epistemological analysis, which requires a clear definition of the teaching objectives. The multiplicity of objectives and their expression with action verbs, aims at transforming the cognitive process into a field of research and dialogue, in order to search for the scientifically most valid historical interpretation. The acquisition of intellectual skills contributes to the understanding of the complex world reality and the complexity of the past, present and future. The awareness and evaluation of different historical interpretations are fundamental stages in the acquisition of historical knowledge. C) Historical evidence: The structure of historical knowledge follows a historical interpretation of the remnants of the past. The student is asked to place the primary and secondary historical sources in a wider historical environment in order to evaluate them. The basic prerequisite is the development of historical skills of exploiting the evidence. A productive use of historical sources by the students, implies their critical assessment and consequently that they are being able to control the credibility and validity of the sources, to distinguish the viewpoint and the intentions of their creator, to draw information by asking questions and seeking answers, in order to be led to the final conclusions.

8.4 New perspectives and contributions to History education

Knowledge of history does not involve the reproduction of information but is produced by the student himself, who learns by developing new ways of using cognitive and conceptual tools. Learning is accomplished by highlighting the historicity of the experienced person and the familiarity with the methodological and conceptual tools of history science. Critical assessment of new information in conjunction with the pre-existing one, leads the students to conduct their own conclusions based on their own experience. In the teaching of the history lesson, the formation of historical skills and the development of activities are set as a dominant principle.
An important stage in learning History is the formulation of hierarchical questions and answers when addressing methodological problems. Through the formulation of scientific questions and the semi-direct dialogue, students can develop critical thinking and be led to the discovery of knowledge, focusing on the student's motivation and interest. Educational-free development questions stimulate students' thinking and cultivate judgment and reflection, circumstances that will gradually lead to historical findings. The technique of encouragement significantly contributes to the development of motivation for students to further engage.

The cognitive educational tools assist the teacher's work in conducting an active-experiential learning which, through the collective dialogue, seeks to direct the student into constructing historical knowledge. Learning is built around the real needs of students, using the creative and directional method. The new approach to didactic science emphasizes the educator's scientific training, to whom it offers flexibility in choosing the content to be learned. The educator can and must be the driving force of an evolutionary course in the educational process. He can bring about the intended replacement of traditional pedagogical practices with modern ones, responsive to the multidimensional attribute that he takes in the classroom, being at the same time a pedagogue and at the same time a critical thinker, researcher and

producer of his educational material. The school book is no longer an exclusive means of completing the educational project. The use of a variety of audiovisual teaching tools is absolutely necessary.

The educator must create the appropriate learning motivation to stimulate pupils' interest by making a meaningful, vivid and clear description of a situation that is intended to be experienced. The performance of foreign mentalities is achieved through the use of **historical empathy** or **rational understanding**. According to P. Lee and D. Shemilt, empathy constitutes an important special feature of historical thinking, through which comprehends otherness as a form of historical explanation. This important dimension of historical understanding include the cognitive and affective processes, aiming to history interpretations. The disciplined and systematic activation of imagination and the visualization is perceived as a mental process of capturing the thoughts, emotions, values and expectations of the actual historical subjects.

Innovation Programs, with the Leeds University's “Schools' Council Project” (SCHP) and the CHATA (Concepts of History and Teaching Approaches) being the most important, are based on the distinction of the overall learning process in four “key stages” and on evaluation frameworks and aim to ensure the flexibility of the teacher, in relation to the planning of the lesson and the improvement of the teaching practice. In the modern pedagogical concept in history teaching, which is comprised of Peter Lee, Dennis Shemilt, Martin Booth, Alaric Dickinson and Rosalyn Ashby and was formed in 1962 by the London University Pedagogical Institute “History in Education”, emphasis is placed on the process of acquiring knowledge, not just the content of learning, although, remembering situations and facts is very essential. The adoption of this technique helps to avoid unnecessary memorizations and at the same time enriches students with new experiences. These will serve as a prerequisite for acquiring the basic skills to which the cognitive, emotional, psychomotor and participatory goals correspond to the preparation and planning of teaching. Educational planning and the development of teaching scenarios is an equally important organizational stage. However, it is desirable to adapt the processes in the organization of teaching, according to the needs of the students in a multicultural class. The teaching method is based on the principle of self-action and the process of active participatory learning for the discovery of knowledge through the constant renewal of the educational tools. In the contemporary context of teaching history, alternative forms of learning, such as dramatization, map building, interactive dialogues – debates and substantial museum visits, are of primary importance. Furthermore, the use of information and communication technologies (ICTs: games, maps, etc.), the systematic use of surveillance material and the development of experiential activities, are undisturbed parts of a rational history understanding.

8.5 An assessment-oriented historical teaching and learning

An integral part of the learning process is the evaluation. Quality control of the educational project is evaluated through assessment. Evaluation is a continuous and systematic process that studies and takes into account information on the whole range of education. It's not just about examining or marking the student's performance. One of its functions is to determine the degree of achievement of the objectives set at an earlier stage in the organization of teaching. Continuous assessment is not only about the knowledge that students will gain, but also about the attitudes and the intellectual skills they will acquire. The questions are divided into examining and pedagogical and constitute a very dynamic means of the educator. There is no attempted policy but an invitation to a co-operation, as they assist the educator in his pedagogical work and facilitate the start and invigoration of the discussion. Through the initial - prognostic assessment the exploration of pupils' knowledge and experiences on a particular historical issue is achieved. Then the quantity and quality of the knowledge acquired by the pupils is determined, which is necessary for the feedback of knowledge. By formulating

pedagogical and free-flowing questions, students' thoughts are centered and judgment and reflection are being cultivated.

The main role and the purpose of assessment is to lead the educator and the student into more productive paths. The comprehension control process is conducted during the teaching process and is useful when does not constitute an independent part. Qualitative assessment focuses on the relationship between teacher and student while linking learning to teaching, highlighting performance scores and preference for student enrollment. The nature of the assessment is to motivate the history teacher to work in a continuous planning of action, reflection, feedback and redesign.

8.6 Building critical thinking skills through conceptual history

History education involves the transmission of those necessary mental functions that lead to the acquiring of general skills, which will provide the student with vital life skills. J. Peyrot, through the testimony of a sixteen-year-old schoolgirl, best compliments the nature of history education: “Past knowledge has made people feel more proud, allowing them to approach other peoples. The ideas of celebrities who have stamped history make us, today's people, wealthier. We live in a country where knowledge of history has always played a very important role. I think that if I did not know history at all, there would be a gap around me. Without knowledge of history I would feel inferior. The story of my family is part of my country's history. Knowledge of history allows me to understand myself and to shape my own ideals”. The social role played by history is summed up in the process of creating personal and collective identity. Through the study of different cultures and the balancing of national, European and world history in the Curriculum, the aim is to develop a spirit of mutual respect and solidarity, characteristics that shape active and responsible citizens.

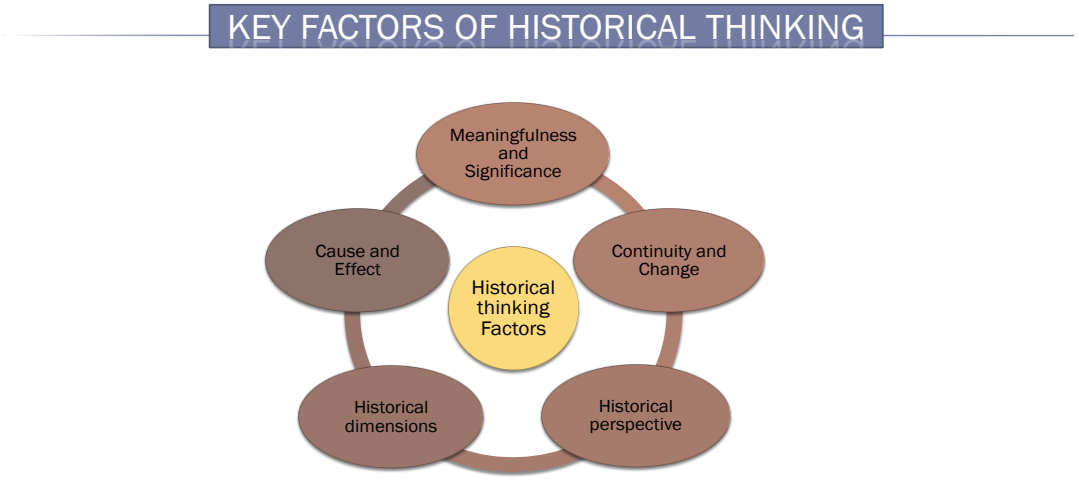


***Figure 1**: Historical thinking Factors*

History teaching is a chronological and thematic process. Therefore, the greatest importance is the development of competences that integrate knowledge into the historical space-time. The basic characteristics of historical thinking are as follows: historical meaningfulness and significance, proper use of historical sources (the source is given for investigation, not for study and hence the teacher must be able to know many ways of using them), the continuity and change in time (what remains and what changes over the years, cause and effect (the reasons are not predefined or recorded to the student as given information, but are an object to be searched), adopting a certain historical perspective (the historian who teaches history is called

and must express moral judgments without prejudging his narratives, understanding the historical dimensions of history.
In a child-centered teaching, in which the cooperative method is dominant, the educator creates the appropriate learning motivation for the student, making him able to challenge, so as to develop critical thinking and historical consciousness. According to contemporary history teaching framework, the dominant request is the developing of the following critical thinking skills: analyzing and synthesizing ability, availability of information, evaluation criterion, documentation and argumentative ability and rational understanding of the values and motives that shaped the action (causality view by linking historical events to each other). History education bears the burden of defending the critical spirit and the development of skills for students, and it must fulfill this purpose.

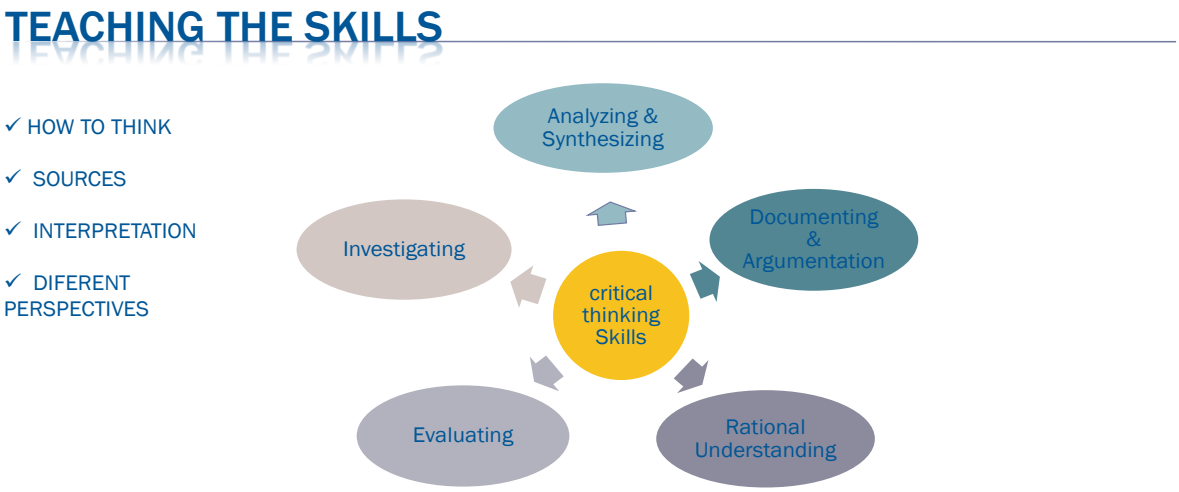


***Figure 2**: Critical thinking skills*

8.7 Conclusions

In the light of the above, school historical knowledge is efficient when it sets a clear goal from the outset, the fulfillment of which puts the student in a continuous process of guided cognitive discovery, with an emphasis on acquiring skills. Children need guidance in order to discover and build their knowledge. We aim to develop exploratory skills for students and provide them with all the necessary resources to help them understand the world, judge actions and behaviors, formulate their own definitions and acquire their own experiences. It should be pointed that by mediating the educator and adopting the appropriate teaching methodology, essential historical knowledge is produced that promotes social skills.

8.8 References

[1] Κώστας Αγγελάκος, Γιώργος Κόκκινος, Η διαθεματικότητα στο σύγχρονο σχολείο και η διδασκαλία της Ιστορίας με τη χρήση των πηγών, *Μεταίχμιο*, 2004

[2] Rosalyn Ashby, Peter Lee, Denis Shemilt, “Putting Principles into Practice: Teaching and Planning”, How Students Learn: History in the Classroom, 2005

[3] Keith Barton, Linda Levstik, “Διδάσκοντας Ιστορία για το συλλογικό αγαθό” (μτφρ. Α. Θεοδωρακάκου, *Μεταίχμι*ο, 2008

[4] Peter Burke,"Αυτοψία, Οι χρήσεις των εικόνων ως ιστορικών μαρτυριών" (μτφρ. Α. Ανδρέου), *Μεταίχμιο*, 2003

[5] Hilary Cooper, "History 5-11: A Guide for Teachers", *Routledge*, 2012

[6] Keith Crawford, "Researching the Ideological and Political Role of the History Textbook - Issues and Methods"*, International Journal of Historical Learning, Teaching and Research 1 (1)*, 2000

[7] Ian Davies, "Debates in History Teaching", Routledge, 2011

[8] Alaric Dickinson, Peter Gordon, Peter Lee, "Raising standards in history education", International Review of History Education 3, *Woburn Press*, 2001

[9] Παναγιώτης Γατσωτής, "Νέες επιστημολογικές και ιστοριογραφικές θεωρήσεις στο χώρο της Ιστορίας και η εφαρμογή τους στη διδακτική πράξη στην πρωτοβάθμια και δευτεροβάθμια εκπαίδευση", Ιστορία των ιστορικών και σχολική Ιστορία: μία προσπάθεια σύγκλισης, *Παιδαγωγικά Ρεύματα στο Αιγαίο 1*, 2005

[10] Chris Husbands, "Τί σημαίνει διδασκαλία της Ιστορίας: γλώσσα, ιδέες και νοήματα" (μτφρ. Α. Λυκούργος), Μεταίχμιο, 2004

[11]Θεοδώρα Κάββουρα, "Διδακτική της Ιστορίας. Επιστήμη, Διδασκαλία, Μάθηση", *Μεταίχμιο*, 2011

[12] Γιώργος Κόκκινος, "Διδακτικές προσεγγίσεις στο μάθημα της Ιστορίας: για μία νέα διδακτική μεθοδολογία στην υπηρεσία της κριτικής ιστορικής σκέψης", *Μεταίχμιο*, 2000

[13] Reter J. Lee, 'Walking backwards into tomorrow' Historical consciousness and understanding history, *International Journal of Historical Learning, Teaching and Research, 4 (1)*, 2004

[14] Ivo Mattozzi, "Εκπαιδεύοντας αναγνώστες ιστορίας" (επιμ.Θ. Κάββουρα), *Μεταίχμιο*, 2005

[15] Henri Moniot, "Η Διδακτική της Ιστορίας" (μτφρ. Ε. Κάννερ), *Μεταίχμιο*, 2000

[16] Ειρήνη Νάκκου, "Τα παιδιά και η ιστορία: ιστορική σκέψη, γνώση και ερμηνεία", *Μεταίχμιο*, 2000

[17] Irene Nakou, Isabel Barca,"Contemporary Public Debates Over History Education", International Review of History Education, *Information Age Publishing*, 2010

[18] Jacques Peyrot, "Η διδασκαλία της Ιστορίας στην Ευρώπη" (μτφρ. Α. Καζάκος), *Μεταίχμιο*, 2000

[19] Arthur J. Phillips, "Issues in history teaching", *Routledge*, 2000

[20] Robert Phillips, "History teaching, nationhood and the state: a study in educational politics", *Cassell*, 1998

[21] Falk Pingel, "The European home: representations of 20th century Europe in history textbooks", *Council of Europe Publishing*, 2000

[22] Robert Stradling, "Teaching 20th-century European History", *Council of Europe Publishing*, 2001

TECHNOLOGY

9 The Advent of Machine Knowledge beyond our Human Comprehension

Matthias GELBMANN
Q-Success, Austria

9.1 Abstract

Artificial intelligence has made significant progress in recent years in the form of advanced machine learning thait is able to produce knowledge that not only exceeds human knowledge in certain areas but is also based on complex computations that humans are no longer able to understand. While considerably increasing the knowledge accessible to us, this new situation also has severe implications and creates new risks: should we trust systems that nobody understands? What kind of decisions can we delegate to machines when we cannot comprehend why the decisions were made? The paper discusses options to respond to these challenges, as well as likely further developments in this area.

Keywords: artificial intelligence, machine learning

9.2 Introduction

Machine knowledge is the knowledge acquired by machines by means of machine learning. According to a common definition, machine learning is a range of AI methods to automatically learn from data without being explicitly programmed.
If we compare today's machine knowledge and human knowledge, then the amount of human knowledge exceeds machine knowledge by many orders of magnitude. Nevertheless, recent developments in AI have brought us specific, comparatively tiny areas of machine knowledge that is not included in human knowledge. Humans have long ago started to develop tools that are more capable in some specific aspects than their own body. Now we have created tools that are, in some specific aspects, more knowledgeable than our brains.

9.3 Stages of AI evolution

In order to see why we are entering a new era now, we need to have a look at how AI evolved in the last 60 years or so and compare earlier stages of AI to this new quality of the last years.
For AI to work we need two components: we need knowledge and we need the ability to apply knowledge. Knowledge, as represented for example in an encyclopedia, is a passive component, and is not sufficient to build an AI system. We need an active component in addition that uses the knowledge to achieve something useful. Wikipedia by itself is not AI, but a system that uses Wikipedia to answer questions is.
The evolution of AI can be shown by examining the evolution of these two components.

9.3.1 Stage 1 AI - basic AI

AI naturally started with low levels of knowledge and simple methods to apply it. An example of such early-stage AI systems are expert systems, the AI hype of the 1980s. Expert systems represent knowledge in sets of *if-then* rules. A so-called inference engine then matches the input data with the conditions in the if-part and, in case of a match, executes the then-part of the rules. The output of all the then-parts of an inference cycle represents the answer of the system to its inputs.
All the rules of an expert system are written by human experts, therefore the knowledge represented in these systems never exceeds human knowledge. However, an extremely small

part of human knowledge is accessible to these systems. It is very easy for expert systems to "explain" how they come to results, just by listing the rules that were used to come to a result. "A computer can never be smarter than the people who programmed it" - this was true for Stage 1 AI, but not for later stages.

9.3.2 Stage 2 AI - exploitation of processing power

Stage 2 AI still uses a relatively low level of knowledge but increases the ability to use the knowledge by using algorithms that can better exploit the processing power of a computer.
A typical case of Stage 2 AI is a classical chess program. Chess programs can evaluate millions of chess positions per second and use algorithms such as minimax and alpha-beta pruning to search the game tree and to find a good move. Chess programs get better the more processing power is used, and since 1997 they play better than the best humans. It is important to note that the chess knowledge of these programs does not exceed the human chess knowledge, but the ability to apply that knowledge millions of times per second enable them to beat human players [1].
Stage 2 AI can exceed human intelligence in their area of expertise. It is also possible to acquire explanations for the results. In the example of the chess program, we can compare the evaluation of the relevant chess positions and see why one is evaluated better than all the others.

9.3.3 Stage 3 AI - automatic creation of new knowledge

Stage 3 AI increases the level of the available knowledge, typically by using machine learning. Machine learning is not new, but a remarkable breakthrough has been made in the last years by developing methods to successfully implement deep learning.
Deep learning uses the concept of Artificial Neural Networks. Neural networks mimic the way neurons work in the human brain. They are good at pattern recognition, be it visual patterns or patterns in more abstract data sets. They have been used for decades, but their use was limited to relatively simple applications such as character recognition.
Deep learning uses large neural networks: hundreds of layers with hundreds of thousands of neurons and millions of connections between the neurons. Much processing power is needed to train such networks, but just as important are specialized algorithms that were only developed in the last decade, and first introduced by Alex Krizhevsky et al in 2012 [2].
Deep learning networks are still tiny compared to the estimated 90 billion neurons in a human brain, and also even the small part of the inner workings of a human brain that we understand is far more complex that the simple calculations used in a neural network. Nevertheless, deep learning can lead to results that are comparable to, and in some cases exceed, human capabilities in specific problem areas.
Although the mathematical foundation of neural networks is relatively simple, the sheer amount of data and calculations in a deep learning network makes it impossible for humans to understand exactly why they come to conclusions from any given input. It is easy to see how each individual neuron works, but impossible to grasp the "big picture" in such a large network. There is also no way for deep learning networks to explain to a human how it works, because the only explanation would be the data flow through its network.
While Stage 2 AI can be better than humans due to sheer processing power, Stage 3 AI systems are the first man-made systems that have knowledge beyond our human comprehension. We can expect that development to continue to a point where machine knowledge not only covers a large part of human knowledge, but also exceeds the amount of human knowledge, see figure 1.

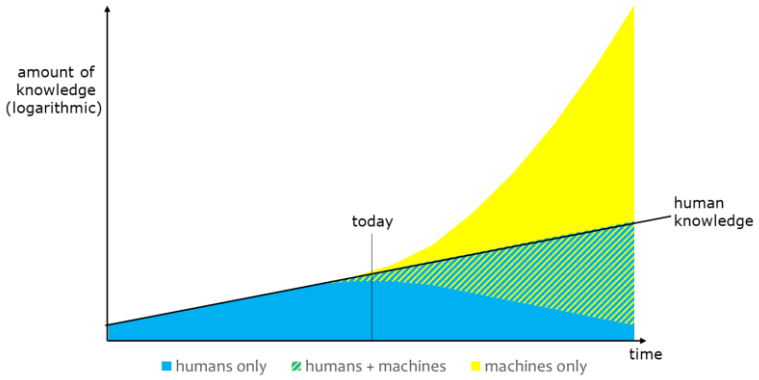


***Figure 1**: human knowledge vs machine knowledge*

New applications of deep learning networks are published daily. Some examples are

- Image recognition, object identification (identifying for example a cat or a dog in a picture), face recognition, mood recognition in faces.
- Speech recognition, including speaker recognition, language translation.
- Stock market trading, where stocks picked by AI often perform better than stocks picked by human traders.
- Game playing systems are among the most published applications. AlfaGo won against the best human Go player in 2016 using deep learning to evaluate Go positions [3]. A similar program, AlfaZero won against the best chess program in 2017 after training its deep learning network for four hours only by playing against itself and without feeding in any human chess knowledge [4]. This is an example of a Stage 3 AI outperforming the best Stage 2 AI due to its superior knowledge.
- Perhaps the most impressive examples are in the medical diagnostic field. AI systems can detect Alzheimer's earlier than doctors, which is very helpful to start treatment at a very early state [5]. AI systems can identify skin cancer from pictures as good or better than the best dermatologists [6]. Another impressive example is a system called Deep Patient. The Mount Sinai Hospital in New York trained its deep network using medical records from about 700,000 individuals, and it was better at predicting disease from a patient's data than doctors. It surprised its makers by also predicting psychiatric disorders, which was not in the original scope of the project, and which doctors do not understand how it can be derived from the available data [7].

9.3.4 Stage 4 AI - automatic creation of new abilities to use knowledge

Stage 3 AI is state-of-the-art today. The further stages described here are assumptions on how AI will evolve in the future.

If we look at the example of the chess-playing AlfaZero, saying that it achieved its performance by applying deep learning is only part of the story. AlfaZero used deep learning essentially to evaluate positions, but the rest of the code implementing the Monte Carlo Tree Search algorithm was hand-coded and hand-optimized code. The deep learning network was a central part, but by itself it could not win a single chess game. Similarly to how machine learning already finds patterns in data without being explicitly programmed, we can expect future AI to find algorithms without being explicitly programmed. This is what Stage 4 AI will provide, thus primarily improving the ability to use knowledge.

Genetic Programming (GP) is one of the techniques available today that are able to automatically generate algorithms. GP is not a new technique but, just as Artificial Neural Networks were used for decades before deep learning brought the impressive results we see today, it would take a similar breakthrough for GP or some similar techniques to advance AI to Stage 4. We will then have machine-generated algorithms that consist of thousands of steps, so that humans are no longer able to understand what they do. We will not be able to see the

“big picture” due to the size of the code. We will then have the ability to apply knowledge in a way that is beyond our human comprehension.

9.3.5 Stage 5 AI - use AI to create or improve AI

The next logical step will be to use the Stage 3 knowledge and the Stage 4 algorithms not only to play chess or to predict Alzheimer’s, but to create and improve AI systems. We do not know what Stage 5 AI systems will look like, but because the procedures to create and to improve them will be automated to a certain extent, we can expect the speed of AI performance improvement to be significantly higher than it is today.
Figure 2 summarizes the 5 stages of the AI evolution.

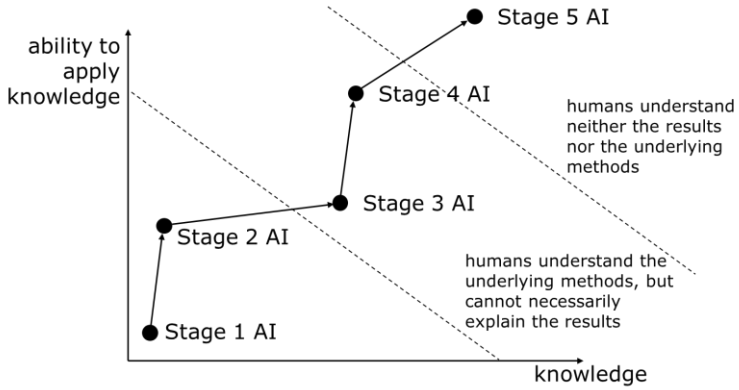


***Figure 2**: the 5 AI stages shown along the two axes of the passive and active component.*

9.4 Dealing with incomprehensible systems

Interacting with systems that we cannot understand leaves some discomfort in most of us. What are our options to deal with that situation?

9.4.1 Creation of technical alternatives

The problem resolves itself if it is possible to somehow enhance the existing systems to provide an explanation. There is a research branch Explainable AI trying to do just that, and any results towards that goal are very valuable. The problem is that in general that is not possible without making compromises. The incomprehensibility of deep learning networks has its roots in the amount of data and of calculations involved, but this is on the other hand exactly what makes them work so well. Any restrictions, such as cutting down or simplifying the connections of the network degrade its performance. In other words, asking for an explanation, or more precisely for an explanation so simple that humans can understand it, deteriorates the system's results.

9.4.2 Ban the development of Stage 3 AI

One extreme proposal would be to ban the development of AI of Stage 3 or higher. The problem with that proposal is that it is practically impossible to enforce. AI systems can be built without anyone noticing it. All it takes is a few talented engineers and some processing power. Plenty of the know-how and of the software tools required to build such systems are freely available.

9.4.3 Ban the use of Stage 3 AI

Monitoring the use of certain AI systems may be easier than monitoring its development, so we could at least ban its use if that makes sense. However, what would be a good reason for a ban? The fact that some people feel uncomfortable seems to be too weak, at least in a liberal society, and particularly when such systems provide benefits that are not achievable in any other way.

Dealing with items that nobody fully understands is not entirely new. For example, the exact mechanisms of how some of the drugs we use can cure diseases may not be fully understood, but by carefully measuring the effects and side effects, we are still confident enough to allow them to be used. We should apply a similar attitude towards AI systems.

9.4.4 Unrestricted use of Stage 3 AI

If we are cautious enough with AI systems that we do not understand, do we need any restrictions at all?
That answer is probably yes. In some circumstances we require an explanation for decisions. For example, were a judge in a court case to rely on an AI that nobody understands to find his verdict, it would be unsatisfactory and could subsequently undermine a country's juridical system. The reasoning for the judge's decisions provides us with the means to find flaws in his judgement and thus a reference point to dismiss a verdict if appropriate.
The European Union in its General Data Protection Regulation (GDPR) enforces a "right to explanation" in some circumstances. The examples listed in that law are decisions on accepting or refusing a credit application and job applications.

9.4.5 Define restrictions for the use of Stage 3 AI

There is one fundamentally new aspect when comparing incomprehensible AI systems with other systems that we do not fully understand such as drugs: AI systems can control things, and with that ability new risks are introduced. A system that does not directly control anything, but only gives recommendations obviously introduces much lower risks than autonomous systems. Furthermore, the potential impact of a failure must be taken into account.
A well-tested medical diagnostic AI that only presents results and leaves the final decision to doctors and patients has little potentially damaging impact. A self-driving car has the potential to kill people. Obviously, we need to take measures to limit that risk. On the other hand, cars driven by humans are probably an even bigger risk, therefore allowing well-tested self-driven cars on our road makes sense.
Figure 3 shows some examples of systems with different AI capabilities and different levels of controls is a diagram indication the corresponding risk levels.

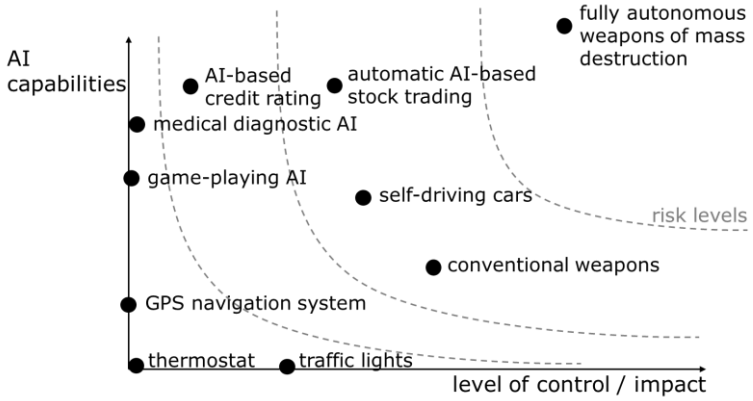


***Figure 3**: AI capabilities vs control levels*

9.5 Conclusions

Humanity faces a new challenge with AI systems beyond our comprehension. The case presented in this paper is that this in itself is not a problem. We need to find regulations that consider the level of risks when we pass control to AI systems and assess the use of Stage 3 AI systems on a case by case basis. Future Stage 5 AI systems will bring new challenges not only due to the much wider range of potential applications, but also due to the speed of developments. It will furthermore intensify ethical and political questions that are beyond the

scope of this paper. Coping with that situation from a regulatory point of view will prove immensely challenging.

9.6 References

[1] Murray Campbell, A. Joseph Hoane Jr., Feng-hsiung Hsu, “Deep Blue”, Artificial Intelligence, Vol 134, Issue 1-2, Jan 2002

[2] Alex Krizhevsky, Ilya Sutskever, Geoffrey E. Hinton, “ImageNet Classification with Deep Convolutional Neural Networks”, Communications of the ACM, Vol 60, Issue 6, Jun 2012

[3] David Silver et al., “Mastering the game of Go with deep neural networks and tree search“, Nature Vol. 529, 28 Jan 2016

[4] David Silver et al., “Mastering Chess and Shogi by Self-Play with a General Reinforcement Learning Algorithm”, arXiv:1712.01815v1 [cs.AI] 5 Dec 2017

[5] Mathotaarachchi S. et al, “Identifying incipient dementia individuals using machine learning and amyloid imaging”, Neurobiol Aging. Vol 59, Nov 2017

[6] Andre Esteva et al, “Dermatologist-level classification of skin cancer with deep neural networks”, Nature, Vol 542, pages 115–118, Feb 2017

[7] Riccardo Miotto, Li Li, Brian A. Kidd, Joel T. Dudley, “Deep Patient: An Unsupervised Representation to Predict the Future of Patients from the Electronic Health Records”, Scientific Reports, Vol 6, Article 26094, May 2016

10 Mobile Evolution to 5G

Felix EDELMANN
Helix IT Consulting e.U., Austria

10.1 Abstract

This paper attempts to show the mobile evolution from 1G to 5G, describe the key features of 5G, outline the activities in Europe defined by EU 5G PPP Public-Private Partnership, look into the current 5G activities in Austria and the Austrian 5G Roadmap. From the various technologies used in 5G massive MIMO and beamforming will be pointed out. It will close with use cases for 5G networks.

Keywords: 5G Technology, Speed GB/s, 5G Scenarios, MIMO, Beamforming

10.2 Introduction

If data transfer lasts not more than a blink of an eye. Mobile data radio is about to make a quantum leap: From 2020, 5G technology will be available as the basis for comprehensive digitization for business and society. Visions like autonomous driving or intelligently networked production should become reality by 2025, see figure 1.

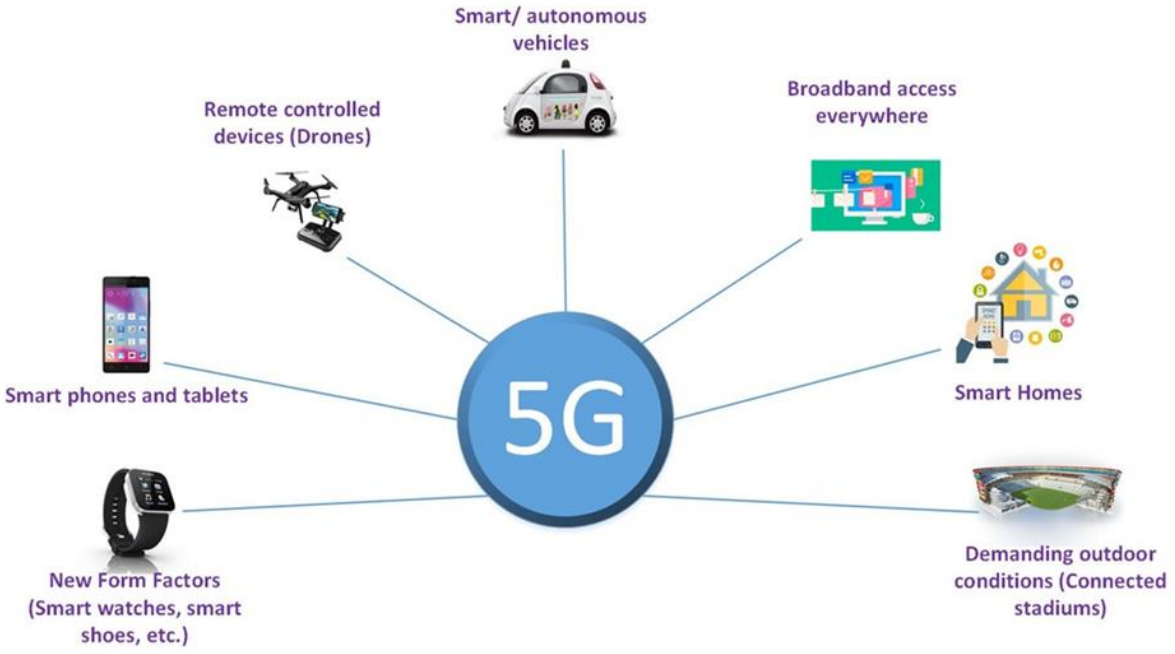


Figure 1: *Various 5G scenarios*
Source: https://5g-ppp.eu/

Innsbruck, 09 th February 2018. Two radio cells in the network of T-Mobile Austria are already showing the future of communication. The plants in Innsbruck are the first in Austria and among the first in Europe, which already work to the greatest extent according to the new 5G standard. With this pre-version of the final 5G standard, the network in Innsbruck creates record transmission rates of two gigabits per second and a latency of only three milliseconds. Super short response time of the network and extremely high bandwidths are major advantages of 5G, which was demonstrated in the Tyrolean capital for the first time.

10.3 Mobile Technologies from 1G to 5G

1G system: Frequency 800 MHz and 900 MHz, Bandwidth: 10 MHz (666 duplex channels with bandwidth of 30 kHz), Analogue switching, Modulation: Frequency Modulation (FM), Voice only, Access technique: Frequency Division Multiple Access (FDMA).

2G system GSM: This standard could support up to 14.4 to 64kbps (maximum) data rate which is sufficient for SMS and email services. On December 3rd 1992, the engineer Neil Papworth sent the first short message from the Short Message Service with the text "Merry Christmas" from a PC to a mobile phone. Twenty years later - in 2012 - 59 billion SMS have already been sent.

2.5G and 2.75G system: General Packet Radio Service (GPRS) was introduced and successfully deployed. GPRS was capable of data rate up to 171kbps, EDGE – Enhanced Data GSM Evolution also developed to improve data rate for GSM networks. EDGE was capable to support up to 473.6kbps.

3G system: UMTS – Universal Mobile Terrestrial / Telecommunication Systems. Data rate of 384kbps is supported. 3G mobile communication system and smart phones became popular. Specific APPs handles multimedia email, social media and healthcare.

3.5G to 3.75 systems: HSDPA – High Speed Downlink Packet access and HSUPA – High Speed Uplink Packet Access came into play. 3.5G network can support up to 2mbps data rate. 3.75 system is an improved version of 3G network with HSPA+ High Speed Packet Access plus. Later this system will evolve into more powerful 3.9G system known as LTE (Long Term Evolution).

4G system: Simultaneous transmission of voice and data is possible with LTE system which significantly improve data rate. All services including voice services are transmitted over IP packets. Complex modulation schemes and carrier aggregation is used to multiply uplink / downlink capacity.

5G system: 5G will be using advanced technologies to deliver ultra-fast internet and multimedia experience for customers. Current LTE advanced networks will transform into supercharged 5G networks in future. To achieve higher data rate, 5G technology will use millimeter waves and unlicensed spectrum for data transmission. Complex modulation technique has been developed to support massive data rate for Internet of Things IoT. [1]

Generation	Speed	Technology	Key Features
1G (1970 –1980s)	14.4 Kbps	AMPS,NMT, TACS	Voice only services
2G (1990 to 2000)	9.6/ 14.4 Kbps	TDMA,CDMA	Voice and Data services
2.5G to 2.75G (2001-2004)	171.2 Kbps 20-40 Kbps	GPRS	Voice, Data and web mobile internet, low speed streaming services and email services.
3G (2004-2005)	3.1 Mbps 500- 700 Kbps	CDMA2000 (1xRTT, EVDO) UMTS and EDGE	Voice, Data, Multimedia, support for smart phone applications, faster web browsing, video calling and TV streaming.
3.5G (2006-2010)	14.4 Mbps 1-3 Mbps	HSPA	All the services from 3G network with enhanced speed and more mobility.
4G (2010 onwards)	100-300 Mbps. 3-5 Mbps 100 Mbps (Wi-Fi)	WiMax, LTE and Wi-Fi	High speed, high quality voice over IP, HD multimedia streaming, 3D gamming, HD video conferencing and worldwide roaming.
5G (Expecting at the end of 2019)	1 to 10 Gbps	LTE advanced schemes, OMA and NOMA	Super fast mobile internet, low latency network for mission critical applications, Internet of Things, security and surveillance, HD multimedia streaming, autonomous driving, smart healthcare applications.

www.rfpage.com

Table 1: *Comparison of 1G to 5G technology, speed and key features*
Source: https://www.rfpage.com/

10.4 The 5G Infrastructure Public-Private Partnership

The 5G Infrastructure Public Private Partnership [1] (5G PPP) is a joint initiative between the European Commission and European ICT industry (ICT manufacturers, telecommunications operators, service providers, SMEs and researcher Institutions). The 5G-PPP is now in its second phase where 21 new projects were launched in Brussels in June 2017. The 5G PPP will deliver solutions, architectures, technologies and standards for the ubiquitous next generation communication infrastructures of the coming decade. The challenge for the 5G Public Private Partnership (5G PPP) is to secure Europe's leadership in the areas where Europe is strong or where there is potential for creating new markets such as smart cities, e-health, intelligent transport, education or entertainment & media, see figure 2. The 5G PPP initiative will reinforce the European industry to successfully compete on global markets and open innovation opportunities. [2]

Figure 2: *The 5G Infrastructure Public Private Partnership (5G PPP)*
Source: https://5g-ppp.eu/

10.5 Mobile in Austria from 1974 to 2018

B network: 1974 Austria started the B network, and the public land mobile radio went in operation. However, one still had to know in which call zone the interlocutor was. 1995 the B network was shut down after almost 21 years.

C network: 1984 the B network approached its capacity limits with 1.770 subscribers. The cellular C network (450 MHz, NMT) went in operation. This was the first time under a country-wide unified area code an uninterrupted transfer of calls in another geographical cell was possible. In June 1985 already 5.000 subscribers could be reached under the area code 0663. 1997 the C network was discontinued.

D network: 1990, the analogue D network (E-TACS, 900 MHz band) was put in operation. The higher frequencies made smaller mobile phones possible. With the same area code as the C network, but with a six-digit number, mobile telephony has now become affordable. 2002 the D network was discontinued.

GSM, 2G: 1994 was the start of the first GSM 900 MHz in Austria. Early 1996, Mobilkom Austria had 120,000 subscribers. Originally expected a maximum of 200.000 users, in March 2000 there were 2.400.000. 1995 max. mobil started in Austria.1998 Austria's 1800 MHz network was started by Connect Austria.

3G: 2002 Mobilkom Austria (A1) launched the first European UMTS network - a new generation of mobile communications had begun in Europe. 2005 HSDPA was launched, allowing downlink data rates of up to 14.4Mb/s. 2006, T-Mobile finally became the first Austrian provider to put HSUPA into operation.

4G: At the end of 2009, the 4th generation mobile radio standard was introduced. With LTE and later LTE-Advanced. The main goal of LTE was a unified architecture that enables transmission based on Internet Protocol IP.

Austria gets a 5G test region. September 2018, companies in Carinthia are to test their applications for the next mobile generation. Self-driving cars, billions of networked devices, robots, video streaming. Current technologies are not sufficient for these requirements. The LTE successor 5G is expected to start in 2020. Austria is currently trying to set the course to play in the front. The Ministry of Infrastructure has given the go-ahead for a 5G test region in Carinthia.

10.6 IMT-2000 to IMT 2020 - 4G/5G

The framework of standards for International Mobile Telecommunications (IMT), encompassing IMT-2000 and IMT-Advanced, spans the 3G and 4G industry perspectives and will continue to evolve as 5G with IMT-2020 See figure 3. [3]

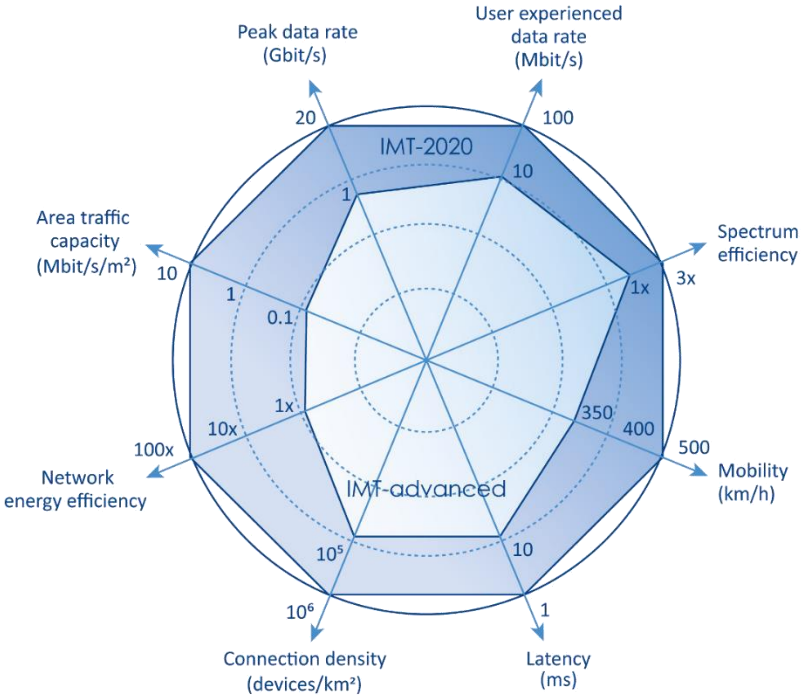


Figure 3: *Enhancement of key capabilities from IMT-Advanced to IMT-2020 [4]*
Source: https://www.researchgate.net

10.6.1 5G Roadmap for Austria

The Austrian federal government underscored the urgent priority of digitization, expanding broadband networks and rolling out the 5G standard. The government also recently presented its '5G Strategy' to the public. Austria should lead 5 G in Europe, 2020 5G in each capital city, use cases for E-Government, E-Health, autonomous driving, industry 4.0, 2025 5G full coverage, 20 times more efficient, far more intelligent then 4G.

10.6.2 5G Activities in Austria

T-Mobile Austria: Innsbruck, 09 th February 2018. With Europe's first 5G drone flight, T-Mobile is demonstrating with Huawei that next-generation mobile is fast enough to control a drone in real-time and transmit a high-resolution camera image of the drone.

A1 Telekom Austria: June 08 th 2018, mobile operator A1 shows "real" 5G in Vienna. A1 set up a complete 5G network in the technology centre in Vienna's Arsenal. Transmission speed of 1.4 Gbit/s were achieved and latencies down 4 ms were measured. A1 CEO Marcus Grausam gave a preview of the technology that will be launched in 2020.

Hutchison Drei Austria: April 19 th 2018, together with the city of Vienna, Drei was launching a kind of precursor to 5G technology. CEO Jan Trionow sees the push as a bridge to 5G. During 2018 the rollout is planned throughout Vienna - and in Austria "where it is needed".

10.7 Technologies used in 5G networks

SDN, Software-defined networking is set to be an integral part of the proposed 5G networks and is the only solution to manage 5G complex networks.

NFV, Network functions virtualization is to decouple software from hardware. With NFV, service providers can deploy various network functions in days instead of months.

cRAN, Cloud Radio Access Network. Current radio access networks (RANs) need to evolve to the growing number of connected devices and increasing data rates for the upcoming 5G era.

Massive MIMO and beamforming allows to go beyond what has been done in the past. It takes all the antenna elements to work together. Beamforming is where the beam focuses the “transmit” and/or “receive” in one specific area to avoid interference from outside sources and to increase gain and throughput. See figure 9. This focuses the beam both vertically and horizontally. It increases coverage and densification without moving an antenna or dropping in a small cell. [5]

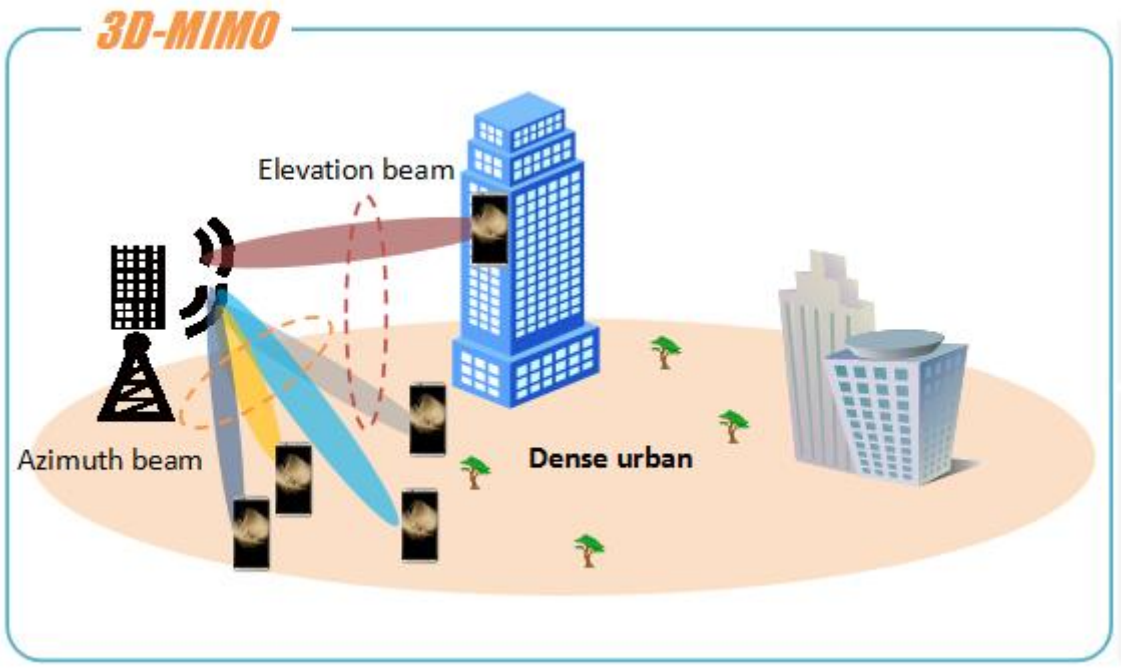


Figure 4: *Massive MIMO 3D beam forming*
Source: http://telecoms.com/

10.8 Top use cases for 5G

Fixed Wireless: One of the top 5G use cases will be fixed wireless access. Fixed wireless will provide Internet access to homes using wireless network technology rather than fixed lines.

Enhanced Mobile Broadband: The 5G standard will take mobile computing performance to the next level with high-speed, always-on, always-connected Internet links with real-time responsiveness. This category includes virtual reality (VR) and augmented reality (AR) experiences.

Massive IoT: One of the most anticipated 5G use cases is the ability to seamlessly connect everything. Industrial IoT is one area where 5G will play a major role, from smart cities to asset tracking, to smart utilities, to agriculture.

Ultra-Reliable Low-Latency Communications URLLC: This category includes new services that will transform industries with ultra-reliable/available low-latency links, such as remote control of critical infrastructure, and (popularly) self-driving vehicles. The level of reliability and latency will be vital to smart-grid control, industrial automation, robotics, drone control and coordination, and so on. [6]

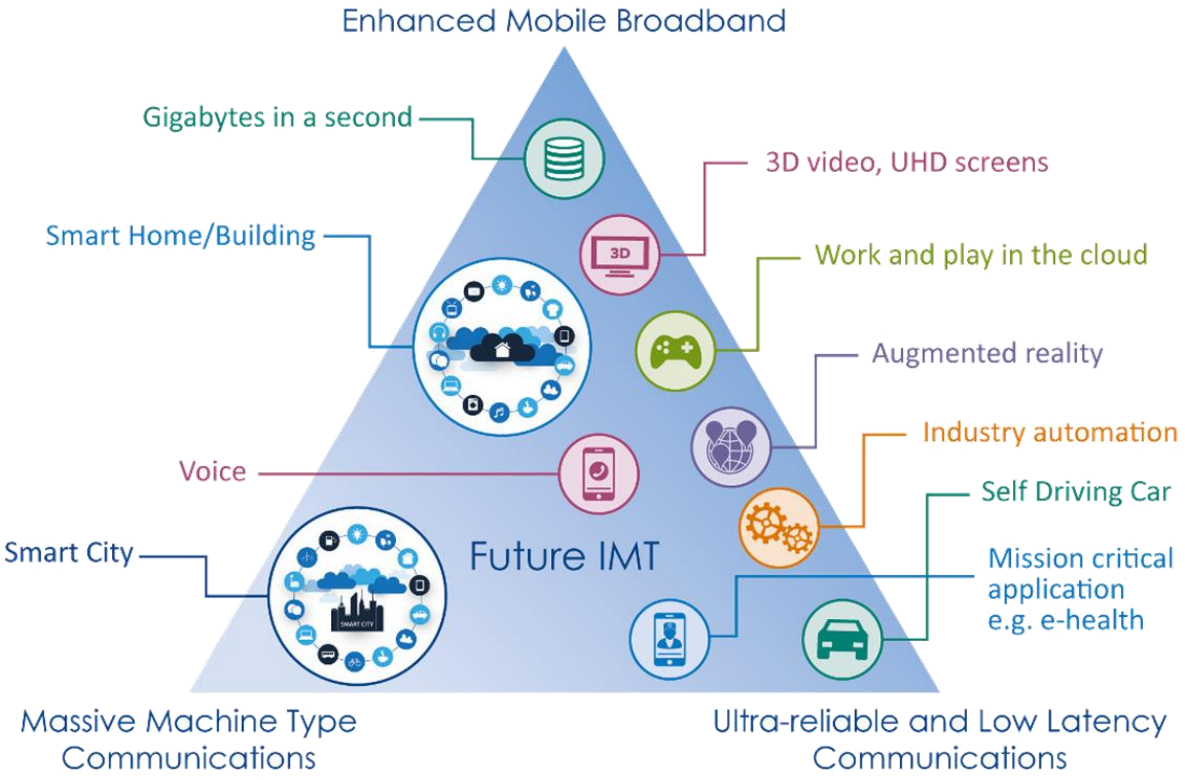


Figure 5: *Top use cases for 5G*
Source: https://www.testandverification.com/

10.9 Use case smart city, Kolumbus, Norway

https://www.zdnet.com/article/scandinavia-gets-its-first-autonomous-public-buses-but-theres-a-big-catch/

To find this website easy just google “Kolumbus Norway 5G”. Look at the Video: Norway's 5G pilot will have driverless buses, drones, and real-time medical diagnoses.

10.10 Conclusion

Wireless technology has been continuously evolving to meet increasing demands and higher requirements. Since the deployment of first generation mobile networks, the telecommunication industry is facing new challenges in terms of technology, efficient utilization of spectrum and most importantly security to end users. Future wireless technologies will provide ultra-fast, and highly secure mobile networks. 5G will revolutionize the mobile

experience with supercharged wireless network, which can support up to 20 GB/s download speed with latency down to 1 ms.

10.11 References

[1] Mobile Technologies from 1G to 5G. Retrieved from https://www.rfpage.com/evolution-of-wireless-technologies-1g-to-5g-in-mobile-communication/

[2] The 5G Infrastructure Public-Private Partnership. Retrieved from https://5g-ppp.eu/

[3] IMT-2000 to IMT 2020 - 4G/5G. Retrieved from https://www.itu.int/en/ITU-R/study-groups/rsg5/rwp5d/imt-2020/Pages/default.aspx

[4] Key capabilities from IMT-Advanced to IMT 2020. Retrieved from https://www.researchgate.net/figure/Enhancement-of-key-capabilities-from-IMT-Advanced-to-IMT-2020_fig2_313486542

[5] Massive MIMO and beamforming. Retrieved from https://wade4wireless.com/2018/01/29/about-massive-mimo-beamforming/

[6] Top use cases for 5G. Retrieved from https://www.sdxcentral.com/5g/definitions/top-5g-use-cases/

11 Tool support in overcoming challenges of knowledge sharing within organisations

Amanda DELAMER
University of Applied Sciences Wiener Neustadt, Austria

11.1 Abstract

Knowledge owned by an organisation is located in various places and defines not only what the business knows but also what it can accomplish. For any organisation, people are its key asset. The status of their knowledge, much of it accumulated and some shared, as well as demands made on it are constantly changing. To keep pace with developments, enhanced sharing of knowledge is something that needs to be actively addressed, encouraged and supported in a complex organisation. Ideally, such an implementation allows the level of knowledge exchange attained to far exceed any due solely to the more routine interactions between people. Efficient tools and processes can allow a concern to better meet its needs by effectively capturing and sharing the knowledge that is essential to its success. This paper examines some of the inherent challenges in knowledge sharing within an organisation and some more practical solutions applied to overcome them.

Keywords: Knowledge management, organisation, knowledge sharing, tool support

11.2 Introduction

Sharing of knowledge is vital within an organisation and needs to be not only encouraged and supported but also actively addressed to optimise use of an essential resource. Knowledge that is easily documented or digitally archived can be readily stored and made available to others. However, knowledge in the form of know-how, experience and softer skills invariably resides with individuals and is by its very nature more difficult to access and impart. People who are bearers of knowledge are a key asset to an organisation and the status of what they know, much accumulated and some shared, as well as demands on that as a resource are constantly changing.

To maintain sustainable competitive advantages, it is vital for an organisation to understand the exact nature of its knowledge assets and how the challenges of managing them can be met. The solutions invariably rely heavily on dedicated technology with ever-improving functionality, which allows valuable organisational insights and records to be stored and shared. However, the successful management of knowledge is inextricably linked to people and the upholding of a culture among them, where both open-communication and the willingness to share expertise thrive.

11.3 Knowledge and the Sharing of It within an Organisation

This paper focuses on knowledge and the sharing of it within organisations using tool support. It is assumed that these tools are primarily embedded in Information and Communication Technology (ICT). Ideally, such purpose-built systems make it easier for organisations to acquire, manipulate, store or disseminate knowledge and to thus facilitate knowledge sharing. Effortless exchange of certain categories of knowledge between people at different locations is commonplace nowadays, thanks to the ubiquitous internet that continues to grow. In the

case of any organisation's own knowledge system, it is ideally tailor-made to meet a very specific set of predetermined needs. Once in operation, such a system's integrity, maintenance and availability as well as how it is worked with will determine how effective and useful it is to all who share it. Within an organisation, the process responsible for the sharing of perspectives, ideas, experience and information, and for ensuring that these are available in the right place and at the right time is referred to as Knowledge Management (KM). Though there is a lack of any common definition of KM, it is clear that the proven benefits of the concept lie principally in the support of know-how transfer, the enabling of more informed decisions and an improvement in efficiency by reducing the need to rediscover knowledge [1].

11.3.1 Data, Information, Knowledge and Wisdom

The underlying question of what exactly constitutes the knowledge assets of an organisation raises the key issue of how to differentiate between what is raw data, processed information and actual knowledge or ultimate wisdom [2]. The distinctions are made as follows:

Data: Discrete and objective facts, measurements or observations that can be analysed to generate information.

Information: Data that have been categorized, analysed, summarized and placed in context in a form that has structure and further meaning.

Knowledge: A combination of data and information, to which is added expert opinion, understanding, skills and experience, thus resulting in an asset that aids decision making. In organisational terms, knowledge is generally thought of as being know-how, applied information, information with judgment or the capacity for effective action. Knowledge may be tacit, explicit, individual and/or collective. It is intrinsically linked to people.

Wisdom: involves using knowledge for the greater good, the ability to discern and judge which aspects of knowledge are true, right, lasting, and applicable to life. It goes deeper and is more uniquely human. It requires a sense of good and bad, right and wrong, ethical and unethical (e.g. morals, ethical codes, principles)

A helpful example to further illustrate the relevant distinctions is that of choosing a car and driving it. Data would include the fuel type, engine horsepower, colour options and so on. Information might comprise a comparison of model features, statistics on colour preferences or details concerning the availability of vehicles from local dealers. How we might put the car to use and how much of the maintenance and repairs we can look after ourselves would then be within the realm of knowledge. Adding an element of wisdom to that would determine the extent to which we are conscientious and considerate drivers with concern for the environment. Knowledge is often referred to as 'know-how' and can be positioned within the four-tiered hierarchy as shown in Fig. 1 below, which summarises the components to signify 'know-what', 'know-which', 'know-how' and 'know-why' respectively.

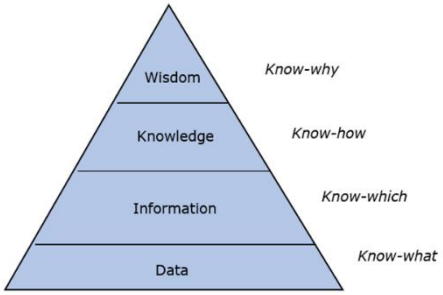


***Figure 1**: Data-Information-Knowledge-Wisdom Hierarchy*

11.3.2 Tacit vs. Explicit Knowledge

To explore aspects of knowledge sharing within organisations it is important to distinguish between what is *explicit* knowledge that can be readily articulated and made generally

available and what is *tacit* knowledge that is stored in people's heads and derived from personal experience. Communication of the latter is logically the more challenging. It is estimated that some 80% of an organisation's knowledge assets are tacit, residing in people, while only the remaining 20% is of the codifiable kind. Fig. 2 illustrates the iceberg analogy used to emphasize the proportions of the more hidden types of knowledge that are a considerable asset to an organisation [3].

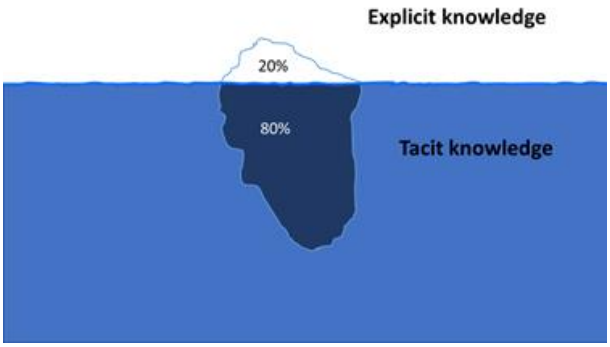


***Figure 2**: Explicit vs. Tacit Knowledge – Iceberg Analogy*

Explicit knowledge is all knowledge that is easily expressed, recorded and codified. It can be made readily accessible in the form of searchable information that is simple to find and understand. Users can collaborate without much difficulty on the creation and the use of such knowledge, allowing it also to be transmitted to others. Most forms of explicit knowledge can be stored in generally-available media, such as databases, documentation archives, reports, memos, notes, etc. The information contained in wikis, handbooks and textbooks are prime examples of this type of knowledge.

Tacit knowledge, on the other hand, is knowledge found in people's heads that is often difficult to share with another person by writing it down or verbalizing it. More specifically, it can be defined as skills, ideas and experiences that people have but that are not codified and may not necessarily be easily expressed. Examples of it in everyday life are: driving a car, speaking a language, inline skating, playing a guitar, interviewing job candidates and deciding how an urgent problem is to be resolved. With tacit knowledge, we are often unaware of both the fact that we possess it and that it could be valuable to others. Effective transfer of it generally requires extensive personal contact, regular interaction and trust. This kind of knowledge can only be revealed through use in a specific context and is transmitted through a community of practice. Often captured by gradually building up expertise, it can then be shared with others through techniques, such as training, learning-by-watching on the job or mentoring. When shared in context, with explanations and the opportunity to let consequences be observed, appropriating tacit knowledge stimulates creative thinking and leads to innovation and change. Any learning experience is augmented when the subject matter being imparted is aligned with the curiosity and interest of the person under instruction [4].

11.4 Management of Knowledge Assets within Organisations

An organisation needs to look at the forms in which its knowledge assets exist and at the different ways in which they can be accessed, shared, and combined, to make best use of them. With a deeper understanding of its knowledge requirements an organisation can implement a KM system optimised for its own specific applications.

11.4.1 Core Knowledge Activities

Activities involved in KM can be described in relation to many different disciplines and approaches but almost all of them focus on the five basic activities shown in sequence in Fig. 3: *identify*, *create, store, share* and *use* [2]. The KM process is initiated with the activity *identify,* which corresponds to making an inventory of all people and all system-based knowledge within the organisation. This is followed by the step *create*, which entails the actual gathering of that knowledge from the people or systems that hold it. During the *store* stage, the knowledge is organised into codifiable and non-codifiable categories and preserved appropriately. Ultimately, knowledge assets can then be passed between people and systems in a *share* phase, prior to fulfilling their function of *use* and bringing benefit to the organisation. A feedback loop allows for continuous maintenance and updating of the system.

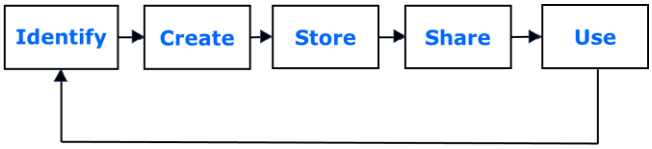


Figure 3: *Core Knowledge Activities (Source: [2], p.297)*

11.4.2 Tool support of knowledge sharing

KM tools include any methods and techniques that are used to support or deliver practical knowledge management. These can be information-technology systems, including e.g. databases, data warehouses, intranets, extranets, content management systems, wikis and portals. Other dedicated tools within the system may offer enhanced functions like data mining, decision support or simulations. An organisation may furthermore build its own Body of Knowledge (BoK) collecting material on methodologies, best practices and lessons learned. In the purely human dimension, there will be methods involving such techniques as mentoring programmes, communities of practice and the use of narratives. All of these and many others are examples of tools used to share knowledge.

For the sharing of knowledge to be efficient, a KM system and the tools supporting it need to be available company-wide with suitable security in place to protect access to this crucial resource. To promote use, it should be easy for staff to update the content and to add information. A system that can deliver accurate and appropriate answers with low response times will best serve not only employees but potentially customers as well. Identifying the right size of knowledge granules or basic elements in the system is a further critical factor. This allows the creators of the knowledge content to best re-use smaller components and to more exactly get what is needed to the individual users. Further valuable inputs for training, coaching and FAQ can be found in the analyses of search patterns and of use history.

11.5 Inherent challenges in knowledge sharing within an organisation

To successfully create and implement a KM system, it is essential to manage the environment where knowledge is exchanged and to build a culture that values expertise [5]. The following list outlines the main motivators that facilitate the sharing of knowledge:

- KM system is reliable, up-to-date and easily accessible
- Top management commitment to KM
- Communication channels and documentation management in place

- Content readily understood, creators of knowledge supported
- Face–to-face dialogues enabled and encouraged
- Knowledge sharing is part of the job and relevant to appraisals
- Time specifically scheduled for training and learning
- Training-on-the-job, job rotation instituted
- Use of newer media to communicate/collaborate/animate/inspire
- Create opportunities for employees to inform colleagues about their work, with room for healthy competition and perhaps offering rewards
- Positive experiences: time and costs saved, intellectual capital retained/accessible, avoiding reinventing the wheel

It is also worth highlighting what ought to be avoided at all costs in the realm of KM within an organisation [6]. Below are some of the recognised deterrents that often creep in gradually, hindering the sharing of knowledge and hampering the efficiency of KM systems:

- When KM fails to add value to the organisation, it is only cost intensive or counterproductive.
- No time allowed, nor importance attached to sharing experience or knowledge
- Sensing that work done is not worth sharing, of limited use
- Inefficient, cumbersome knowledges system and processes
- Little motivation, least glamorous part of job
- Lack of job security and attempts to compensate with knowledge hoarding
- High staff turnover, aging workforce with loss of know-how due to retirement

A positive example of how to very constructively share knowledge is given to us in ‘NASA Lessons Learned’ [7]. After some notable mission failures, NASA identified its need to make a strong commitment to becoming the best learning organisation it could be, making knowledge central to its new vision [8]. As part of this move, their database of lessons learned was made accessible to anyone over internet. An outstanding feature of this resource is that whether the content is dealing with rocket science or is more akin to common sense, it clearly aims to facilitate and teach the user of it. The stored knowledge is carefully rendered intelligible and very readable. By communicating effectively, the creators are ultimately showing the user that they care about the knowledge stored and that it is used.

11.6 Conclusions

Knowledge and the management of it is considered to be an important factor in organisational survival. KM helps to share valuable organisational insights, to reduce redundant work, to avoid reinventing the wheel, to optimise training, to retain intellectual capital and to adapt to changing environments and markets. Successful organisations now understand why they must manage knowledge and that to do so effectively they must pay attention to three key components: people, processes and technology. Implementing solutions to the inherent challenges of sharing knowledge requires the investment of time, resources and energy but is, nonetheless, essential and stands to yield significant benefits. Although great emphasis is often put on technology in managing knowledge and in the sharing of it within organisations, we may never lose sight of the discerning question: ‘why is this important and to whom?’.

11.7 References

[1] Axelos, “Best Management Practice portfolio: common glossary of terms and definitions “, Version 1, 2012. https://www.axelos.com/corporate/media/files/glossaries/axelos-common-glossary.pdf

[2] Serrat O., “Knowledge solutions: Tools, methods, and approaches to drive organizational performance “, Springer, 2017. https://link.springer.com/book/10.1007%2F978-981-10-0983-9?page=5#toc.

[3] Serrat O., “Notions of knowledge management “, Washington, DC: Asian Development Bank, 2011. https://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?article=1179&context=intl

[4] “Dr David Eagleman talks about tacit knowledge & how we learn “, Podcast, June 3rd 2015, https://apqcpodcasts.podbean.com/e/dr-david-eagleman-talks-about-tacit-knowledge-how-we-learn-1433355914/

[5] Omotayo F. O., “Knowledge Management as an Important Tool in Organisational Management: a Review of Literature “. Library Philosophy and Practice (e-journal), .2015. https://digitalcommons.unl.edu/libphilprac/1238/

[6] Hoong L. S. and Lim T. M., “Positive and negative affect on the adoption of knowledge sharing tools in enterprises “, 2014 IEEE International Conference on Progress in Informatics and Computing, Shanghai, 2014, pp. 610-614. http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6972407&isnumber=6972283

[7] “NASA Lessons Learned “ https://www.nasa.gov/offices/oce/functions/lessons/index.html (accessed May 2018)

[8] Rogers, E.W. “A Knowledge Management Architecture of Learning Practices to Help Goddard Function More Like a Learning Organization “, NASA Goddard Space Flight Center, 2011 https://www.nasa.gov/centers/goddard/pdf/636901main_Goddard%20Learning%20Plan.pdf

12 The Role and Importance of the Field of Mechatronics in Industry

Arbnor PAJAZITI
University of Prishtina, Kosovo

12.1 Abstract

The importance of Mechatronics will increase even more due to the requirements of customers by providing more attractive jobs for people with this qualification but who possess adequate competence and skills.
As a result of all these that the above Technical Universities, Faculties Applied Sciences and various institutes around the world that have organized Mechatronics studies.
The trend present everywhere and growing of technological products with a high degree of complexity and integrated functionality increases the demand for mechatronics engineers with essential interdisciplinary knowledge of action.
The increased use of Mechatronics concepts in almost all industrial fields enhances employment opportunities for graduates in the Mechatronics program.
Mechatronics engineers can be found in a variety of functions, such as product development, production and manufacturing technology, assembly automation, modernization of processes, maintenance, quality control and sales.

Keywords: Mechatronics, Industry, Intelligent Automation, Manufacturing.

12.2 Introduction

Mechatronics has become the key for many products and services. Modern systems today have reached the level of perfection, which level was hard to imagine with the use of traditional methods.
Mechatronics integrates the classical fields of mechanical engineering, electrical engineering, computers engineering and information technology to realize basic principles of contemporary methodology design.
The curriculum for Bachelor and Master studies in the field of Mechatronics supports the synergetic integration of mechanical engineering precision, electronics engineering and systems, always thinking in the design, implementation, operation and maintenance of products and intelligent services.

The advancement of teaching curriculums is as follows:

- Constant efforts for curriculum development and improvement based upon the requests of the economy and based on the feedback from the companies where graduates are employed.
- Changes in elective subjects - removal of those subjects that are not elected from students and implementation of new contemporary subjects.
- Adding new elective subjects based on Cooperation with the Partner Institutions, International projects and economy.
- Changes in ECTS credits **-** Application of ECTS in third year of Bachelor Studies, Diploma of Bachelor level – 6 credits, Internship – 4 credits.
- Diploma based on projects and Internship - Practical work is done parallely with approval of diploma work in cooperation with Mentor, Keeping of Journal of Internship is done before approval of theme at mentor of diploma.

- Visits to companies and partner institutions - Organized daily visits with students to companies and partner institutions for practical knowledge of work and processes, and information about labour market requirements.

These includes also:

- Increasing demand for graduate engineers with knowledge and skills in Mechatronics;
- The demand for specialized knowledge and skills in Mechatronics in a particular company;
- Selecting from the list of declared priorities of industrial systems which have the main requirement for graduate engineers in Mechatronics.

Graduated students in Mechatronics mainly work in all sectors of industry, including companies engaged in:

- Intelligent Automation (modern programming concepts)
- Methods and Systems of Mechatronics
- Advanced robotics (mobile robots and services)
- Maintaining and improving the existing systems for control systems;
- Application of new technologies which involves Mechatronic systems,
- Intelligent Manufacturing, etc.

Interaction between research and teaching in programs is reflected in following aspects:

- Within the FME, research is conducted in 10 existing Laboratories and in collaboration with the economy. These research results are published in international scientific journals and as such, are planned for implementation in curricula of the respective subjects.
- Research together with partner companies from Industry and Institutions.
- Within the FME's external mobility, research of PhD candidates who have studied abroad and still study are planned for implementation in curricula of the respective subjects.

The importance of Mechatronics will increase even more due to the requirements of customers by providing more attractive jobs for people with this qualification but who possess adequate competence and skills.

This article presents the role and importance of the field of Mechatronics in the industry. Section 1.2 of this paper discusses the importance of Mechatronics as an interdisciplinary area of the engineering sciences that are: electronics (microelectronics, power electronics, sensors, actuators), information technology (system theory, modelling, automation technology, software and artificial intelligence), and mechanics (mechanical elements, machines, precision mechanics).

Section 1.3 presents the examples of Mechatronics Systems that are: automobile industry, computers, cameras, robotics, micro-mechatronics, nano-mechatronics, etc. Benefits of Mechatronics Systems are described in Section 1.4. Section 1.5 introduces the courses of Mechatronics that are delivered at the Faculty of Mechanical Engineering, University of Prishtina. Finally, the contributions of the paper is described in the Section 21.6.

12.3 Examples of Mechatronics Systems

Mechatronic Systems mostly have microcomputers to ensure smooth functioning and higher dependability. Few examples of Mechatronics Systems are:

- Antilock Brake System (ABS)
- Electronic Fuel Injection (EFI)
- Traction Control System (TCS)
- Adaptive Cruise Control (ACC)
- Automatic Camera
- Scanner
- Hard Disk Drive
- Industrial Robots

• Mobile Robots (Wheeled Robots, Legged Robots).

A distinguishing feature of modern Mechatronics Systems compared to earlier controlled machines is the miniaturization of electronic information processing equipment. Increasingly, computer and electronic sensors and actuators van be embedded in the structures and machines.

12.4 Benefits of Mechatronics Systems

Mechatronic Systems permit many improved and new functions as following:

- *Enhanced features and functionality*

A mechanical design typically provides only one function. Designing with a microcontroller offers the flexibility of adding features like LCD displays, lighting LEDs, a user interface, programmability, safety features, speed control etc. Modern washing machines, for instance, offer many features over the old mechanical designs. These features include a display that gives cycle information as well as providing a stain removal guide. These machines use microcontrollers to efficiently vary the speed of different cycles based on the content being washed.

- *More user-friendly*

Mechatronic systems are more user-friendly e.g. power door locks, keyless entry, cruise control etc.

- *Precision control*

Flow rate, speed, position, and any number of other variables can be controlled precisely with a microcontroller. Cruise control in an automobile is a great example of how a mechatronic solution allows for precise control. In order to give the car a smooth acceleration to the desired speed as well as maintaining a constant velocity over varying load conditions.

- *More efficient*

The efficiency of a system can be improved by adding intelligence to the design. Certain portions of the system can be shut-off when not in use or a microcontroller can make better use of the energy available.

- *Lower cost*

A complex mechanical solution may be simplified using a microcontroller-based approach. Design time, product size, and reliability can all be improved with a mechatronic solution.

- *Flexible design (reprogrammable)*

Mechatronic systems are flexible and can be easily switched to perform different jobs by simply changing the robot control program. This procedure is called "reprogramming“.

- *More reliable*

Mechanical designs are prone to wear and tear over time. For example mechanical odometers use a direct drive system that consists of a flexible cable running from the transmission to the odometer gage. The solution is unreliable because the cable is prone to failure. The modern mechatronic solution consists of an optical encoder and digital display, which increases system reliability.

- *Smaller size*

Adding a microcontroller to a system may result in space savings.

- *Safer*

Adding intelligence to a system makes it safer. Whether you add an automatic shutdown to a coffee pot or sense when a system is overheating, numerous safety checks can be easily added to a system when a microcontroller is controlling the system.

12.5 Courses of Mechatronics at the University

The Department of Mechatronics with work and continuous engagement has managed to get closer to the advancement in technology. The courses and curricula of this Department are harmonized with those of Western European universities, [1]-[4].

12.5.1 Teaching Methods

The courses mostly consist of classroom lectures on mechatronics topics, emphasizing on engineering principles and technologies. This is followed by laboratory sessions of discovery and experiments in the laboratories, where students conduct hands-on embedded microcomputer experiments to build and verify mechatronics systems discussed in the lectures.

12.5.2 Course Description

Mechatronics subjects are taught through a series of hands-on simulation and experiment assignments, Fig. 1. Essential principles for each of the assignments are explained; the assignment goals are verified by computer simulation and validated by experiments. The courses requires each student to procure his/her own microcontroller and the necessary electronics toolkit and components. Matlab/Simulink/Simscape and other specialized software are used as a tool for simulation as well as for interfacing with the microcontroller. At the end of the each course, students gain understanding of mechatronics and various aspects for putting a mechatronics system together.

***Figure 1**: The work on small groups at the Laboratory of Mechantronics.*

12.5.3 Case study: Auto Target Tracking System Experiment

With this project, we wanted to show and test a camera-based feedback control servo system that can track a specific colored object. This system consist from a USB camera mounted on a servomotor that is controlled by a laptop PC and an Arduino Uno board. A Matlab program finds a target color in the camera images and tells the servomotor to track the target. All the process is described and detailed in the following slides, Fig. 2.
This project as a laboratory project is of great importance in the field of Mechatronics. Its importance lies in the interconnection of the three main areas that define Mechatronics such as: Mechanics, Electronics and Computers.
In the Mechanical part that is the foremost and the starting point of the project, we have to do with the shape of the car from and the idea came to us, because a car of today has the meaning of Mechatronics. In this section we have assembled the wheels in the mobile robot chassis that operate by DC motors and mounting the auxiliary wheel at the front of the chassis as well as the installation of ultrasonic HC-SR04 sensor and Arduino microcontroller along with motor shield.

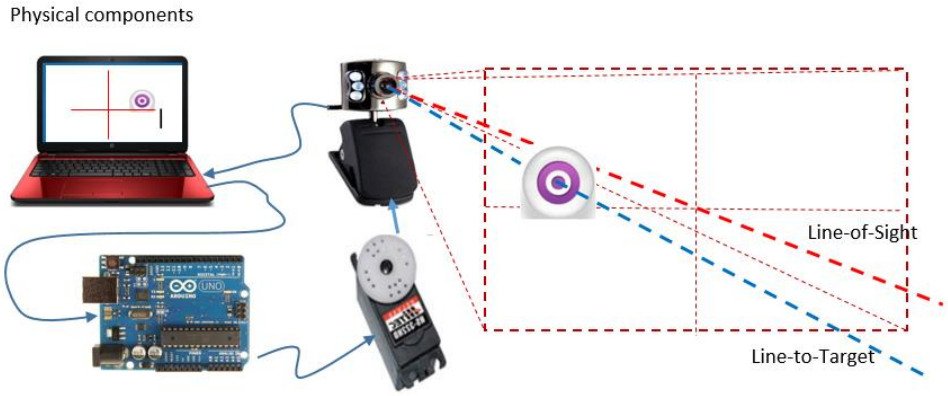


***Figure 2**: Hardware components of an example.*

12.5.4 Experimental Runs & Results

After all this, we come to the conclusion that the distance sensor and distance control of a lab equipment like the two-wheeled robot are working. We see that this principle of remote sensing and remote operation is used in all advanced technology vehicles, Fig. 3.

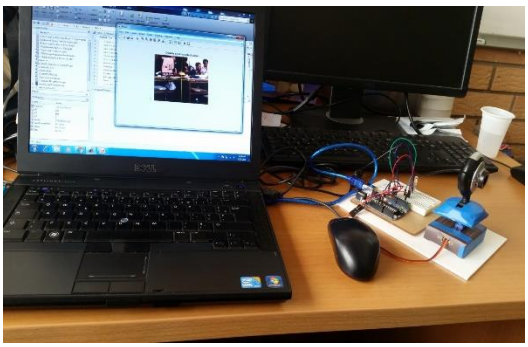


***Figure 3**: Experiments with the developed project.*

12.5.5 Student's Projects

During the lecture process, students are committed to work on the realization of various projects to understand the connection between the theoretical part and the practical part of the lecture being taught. The ideas for realizing the final projects are derived from the students themselves, Fig. 4.

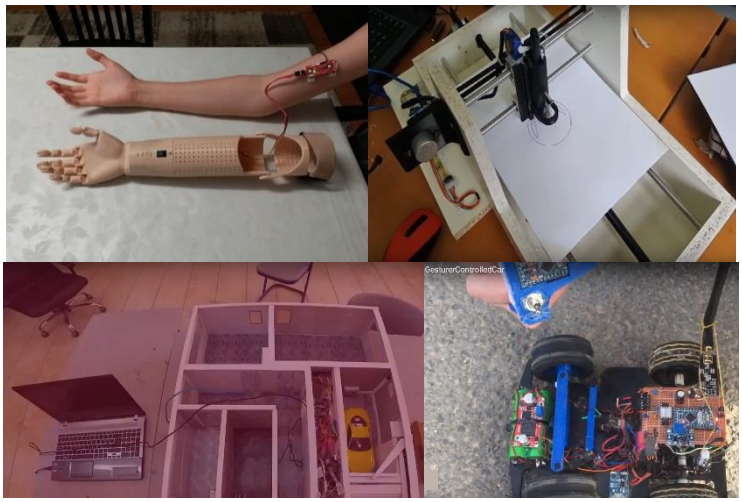


***Figure 4**: Some of the student projects.*

12.5.6 Student's Diploma Works

At the end of the Bachelor and Master studies, students are required to work on the diploma work, which in the field of Mechatronics means that a more advanced project should be carried out, compared to the projects they have implemented within the framework of the learning process.
Microcomputers, electric and electronic components and various sensors are usually purchased by the Faculty of Mechanical Engineering, while the programming, machining of various mechanical parts is done in the Mechatronics Laboratory and others, Fig. 5.

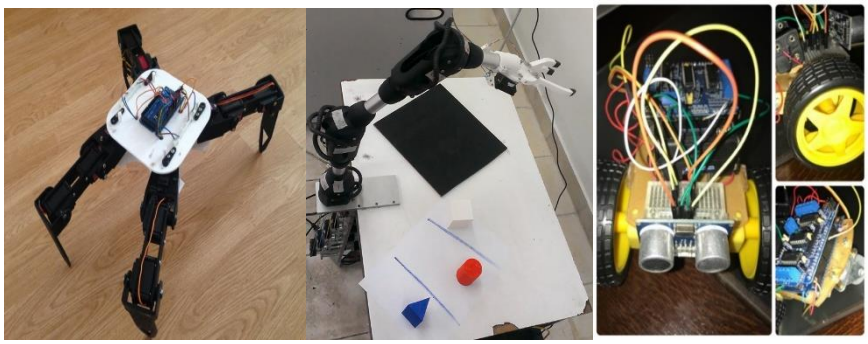


***Figure 5**: Diploma work student's projects.*

12.5.7 Site visits to the Industry Partners

For the internship, the student is required to stay one month in the company, to be informed about the work processes and the machines that are installed in it. First, they get acquainted with every CNC machine and the possibilities of what can be done with them. Also, after the end of the CNC machine presentation, students are also informed about the programs the company works and the machines they have. Mostly CNC machines are initially familiar with their operation, working conditions and safety while working with them.
The following days after notice of working conditions, safety and after all the machines that are there are installed, they must continue to generate the software programs of these CNC machines.

When in professional practice, students are usually given the task of learning how to generate some code patterns. One of the models of the CNC machines that students need to do the programming, associated with calculations is shown in Fig. 6.

***Figure 6**: The programing of the real machines in industry.*

12.6 Conclusions

In this presentation we have seen some facts about Mechatronics, its role in Industry and era-wise evolution, as following:

- Mechatronics is a technical field that applies a system approach by combining traditional engineering disciplines such as: Electronic and Mechanical Engineering, and Computer Science. Integrating these disciplines makes it possible to create products with enhanced functionalities and capabilities that have previously been considered unfeasible.
- Mechatronics specialists have the necessary skills to take into account a wide range of areas of competence and effectively combine different aspects as needed. In other words, they may think outside the proverbial box, are fit to work as project managers, or in research and development.
- Different disciplines are becoming more and more integrated, and the Mechatronic Systems are becoming smaller and more compact. These systems are increasingly being used in the field of Micro-technology and in other areas, such as Medical Technology.
- The growing use of Mechatronic concepts in almost all industrial fields expands employment opportunities for graduates in the program of Mechatronics. Mechatronics engineers can be found in a variety of functions, such as Product Development, Production and Manufacturing Technology, Assembly Automation, Process Modernization, Maintenance, Quality Control and Sales.

12.7 References

[1] Arbnor Pajaziti, “Mechatronics Project – 1”, *University of Prishtina*, 2016

[2] Bolton, W., Mechatronics: “Electronic Control Systems in Mechanical Engineering”, *4th Edition, Pearson,* 2008

[3] Isermann, R., Mechatronic Systems: *Fundamentals, Springer*, 2005

[4] Clarence W. de Silva, Mechatronics - An Integrated Approach, *CRC Press, Boca Raton,* 2005

[F1] https://images-na.ssl-images-amazon.com/images/I/31raUar9A4L._SX466_.jpg

[F2] http://img.game.co.uk/ml2/3/3/7/2/337275_scr1_a.png

[F3] http://www.mrpt.org/wp-content/uploads/2013/10/SICK_LMS100.jpg

[F4] https://www.hokuyo-aut.jp/02sensor/07scanner/img/utm_30lx_top.jpg

[F5] http://www.ctralie.com/Teaching/DukeDusty2/apartmentmap.jpeg

[F6] http://boofcv.org/images/thumb/9/99/Object_contours.jpg/631px-Object_contours.jpg

13 A Survey on the Integration of Internet of Things and Cloud Computing for Precision Agriculture

Eleni SYMEONAKI
University of West Attica, Aigaleo, Greece

Konstantinos ARVANITIS
Agricultural University of Athens, Athens, Greece

Dimitrios PIROMALIS
University of West Attica, Aigaleo, Greece

Dimitrios TSELES
University of West Attica, Aigaleo, Greece

13.1 Abstract

During the recent decades several sectors of production and services have been benefitted from the rapid development of Information and Communication Technologies (ICT). The integration of these technologies in the agricultural sector within the grounds of Precision Agriculture is of particular importance and concerns significantly the scientific community, as it is considered to be among the most innovative methods of agricultural practice, being directly related to the productivity improvement and sustainable development. In particular the integration of Internet of Things (IoT) in agriculture, through the automation and total digital management of agricultural production using Wireless Sensor Networks (WSN) in order to acquire and monitor data concerning the cultivations, as well as through the employment of Cloud Computing applications for transferring, storing and processing these data using the Internet, is without any doubt an innovative research field. In this paper an attempt is made to review scientific approaches as well as research practices regarding the integration of Internet of Things on the grounds of Precision Agriculture, focusing particularly on the study and examination of real applications needs in agriculture with regard on Cloud Computing engineering technologies.

Keywords: Precision Agriculture, Internet of Things, Cloud Computing, Wireless Sensor Networks

13.2 Introduction

The implementation of technologies which provide reliable, cheaper and user friendly ICT tools in agriculture is a major asset for its sustainable growth. Smart Agriculture solutions enable more efficient operations and management of resources in agricultural production by interconnecting the areas of Management Information Systems (MIS), Precision Agriculture (PA) and Agricultural Automation. In particular, Precision Agriculture (PA) is a whole-farm management approach which aims in improving agricultural production by maximizing the efficiency inputs and minimizing their environmental impacts in terms of sustainability [see P1]. For this purpose in Precision Agriculture innovative techniques are applied, involving informatization, satellite positioning data, remote sensing and proximal data gathering.

13.3 IoT and Cloud Computing for Precision Agriculture

Although Internet of Things (IoT) and Cloud Computing technologies share several complementary characteristics [see F1], they have developed separately during the past years. At present an innovative IT approach is gaining ground according which these two complementary technologies are combined, offering in this way a great number of benefits [see P2].

Internet of Things (IoT)	Cloud Computing
Diffusive (things placed everywhere)	Ubiquitous (resources usable from everywhere)
Real World Things	Virtual Resources
Limited Computational Capabilities	Virtually Unlimited Computational Capabilities
Limited Storage	Virtually Unlimited Storage
Internet as a Point of Convergence	Internet as a Service
Big Data Source	Big Data Management

***Figure 1**: Complementary Characteristics of Internet of Things and Cloud Computing [F1]*

Agricultural Informatization, through the integration of Internet of Things (IoT) and Cloud Computing may bring revolutionary changes to agriculture, through the automation of the entire agricultural production. A primary reason for adopting these technologies in Precision Agriculture is to facilitate the storage, management, access and dissemination of information which are required to support farmers in decision making and strategy planning so as to achieve efficient management of resources and higher cultivation production.
Some of the most essential features of Internet of Things (IoT) and Cloud Computing for Precision Agriculture [see P3] are:

- Data Acquisition and Remote Storage
- Low-cost Access to ICT Resources
- Online Agriculture Expert Consultation
- Land Records Automation
- Weather Forecasting

13.4 Typical Framework of IoT and Cloud Computing for Precision Agriculture

The integration of the Internet of Things (IoT) and Cloud Computing technologies for Precision Agriculture, through the automation and digital management of the entire agricultural production is an innovative research field. According to a typical framework for integrating these two technologies in agricultural applications [see F2] the management platform, which is the “core” of the Cloud and Data Storage, involves the users’ access to the application interface, the computing and processing of the customization services as well as the organizing and coordinating of the service nodes in the data center. The essential networking services are provided in ways that ensure the efficient and secure transfer of the acquired data through RFID, Wireless Sensor Networks (WSNs), gateways or cloud proxy machines. The wireless network communication is established by applying protocols and standards such as Zigbee, LoRaWAN, LPWA, Bluetooth, Wi-Fi, as well as GPRS/3G/4G, whereas optical cable and other wire communication protocols and technologies may be applied as well. Any additional communication required may be established in service-oriented methods via messaging applications [see P4].

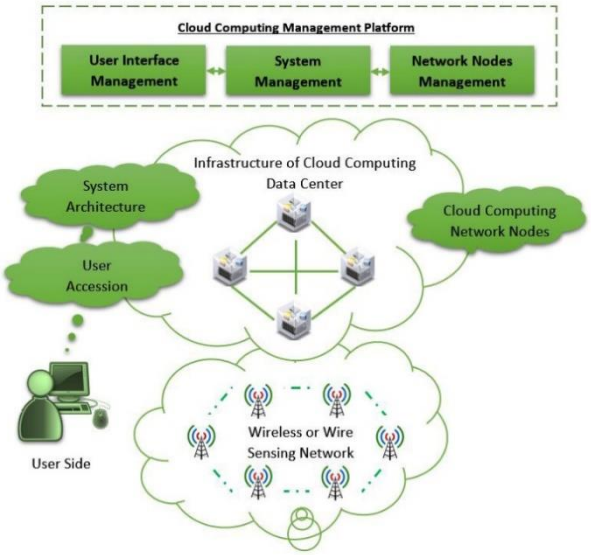


***Figure 2**: Typical Framework of IoT and Cloud Computing for Precision Agriculture [F2]*

13.5 Examples of IoT and Cloud Computing Applications for Precision Agriculture

Several Internet of Things (IoT) and Cloud Computing applications for the needs of the agricultural sector have been developed and introduced during the past few years, some of which are briefly overviewed as following:

- Concept Model of Mobile Cloud Computing (MCC): Mobile infrastructure which employs application features and services designed to be user friendly providing farmers with extended and seamless functionality despite any limitations of mobile devices resources [see P5]. This application employs simple handheld devices such as laptops, tablets and smartphones which support Wi-Fi, GPRS, 3G or 4G technologies [see F3].

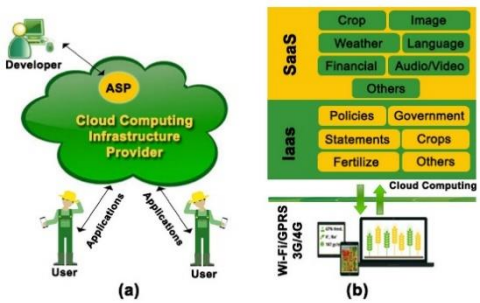


***Figure 3**: Concept Model of Mobile Cloud Computing (MCC) [F3]*

- Wireless Sensor Actor Networks (WSANs) with Cloud Computing Services: It integrates Wireless Sensor Actor Networks (WSANs) with Cloud Computing Services [see F4]. In this application environmental data are acquired by sensors and are processed with the aid of a Decision Support System (DSS). Sensor nodes which acquire environmental data and a group of actor nodes which operate according to the decision taken by the DSS, are interconnected with wireless medium [see P6].

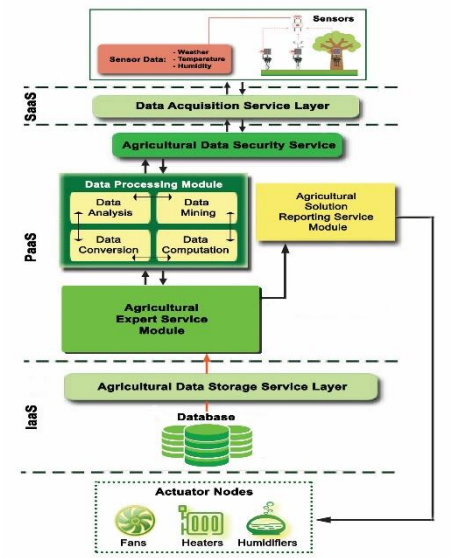


***Figure 4**: Wireless Sensor Actor Networks (WSANs) with Cloud Computing Services [F4]*

- Agriculture Production Process as a PDCA Cycle: Primary sensing and knowledge management techniques are used to provide cloud services. In this application production data are routinely collected whereas analysis engines analyze the stored data and provide advice and suggestions about the agricultural production [see P7].

13.6 Benefits and Challenges of IoT and Cloud Computing for Precision Agriculture

The integration of Precision Agriculture with innovative technologies such as the Internet of Things (IoT) and Cloud Computing can give a strong impetus to the entire development of the agricultural sector in terms of sustainability. In particular, the implementation of these technologies in Precision Agriculture presents the following advantages [see P8]:

- Better and more efficiently organized information resources are guaranteed as the management of data is performed by the service providers.
- Information can be accessed by stakeholders at any time or location through the e-data bank databases.
- The communication and interaction among stakeholders worldwide is effortless, fast and secure.
- The requirements in maintenance infrastructure are significantly reduced as all technical issues are in the responsibility of service providers.
- Due to the fact that all communication attempts are result oriented, farmers, companies and researchers are motivated to involve more into the field of Precision Agriculture.
- The problem of rural-urban migration and unemployment can be reduced as services are provided remotely at any time.
- Due to the mass involvement of different stakeholders, cloud-based IoT applications in agriculture can boost sustainable growth and economic development.

Despite the fact that the agricultural sector may be greatly benefited by the adoption of the Internet of Things (IoT) and Cloud Computing technologies, their actual implementation seems to be precocious as usage in the open fields is mostly focusing on simple applications. Considering the present conditions, some challenges and concerns are to be encountered about the efficient integration of the Internet of Things (IoT) and Cloud Computing technologies in agriculture:

- Simplify the usage of present applications and make them cost-effective in order to be user-friendly and affordable for the majority of farmers

- Establish a certain degree of homogeneity and interoperability among all data and devices through open source technologies for standards, applications and platforms, specially addressing to the requirements of Precision Agriculture.
- Provide wireless communication in rural areas by establishing broad, reliable, constant, high-speed and low-cost network coverage.
- Establish constant interaction with third party data-bases containing information about soil, water and air data, insects and pest control, meteorological history and forecast, satellite imagery, logistics and retail analytics etc.
- Minimize the high extent of computer illiteracy in rural areas by providing appropriate training.

13.7 Conclusions

The future growth of agriculture depends on the adaptation of cutting-edge technologies which focus on farmer needs such as the Internet of Things (IoT) and Cloud Computing. The implementation of such technologies supports the agricultural community in terms of accessibility and affordability.
The integration of the Internet of Things (IoT) and Cloud Computing technologies in Precision Agriculture provides a flexible regulatory environmet for services and innovations leading in this way into the automation of the entire production through Integrated Farm Management.

13.8 References

[1] McBratney A., Whelan B., Ancev T., Bouma J., “Future Directions of Precision Agriculture”, ICPA, 2004

[2] Parwekar P., “From Internet of Things towards Cloud of Things, ICCCT, 2011

[3] TongKe F. “Smart Agriculture based on Cloud Computing and IoT, JCIT, 2013

[4] Ken C. “Internet of Things Technology Applied in Field Information Monitoring”, AISS, 2012

[5] Prasad S., “AgroMobile: A Cloud-Based Framework for Agriculturists on Mobile Platform”, IJAST, 2013

[6] Mahesh D.S., Savitha S., Anvekar D.K., “A Cloud Computing Architecture with Wireless Sensor Networks for Agricultural Applications”, IJCNCS, 2013

[7] Hori M., Kawashima E., Yamazaki T., “Application of Cloud Computing to Agriculture and Prospects in Other Fields”, FSTJ, 2010

[8] Gao J., Bai X., Tsai W., “Cloud Testing-Issues, Challenges, Needs and Practice, SEIJ, 2011

14 The Internet of Things. Impact on Society and Education

Radu VASIU
Politehnica University of Timisoara, Romania

14.1 Abstract

The Internet of Things (IoT) is experiencing explosive growth, and will impact almost every industry. I.n 2020, the worldwide IoT market is expected to be worth $3 trillion (Gartner Research). That amount is larger than any individual European country's Gross Domestic Product (other than Germany). However, enterprises (especially SME's and start-ups) must start taking proactive steps to address the changes brought by IoT. If European SME's/Start - ups don't soon take the necessary steps, they'll risk getting l eft behind and putting their businesses at a competitive disadvantage.
The paper is based on the work done inside the Multimedia Research Centre of the Politehnica University of Timisoara as part of the IoT Rapid-Proto Labs, a European transnational project, co-funded by the European Union Erasmus+ Knowledge Alliance Programme, that brings higher education institutions and businesses together to accelerate Internet of Things (IoT) product development.

Keywords: IoT, sensors, connectivity, people & processes, IoT ProtoLabs project

14.2 Introduction

Imagine yourself waking up in the morning fully recovered and relaxed. Due to the new smart alarm clock, your sleep cycles are monitored and the obtained data is analyzed by intelligent applications. Your goal of waking up earlier without feeling any anxiety or tiredness, can be achieved by the features of the new device.

Figure 1. *Sleeping monitoring devices (http://www.getkello.com/# [1])*

While in the kitchen, a blinking light is reminding you to take your daily vitamins. You can even postpone the action for a certain amount of minutes. If you forget to take them, the medicine bottle cap will go online and will send a notification to your doctor.

Figure 2. *Smart medication (www.vitality.net/glowcaps.html [2])*

While leaving the house, your intelligent umbrella is lit up meaning that it has checked the local weather reports and predicts showers during the day. You pick it up because you already know that in the past these devices has been of tremendous help.

Figure 3. *Smart umbrella*

While driving your car towards the workplace or even taking public transportation vehicle, your mobile phone will show you which is the best route to take in order to avoid traffic jams, but also the most polluted areas. This is all possible based on low-cost monitoring systems using the Vehicular Sensor Networks. Such systems collect, process and distribute data from sensors which are located on vehicles belonging to the public transportation bus fleet to a certain central server. The data can be collected from a set of pollution sensors, while the communication between the nodes and the central server can be achieved by means of cellular networks or radio links. Due to the mobility of the fleet, with fewer sensors, the entire area of a city can be monitored. Giving the fact that the same buses move on the same routes during the day, a pollution variation, but also coverage problems can be determined. The sensors will measure the concentration of different types of gases like ozone, carbon dioxide, carbon monoxide, but also volatile organic compounds.
Figure 4 presents the architecture of a typical Vehicular Sensor Network for air quality monitoring. It can be noted that such a system is formed by vehicular sensor nodes (in our case the public buses each equipped with a microcontroller, pollution sensors and communication devices), access points (receives data from each vehicular node and sends it to the central server) and central server (stores the received data from the access point, processes the data and sends back a certain result).

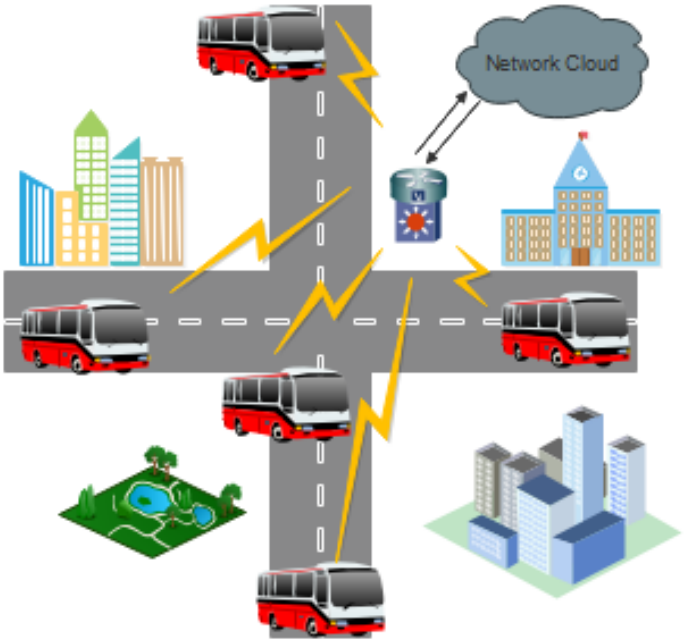


Figure 4. *Architecture of a Vehicular Sensor Network*

Your mobile phone is also constantly measuring your driving style and based on the collected data, information on how to optimize your fuel consumption are provided. You can study profiles of other drivers based on the data that are stored and processed on the internet.
During the lunch break, a heart monitor located in your wrist band and a pedometer in the training shoes track your run and offer results and statistics. These are displayed on the wrist band display in the form of distance, time and burnt calories. The wrist band comes with an on-line tracking site which integrates with your supermarket shopping account so that you may know how many calories you can still eat during the day.

Figure 5. *Smart monitoring*

14.3 Components of an IoT system

So far we have seen a spectrum of examples of Internet of Things; but which is the common thread present to all these applications? And why such a name? Well, analyzing the Internet of Things name and all these products, we can see that all these cases used the internet to send and receive different information. More than that, the particular gadget involved in each application was not a desktop PC, a laptop or even a mobile phone, but an object; it was a thing! Such a thing is designed for a certain purpose, being present physically in the real world,

in our homes, in the car or even worn on the body. Such an object can receive different inputs from the real world, our daily world, and then transform that into data which will be sent to the internet in order to be processed. Getting information into the object (let's call it a device) and also finding out different parameters from the surrounding can be done with sensors. The wrist band can monitor your heart beat based on a specialized sensor or the level pollution is measured by an entire spectrum of pollution sensors, ranging from ozone to particle matter.
The device can also produce different outputs to the exterior world with some special equipment called actuators. The outputs can be triggered based on the results obtained after processing on the internet the data that was collected from the sensors. So your wrist band might vibrate to tell you that you have reached the target of your daily calories or a pollution monitor system might trigger an alarm when the air reaches a certain level of pollution.
There are several definitions used for Internet of Things, also called The Internet of Objects.
Wikipedia says: *"The Internet of Things refers to a wireless network between objects, usually the network will be wireless and self-configuring, such as household appliances."* This is still a very limited definition, based on a specific application that stayed at the beginning of IoT development.
In 2008, the research community stated that *"The term "Internet of Things" has come to describe a number of technologies and research disciplines that enable the Internet to reach out into the real world of physical objects."*
Finally, at this moment it is stated that for 2020: *"Things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts"* [3].
So, the Internet of Things (also called "The Internet of Everything" by Cisco) is a network of connected devices (some physical objects) which communicate over the Internet (Figure 6).

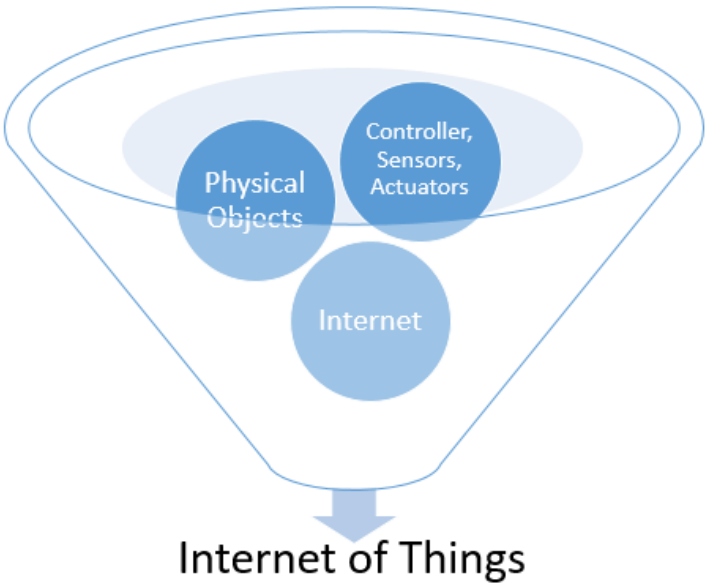


Figure 6. *Internet of Things components*

Based on some sensors, such objects gather data from our surrounding, the data is being processed in a controlled way and the results of such processing can be observed in the exterior world by means of different actuators.

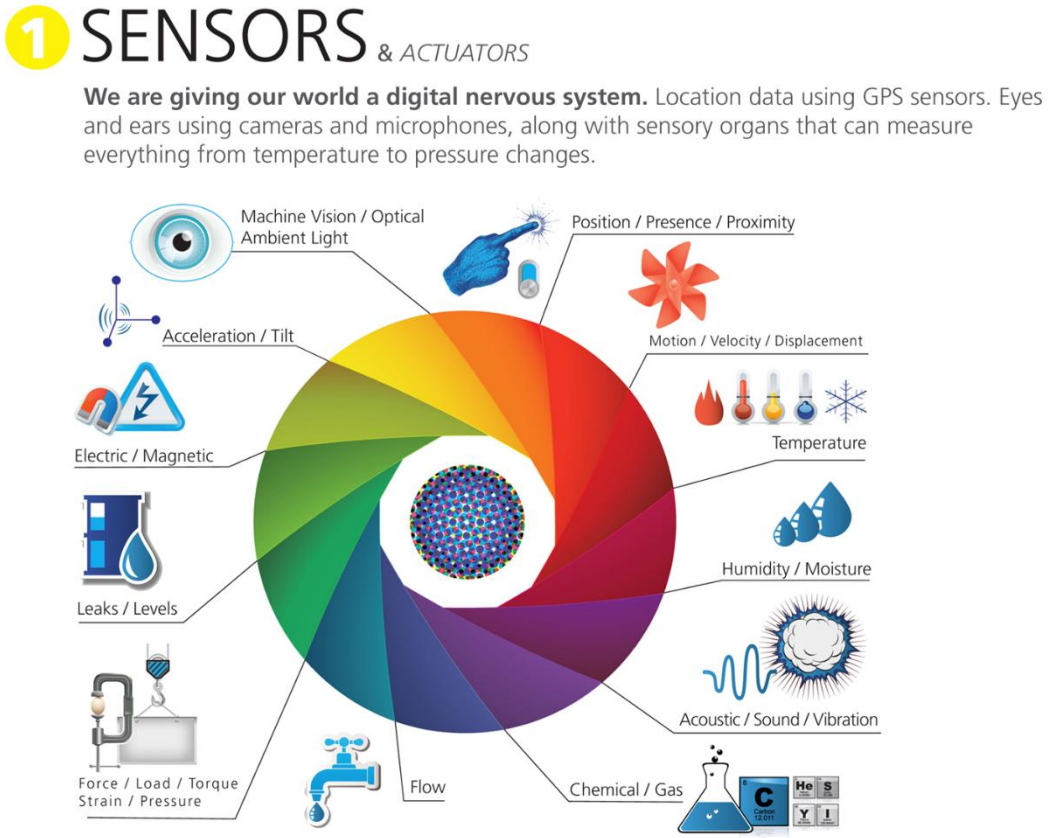


Figure 7. *Examples of sensors and actuators for IoT*

Sensors are input components that measure physical variables and convert them to electrical signals. Sensing refers to the acquisition of heterogeneous streams of data from a set of sensors integrated within the networked things. Multiple kinds of sensing elements are embedded in everyday objects, in wearable devices or positioned in the environment so they can adequately measure the physical phenomena of interest. Common sensors include: environmental sensors (temperature, humidity, light, air quality), motion sensing (accelerometers, gyroscopes, vibrations, pressure), biometric (heart rate, respiration, ECG/EMG/EEG, GSR), audio and imaging.

While sensors convert a physical variable like temperature to an electrical signal, output devices are the inverse: they convert an electrical signal to a physical outcome. Output devices include LEDs, speakers and screens, and actuators like motors or solenoids that move or control things in the physical world. Actuators are commonly deployed within industrial IoT applications; for example, pneumatic linear actuators are widely adopted in manufacturing to move and grip products during the assembly process.

Communication is central to the Internet of Things. Networking technologies enable IoT devices to communicate with other devices as well as with applications and services that are running in the cloud. The internet relies on standardized protocols to ensure that communication between heterogeneous devices can occur securely and reliably. Standard protocols specify the rules and formats that devices use for establishing and managing networks, as well as for transmission of data across those networks.

Networks are often described as being built up from a stack of technologies, with technologies at the bottom of the stack, such as Bluetooth LE, relating to physically connecting devices, while technologies further up the stack, such as IPv6, relating to logical device addressing and routing of network traffic. Technologies at the top of the stack are used by the applications that are running on top of those layers, for example, message queuing technologies.

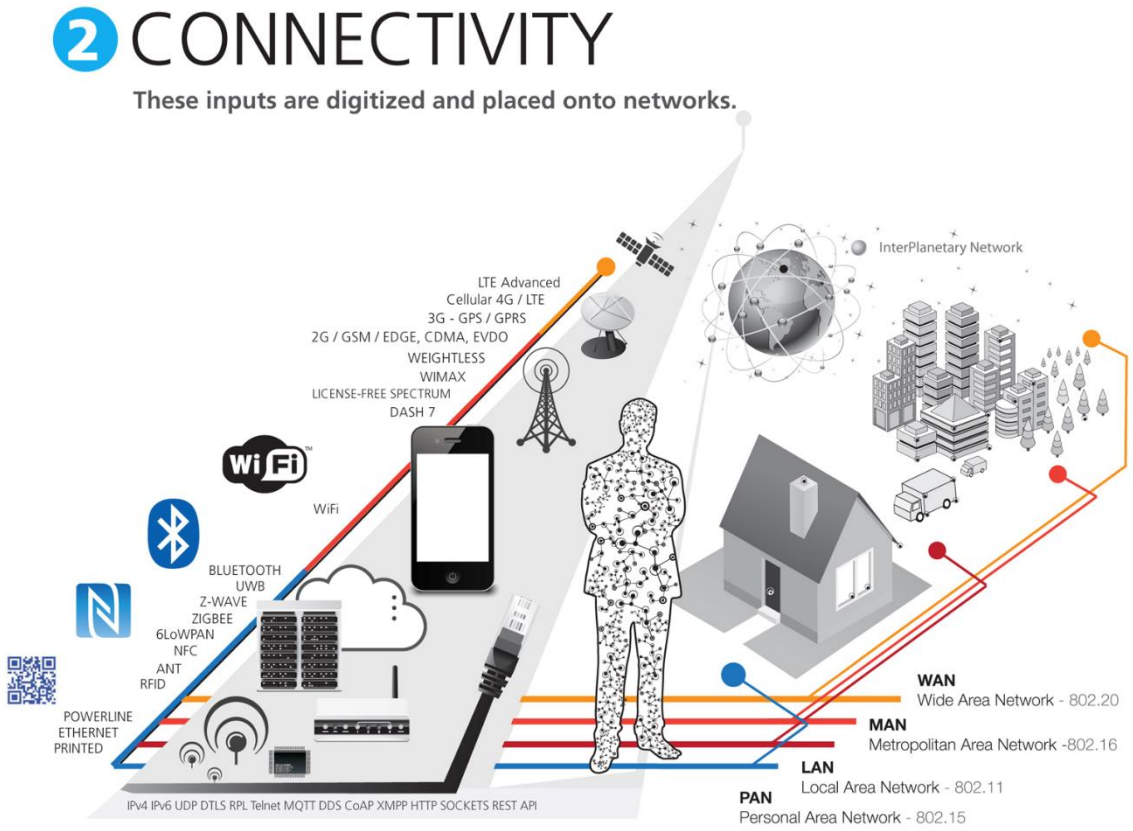


Figure 8. *IoT connectivity*

As seen in our previous examples, an Internet of Things device gives the possibility to control a certain object through the internet. It has a certain controller part which is used to read some data coming from sensors, send the data for storing, processing, analyzing to the internet, and based on the results, control some actuators, some other devices. The controller is directly interfacing with the real world through these sensors and actuators, but also exchanging data with servers connected by the internet.

In order to build such an embedded system IoT device, the controller can be any type of processing board like Arduino, Raspberry Pi, DragonBoard™ 410c and so on. The vision of Even Upton, the cofounder of Raspberry Pi, was to offer a very cheap education computer which can run an operating system (like Raspbian), talk to the Internet and even drive a monitor. During the years, different versions of Raspberry Pi appeared on the market, as it can be seen in this table, which have different levels of equipping.

The development of IoT applications become easier and easier due to the increasing number of devices and software libraries that are helping developers with coding the devices. IoT already become a mass application, used by more and more people to control and monitor different processes, as suggested in Figure 9.

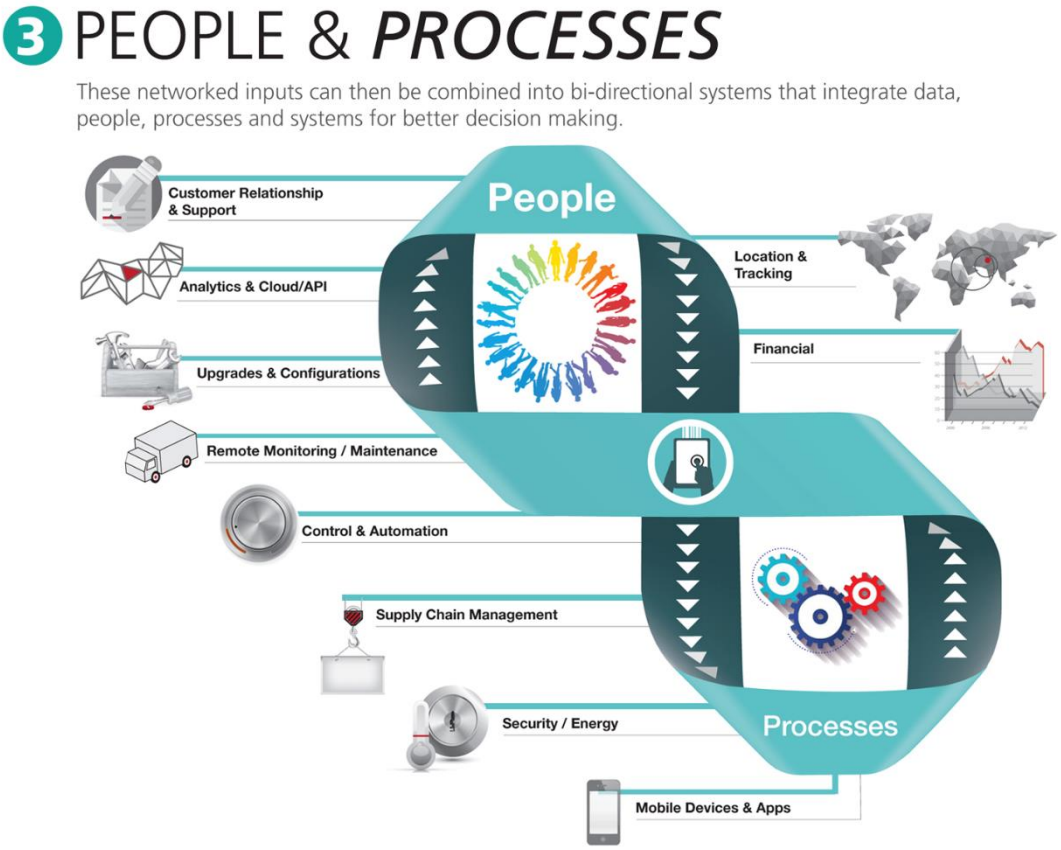


Figure 9. *IoT processes*

14.4 Future and impact of IoT

The evolution of IoT is tremendous. Until the years 2010s we used the term Internet of People, while after that the number of connected devices increased so much that we switch to the term Internet of Things (see Figure 10).

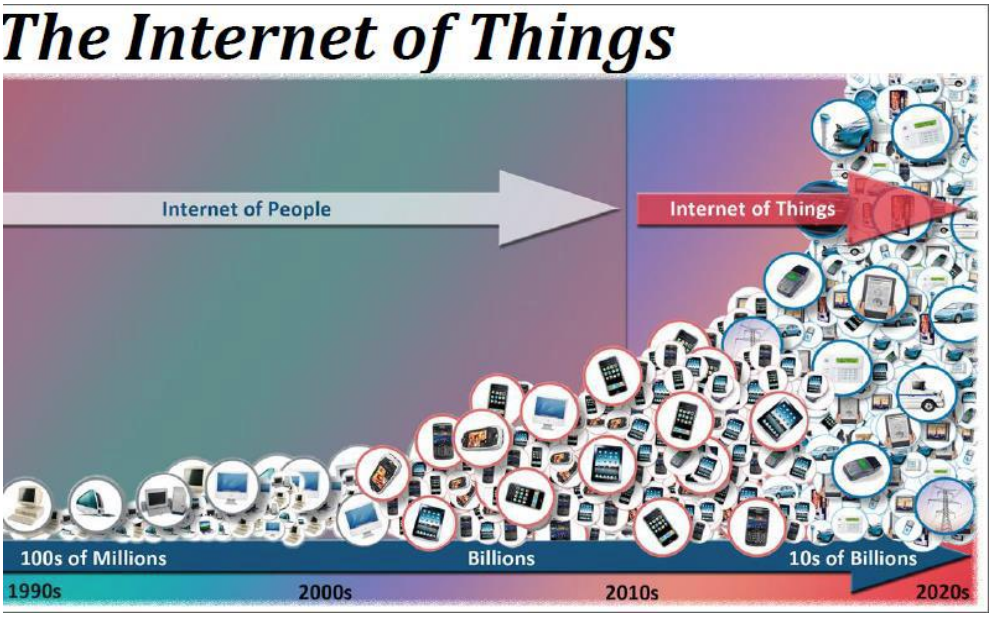


Figure 10. *From Internet of People to Internet of Things*

The number of application, devices and data collected increased so much that it is difficult at this moment to image any domain of life that is not affected by the revolution in IoT. Figure 11 illustrates the spread of IoT. We practically switched from *connectivity* to **everyone**, in **any place** and **any moment**, to *connectivity* to **everything**.

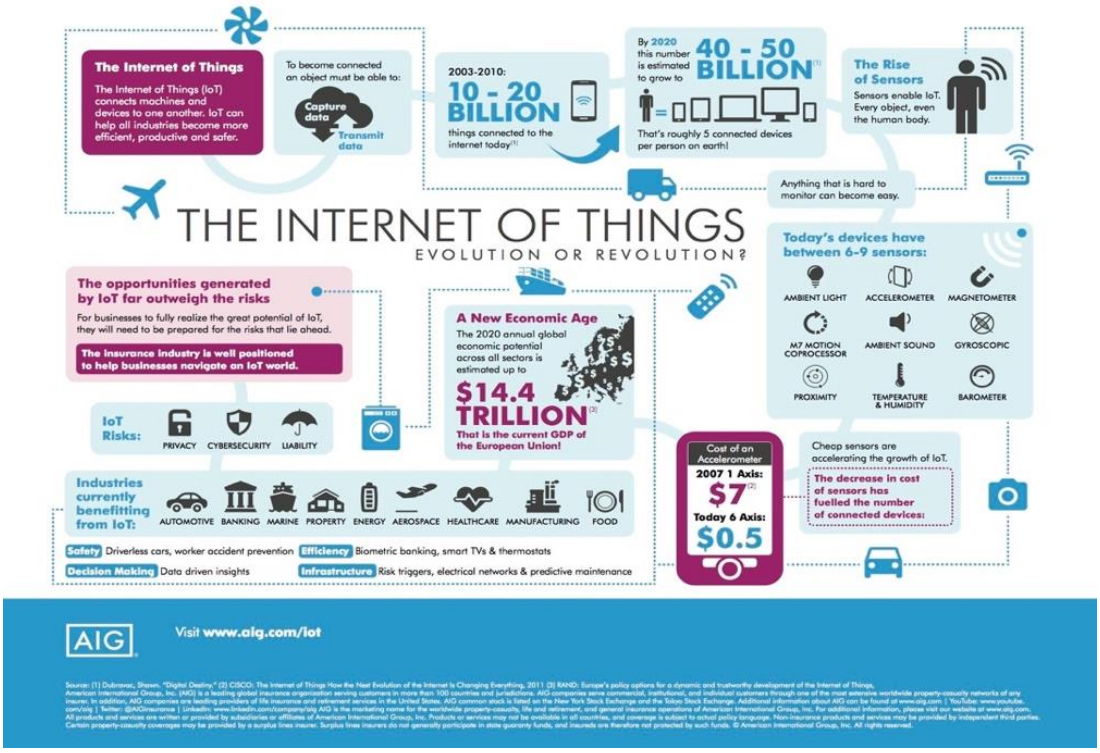


Figure 11. *Evolution of IoT*

The revolutionary development of IoT also comes with an increase of concerns regarding our future as humanity. This concerns are mainly having to do with the way data is collected, stored and used, and mainly by whom. It is recognized that information means power: economic, political, social, etc [4]. The way we are using the power of information can not only revolutionary change our life by making it easier, but can also affect our freedom and rights to privacy.

Peter-Paul Verbeek, a professor of philosophy of technology from Netherlands, writes that technology already influences our moral decision making, which in turns **affects human agency, privacy and autonomy**. He cautions against viewing technology merely as a human tool and advocates instead to consider it as an active agent.

Justin Brookman, of the Center for Democracy and Technology, expressed concern regarding the impact of IoT on consumer privacy, saying that "There are some people in the commercial space who say, 'Oh, big data — well, let's collect everything, keep it around forever, we'll pay for somebody to **think about security later.**' The question is whether we want to have some sort of policy framework in place to limit that.

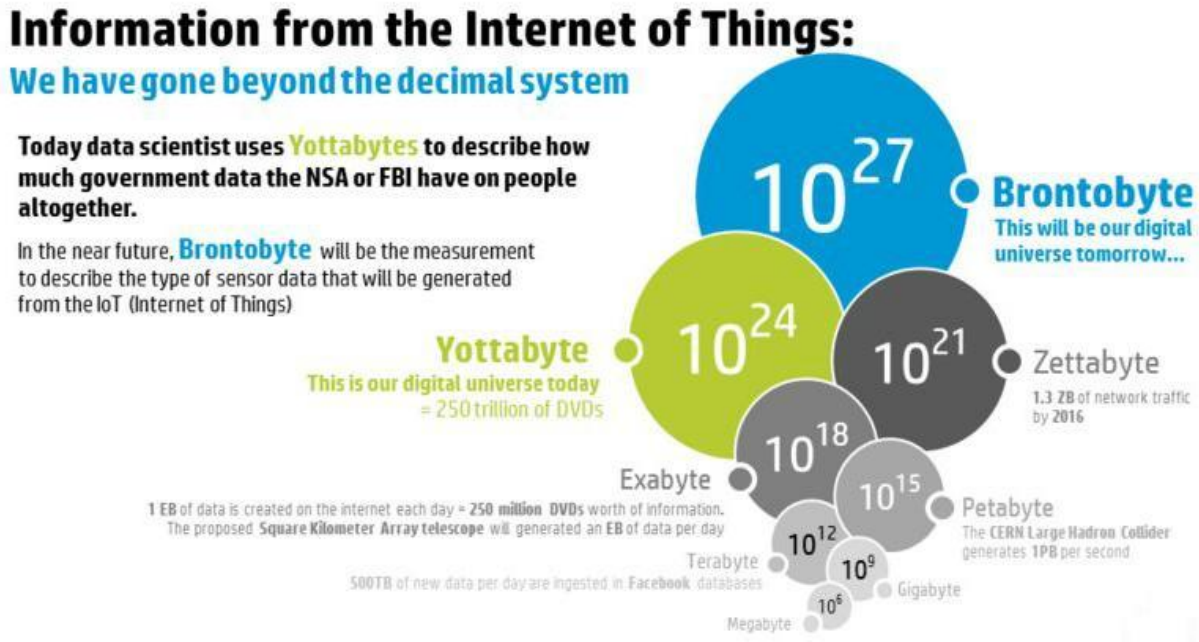


Figure 12. *New unit measures for collected data*

Just in order to have an idea about the quantity of data that is collected, we should say that new unit measures have been introduced, such as *Yottabytes* and *Brontobytes*. See Figure 12 for details.

14.5 IoT ProtoLabs Project

IoT Rapid-ProtoLabs is a European transnational project, co-funded by the European Union Erasmus+ Knowledge Alliance Programme, bringing higher education institutions and businesses together to accelerate Internet of Things (IoT) product development. The partners in the project are: Haaga-Helia University of Applied Sciences, Finland (project coordinator), University of Leiden, the Netherlands, Politehnica University of Timisoara, Romania, Technical University Delft, the Netherlands, Bruno Kessler Foundation, Italy, 247GRAD, Germany and Houston inc. Consulting, Finland. The project implementation timing is for three years, until 31st December 2020.

The project will create and implement a multidisciplinary (ICT, Design and Electronical Engineering) course curriculum which is focused on real problem-based activities (innovative IoT product development for SME's/Start-ups). Cross-border teams of students, teachers (coaches) and practitioners will jointly develop solutions to challenging IoT applications (Internet-connected objects), add value for enterprises and strengthen the employability, creativity and career prospects of students. IoT Rapid-Proto Labs represents an innovative, multidisciplinary, and low-risk enabler of SME/Start-up IoT innovation.

Distributed teams of multidisciplinary students (from three European countries – Finland, Netherlands and Romania) will be supported by a Project Arena (web-platform) which enables them to effectively collaborate on rapid-prototyping of IoT products/services. The Project Arena also stimulates the flow of knowledge and innovation between Higher Education, enterprises and other stakeholders. Each IoT Proto-Lab student-centred team will rapidly set-up, trial and test an innovative IoT solution for their SME/Start-up client (18 clients in the complete project cycle). Throughout the discovery, design, develop and test process, student teams are continually supported by teachers, external coaches (Research Centre and ICT Process Development House) and client staff. The fields of study embedded in the project curriculum (e-Competences, design thinking, lean/agile processes etc.) are highly relevant for every business today.

This project contributes to the modernisation of Europe's Higher Education system (relevance/quality) and reinforces the European Knowledge Triangle (more effective links between education, research, and enterprise innovation).

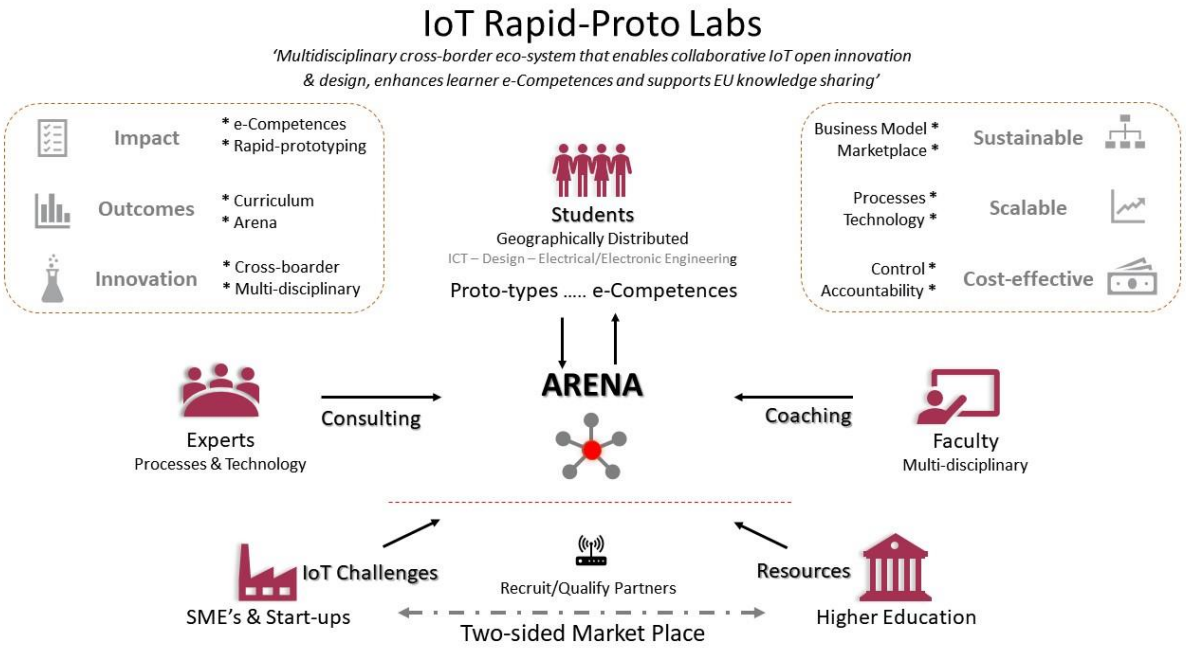


Figure 13. *IoT ProtoLabs project structure*

The main target groups of the project are VET students, girls in secondary school, professors and teachers, VET sector, employees. The expected significant public results are: IoT Rapid-Proto Labs Web-Arena (scalable) for project management (tools), marketplace activities (projects), and dissemination of knowledge.
More information can be found on the project's web site: www.iotprotolabs.eu.

14.6 Conclusions

Internet of Things is a very important topic those days and has a tremendous influence on our day to day life. More and more "objects" are connected and can directly communicate through the Internet, thus helping to make our life easier and safer, making economy and commerce more effective, allowing new ways of enjoying our free time, etc.
On the other hand, the immense number of data that are collected and stored by the developed applications are increasingly raising the potential of intrusion into our private life and private data, so the impact on our social life is higher and higher. All those concerns are addressed both by scientist and philosophers, but are not yet fully addressed by the educational system. At the moment, the need of changes in the educational paradigm is just perceived and more still has to be done in order to find the correct technical developments and technologies that might help in balancing the need of privacy and security while offering at large scale different open applications for the benefit of large communities.

14.7 References

[1] ***, "Your personal Sleep Trainer", available at *http://www.getkello.com/#*, last accessed on May 2018

[2] ***, "Vitality – A new, smarter approach to medication adherence" available at *www.vitality.net/glowcaps.html,* last accessed on May 2018

[3] Jayavardhana Gubbi, Rajkumar Buyya, Slaven Marusic, Marimuthu Palaniswamia, “Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions” available at http://arxiv.org/pdf/1207.0203.pdf, last accessed on May 2018

[4] FORBES, “A Simple Explanation of 'The Internet Of Things”, available at http://www.forbes.com/sites/jacobmorgan/2014/05/13/simple-explanation-internet-things-that-anyone-can-understand/, last accessed May 2018

[5] Internet of Things Rapid ProtoLabs project description, available at www.iotprotolabs.eu, last accessed on May 2018

SOCIETY
&
BUSINESS

15 Using Indicator-Based Models for (Re) Orientating Enterprises Towards Ethical Behaviour

Günter KOCH
Humboldt Cosmos Multiversity, Tacaronte / Tenerife, Spain

15.1 Abstract

In the age of fundamental disruptions and in search to overcome current dominating economics paradigms, orientating and re-orientating organisations, especially companies, can be best driven into new directions by means of new economic models „beyond the mainstream“. Such mostly bottom-up constructed models aim to compile indicators serving as subgoals for defining the discrete steps of changes to be achieved. In the spirit of mastering challenges going far beyond today‘s predominant materialistic paradigm (denoted as neo-liberal) which is currently governed by finance, these models intend to add non-financial indicators guiding towards more ethics in entrepreneurial activities, especially for serving the common good.
This article discusses currently emerging new models as well as the question, if such models complementary to the classic financial ones can be merged or superseeded by new supermodels under discussion.

15.2 Theory Building, Model and Method Construction

Since this article ultimately will discuss how any operational unit, typically an enterprise, can become orientated towards a business strategy which is accepted as ethical, the discussion conducted is about a potential theory behind such model, about the model itself and the method to apply it.
To begin with, the three key terms: theory, model and methods shall be elaborated discoursively, not attempting to provide general definitions rather than specific ones for the purpose of this paper and its roots.
Starting with what theory is underlying to the models employed, the shortest definition the author could elaborate has been issued by the American Association for the Advancement of Sciene (AAAS) [1]: *„A (scientific) theory is a well-substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment. Such fact-supported theories are not "guesses" but reliable accounts of the real world. The theory of biological evolution is more than "just a theory." It is as factual an explanation of the universe as the atomic theory of matter or the germ theory of disease. Our understanding of gravity is still a work in progress. But the phenomenon of gravity, like evolution, is an accepted fact“.*
Since the subjects treated in this article are not real in terms of material, rather than immaterial and intangible, and since we have to face that the applicants of such theory are practitioners, the definition above has to be adapted after Clay Christensen and David Sundahl [2] (Quote): *„A theory is a statement of what causes what, and why, and under what circumstances. A theory can be a contingent statement or a proven statement.*
Many managers shy away from using the word “theory” because it is associated with the term theoretical which suggests impractical. But managers use theory every day. They make decisions on some basis of cause and effect, often without being specific about their reasoning“.
Building a theory is a process which, in science, usually takes a long route, starting from observations, going through classifications, then abstractions and finally ending in a description most often formulated and represented as a model. Once a theory is settled and

converted into a commonly accepted and respected understanding, the theory expands into a commonly governing paradigm – as shown in Fig. 1

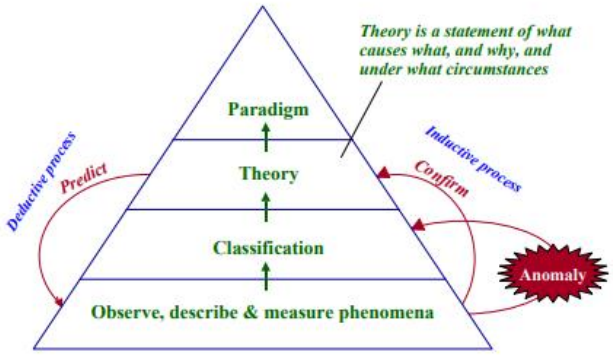


***Figure 1**: The process by which theory is built*

A theory may not be “stable” from on its birth. In its application in practice, “anomalies” may be discovered, which would falsify the theory and its validity. If the model can be “repaired” it will survive, if not, the theory needs to be replaced by a new one (as was the case in history when the geocentric model of our planet had to be replaced by the heliocentric). (Here reference must be made to K. Popper [3])
Most theories in social sciences – and in this article we consider management of organisations as a subdisicipline of social sciences – are being developed bottom up, i.e. from observations through abstractions towards a general set of statements. A typical process of developing a theory in this way is the “Grounded Theory” [4]. Generating a theory by the method of Grounded Theory means that its definition is developed by inductions. (Although we may expect that Grounded Theory building is a qualitative method, in fact it is not. It is a general method guiding a systematic generation of a theory through some systematic research, following a set of rigorous research procedures leading to the emergence of resulting conceptual categories).
One way to represent a theory in an easy to conceive way is by condensing it into one or a set of graphical models for the ease of ist condense represetantion – see Fig. 2

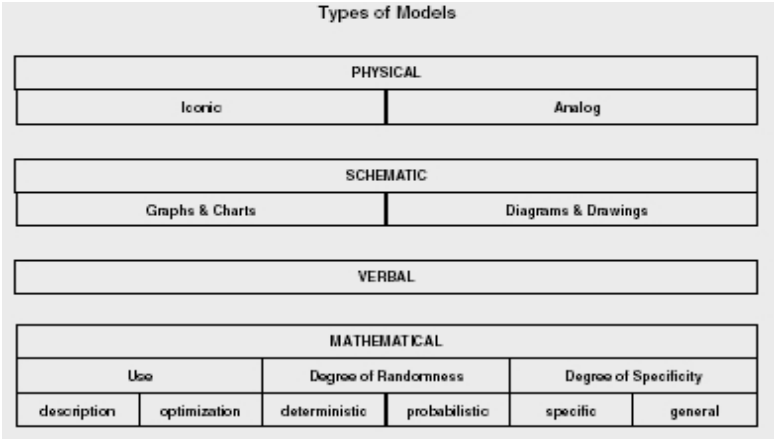


***Figure 2**: Types and representations of models*

After the „Encyclopedia of Management“ [5] the quality of models is defined by their accurarcy: (quote*): „The accuracy of the results of the model analysis is dependent upon how well the resuming model represents reality. The closer the model is to its actual „real“ counterpart, the more accurate the conclusions drawn and the predictions made about the object of attention. Hence, the model user must strive for the most accurate representation possible. Model users also must be careful to identify the decision variable values that provide the best output for the*

model. This is referred to as the model's optimal solution. However, the model user also must be careful not to include irrelevant variables that may cloud the picture and cause inaccurate conclusions or force the model user to spend an unnecessary amount of time in analysis".

15.2.1 A rough survey on a) a history of methods and b) methods classifiction

Frameworks as models for defining methods for managment processes have been invented and introduced first time after World War 2 and since then to our days exploded in numbers. Today, we have to observe, that every week a new model is being published and promoted as *the* ultimate cure for an organisation to become more efficient an profitable (see Fig. 3).

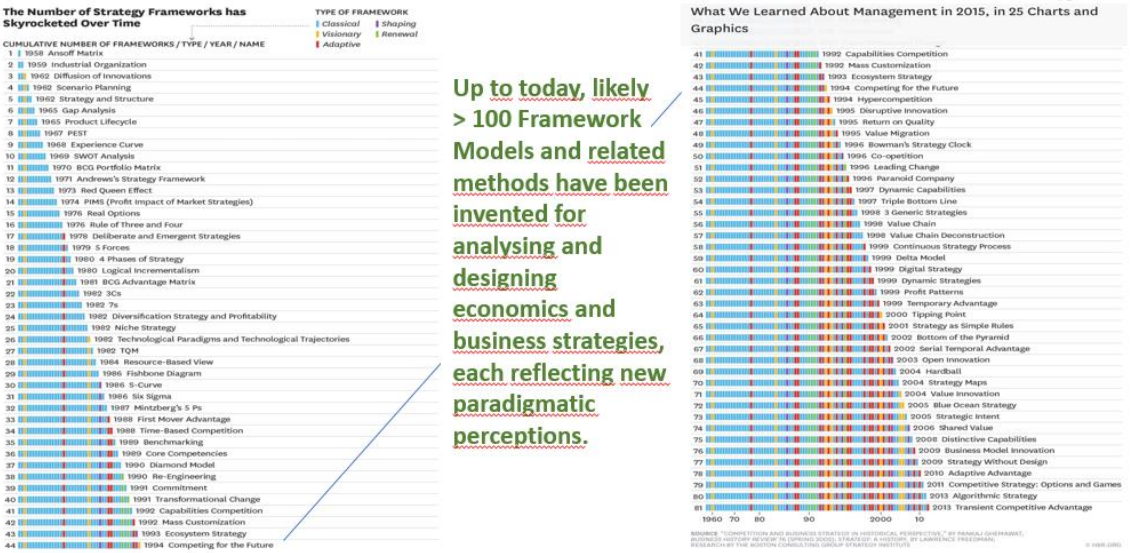


***Figure3**: Increase in numbers of framework models (for visualization purpose only. Copied rom "Frankfurter Allgemeine Zeitung))*

15.2.2 Author's history in method developments

The author of this article himself has experienced and managed several projects in which he was responsible for the development and roll-out of management models. This history which is comprised in Fig. 4. started with the invention of a formal language for requirements engineering, then was continued with the invention of a model for identifying the maturity level of a software producing organisation, e,g, sofware enterprises - this metthod became an ISO standard - then continued with building a model for the identification oft he intellctual capital of any organisation.

Figure4: *The author's involvement in developing and launching method models*

15.3 The „Intellectual Capital Report" model – as ultimately applied to Austrian Universities

One of the models from the previously presented history which even became subject of legislation in Austria [6] was the Intellectual Capital Reporting model – in German called „Wissensbilanz" – which defines the framework for an analytical report applicable in first place to „knowledge organisations" such as research centers or universities, but as well to any company producing intellectual products and services as might be software, web design, content stories etc. This model is presented in Fig. 5. It has four subsequent „domains" and its interpretation implies a methodogical flow from left to right following an „Input – Process – Output" (IPO) pattern.

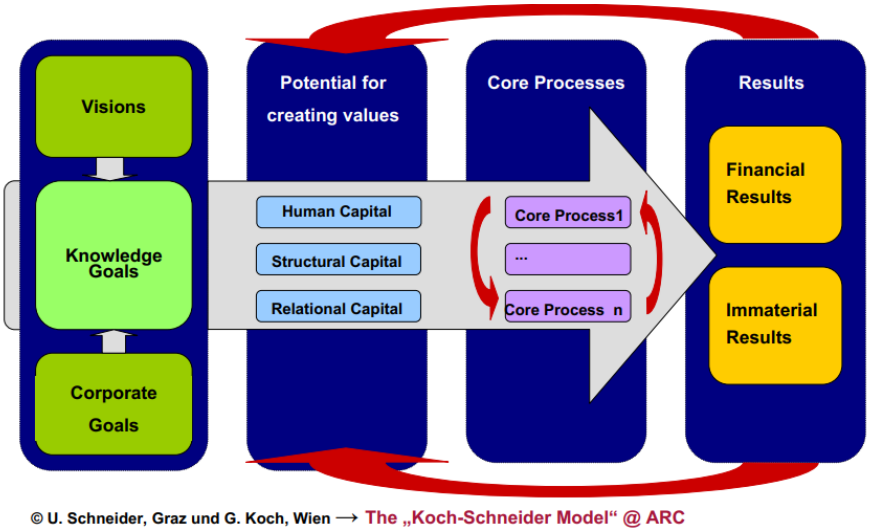


Figure 5: *The so called Koch-Schneider model for representing an organization as a knowledge organization, creating intellectual capital*

This model also forms the basic reference for a reporting standard which has been condensed into a legal reporting obligation for all public universities in Austria.
The „philosophy“ of this Intellectual Capital Reporting (ICR) model is to describe „knowledge assets“ such as Human, Relational and Structural Capital values of an organisation, its key processes and results which, besides financial results, cannot be expressed in monetary terms, i.e. in addition and complementary to criteria which can be captured and transformed into financial data which usually are presented in a classical and formalised financial report.
The presentation of this additional and non-financial dimension is tricky insofar the critera and values associated with cannot be expressed in one single „currency“, rather than through a more or less well defined structure of many indicators.
A model intended to be used as a working framework implies its application, i.e. a process describing how this model is a) to be interpreted and b) to be applied in practice. The Intellectual Capital Reporting (ICR) model as introduced above, is to be implemented along a sequence of steps as e.g. explained in Fig. 6. (This scheme has been taken over from the INCAS project [7], a derivative oft he original IC Reporting method as first time published by the author and colleagues [8]).

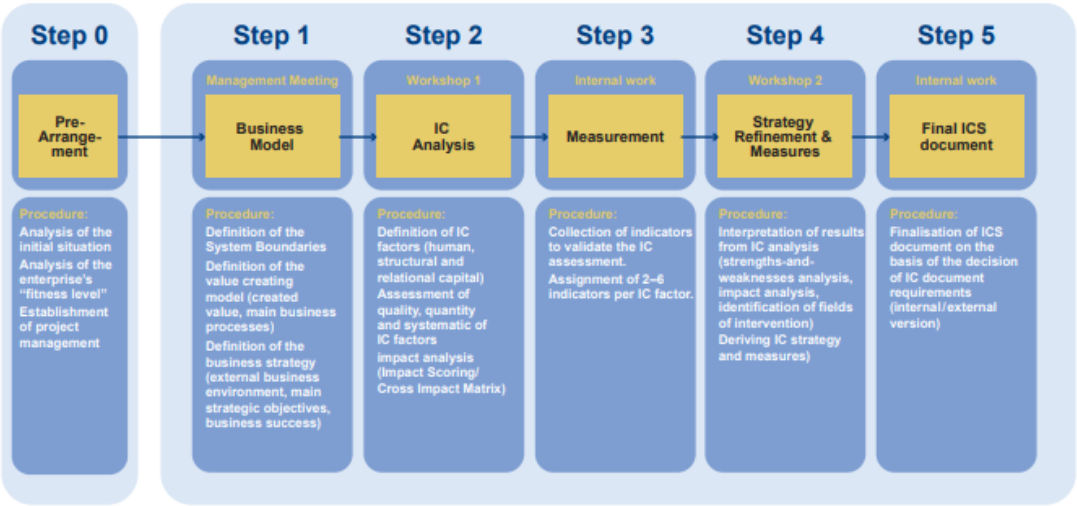


Figure 6: *the methodological process implementing the Koch-Schneider ICR model (following INCAS)*

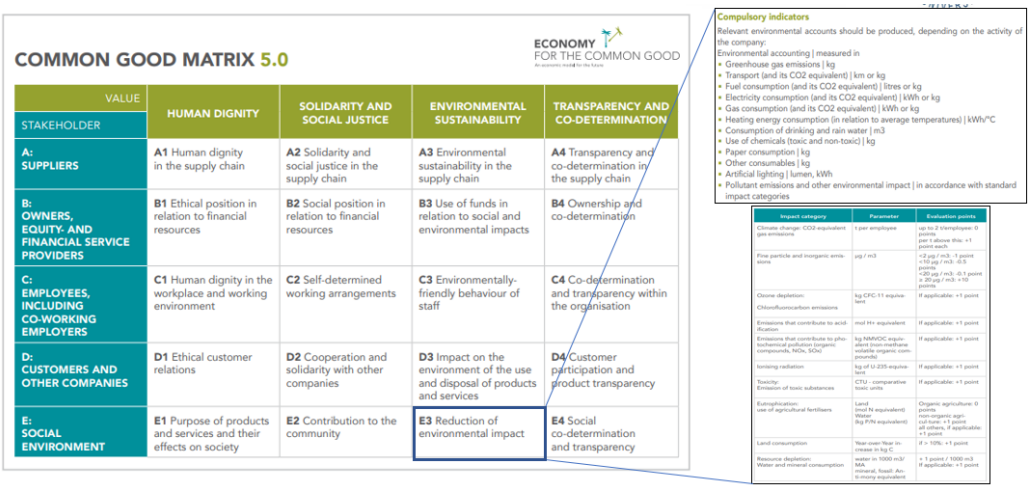
15.4 Models for „re-inveting economy and economics“

Most framework models show „boxes“ representing specific categories of aspects which ensemble constitute either a theory or a selective model to be implemented for practical actions. One of the globally best known framework models is the structured collection of the 17 Sustainable Development Goals (SDGs) of the United Nations [9]. Each of these 17 global macro goals is broken down again in about 10 indicators per each goal. The purpose of this model is to provoke a global change in economic, social/societal and environmental developments.

Figure7: *The Sustainable Development Goals framework model and – as an example – one of its breakdowns into implementing indicators ("subgoals")*

15.4.1 The operational model for analysis on „Economics for the Common Good" (ECG)

Like the SDG-model implies and intends to guide its addressees – first hand large public institutions such as governments and governmental bodies down to each individual person – i.e. that they take the indicators as measurable or at least qualitatively describable objectives. On a lower and practicable level one (out of several) methods may be chosen which is best suited to raise consciousness and motivation of business leaders and employees to aim at better moral direction of their organistion. The result of such refinement will be a balance sheet for identifiying and implementing ethical management standards beyond those for today's reductionistic, neoliberal, financial profit-orientation. Such a model has been developed in a group exercise under the intellectual leaderhip of Christian Felber [10]. The result of their group work is model representing the „Balance Sheet for the Common Good" [11]. Its current version is presented in Fig. 8. This „balance scheme" leads beyond the classical and currently used financail reporting standards – likewise did the Intellectual Capital Reporting (ICR) sheet introduced above. The balance sheet for analyzing the common good qualification of its users is intended first hand to raise awareness on aspects which are not captured in the usual offical and legally imposed prescriptions in business reporting standards [12]. In the very end the intention of this reporting model is, that the categories in this balance sheet for the Common Good, once applied and „measured", may serve as a foundation for re-calcualting tax levels or privileges depending on the results of the compound quantifications of the related indicators.



COMMON GOOD MATRIX 5.0

ECONOMY FOR THE COMMON GOOD

VALUE / STAKEHOLDER	HUMAN DIGNITY	SOLIDARITY AND SOCIAL JUSTICE	ENVIRONMENTAL SUSTAINABILITY	TRANSPARENCY AND CO-DETERMINATION
A: SUPPLIERS	A1 Human dignity in the supply chain	A2 Solidarity and social justice in the supply chain	A3 Environmental sustainability in the supply chain	A4 Transparency and co-determination in the supply chain
B: OWNERS, EQUITY- AND FINANCIAL SERVICE PROVIDERS	B1 Ethical position in relation to financial resources	B2 Social position in relation to financial resources	B3 Use of funds in relation to social and environmental impacts	B4 Ownership and co-determination
C: EMPLOYEES, INCLUDING CO-WORKING EMPLOYERS	C1 Human dignity in the workplace and working environment	C2 Self-determined working arrangements	C3 Environmentally-friendly behaviour of staff	C4 Co-determination and transparency within the organisation
D: CUSTOMERS AND OTHER COMPANIES	D1 Ethical customer relations	D2 Cooperation and solidarity with other companies	D3 Impact on the environment of the use and disposal of products and services	D4 Customer participation and product transparency
E: SOCIAL ENVIRONMENT	E1 Purpose of products and services and their effects on society	E2 Contribution to the community	E3 Reduction of environmental impact	E4 Social co-determination and transparency

Compulsory indicators

Relevant environmental accounts should be produced, depending on the activity of the company:

Environmental accounting | measured in

- Greenhouse gas emissions | kg
- Transport (and its CO2 equivalent) | km or kg
- Fuel consumption (and its CO2 equivalent) | litres or kg
- Electricity consumption (and its CO2 equivalent) | kWh or kg
- Gas consumption (and its CO2 equivalent) | kWh or kg
- Heating energy consumption (in relation to average temperatures) | kWh/°C
- Consumption of drinking and rain water | m3
- Use of chemicals (toxic and non-toxic) | kg
- Paper consumption | kg
- Other consumables | kg
- Artificial lighting | lumen, kWh
- Pollutant emissions and other environmental impact | in accordance with standard impact categories

Impact category	Parameter	Evaluation points
Climate change: CO2-equivalent gas emissions	t per employee	up to 2 t/employee: 0 points per t above this: +1 point each
Fine particle and inorganic emissions	µg / m3	<2 µg / m3: -1 point <10 µg / m3: -0.5 points <20 µg / m3: -0.1 point ≥ 20 µg / m3: +10 points
Ozone depletion: Chlorofluorocarbon emissions	kg CFC-11 equivalent	If applicable: +1 point
Emissions that contribute to acidification	mol H+ equivalent	If applicable: +1 point
Emissions that contribute to photochemical pollution (organic compounds, NOx, SOx)	kg NMVOC equivalent (non-methane volatile organic compounds)	If applicable: +1 point
Ionising radiation	kg of U-235-equivalent	If applicable: +1 point
Toxicity: Emission of toxic substances	CTU - comparative toxic units	If applicable: +1 point
Eutrophication: use of agricultural fertilisers	Land kg P/N equivalent) Water (kg P/N equivalent)	Organic agriculture: 0 points non-organic agri-cul-ture: +1 point all others, if applicable +1 point
Land consumption	Year-over-Year increase in kg C	if > 10%: +1 point
Resource depletion: Water and mineral consumption	water in 1000 m3/ MA mineral, fossil: An-ti-mony equivalent	+ 1 point / 1000 m3 If applicable: +1 point

Figure 8: *The "Matrix Model" structuring the categories for a "Balance Sheet" of economics for the Common Good*

15.5 Merging models

The idea of developing reporting models „beyond" classical GDP-based indicator models is not new, as is the case for versions applicable to the economics on business level. As had been pointed out in the introductory section x.2.1 and Fig.3. There exist innumerable many framework models. Also in „theory" many different approaches have been published, the most relevant of those are represented in Fig.9.

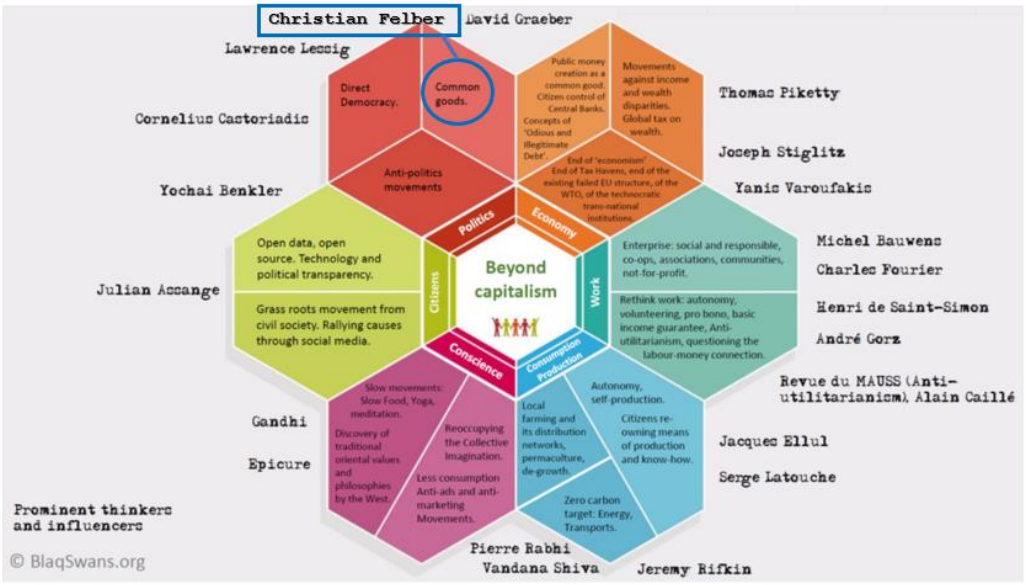


Figure 9: *Main theories in alternative economy*

All these different theories adress either only specific aspects in economy or intend to argue in favour of a new theory bulid on new and divergent observations, as e.g. the French economist Piketty did by collecting and interpreting latest historic data on „the wealth of nations" – an intention to induce a new perspective in economy towards the post Adam-Smith-Age [13].

On a more practical level the question would be, if and how economics models can be combiend, say merged, as e.g. the „matrix" for representing an economic unit being qualified for its contribution to the Common Good with the ICR (intellectual capital reporting) model applicable to companies based on knowledge capital.

15.6 The „Doughnut Economics“ model as a supermodel?

One of the main criticism on the matrix model for identifying the qualification of being an organisation serving the idea oft he Economy for the Common Good, is, that its scientific foundations are not sufficiently sound. This cristicism is partly based on the fact that ist authors are no scientists (rather than, at best, „citizen scientists“) and that their model is more motivated by a strategic political idea implemented by a movement of convinced followers. The question valid to be discussed is with which scientifc rigour and mehod the matrix model has been developed and by whom. (W.r.t. the latter question, the ICR model had been declared to be „scientific“ for the simple reason that it emerged from a research organisation).
The initiator and promotor of the model of the „Economy for the Common Good“, Christian Felber, decided not only to establish a research association [14] with the mission to collect „brains“ from the scientifc community supporting research for creating scientific foundations for this „philosophy“, he also suggested to link up with Kate Raworth, a British scientist who published on „The Doughnut Economics“ [15]. The model (or better: set of models) of Doughnut Economics is a composition made up from a wide range of insights, each of which captured in a partial model, which its author has gained in her very different life circumstances, as e.g. making practical experience in developing economies, in family economics and through scientific studies at research institutes and universities. In a way, Doughnut Economics serves as a reference model for the current discussion on how economy and enterprise economics can be redirected towards a more responsible and ethic direction without stressing a revolution.
C. Felber in a private communication worked out a long list of criteria comparing his own approaches versus Kate Raworth’s [16], thereby demonstrating the high level of similarities in their basic concepts. K. Raworth by her personal history and her methodological rigour applied may claim to be better recognised and respected in the scientific community.
In order to better understand the Doughnut model and espcially how it applies in practical analysis, an intercative computer program of the University of Leeds [17] must be recommended for experimentation thereby receiving insights on the advancements of national policies in conforming to the Doughnut profile. As an example, see Fig. 10.

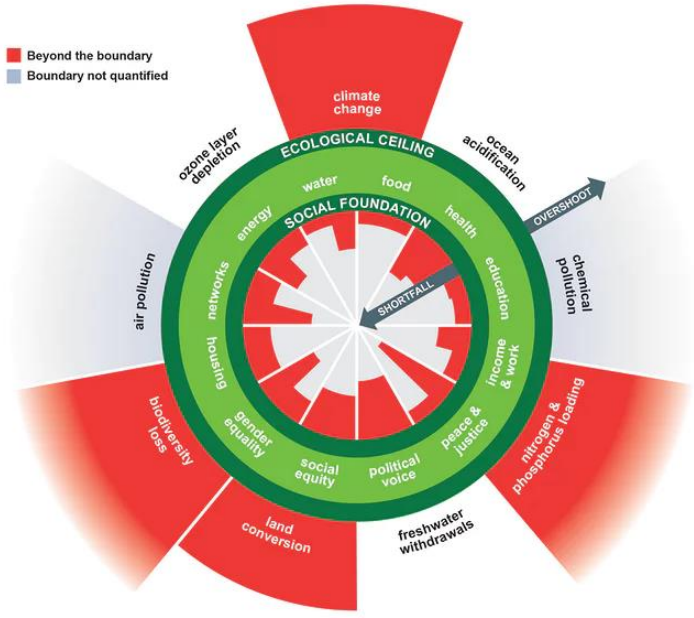


Figure 10: *A template for a specific “Doughnut analysis” of a specific case*

15.7 Conclusions

This article is more about describing a partial aspect of current endavors to identify, construct and apply new theories and, compliant with such theories, new models applicable for redirecting organisations, especially companies to engage in ethical management by applying

such holistic models based on indicators „beyond“ classical standard reporting criteria, as currently applied in business practice and required by legal obligations. The author does not expand on the question how such new methods for directing companies applying new indicators already are taken up in policy making processes as are e.g. investigated by relevant political decision making bodies such as the European Economic and Social Committee (ESSC) which decided to commit towards supporting the legal implementation oft he concept of an Economy for the Common Good [18]. Rather the subject of this article is on the question in which way new methodolgies can be created to identifiy or to construct a „supermodel“ of a new economy which may also serve for reference in future law making (where the European Parliament on a more abstract level may engage in creating a so called directive, in a first step as an extension towards improving the so called non financial reporting standards, already today mandatory for companies with more than 500 employees [19]).

This paper therefore serves more for outlining a future program in developing future models for designing company directions by discussing questions such as merging models, inventing new models or adapting existing models [20] as is pointed out in the last section introducing the Doughnut Economics framework.

15.8 References

[1] National Academy of Sciences (2008), *Science, Evolution, and Creationism*.. Washington, D.C: National Academies Press. ISBN 0-309-10586-2.

[2] Clayton M. Christensen; David M. Sundahl: The Process of Building Theory, Harvard Business School Draft, 2001. (http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=58868E3E792452CD14408C149D683942?doi=10.1.1.128.3536&rep=rep1&type=pdf)

[3] Karl *Popper (1959): The Logic of Scientific Discovery (2002 pbk; 2005 ebook ed.). Routledge.* ISBN 978-0-415-27844-7.

[4] Glaser, B. & Straus, A. (1967), The Discovery of Grounded Theory: Strategies of Qualitative Research. London: Wiedenfeld and Nicholson.

[5] Encyclopedia of management: http://www.referenceforbusiness.com/management/Mar-No/Models-and-Modeling.html

[6] Austrian Ministry for Science, Research and Economy: Universities Act 2002*: **§ 11**. „Starting in 2005, the Federal Minister shall submit to the National Council at the minimum every three years a report on the universities' previous development and future strategy based on **the universities' intellectual capital reports**. Such ministerial reports shall contain, inter alia, a discussion of the advancement of junior academics, developments with regard to universities' staffing, and the situation of students“ .*-> https://static.uni-graz.at/fileadmin/Akgl/ENGLISCH/UG_EN_2016.pdf

[7] INCAS - Intellectual Capital for Europe: http://www.psych.lse.ac.uk/incas/

[8] G. Koch, K.-H. Leitner, M. Bornemann: Measuring and reporting intangible assets and results in a European Contract Research Organization. Joint German-OECD Conference Benchmarking Industry-Science Relationships, October 16 – 17, 2000, Berlin, Germany

[9] United Nations: Sustainable development Goals – 17 Goals to Transform Our World. https://www.un.org/sustainabledevelopment/sustainable-development-goals/

[10] Christian Felber: Change Everything - Creating an Economy for the Common Good. (Translated by Susan Nurmi). ZED Books Ltd., London, 2015.

[11] The Common Good Balance Sheet – version 5.0 – see https://www.ecogood.org/en/common-good-balance-sheet/common-good-matrix/

[12] IFRS Foundation and the International Accounting Standards Board (IASB)International: Financial Reporting Standards, in short called IFRS. (IFRS are standards issued by the to provide a common global language for business affairs so that company accounts are comparable across international boundaries).

[13] Thomas Piketty: Capital in the Twenty First Century. Harvard Business Press, 2013

[14] Forschungsverein Gemeinwohlökonomie. https://www.ecogood.org/de/forschungsverein/

[15] Kate Raworhth: Doughnut Economics . Seven Ways to Think Like a 21st-Century Economist See Random House Publisher, 2017 - see https://www.penguin.co.uk/books/1107761/doughnut-economics/#c4pQlJOXsyqu8bGs.99.

[16] Daniela von Pfuhlstein (Blogpost): Vergleichende Übersicht: Donut-Ökonomie versus Gemeinwohl Ökonomie. https://www.ecogood.org/de/metanavigation-top/blog/vergleichende-ubersicht-donut-okonomie-gemeinwohl-okonomie/

[17] O'Neill, D.W., Fanning, A.L., Lamb, W.F., and Steinberger, J.K. (2018). A good life for all within planetary boundaries. *Nature Sustainability* 1, 88-95. doi: 10.1038/s41893-018-0021-4.

Doughnut analysis for countries: https://goodlife.leeds.ac.uk/countries/ @ University of Leeds / Leeds Social Sciences Institute / http://sustainability.leeds.ac.uk/

[18] (EESC) Carlos Trias Pintó (Rapporteur), Stefano Plamieri (Co-Rapporteur): Economy fort he Common Good. European Economic and Social Committee. (EESC). Reference: ECO/378-EESC-2015-02060-00-00-ac-tra

[19] European Commission: Guidelines on Non-Financial Reporting - https://ec.europa.eu/info/publications/170626-non-financial-reporting-guidelines_en

[20] Global Reporting Initiative - see https://en.wikipedia.org/wiki/Global_Reporting_Initiative or WICI Intangibles Reporting Framework – see http://www.wici-global.com/wirf/WICI_Intangibles_Reporting_Framework_v1.0.pdf

16 Knowledge-Exchange between Universities and Business World

Johann GÜNTHER
Jianghan University, Wuhan, China; State University for Telecommunications, St. Petersburg, Russia; Danube University, Krems, Austria

16.1 Introduction

In the middle ages the only education institutes were in hand of the church. Monasteries, mosques and churches had a monopoly in educating young people. Craft training was based on the master apprentice principle. Branches were responsible for the education of their offspring. Mobility is supported by the state to show young people the way into our global world. Since universities are concerned exclusively with the past and with intellectual subjects until the 18th century, today vocational subjects are becoming current again and governments are promoting the cooperation between business and higher education.
New types of universities emerged in the form of Universities of Applied Sciences.

Keywords: Higher Education; employability, mobility

16.2 Trends in Education Systems

Universities were originally elite and only available to a selected clientele. In Europe the monasteries were exclusively responsible for training. Vocational training was completed by training on the job. Knowledge has been passed on to the next generation by the respective professional group. The learner's gained international experience by working in different countries.
Universities were confined to spiritual science and theology. Up to the eighteenth century their education was only related to the past. This university education was useless for the economy. Many professors in the 20th and 21st century wanted to have nothing to do with an economic contact. It was not state of the art.
The economic representatives began their influence over the education system with the creation of technical colleges and middle schools. An education in secondary education. Only later were they upgraded to "Higher Education".
Medicine or veterinary medicine were recognized as academic training only at the beginning of the 20th century. Veterinary medicine was accepted before the human medicine. Similar technical education emerged into technical colleges or universities in the transition from the 19th to the 20th century. They were converted from technical schools.
Economics and science have been separate paths for centuries. An approach came into existence only in the second half of the 20th century and the process is still ongoing.
This cooperation is an enrichment for many professions, an obstacle for others. The economy would like to have university graduates, who are fully trained specialists. Universities see themselves as universal trainers with a long-term effect. For the economy, a short-term horizon with detailed expertise is the ideal. Nowadays we have more people, who can read and write. Especially in the last 200 years the proportion has nearly swapped. „Literacy is a key skill and a key measure of a population’s education. In this entry we discuss historical trends, as well as recent developments in literacy. From a historical perspective, literacy levels for the world population have risen drastically in the last couple of centuries. While only 12% of the people in the world could read and write in 1820, today the share has reversed: only 17% of the world population remains illiterate“ [93]

[93] ROSER, Max; ORTIZ-OSPINA, Esteban: „Literacy“, at https://ourworldindata.org/literacy

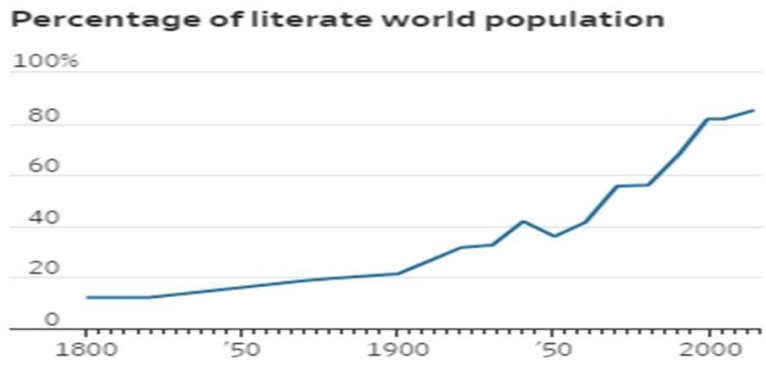


Figure 1: *Percentage of literate world population*
Source: Calculated based on figures from www.ourworldindata.org

The latest data from CIA Facebook is from the year 2011 and shows literacy rate for the entire population by country:

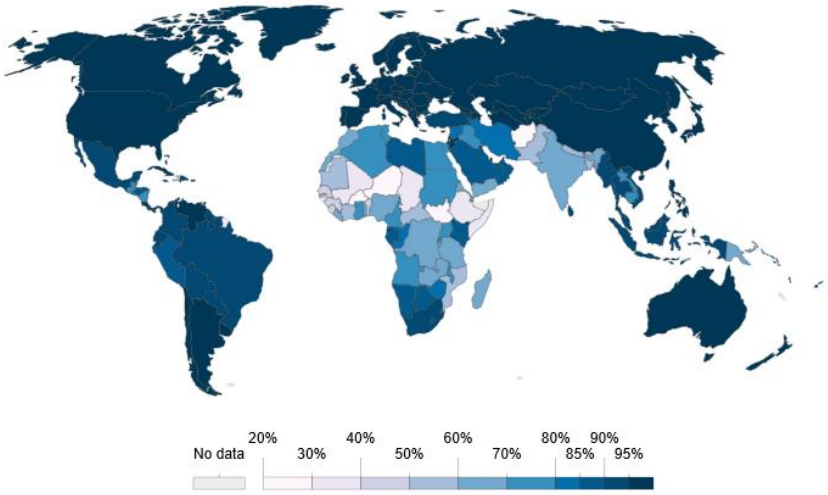


Figure 2: *Source: CIA Factbook (2016), https://ourworldindata.org/literacy*

Our world has been global in recent decades. Everywhere in the world the behavior is similar. The global economy sets standards that are the same everywhere.
The education system was also adopted. In the liberalism of our time, the economy and economic thinking prevail. Ministers of Education have shaped the concept of employability and want to educate young people that they can be used immediately and without additional training in economic positions. Universities are no longer just the big and free thinkers. They were partly deprived of their freedom and are measured at the output. Their graduates must be able to be quickly transferred to the labor market.
Labor ministries issue statistics that show even from which university and which college as many graduates are registered as unemployed. A hit parade of employability arose. First priority was not the mediated knowledge. The important became the employability of young people as workers.
Companies are getting more and more jobs. This means that students must be prepared for a future independence. There will be less and fewer employees and more entrepreneurs.
Universities are becoming increasingly international and virtual. Cooperations offer opportunities for international studies, as they have never existed before. Competition for educational institutions is no longer in the neighborhood, but worldwide. Indian students enroll in the US and Russians in England.

16.3 International Compatibility of Education Sytems

In Europe it was the European Union that initiated a rethinking process in the tertiary education system.
"As a Bologna process, a transnational university reform aimed at the creation of a single European Higher Education Area is aimed at harmonizing European courses and diplomas as well as for international students' mobility across Europe. The term refers to a politico-programmatic declaration signed in Bologna by 29 European ministers of education in Bologna in 1999."[94] From the original 29 countries that signed this agreement.
In April 2009, the responsible ministers of education decided in a conference in Leuven to address further issues, one of which is employability.

16.4 Employability

Employability is intended to increase the employment opportunities of the graduates through a teaching in the sense of professional relevance and to provide the economy with short-term specialist staff. The employability of university graduates is one of the major objectives of the Bologna process and has already been defined as an objective in the Bologna Declaration 1999: "(...) a clear common goal: to create a European space for higher education employability and mobility of citizens and to increase the international competitiveness of European higher education."[95] "What is the target of universities? Students want a good job at the end of their studies, professors want and must research. Universities get money for their students, but they receive their reputation through research. Research is also important to employers, but more important to them are creative personalities. And politicians want everything at the same time: excellence in research as well as in teaching and further education". The bachelor's degree has brought an approach between university and business. The academic career is initiated with the doctorate degree. Bachelor's and Master's are more business oriented.
In Germany acquired 2014
• 50% a Bachelor's,
• 21% a master degree and only
• 6% doctorate.
• The rest were still "old" diplomas.

16.5 Research and Teaching

In many countries, research and teaching have been separated. In the former Yugoslavia universities and colleges were exclusively teaching institutions. Research was located in separate research institutes. Research was frowned upon at universities. They concentrated on teaching and training. The doctrine was very far from practical content.
The advantages were a specialization. The good educators (?) were at the higher education and scientists and researchers in research institutions.
This system was the furthest from the Bologna Agreement and it is likely that at least one generation will need to implement it in Bologna. In principle we must differentiate between
• "Research" and
• "Development".
While research is long-term and successes become visible at a later stage, short-term success in the form of products is necessary in development.
In the tertiary education system a division has crystallized out here:

[94] https://de.wikipedia.org/wiki/Bologna-Prozess, February 20th 2018
[95] Wilfried Schubarth: Beschäftigungsfähigkeit als Bildungsziel an Hochschulen, 2015, https://www.hrk-nexus.de/aktuelles/news/detailansicht/meldung/aufsatz-beschaeftigungsfaehigkeit-als-ein-wesentliches-merkmal-der-lehr-und-studienqualitaet-3695/, January 30th 2018

- traditional universities focus on research, and
- Universities of Applied Sciences on Development.

The focus on economic cooperation in universities of applied sciences is greater than in universities.

16.6 Different Types of Universities

16.6.1 Marketdriven Training: Universities of Applied Sciences

In the mid-nineties, new Higher Education Institutions were created in Europe: Universities of Applied Sciences. They had a stronger focus on market-oriented education than traditional universities.

The legislation made a clear division:

- Universities should focus on research and teaching.
- Universities of Applied Schiences should focus on business-oriented teaching and development. Experts from the business world were increasingly used as teachers.

Universities of Applied Sciences reflect what the industry needs. The market capitalisation has changed. In the last 10 years the biggest companies had a big change. The 5 biggest organisations are in digital business. „The oil barons have been replaced by the whiz kids of Silicon Valley“[96]

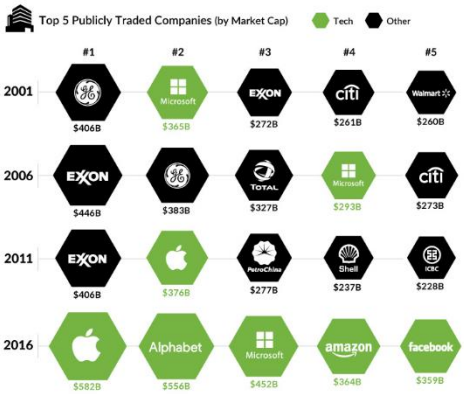


Figure 3: *Source: „The largest companies by market CAP“, www.visualcapitalist.com, http://www.visualcapitalist.com/chart-largest-companies-market-cap-15-years/*

16.6.2 Special Universities

After the introduction of the Bachalor study, some existing educational institutions were transformed into higher education institutions. This happend in:

- health care (physiotherapy, training of midwives, etc),
- social work,
- military and police academies,
- teacher training institutions and others.

16.6.3 Private Universities

In the mid-1990s the first private universities were established in Europe. They were financed by private persons or by public institutions. The national states have created their own regulations for these institutions. Accreditation agencies and quality agencies are two bodies that gave governments control over this new tertiary education system.

[96] DESJARDINS, Jeff: „The Largest Companies by Market Cap Over 15 Years“, 2016 http://www.visualcapitalist.com/chart-largest-companies-market-cap-15-years/

16.7 Employability Requirements

Some countries have very specific requirements to give the graduate high professional qualifications.
On the one hand, this is caused by restrictions on admission, and on the other hand, by regulating the offer of studies.
Universities of Applied Sciences have to prove the chances of future graduates in the labor market in order to get a license - an authorization - to carry out a certain study subject.
Continuous reports show how many graduates received a job after graduation and how many are unemployed. An important decision-making criterion for those who will start their studies.

For traditional institutions, changes are more difficult to implement than for new institutions. The already mentioned Universities of Applied Sciences are an example of this. But also countries that have a strong need to catch up can more easily implement these new requirements because they do not have to pay attention to any past systems.

16.8 Output Orientation

Closer cooperation between business and the tertiary education system leads to the adoption of economic parameters in universities. One of these is output orientation. The economy is increasingly moving from input orientation to output orientation.

The work performance was measured in time. Workers are paid for their attendance time and not for production. Output-oriented payment means that only the performance that has been provided is paid. Work orders are defined in a target definition and in which time unit this goal is reached is no longer relevant for payment. People who work faster are better paid than slow ones. In the knowledge management sector, smart workers are better paid. Their time effort to meet a particular goal, a defined task, is shorter. There is a similar change in the education system. Teaching performance has been and is defined in semester weeks and in teaching units. The hours which a lecturer will "read" are measured. In Europe, the measurement unit is converted to ECTS - European Transfer Points. They have the purpose not only of the fact that teaching is recognized internationally and that students can also take their acquired lectures to other countries and universities, but that lectures are no longer defined in lecture units but in learning units. An ECT point expresses the amount of time an average student has to spend on acquiring a particular teaching unit. This includes the presence time in a seminar room and the time of the study and the repetition of the teaching material. Four ECTS credits can consist of a one-hour lecture, for which three hours have to be learned. It can also be a four-hour lecture, which does not require any repetition.
Only with the ECTS points can e-learning and distance learning be evaluated. In the field of distance learning, there may be ECTS credits without attendance hours.

16.9 Conclusion - Future from the Perspective of Students

For this question, I used my students from the master program "Research and Innovation in Higher Education" at Danube University[97]. Every year a cohort of 19 Students from 14 different countries (Bangladesh, China, Ethiopia, Germany, Indonesia, Korea, Mexico, Moldavia, Russia, Serbia, Turkey, UK, US, Vietnam) starts. They are very high-level-students due to the fact that they were selected out of 400 applications. We can use their answers for the question "How young people see the future of education?". First of all, they categorize education institutes in 3 types:

[97] https://www.donau-uni.ac.at/de/studium/marihe/index.php October 3th 2017

1. traditional state-run institutions,
2. private institutions (both local and foreign institutions) and
3. joint-nation institutions.

Maybe some of their future perspectives are wishes for themselves because they are closer to the future. They will be affected more by the next years than older people like teachers or experts.

They envisage more practical application in education rather than theory. Practical experience will have an impact on theory.

Basically education institutions are more like market-orientated companies, they will compete more with each other to get more students, more funds and more academic fruits.

There will be an increasing number of education institutes and fewer students worldwide.

Technology will be the top priority of education. Every institution will specialize in certain areas.

The role of governments will change. Government will no longer favor only state-run schools.

There will be an increasing competition. The governments will give more autonomy to public schools and they will no longer favor only state-run institutions. Schools will be allowed to have more business cooperation.

Students today envisage professional managers for management positions, such as rectors, deans, etc. Professional managers will have an academic background or outsiders will come from firms. Private funding will play a more active role.

University education is becoming increasingly global and international. A competition is emerging from the three regions of America, Europe and the Far East.

16.10 References

CIA Factbook (2016), https://ourworldindata.org/literacy

DESJARDINS, Jeff: „The Largest Companies by Market Cap Over 15 Years“, 2016 http://www.visualcapitalist.com/chart-largest-companies-market-cap-15-years/

NN: „Bologna Process“, https://de.wikipedia.org/wiki/Bologna-Prozess, Febr. 20 2018

NN: „Percentage of literate world population“, www.ourworldindata.org

SCHUBARTH, Wilfried: „Beschäftigungsfähigkeit als Bildungsziel an Hochschulen, 2015“, https://www.hrk-nexus.de/aktuelles/news/detailansicht/meldung/aufsatz-beschaeftigungsfaehigkeit-als-ein-wesentliches-merkmal-der-lehr-und-studienqualitaet-3695/, January 30th 2018

17 Putting Knowledge into Music Tourism: The Role of Information Services in Local Culture Promotion

Charilaos LAVRANOS
Ionian University, Corfu, Greece

17.1 Abstract

Information forms the base of society and economy. In that respect, information and communication technologies (ICTs) and practices play an important role in individuals' decision-making. Moreover, information and information dissemination is important for recording the experiences as well as for the understanding and sharing cultural phenomena. Therefore, novel information systems and services have been developed aiming at information dissemination into various domains of human activities, including music tourism. This paper focuses on the presentation of the role of information services in local culture promotion, which has a direct impact on the way that individuals and music tourists, in particular, handle and utilize information within their decision-making process. The results of this review would be of interest in terms of better understanding the importance of putting knowledge into music tourism in relation to local culture promotion through information services. The significance and originality of the current study reside in exploring facets of information to music tourism interrelations.

Keywords: knowledge, information, information services, music tourism, culture

17.2 Introduction

Nowadays, there has been a rapid development of information and communication technologies (ICTs) in various fields of human activity, including library sector as information service provider [see 1]. The technological evolution of the digital age has come to libraries by affecting and improving the information services provided by them to the society [see 2]. Libraries constitute "treasuries" of knowledge, preserving the cultural heritage and trying to satisfy the needs and expectations of the users through their information services [see 3]. Their role, running by digital technology, is based on knowledge intensification and has been one of the key factors in the information dissemination; while at the same time influence social and local economic development, providing services in order to improve several fields of human activity including public health, entrepreneurship, as well as for the support of regional tourism [see 4]. The development of ICTs has changed not only the nature of the library services, but also the expectations of their community users [see 1]. The demand for traditional library information services is decreased and modern services and information channels are more and more appraised [see 4]. Therefore, online library services are commonly available and the use of information technology in a diverse region of human activity, including tourism, is ordinary. In particular, the development of advanced communication tools (e.g., social media, mobile applications) changes the role of library information services as the potential visitors want to use the online services which are most convenient for them [see 5].

Information seeking and research is considered as crucial to tourists' choices about issues before, during and after their visit to a tourist destination [see 5]. The impact of ICTs is significant on several tourism aspects, consisting of information seeking and searching processes as well as consumption patterns, to tourism experiences and their preparations [see 6]. Furthermore, the Internet development, the computer use expansion, as well as the increased information literacy skills of the users, have helped tourists reach higher levels of

access to information and trip organization [see 7]. The implementation of ICTs in tourism, offers to tourists the opportunity to get access to a large amount of information about destinations, accommodation, transportation, and tourist attractions at a worldwide level [see 6]. For that reason, efforts taken to carry out library services through technologies in tourism promotion may give a greater recognition of specific tourism aspects and other several issues [see 8]. Therefore, Libraries need to adapt to the exploitation of new information technologies providing access to information services for the purpose of the creative expression of local communities as reliable and convenient service providers.
This paper, aims to study the role of libraries and their information services in local culture promotion, focusing on the information facet of music tourism. It offers an insight into typical tasks and the corresponding support functions commonly offered by existing library information services on tourism, and especially on music tourism. The main contribution of the paper proposes a novel research framework with implications for further research both within the contexts of library information technologies and services, as a means of focusing on local culture promotion for tourism purposes. The remainder of the paper is structured as follows: Section 1.3 provides the required background knowledge; Section 1.4 provides a review of the role of library services and technologies in music tourism; while Section 1.5 summarizes the conclusions and further research issues.

17.3 Background knowledge

Tourism is an interdisciplinary, economic and social phenomenon, directly linked to search and access to information services in order to meet the information needs of visitors related to vacations away from their place of residence [see 5]. Information research refers to an interdisciplinary field that has emerged from the need to manage and organize information itself [see 9]. It constitutes an integral part of everyday life of people, influencing through the transmission of ideas and feelings the way they think, feel, express and create [see 10]. Furthermore, information is provided through a variety of activities, processes, systems and services that are directly related to technological development [see 11]. Access to information is of particular importance as it contributes to the cognitive, intellectual, emotional, and cultural development of society contributing to expression and creativity [see 12].
On the other hand, music is a unique experience of cultural and creative expression. The different types of music information constitute products of human culture, connected with the historical, social and geographical context in which they exist [see 12]. Nowadays, music information is a benchmark in the everyday life of people, a source of artistic expression and pleasure of the society, but also a cultural product which is transferred through formal and informal pathways of information technologies [see 13]. At the same time, people travel all over the world with the aim of approaching and locating music in the context of music tourism consciously as festival participants, supporters of a musical genre, as pilgrims, etc. It has been established in the minds of people the idea of music tourism, which travel to different destinations of the world to attend touring artists, to take part in music festivals and get to know the music cultural heritage of each destination [see 14]. In this case, music is entering into the consciousness of tourists as a welcome accompaniment to the experience of a travel destination [see 14].
Music information provides an important and at the same time touching narration for tourists, as an expression of culture, a form of heritage, a sign of the destination, and an indicator of moments. This leads people to know the musical culture and to reach musical creativity of other destinations as it constitutes also a cultural and social event [see 15]. Therefore, music tourism is the means of cultural acquisition or transmission; while acquired music information is transformed into a personal knowledge of world culture through information organizations. Music tourism is a phenomenon associated with the modernization of society. Furthermore, constitutes an important part of the creative industry, shaping a commercial interaction between the producer, performer, and consumer of the musical product [see 16]. Indicatively, it is mentioned that according to UK Music “Wish You Where Here” reports, 9.5 million music tourists attended music events in the UK in 2014 as well as 10.4 million music tourists in 2015.

The total number of music tourists from the UK and overseas increased by 20% in 2016 to 12.5 million, of which 11.6 million were UK citizens visiting live music events in other parts of the UK, having, among other things, a huge contribution to the UK economy [see 17].
At the same time, information organizations such as libraries constitute organized sociocultural institutions aiming at the provision of information services to their community in order to meet their informational, educational, as well as leisure needs. Libraries may be divided according to their character, ownership, topic and territorial range, playing a vital social, cultural, educational and economic role in the everyday life of all of their community members [see 18]. From a tourism point of view, libraries may be visited with the purpose of searching their collections (manuscripts, books, maps), using their information services, for architecture and interiors reasons or meeting their exhibitions and cultural events [see P19]. In that framework, libraries may be very interesting cultural institutions for tourists and stimulate the development of a tourism space.

17.4 Review of the role of libraries in music tourism

In the context of music tourism, music is considered as a part of cultural tourism development linking with everyday life aspects, geographic area and society [see 14]. Music information and tourism are in terms of their basic characteristics two fields of the modern civilization, affecting positively the social development. There are several ways of viewing music tourism within the information involvement: a) from a cultural point of view as a promotion of cultural goods, b) from an educational point of view as an exploration of national and local musical values, c) from a marketing point of view as the managing of musical culture, d) from an economic point of view as a product with musical and economic value and e) from an organizational point of view as the interaction between two sectors merging with a view to forming a common product [see 16]. Observing the role of libraries in tourism, the need for information or other content which is mediated by library information services is connected with most of the above-mentioned issues, supporting the society with the encouragement and improvement of creativity and intellectual freedoms [see 20]. According to Miedzińska [see 19], the usual motives for tourist visits to libraries are the aesthetic experience, educational reasons, meeting history and books, interest in architecture and art, as well as interest in a given area.
Libraries, as cultural institutions, constitute an important factor for the development of music tourism. The role of libraries in music tourism has to do with the information provision to tourists on a destination before, during and after their visit; while working together with other organizations, institutions and authorities for promoting a place. Before a visit, libraries inform music tourists about their destination choices, the music culture of a region in order to promote music tourism attractions, cultural events, the music information material they hold, as well as their information services (related to technical equipment) and capabilities. During a visit, libraries relate primarily to informational support meeting the information needs of specific user groups, such as music tourists. Furthermore, libraries that have the advantage of possessing unique collections (such as music collections) are likely to organize permanent and temporary exhibitions or cultural events open to visitors which are often of interest to tourists. By digitizing their collections, including music information material from cultural events that have taken place, libraries enable a direct online access to their material. Furthermore, with the digitization of cultural heritage and the Internet use libraries provide information that takes an active part in the presentation of specific aspects to music tourists after their visit, contributing to the cultural institution's provision and attracting more potential visitors [see 20]. In this way, libraries become a significant factor for tourism development based on knowledge dissemination managed by digital technology.
There are several roles of libraries' involvement in music tourism. Libraries as information providers relate primarily to knowledge support meeting the information needs of music tourists. Also, libraries support the educational context, providing access to the stored knowledge and promoting general and information literacy skills (the skills to use information technologies and their applications to access information [see P20]) of local users as well as music tourists. Libraries' cultural function in music tourism refers to the fact that there is an

intercultural interaction between music, tourists and locals, promoting awareness of local cultural identity as well as the global cultural achievements. Furthermore, libraries may be a music tourism destination as historically valuable monuments and as a point of music tourist routes [see 21] in collaboration with other similar institutions or tour operators. Therefore, libraries' function and music tourism constitute parts of activities based on the cultural identity of the society presenting opportunities in the context of knowledge promotion such us to: a) promote and preserve local culture as expressed through the existing musical culture, b) provide digital material to the demand for the valorization of musical culture, c) promote inter-culturalism through the organization of cultural and educational activities and d) organise joint actions that will allow the exchange of experiences between music tourists and locals.

17.5 Conclusions

In recent years, aspects of information and information dissemination are presented more and more in a variety of tourism areas, including music tourism, as a result of research and analysis of tourism interests. In conclusion, this paper presented the role of libraries and their services in music tourism and local culture promotion. The research discussed that libraries through information technologies and services may be a significant factor in the provision of tourism information and music tourism development, as a use of libraries for tourism purposes may positively affect tourism attitudes. The outcomes of this brief review would be of interest in terms of better understanding the important role of the libraries in tourism information provision, putting knowledge into music tourism in relation to local culture promotion. Furthermore, the present conceptual study provides foundations for further discourse and research on topics related to library information services and technologies for tourism, and in particular music tourism. Certainly, an empirical evidence, as well as qualitative and quantitative research, is required for a further exploration of the relationship between libraries and their information services and tourism industry, and their interaction with information dissemination in music tourism.

17.6 References

[1] Lori Bowen Ayre, "The Impact of Information Technology on Public Libraries", *Public Library Quarterly, Vol. 35, No. 4, December 2016*

[2] Neelam Prasad, "Synergizing the collections of libraries archives and museums for better user services", *IFLA Journal, Vol. 37, No. 3, October 2011*

[3] Violeta Tosic, Sanja Lazarevic, "The role of libraries in the development of cultural tourism with special emphasis to the Bibliotheca Alexandria in Egypt", *UTMS Journal of Economics, Vol. 1, No. 2, December 2010*

[4] Petros A. Kostagiolas, Christina Banou, Evangelia-Maria Laskari, "Strategic planning and management for the public libraries: The case of Greek central public libraries", *Library Management, Vol. 30, No. 4/5, May 2009*

[5] John Fotis, Dimitrios Buhalis, Nicos Rossides, "Social Media Use and Impact during the Holiday Travel Planning Process", *Information and Communication Technologies in Tourism*, 2012

[6] Dimitrios Buhalis, "Information Technology as a Strategic Tool for Economic, Social, Cultural and Environmental Benefits Enhancement of Tourism at Destination Regions", *Progress in Tourism and Hospitality Research, Vol. 3, No. 1, March 1997*

[7] Jens Kr. Steen Jacobsen, Ana María Munar, "Tourist information search and destination choice in a digital age", *Tourism Management Perspectives, Vol. 1, January 2012*

[8] Aneta Pawłowska, Łukasz Matoga, Elżbieta Stach, “The Use of Information and Communication Technologies (ICTs) in Tourist Information and Promotion of the Polish Carpathians in Foreign Tourism Markets”, *Journal of Travel & Tourism Marketing, Vol. 32, No. 5, August 2015*

[9] Thomas D. Wilson, “Information behaviour: an interdisciplinary perspective”, *Information Processing & Management, Vol. 33, No. 4, July 1997*

[10] Reijo Savolainen, “Everyday life information seeking: Approaching information seeking in the context of ‘way of life’”, *Library & Information Science Research, Vol. 17, No. 3, Summer 1995*

[11] Donald O. Case, “Looking for information: A survey of research on information seeking, needs and behavior”, Bingley: Emerald Group Publishing, 2012

[12] Charilaos Lavranos, Petros A. Kostagiolas, Konstantina Martzoukou, Joseph Papadatos, “Music information seeking behaviour as motivator for musical creativity: Conceptual analysis and literature review”, *Journal of Documentation, Vol. 71, No. 5, September 2015*

[13] Charilaos Lavranos, Petros A. Kostagiolas, Nikolaos Korfiatis, Joseph Papadatos, “Information seeking for musical creativity: A systematic literature review”, *Journal of the Association for Information Science and Technology, Vol. 67, No. 9, August 2016*

[14] Brett Lashua, Karl Spracklen, Phil Long, “Introduction to the special issue: Music and Tourism”, *Tourist Studies, Vol. 14, No. 1, March 2014*

[15] Chris Gibson, John Connell, “Music, Tourism and the Transformation of Memphis”, *Tourism Geographies, Vol. 9, No. 2, April 2007*

[16] Chris Gibson, John Connell, “‘Bongo Fury’: tourism, music and cultural economy at Byron Bay, Australia”, *Tijdschrift voor economische en sociale geografie, Vol. 94, No. 2, May 2003*

[17] UK Music, “Research & Reports - UK Music”, 2017

[18] Petros A. Kostagiolas, Charilaos Lavranos, Konstantina Martzoukou, Joseph Papadatos, “Keeping the score: Outreach services and collaboration for academic music libraries in financially straitened times”, *Library Management, Vol 36, No. 6/7, June 2015*

[19] Magdalena Miedzińska, Sławoj Tanaś “The tourism attractiveness of Polish libraries”, *Tourism, Vol. 19, No. 1-2, July 2009*

[20] David Bawden, “Information and digital literacies: A review of concepts”, *Journal of Documentation, Vol. 57, No. 2, March 2001*

[21] Ksenija Tokić, “Content Analysis of the Croatian Tourism Library Websites in Relation to the Information Literacy”, ECIL, 2014

18 Society-Culture-Sports: The Contribution of Social and Cultural History of Sports

Akis PAVLOGIANNIS
Ionian University, Corfu, Greece

George PAVLOGIANNIS
Physical Education and Sports Science, Aristotle University, Thessaloniki, Greece

18.1 Abstract

The institutional and social changes that have caused the widespread acceptance of the importance of the phenomenon of sports and exercise and the expansion of the subjects and disciplines of history science have led to the emergence of scientific and research fields. Systematization of the social and cultural history of sports, with extension to the culture of human body, health, diet and entertainment, is an innovating process with obvious value and utility, mainly because it allows the approach of sports beyond the stereotypical opinion of the humble physical activities and their research as social process through which cultural significant data are produced. The development research and laboratory infrastructures around the history and management of athletic culture contributes to the emergence of new scientists who will focus on the specific topics of athletic events and at the same time they will manage interdisciplinary the cultural environment of sports and they will examine their interactions in the different levels of social, educational and scientific use.

18.2 Introduction

Sports topics are very essential, for the simple and obvious reason that they engage with, in a lot of different ways, a large majority of citizens. This large and multifaceted occupation with sports is now gaining a great deal of interest for many different reasons, mainly because it seems not to depend on separate criteria of social classes, descent and gender, without of course implying the autonomy of sport. Such an activity (sports), which is supposed to be a phenomenon, refers to social issues and reflects cultural practices. It is also linked to "information" both in the context of the formation of the world of sports and in the development of the various parameters and activities of sports. It seems that there is a problem at this point of interest in the organization and dissemination of “information”, because there is a contradiction of the poor influence of representatives of the social sciences on such a popular activity, such as sports. The inclusion of athletic and physical activities in the context of research into social and cultural history and their approach through modern tools of historical research may favorably influence the formation and development of sport information and, by extension, the management of the evidence and the effects of athletic and physical culture.[98]

[98] The topic of research about the appearance and functioning of gymnastics and sports in the methodological framework of social and cultural history, with the basic prerequisite of liberation from the ideals and stereotypes of the past, was introduced into the domestic dialogue on the historical interpretation of sports and physical activities by Christina Koulouri at the end of the 20th century. At the same time, she had greatly expanded the bibliographic approach of gymnastics and sport in the fields of intersection of social and historical sciences: Koulouri, C. (1997). Sports and aspects of urban sociability. Gymnastic and sports clubs 1870-1922. Athens: Historical Archive of Greek Youth, General Secretariat for New Generation, Center for Modern Greek Studies [in Greek]. In the international research environment the starting point for a "new" sports story: Chartier R. & Vigarrelo, R. [1982]. Les trajetoires du sport, Pratiques et spectacle. Le Debat 19.

The view of sports and of practices and behaviors as well, that are developed around them, must become a substantive discussion in the research fields of cultural history not only on a theoretical level but also in relation to the level and manner of their implementation in the function of sports organizations. This development of the redefinition of sports through social and cultural sciences, will further influence the constitution of "information" and the "informing" process that is focused on sports practices and expectations.[99] It will reconstruct the “building” of information that at this time is loose and controlled by others. It will reconstitute the content of information that remains committed to a narrow and directed perception of athletic expectations[100]. The widening of the concept of “success” from its closed utilitarian dimension to the open social and cultural fields[101] (modern demands of the quality management of citizens' time[102]) passes through the research of history and culture. Necessary factor in order to co-modulate the information process through the theorization of the influences and practices of sports that is dealt with social and historical interpretation is to release them from any form of reduction, especially economic, which makes athletic and physical activities to look like other social phenomena and thus makes their transformation into an independent research object with remarkable social significance and impact more difficult[103].

The main concerns about the scientific subject of Sports History are briefly contained in indicative views of representatives of the social sciences[104]. Polley wonders “if sports history exists” and “who are considered as historians of sports”[105], Weber notes that PhD theses (doctoral theses) are needed to explain the absence of sports theory in the scientific community[106] and Elias wonders about what kind of society is the one that more and more people are in to these competitions which are named as sports[107]. A common component of these phrases is the indifference by the world of intellect on the world of sports, something that has decisively influenced the historical and sociological research in this field. Through the absence of strong scientific structures, sports have incorporated the terms of "diachronicity"

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[99] Expressions of these concerns are put in the study: Bourdieu, P. [1980]. Comment peut-on etre sportif. in P. Bourdieu, Questions de sociologie. Paris: Minuit. Very interesting for the relationship of sport and social reality, despite its critical views, it remains the theory of the "process of culture and sports" introduced by Elias and Dunning to express the use of modern sports as mechanisms of peace in society and self-control behavior: Elias, N. & Dunning, E. [1998]. Quest for excitement - Sport and leisure in the civilizing progress [eds] P. Kyprianos. Athens: Δρομέας / Dromeas [in Greek].

[100] For such a case: Pavlogiannis, O. [2018]. From information management to the formation of the athleteic consciousness of the child. In Canellopoulou - Boti, M. [eds]. “Information and Child. Searches of History, Law, Ethics, Culture". Proceedings of the Conference [Corfu, 28-29 / 4/2017]. Ionian University. Athens: Οσελότος / Oselotos: 528 - 539.

[101] Ordine, N. [2013]. The usefulness of the waste. Manifesto with an essay by Abraham Flexner. Athens: Άγρα / Agra [in Greek] .

[102] The issue of new perceptions and optics in the management of citizens' time is a "separate chapter" in the sociological and historical approach of sport and exercise. Indicatively: Horne, J, Jary, D.D., Tomlison, A. [1987]. Sport, leisure and social relations. London, Dunning, E. & Rojek, C. eds [1992]. Sport and leisure in the civilization process. Critique and counter-critique. London: Macmillan, Jarvie, G. & Maguire, J. [1994]. Sport and Leisure in Social Thinking. London and New York: Routledge. In Greek-language literature : Elias, N. & Dunning, E. [1998], Koronaiou, A. eds [1996]. Sociology of leisure time. Athens: Νήσος / Nisos [in Greek], Myrizakis, G.G. [1997]. Free time for young people. Recreational and athletic activities. Athens: EKKE [in Greek] .

[103] See Elias, N. & Dunning, E. [1998]: 169-196. For this view of sports on the basis of political and economic practices see “The Tough War of Sports” (1997, October). Tributes Le Monde Diplomatique. Athens: Publications Δρομέας / Dromeas [in Greek].

[104] Hobsbawm, E. [1987]. The Age of Empire 1870 - 1914. London: Weidenfeld & Nicolson: 179-183. More recently: Hill, J., 2003, "Introduction: Sport and Politics". Journal of Contemporary History, 38/3: 355-361.

[105] Polley, M. [2007]. Sports History: A Practical Guide. Basingstoke: Palgrave

[106] Weber, E. [1971]. Gymnastics and sports in fin-de-Siecle France: Opium of the classes?. American Historical Review 76: 70.

[107] Elias, N. [1997]. The evolution of culture. Sociogenic and psychogenic investigations. [Über den Prozeß der Zivilisation: Soziogenetische und psycogenetische untersuchungen: Wandlungen des Verhaltens in den weltlichen Oberschichten des Abendlandes], vol. A-B. Athens: Νεφέλη / Nefeli: 19 [in Greek].

and "ecumenicity" and they also have created the myth of their autonomous functioning beyond time, cultural system, social and political conditions[108]. In the Greek case the removal of the historical time endorsed the integration of sports into the Greek narrative of cohesion and the formation of national memory, national identity and historical consciousness[109].
However, in recent years the developments in the field of human sciences have promoted the research of sports as a creation of western European modernity[110]. As a result, on the one hand, the changes of the institutions and the society that have led to the broad acceptance of the significance of the phenomenon of sport and exercise and on the other hand the widening of the topics and the development of the forms, methods and tools of the science of history led to the appearance of new scientific disciplines. In the documentation of the request are contained some specific reasons which will be briefly given below and which can be part of a wider discussion about the scientific fields in which the science of "History of Sport" can be developed and acted upon[111].

18.3 Social Sciences and Sports

At the level of sociological approach, History as a social science has recognized the field of social sciences as a fertile field of exploration and examination of key issues that provide theoretical and comparative advantages in historiographic optics[112]. In this way, sport is now a privileged scientific and research field of understanding of modern society, which is historically structured as a part of it. In the fields of sociological research of sports[113], apart from the indifference of the area of intelligence for sports and the limited interdisciplinary approach, the difficulties follow the myth of the widely accepted theories of diachronicity and universality, which in this case strengthened the problematic perception of autonomy of sport beyond social and cultural reality.
According to the modern sociological view, sports topics and practices are monitored and discussed as part of a cultural context that follows social transformations, class reclassifications, colonial and migratory policies, political differentiations, social conquests, economic models [114]. In a deeper and more detailed exploration, the structure of sport topics

[108] Zaimakis, I. & Fournaraki E. [2015]. Introduction. In Zaimakis, I. & Fournarakis E. [eds] Society and Sports in Greece Sociological, Historical and Anthropological Approaches. Athens: Αλεξάνδρεια / Alexandria: 9 – 21 [in Greek]. See Elias, N. & Dunning, E. [1998] : 19 - 38. For the mythological function of sports practices and the difficulties it has caused in social and historical analysis, for example: Hargreaves, J. eds, [1982]. Sport Culture Ideology. New York: Routledge, Vigarello, G. [2004]. From the game to the athletic show. The birth of a myth [Du jeu ancien au show sportif. La naissance d' un mythe]. [Eds] N. Dinopoulou. Athens: Αλεξάνδρεια / Alexandria [in Greek].
[109] Koulouri, C. [1997] : 24-28. Kitroeff, A. [2004]. Wrestling with the Ancients: Modern Greek Identity and the Olympics. New York: Athens Printing Company.
[110] The theory of the figuration of Elias and Dunning determines, not without objection and criticism, this new view of sports. In the Greek bibliography for this new view of sports and physical activities as modern inventions and for the "topics of views of domestic research and scientific procedures": Zaimakis, I. & Fournaraki E. eds, [2015]. Society and Sports in Greece Sociological, Historical and Anthropological Approaches. Athens: Αλεξάνδρεια / Alexandria [in Greek] .
[111] Koulouri, C. [2015]. The History of Greek Sports: Sports, Physical Education and Olympic Games. In Zaimakis, I. & Fournarakis E. [2015] : 57-122.
[112] For the first review in Greek bibliography of this interest of social scientists for game and sports: Koulouri, C. [1997]: 17 - 24. In addition to the work of Elias, & Dunning, [1998] and Bourdieu, [1980], which have already been mentioned, a special place in this thematic literature of social sciences is occupied by Huizinga, J. [1989]. Homo Ludens.. Athens: Γνώση / Gnosi [in Greek], Hargreaves, J. [1986]. Sport, Power and Culture: A social and historical analysis of popular sports in Britain. Cambridge.
[113] For this "close" relationship between sociology and sport: Dunning, E. [2004]. Sociology of sport in the balance: Critical reflections on recent and more sustainable trends. Sport in Society 7/1: 1-24 [2-3].
[114] For a comprehensive overview of the international sociological view of sport as a complex social phenomenon in the Greek literature: Zaimakis, G. [2015]. Theoretical trends and approaches in the sociology of sport. In Zaimakis, G. & Fournarakis, E.: 123-183.

(practical and theoretical) and their respective institutions is approached through different social sciences and new visions of developing the culture of sports, such as in relation to manhood patterns and gender inequalities, social peacemaking, behavior patterns the current economic systems and the cultural imperialism[115]. However, these new interdisciplinary paths are often inaccessible, because they because they impinge on powerful mentalities that some times reproduce images that at times raise at least reasonable concerns.

18.4 History and Sports

In a historiographic level, since the second half of the last century, and especially since 1970s, sports have gradually stopped being considered as humble physical activities and have begun to be explored in the process of culture as a social process. The main demand in this process of creating the identity the Sports History[116], is the gradual transition from the "historicism" of the phenomenological and linear character and the dominance of descriptiveness and empiricism to the social and cultural history that studies the sports in the context of social and historical changes[117]. The issue though, especially in Greece until the last decade of 20th century, is much more complicated. It is considered extremely necessary to manage two additional situations, one of which is mainly for intellectuals, professional historians and representatives of complementary sciences around History and the other for professionals in sports and physical education, for fans and journalists. In the first case, the deduction of historical time is confirmed through the integration of sport into the Greek narrative of continuity and cohesion, something that on the one hand was adapted to the historical need of forming national memory and identity but on the other hand encapsulated athletic historiography into the national one and allowed the production of anachronistic and dangerous narratives. In the second case, the rich historiographical production of sports has been limited to professionals and fans of gymnastics, remaining most of the times far from social and historical changes, and displaying research deficiencies in interdisciplinary issues, resource management and the use of new forms and tools of historical science[118].
In the field of social sciences, the aim is to transform the past into history through research-based information processing, which will involve mechanisms of discharging, distancing itself from events of idealization and demonization, and will extend to scientific areas ignored by the field of sports (such as local history, oral history, microhistory, etc.) using new research tools and parameters (such as memory, mediation, interview, practice, etc.)[119]. "History" is not

[115] The systematicisation of the study of sports in the international research environment in the fields of social sciences has contributed to the formation of a remarkable thematic literature. Indicatively: Jarvie, G. [2012]. Sport, culture and society. New York: Routledge, Pope, S.W. & Nauright, J. [2012]. Routledge companion to sports history. London: Routledge Mangan, J.A. [1998]. The games ethics and imperialism: Aspects of the diffusion of an ideal. London: Frank Cass Publisher, Brohm, J.M. [1992]. Political Sociology of Sport. Nancy: Press Universitaires Nancy, Messner, M.A. & Sabo, D.F. [1990]. Sport, men and gender order. Critical feminist perspectives. Human Kinetics Books.
[116] Due to the limits of this article, the term "sport" alternates with words like athletics, gymnastics, physical education, physical activities, sports practices. Schematically, it is useful to note that gymnastics and physical education are linked to pedagogical, health, physical well-being and military objectives, while sports and athletics , although their absolute identification is not effortless, refer to competitive shows, games, recreational and social activities. The meaning of “competitive” passes through gymnastics and sports. Subdivisions can be continued and distinguished according to the baseline. For example, "gymnastics" as an educational and social measure follows the German-Swiss or Swedish system accordingly.
[117] Iggers, G. [1999]. Historiography in the twentieth century. From scientific objectivity to the challenge of postmodernism. Athens: Νεφέλη / Nefeli [in Greek], Booth, D. [2005]. The field. Truth and fiction in sport history. London: Routledge.
[118] These issues are addressed in an outlook by Koulouri, C. [2015]: The History of Greek Sport. In Zaimakis G. & Fournarakis E.: 77-110.
[119] It is obvious that the relevant literature, especially the international one, is extensive. Indicatively and mainly in the Greek language: Liakos, A. [2007]. How does past become history? Athens: Πόλις / Polis [in Greek], Thompson, P. [2002]. The voice of the past: Oral history. Athens: Πλέθρον / Plethron

enough for every interpretation, and it is not the only valid form of knowledge as well[120]. For example, is it possible to understand the appearance and development of cricket in Corfu if we do not see the specific sport as an invention of British society in the 18th and 19th centuries that expressed industrial society needs that were spread through colonial politics and cultural influence and also if we do not take into consideration the transformations that took part in the urban environment of Corfu society[121]? Is it, also, possible to study the function of sports through the years of the Greek Civil War, as well as in the period before and after that, without the recognition of the relation between memory - history and in more detail the contribution of the term of "trauma" and emotional load to this memory function[122]? Should not the modern term of "nostalgia" be considered in the field of study of the professionalism of sports in our time, which sometimes erroneously shapes ideological developmental conditions in the past[123]?

[in Greek], Abrams, L. [2016]. Oral History Theory. Athens: Πλέθρον / Plethron [in Greek], Tsiolis, G. & Siouti, Er. eds [2013]. Biographical (re) constructions in later modernity. Theoretical and methodological issues of biographical research in social sciences. Athens: Νήσος / Νισος [in Greek], Cahn, S.K. [1994]. Sports talk: Oral history and its uses, problems and opportunities for sport history. The Journal of American History, 81/2: 594-609. For "memory", culture of memories and analysis of mediations: Halbwachs, M. [2013]. The social context of memory [Les Cadres Sociaux De La Memoire]. Athens: Νεφέλη / Nefeli [in Greek], mainly Assmann, J. [2017]. Cultural Memory and Early Civilization: Writing, Remembrance, and Political Imagination. Heraklion: ΠΕΚ / PEC [in Greek]. For the study of historical practices: Herman, P. [2011]. Performing history: How historical scholarship is shaped by epistemic virtues. History and Theory, 50/1: 1-19. For the "body" in general: Pourkos, M. eds [2017]. The Body as a Place of Life, Identity and social matters. Athens: Publications 8 [in Greek]. For the place of bodily culture in sports: Fournaraki, E. & Z. Papakonstantinou. [2011]. Sports, Bodily Culture and Classical Antiquity in Modern Greece. London: Routledge. See also Fournaraki, E. [1998]. Education for both genders in 19th century Greece. In the Proceedings of the International Symposium: The Times of History. For a history of childhood and youth. Athens: IAEN: 293-315 [in Greek].

[120] Karr, E.H. [1999]. What is History? Thoughts on the theory of history and the role of the historian. Athens: Knowledge: 11 – 79 [in Greek].

[121] Koulouri, C. [1997]. 28-44: for sports and forms of sociality and time management, 171-279: for the development of sports clubs and the case of Corfu in the late 19th and early 20th centuries. See also still Mangan, J.A. [1981]. Athletism in the Victorian and Edwardian public school. The emergence and consolidation of an educational ideology. Cambridge: Cambridge U. P., Guttmann, A. [1994]. Games and empires: Modern sport and cultural imperialism. New York: Columbia University Press, Elias, N. & Dunning, E. [1998]. O., Mangan, J.A. [1998]. I.

[122] For the "trauma" as a tool for memory processing and study: Caruth, C. [1996]. Unclaimed experience: Trauma, narrative and history. London: Johns Hopkins University Press, Alexander, C.J. [2012]. Trauma: A social theory. Polity Press.

[123] Boym, S. [2002]. The future of nostalgia. New York: Basic Books. For nostalgia over the disappointing present: Shaw, C. & Chase, M. [1989]. The dimensions of nostalgia. In Shaw, C. & Chase, M. The imagined past: History and nostalgia. Manchester University Press. For an interesting application in the Greek bibliography of the mechanisms of memory formation in relation to mediation, trauma, nostalgia and historical practice and writing: Salvanou A. [2018]. The formation of refugee memory. The past as history and practice. Athens: Νεφέλη / Nefeli [in Greek].

18.5 History and Greek Ancient Times

A special topic in the history of sports is Greek antiquity, the period that sport and physical exercise acquire the timeless human values and crystallize the cultural value that affects Western modern civilization[124]. The same subject displays its own characteristics for obvious reasons in the history of the Greek nation, where national history incorporates the history of sport and, through the well-known shape of continuity, determines the national imaginary situation[125]. The abstraction and eventual "erosion" of historical time, characteristics that "ensured" the duration and the idealization of sports and fitness conditions and gradually formed a militant ideologically sporting story have dominant positions in these methodical conventions.

For example, there is a outdated and wrong perception of the decline of sport in Hellenistic and Roman antiquity rather than the modern view of the normal change of gymnastics and sports institutions as an expression of the new forms of political and social organization[126].

The management of these issues is a complex process, since the intellectual contribution of antiquity is great, its "loans" are real and decisive and the adjustment of its ideas through the dimensions and mechanisms of cultural memory is irrefutable[127] . The crucial point in these concerns is the decoupling of the research methodology, which may also deal with fields of continuity and intersection at historical time, from "legitimizing needs" and the re-examination of the significance of the past uses in the present. We refer to the way that specific societies interpret the past, positive or negative, and use it systematically in the context of their own time, which is often far away from the past that they invoke. Research into the transformation of past sports practices and scripts into modern expressions requires new considerations of

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[124] For the presentation and critical procedure of classical heritage in modern sport: Kitroeff, A. [2004], Koulouri, C. [2010]. From Antiquity to Olympic Revival: Sports and Greek National Historiography (19th-20th Centuries). International Journal of the History of Sport 27/12: 2014-20152, Fournaraki, E. & Z. Papakonstantinou. [2011].

[125] Generally, about the relationship of historians with the formation of national ideology, see introduction at: Berger, S. & Lorenz, C. ed. [2015]. Nationalizing the past. Historians as nation builders in modern Europe. Palgrave Macmillan: 1 - 25. In Greece, by the end of the 20th century, the positions and practices of the main exponent of romantic historiography Konstantinos Paparrigopoulos are reproduced, mainly by gymnastics professionals and archaeologists, according to which sport, physical activity and the struggling institutions acquire cultural content and become a component of the continuity of the nation. The effect is obvious in the History of the Greek Nation. Athens: Publishing Athens: [mainly] volumes B '- F'. Indicative for professionals in gymnastics in the educational and academic field: Pavlinis, E. [1927]. History of gymnastics. Athens [in Greek], Chrysafis, I. [1965, reprint]. The Gymnastics of the Ancient. Athens [in Greek]. In recent years: Giannakis, Th. [1980]. Physical education and sport over time. Athens [in Greek], Giatsis, S. [2000]. History of sports and games in the Greek world during Greco-Roman, Byzantine and Modern times. Elements from European sport and modern Olympic games. Thessaloniki: Elimia Graphic Arts [in Greek]. For the "archaeological" approach with common characteristics : Yalouris, N. eds. [1982]. The Olympic Games in Ancient Greece. Athens: Editorial of Athens [in Greek], Yialouris , N. [1996]. The contribution of struggles to the development of arts and Literature. Sports and Society 14: 43-52 [in Greek]. For the first changes in the writing of history of sport: Mouratidis, I. [1992]. History of physical education (with elements of philosophy). Thessaloniki: Χριστοδουλίδης / Christodoulides [in Greek], Albanidis, E., [2004]. History of sport in the ancient Greek world (with reference to the Olympic Games of 1896 and modern Greek sport). Thessaloniki: SALTO [in Greek].

[126] For sports in the Hellenistic and imperial years, in the context of the new institutions of social and political organization, without the confirmation of "continuity" affairs throughout the centuries: Albanidis, E. [1995]. .Sports in Thrace during Hellenistic and Roman times. Xanthi, Department of Physical Education and Sport Science, Doctoral Thesis [in Greek], Pavlogiannis, O. [2000]. The evolution of gymnastics and sports ideas in Hellenistic and imperial times. Corfu: Ionian University. Department of History: Unpublished PhD Thesis [in Greek]. For "new" archaeological approaches: Kefalidou, E. [1996]. Nikitis. Illustrative study of ancient Greek sport. Thessaloniki [in Greek], Valavanis, P. [2004]. Sacraments and games in ancient Greece: Olympia, Delphi, Isthmia, Nemea. Athens: Καπόν / Kapon [in Greek]. The "new" history of sports, with its inclusion in the fields of social and cultural history, begins in Greece with C. Koulouri: [1997].

[127] Assmann, J. [2017].

the use of the past and of the art of history. This, also, needs the ability to synthesize by recognizing and choosing between its sources its own and its readers' prejudices and the wrong opinions that the modern ones themselves have established. All this procedure has to become true without anachronism[128].

18.6 History and Olympic Games

The timing of the 2004 Olympic Games in Athens and Greece, which is recorded in the consciousness of the modern world as the birthplace of the Olympic Games, started the production and the publication of a large number of writing and artistic creations for all the dimensions of the topic and for most of the periods of sports and gymnastics. At the level of historical and sociological research, what is primarily noted is the absence of principles, methods and tools in the work of the well-know
receipt of the ideal version of of sport that contains human values and highlights the history of the Olympic Games as a way to reproduce moral values and national ideals[129] .
These scientific "aberrations" penetrate into the very short period of application of the Olympic education in our country and the few school textbooks of Olympic education[130]. However, since the Olympic Games are at the same time a global event beyond the national and local particularities, Olympic ideology accepts the criticism of historical and social sciences about creating texts and events of a dominant ideology that usually reproduce hierarchical structures and phenomena of exclusion and eventually misinforming[131]. In Greece the problem is shaped when a large part of this old bibliography and a big amount of dissimilar events, which sometimes are moving to the limits of the picturesque, constitute a composition of propaganda, journalism and amateur history and memoirs and testimonies in which scientific historiography owns a small part. From all the above we can understand that it is necessary to establish the view of the social and cultural practices of the Olympic Games, from a structural, functional and value point of view in the context of the synergy of at least historical, sociological and anthropological studies and following the modern perception of the "new" history of sports and physical activities to be examined through their relevance to social and cultural contexts[132].

18.7 Cultural Heritage and Sports

Dealing with the interests and sports sciences contains the familiarity with written and virtual / digital files, collections, museums of Sport, ritual procedures[133], bibliography about gymnastic, literature and sports content. Managing the material and the intangible culture of sports and

[128] Liakos, A. [1999]. Essay on a Poetic of History. Historical 6/31: 259-289 [in Greek] . See also Lorenz, C. & Bevernage, B. [2013]. Breaking up time: Negotiating the boundaries between present, past and future. Vandenhoeck & Ruprecht.
[129] For a comprehensive overview of theory and methodology issues in the history of Olympic Games: Koulouri, C. [2015]. The history of the Olympic Games. In Zaimakis, G. & Fournarakis, E. 100-106.
[130] Tzachrista, B. [2015]. The invention of antiquity in the Olympic Education Handbooks "Athens 2004". In Zaimakis, G. & Fournarakis E. : 253-288.
[131] Chatziefstathiou, D. - Henry, I. [2015]. The construction of the speech on Olympism in the modern Olympic Motion: Olympism, Governance and Power Technologies. In Zaimakis, G. - Fournarakis, E.: 182-214.
[132] This modern view of games takes place through works of professional historians. Indicatively: Georgiadis, K. [2003]. Olympic Revival: The Revival of the Olympic Games in the Modern Times. Athens: Publishing Athens, .Kitroeff, A. [2004]., Solomou – Prokopiou, A. & Vogiatzi, I. [2004]. Athens in the late 19th century and the first international Olympic Games. Athens: General Secretariat Olympic Games, Historical and Ethnological Company of Greece [in Greek], Coulouri, C. [2005]. Athleticism, society and identity: A survey of scholarly debate. Imeros 5.1: 333-343.
[133] Indicative of "rituals" as a cultural practice: Hobsbawm, E. & Ranger, T. [2004]. The invention of tradition. Athens: Θεμέλιο / Themelio [in Greek], Assmann, J. [2017].

physical activities is de facto a new and attractive proposal[134]. However, the question that effortlessly and maybe ironically comes in our minds is "What files? What evidence? What documents? And this question not only reflects the reality, but also confirms the indifference that for a long time the world of science and the intelligence showed on these issues and secondly the sloppy that exists in relation to sporting items and documents.

The reluctance of the state, the official organizations, the sports and cultural associations themselves and the individuals sports people to organize, maintain and manage their sports material, a remnant of the stereotypical position on the humility of sports and physical activities, is responsible for the poverty of sports records and the formation of a reality with broken, fragmented and inaccessible sports evidence, even in the official organizations, such as athletic federations. This is also responsible for the lack of archival consciousness in the field of sports. Similarly, the poverty of collections and sports museums in Greece is noticed[135]. A common element in the evaluation of the archival and museum reality of sports is the discovery of the well-known difficulty of moving from historicism to the new historical readings of postmodernism. Historicism is, therefore, a dominant example of historical knowledge centered around the archive, where almost all dialogue with the past and the verification of information takes place. In this way, the neutrality and authority of the archives (their power) are being shaped, a reality that often leads to the production of historical knowledge outside the mechanisms of controlling the historical sources of archival sources and removes it from modern research tools such as memory and subjectivity[136].

In a same way, in sports museums[137] and especially in sports collections / exhibitions organized by associations, federations, social and voluntary organizations and individually sports people are rarely recorded attempts to apply events of social and cultural history[138]. On the other hand, there is the linear narrative concept that, with problems of research consistency, reproduces the well-known myths of continuity and great achievements and maintains the protagonists and performances in the foreground, unaware of the events, small and old things of everyday life, and for their faces and experiences which do not fit into the official narrations of history[139]. Regarding some international examples, such as major sports clubs, they are a scientific challenge, because they have managed to combine their organized archives with the operation of museums and libraries and using forms of public history such as social media and websites.

In Greece the "touring" in the past of sports clubs as an application of social history or the organization of small museums and exhibitions as a form of communal / collective memory in the context of their micro-history is a challenge for the exploitation of their archival material[140].

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[134] For cultural material management issues: Poulios I., Aliivatou, M., Arabatzis, G., Giannakidis, A., Karahalis, N., Mascha, E., Mouliou, M., Papadaki, M., Prosuli, X, Touloupa, S. [2015]. Cultural Management, Local Society, Sustainable Development. Athens: Greek Academic Electronic Books and Assistants [SEAB] [in Greek].

[135] The first systematic effort: Koulouri, X. Ed. [2002].Archives and history of the Olympic Games Committee. Athens: International Olympic Academy [in Greek]. At the level of sports clubs: Kardasis, B. [1996]. Olympiakos Piraeus: An archive, a story. Istor 9: 59-86 [in Greek].

[136] Liakos, A. [2007] : 81-89, Karr, E.H. [1999]: 11-79, Mbembe, A. [2002]. The power of the archive and its limits. In Hamilton, C. eds. Refiguring the archive. Cape Town: David Philip: 19-26.

[137] We mean three museums. The two in Ancient Olympia: "Museum of the Ancient Olympic Games" and "Museum of Modern Olympic Games" as well as the Olympic Museum in Thessaloniki. In recent years, the basketball thematic basketball museum of the YMCA Thessaloniki has been remarkable. . The two museums in Thessaloniki implement several educational programs for all levels of education.

[138] Indicatively, for a modern view of the museums see: Nakou, E. [2001]. Museums: We Things and Culture. Athens: Νήσος / Nısos [in Greek], Kokkinos, G. & Alexakis, E., Ed. [2002]. Interdisciplinary Approaches to Museum Education. Athens: Μεταίχμιο / Metaichmio [in Greek], Gazi, A. & Nikiforidou, A. [2004]. Texts about museums and exhibitions. Considerations, methodology, study. Museology International Scientific Electronic Journal, Issue 2 [in Greek].

[139] Vamplew, W. [1998]. Facts and artefacts: Sports historians and sports museums. Journal of Sport History, 25/2: 268-282.

[140] Thematic Museum of the Historic Athletic Club of YMCA Thessaloniki which has at its target point the sport of Basketball. For this different approach and study of sports clubs and sports that cultivate in the fields of social and cultural history: Koulouri, C. [1997]. 209 - 259 [Panellinios Athens: Gymnastic

They may also be involved in the study of local [sports] history that records the specificities of each city as well as any influences it has received from other cultures and combines it with the founding of sports clubs as a conscious choice of local societies and as a new proposition of sociability[141].
They can also follow the oral history that builds new sources of information, giving voice to people not only from the foreground but also from the background, people who have offered time, money and their own soul to support sports. No matter how these paths of historical browsing are drawn, they are a way to mitigate the real danger, which is to write the history of sports in the absence of records and evidence.

18.8 Conclusions

Sport has always been a complex and extremely popular phenomenon, and as a result it has a wide resonance and a high popular base, it is very popular to all the different classes and a very big part of the media. Because of this situation sports are offered to develop cultural and intercultural approaches. The issue of problematic historical information is primary because it confirms the inadequate historical research and the outdated knowledge production, since History is not only a science but also an art / technique as it examines the methods of processing the past and transmitting information. However, all this defines only the surface of the problem. Historical recording and analysis of this reality, which is a key priority for modern science and manly work of the historian of sport, faces difficulties, because sports remain for a long time captive of mythologies and their demonic activities. The approaching of sports as a distinct subject of social sciences through the demanding of social and cultural history is a laborious process because it must reach a greater depth than its stereotypes reach. And because these stereotypes are usually based on reality, prior to historical writing, it is necessary to precede the turning of the research look into the daily reality, where those who do not fit in the martial and national stories remain inert and speechless.

Club], 261-289 [Ethnikos Athens: Gymnastic Club], 291-219 [Omilos Ereton Pireus: Rowing Sport club], 321-355 [Tennis Club of Athens].

[141] Indicatively: Tombros, N. [2010]. Nautical Club of Patra.80 years of gold history in the water sports. Patra : Nautical Club of Patra [in Greek], Ballas, G. [2017]. Nautical Glub of Argostoli.The difficult times of 1957 - 1983 (the beginning - the action - the athletes). Argostoli: Kefalonitis [in Greek]. Different writing, in accordance with the principles and methods of social history, is a book of Zaimaki, G. [2010]. Ergotelis [1909 - 2009]. Pictures of the athletic and social history of a progressive-friendly club. Athens: Αλεξάνδρεια / Alexandria [in Greek]. For a suggestion of educational use of the cultural history of a sports club see: Pavlogiannis, A. & Ganatsiou, P. [2018]. When Art meets the History of Sport - An Educational Program for the Navy Sports Club of Corfu [NAOK]. In Proceedings of the Conference "Bridges of Communication of Art and Didactics". [Regional South Aegean Education Directorate, Syros 10-12 / 6/2016]. Athens: Ars Libri [under publication] – [in Greek].

19 Impact of non-performing Loans on Landing and Capital: a Study in commercial Banks in Kosovo

Arta Hoti ARIFAJ
University of Prishtina, Prishtina, Kosovo

Sami ARIFAJ
University of Vienna, Austria

Gazmend LUBOTENI
University of Prishtina, Prishtina, Kosovo

19.1 Abstract

This research is one of several works that assesses the performance of commercial banks in Kosovo, including the structure of non-performing loans in the Banking System of the Republic of Kosovo. The main purpose of this paper is the analysis of impact of nonperforming loans on the banking sector in Kosovo. The research was conducted based on the financial indicators of commercial banks such as: first tier capital, second tier capital, total capital and total loans. These indicators are obtained from the Central Bank of the Republic of Kosovo, and the examination period is 10 years 2006-2015. Consequently, several questions arise: Do nonperforming loans have a negative impact on other financial indicators in the banking system of Kosovo? What is the impact of nonperforming loans on total capital? What is the impact of nonperforming loans on lending? To answer these questions, we did a review of empirical studies using the SPSS model for the impact of bad loans measurement. In reviewing the foreign literature, one can notice that there are more studies that provide the direct relation of financial indicators in non-performing loans, whereas we have researched the impact and dependence of non-performing loans on those financial indicators.

Keywords: Non-performing loans, credit risk, lending, total capital and total loans.
JEL Code: G01 G21 G31

19.2 Introduction

Regardless of the fact that risk management techniques were considerably developed recently for risk management in a structured manner, still the risk was too exposed and created conditions for systematic instability.

According to studies of many authors, a strong and independent management is highly necessary for the bank, as well as strict monitoring by regulatory authorities, such that the risks of today's modern banks are managed adequately, and in addition, according to them, banking governance plays an important role in the bank performance (Acharya and Richardson, 2009; Kirkpatric, 2009; Diamond and Rajan, 2009). Despite ongoing efforts to control banking lending activities, problem loans are still large in numbers. According to the Global Financial Stability Report, the International Monetary Fund (2007), the overall level of problem loans exposes large disparities in many developed and developing countries.

According to studies by authors Keeton and Morris (1987) and a study by Keeton (1999) high losses suffered by banks come as a result of different processes, mainly due to a weak process of loan management, some banks represent a high level of loan losses because they are located in areas with unfavorable economic conditions, and the banks' desire to extend loans even when the problem loan ratio is increasing rapidly. The concern due to the high level presence of NPLs in the whole world and especially in Europe, prompted us to analyze the NPL status in Kosovo. The main purpose of this research is credit analysis in general in

commercial banks in Kosovo. To be exact, the study relates to problems of loans that do not perform, i.e. non-performing loans. The concern regarding non-performing loans in European countries where the level of bad loans is constantly increasing, is the instigator of our research. This financial situation is also present in Kosovo. However, with a very low significant difference compared to the countries of the region. Our study is motivated by hypotheses that non-performing loans will affect in the banking sector. In this research we have focused mainly on the analysis of the impact of these loans on capital indicators and on lending of banks. The main purpose of this research was to conduct an analysis of lending in general in the commercial banks in Kosovo with a focus on non-performing loans and their impact in the banking sector.

19.3 Literature Review

The financial system health has an important role in a country (Abiola and Olausi, 2014; Das and Ghosh, 2007), as its failure could undermine the country's economic development. The company's financial performance is the ability to generate new resources every day. Measurement of banking performance can be carried out through traditional measurements and market-based measurements (Aktan and Bulut, 2008). Empirical research has revealed evidence that supports the view that financial development contributes to economic growth. Our research concretely explores non-performing loans in the Kosovo Banking System.

The deterioration of loan quality, as per authors Reinhart and Rogoff (2010) may result in significant losses to the bank and this is known as the beginning of a bank crisis. The simple banking theory is that banks act as financial intermediaries between depositors and borrowers (Diamond et al, 1984).

According to Mishkin (2007) the financial system throughout the entire world is extremely complex, the banks are also the most important source of external funds used for financing businesses. Therefore, banks have an important position in the economy of the whole world, acting as a financial intermediary for private consumers, for the businesses and the governments. The theory on banking system as a financial intermediary has been published by many well-known journals and also includes some of the most renowned economists in the field, such as: (Keynes, 1936; Gurley and Shaw, 1955; Diamond et al., 1984, 1991, 1997; Diamond and Rajan, 2001; Eatwell, Milgate and Newman, 1989; Myers and Rajan, 1998; Allen and Santomero, 2001; Matthews and Thompson; 2005) and many other authors. Regardless of the volume of loans, both performing and non-performing, there is no relevant global standard for their classification and reporting. However, in more and more countries, the regulators and banks are moving towards adoption and adaptation of best practices (Grieser and Wulfken, 2009).

According to Sufian (2011) trend movements of credit risk are obvious from the fact of how the bank is provisioned within a year compared to total loans. In addition, Flamini, Schumacher and McDonald (2009), define credit risk as the proportion of total loans to total assets. Credit risk by many authors is considered a critical issue in bank management, and therefore special attention should be paid to credit risk as it automatically affects the bank's profitability.

Alalaya and Khattab (2015) argued that commercial banks have an important role in the economic development and are one of the main indicators that trigger economic growth as a community service provider, and meetings are also considered necessary for services carried out with monetary means in the form of loans or debts. According to researchers Pass and Davies (1993), banks in the physical sense as depository institutions should be licensed by the country's authorities to act as a depot for the depositing of financial means of natural persons, enterprises and other institutions, and also as a financial institution the bank should always be available to customers seeking financial consulting.

19.4 Methodology

This paper is based on the financial data of commercial banks of the Republic of Kosovo on the management of credit risk, namely of problem loans. The main methods used in this paper are: structure index, dynamics index and correlation. The statistical package SPSS 22, which was considered a good inclusive opportunity to increase the credibility of the scientific study, has been applied for the findings on these parameters and the processing of data. Data obtained are presented through.

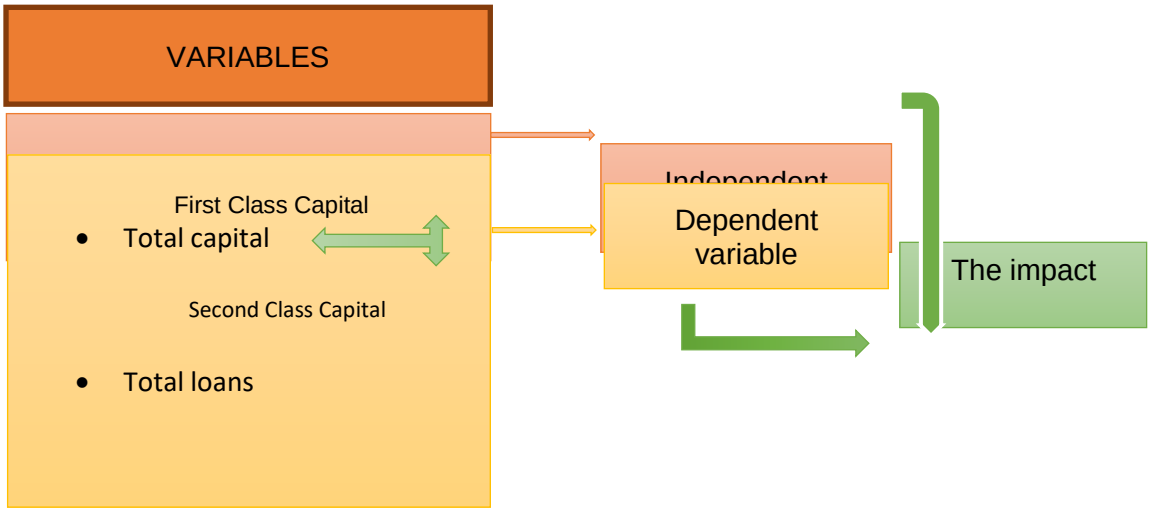


***Figure. 1**. Conceptual model of variables*

To describe the type of information, we have used the quantitative research method, and this kind of data is collected during the analyzed experiment. Many authors have used different models to see the impact of various factors on the problem loan level.

19.5 Results and Discussion

This section presents detailed results of this empirical study. The hypotheses examine whether non-performing loans have correlation to total capital and total loans. Initially, a comparison of total capital, total loans and non-performing loans was carried out over the 10-year period 2006-2015. The main researched hypotheses have been verified through the linear regression.

Research results related to the first hypothesis

Results by linear regression

- First Hypothesis H1: Trend of nonperforming loans has no negative impact on capital indicators.

In order to answer this question and in the function of verifying the above hypothesis, a linear regression model was built from the SPSS 23 statistical package. This model assists to obtain the link between nonperforming loans (independent variable - Y) and total capital (dependent variable - X1).

The regression model is Y= 118.631+(1.597X1)

Results are presented on table 1.

This model is presented as significant (F=35.452, p< 0.05) and its explanatory power is approximately 93% (R= 0.928).

Findings show that the independent variable, the nonperforming loans, had no negative impact (B=1.597) on the dependent variable which is the banks' total capital. Therefore, nonperforming loans had no impact on the decrease (t=5.344, p<0.05) of the banks' total capital. Though theoretically, the growth of non-performing loans has an impact on the

reduction of capital indicators since when problem loans increase and become loan losses, this increases expenditures on loan losses which has an impact on reducing net profit, and this directly leads to a decrease in capital and capital adequacy ratios. In our research case, the result shows that non-performing loans have no impact on reducing total capital, because the profit over the years has been much higher than expenditure from bad debts (non-performing loans).

Summary of the model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.928.	.861	.857	.37858

a. Predictors: (Constant), Nonperforming loans
b. Dependent variable: Total capital

ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	262324.250	1	262324.250	35.452	.000.
	Residual	42336.937	38	1114,130		
	Total	304661.187	39			

a. Dependent variable: Total loans
b. Predictors: (Constant), Nonperforming loans

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	118.631	10.061		1.791	,000
	Nonperforming loans	1.597	.104	.928	5.344	,000

a. Dependent variable: Total capital

Table 1: *Regression model results*

In conclusion, the following results were obtained and discussed by comparing non-performing loans with Tier I capital, Tier II capital and total capital, and using regression, the impact of nonperforming loans on total capital was measured.
The linear regression model shows that non-performing loans did not have an adverse impact on bank total capital with coefficients ($t = 5.344$, $p < 0.05$), therefore non-performing loans did not result in reduction of total bank capital. As noted above, the growth of non-performing loans has an impact on the reduction of capital indicators since when problem loans increase and become loan losses, this increases expenditures on loan losses which has an impact on reducing net profit, and this directly leads to a decrease in capital and capital adequacy ratios. In our research case, the result shows that non-performing loans have no impact on reducing total capital, because the profit over the years has been much higher than expenditure from bad debts (non-performing loans).

19.6 Research results related to the second hypothesis

19.6.1 Results by correlation

Verification of H2 hypothesis: Non-performing loans impact a decrease of lending in the banking sector. In order to answer this question and in the function of verifying the above hypothesis, a linear regression model was built from the SPSS 23 statistical package. This model assists to obtain the link between non-performing loans (dependent variable - Y) and dividend (independent variable - X1).
The regression model is Y= 92.665 +(-3.903X1)
Results are presented on table 2.
This model is presented as significant (F=27.629, p< 0.05) and its explanatory power is approximately 65% (R= 0.649).
The analysis shows that non-performing loans have a negative impact on lending (t=-5.256, p<0.05). The result is also confirmed by coefficient (B=-3.903) where findings show that lending has been decreasing over the years in the banking system in Kosovo, while non-performing loans have been increasing.

Summary of the model

a. Predictors: (Constant), Nonperforming loans
b. Dependent variable: Total loans

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	43292.380	1	43292.380	27.629	.000[b]
	Residual	59541.874	38	1566.891		
	Total	102834.253	39			

a. Dependent variable: Total loans

b. Predictors: (Constant), Nonperforming loans

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	92.665	1.180		14.037	.000
	Total loans	-3.903	.021	-.649	-5.256	.000

a. Dependent variable: Total loans

Table 2: *Regression model results*

As mentioned above, the linear regression model was applied for the verification of this hypothesis. The following results were obtained and discussed by comparing non-performing loans with total loans.

The linear regression model shows that non-performing loans have a negative impact on lending (t=-5.256, p<0.05). This result is also confirmed by the coefficient (B = -3.303). To study the link between these two variables, the ratio of total loans to problem loans was applied.
There has been various research on lending and non-performing loans, we have analyzed some studies that show that there is a negative correlation between non-performing loans and total loans, this suggests that we may obtain a negative impact from total loans to non-performing loans (Hosna, Manzura & Juanjuan, 2009; Felix and Claudine, 2008). Referring to

such well-known authors' research we also studied the correlation between these variables and our findings correspond to the findings of foreign authors.

19.7 Conclusions

According to the results of our research we can conclude that non-performing loans are an important factor that may affect the financial health of the banking system. In the Kosovo banking system, non-performing loans are not very high compared to the countries of the region and other countries, and during the period examined in our study they did not have any significant impact that exacerbates the banking system.
Regression findings show that non-performing loans as independent variables have an impact on almost all other variables, and we have come to the conclusion that the financial health of the banking system is affected by problem loans, which may have an impact on many financial ratios, an actual example of verification of the above is our research.
In support of the above conclusions from the theoretical approach and the analysis of empirical data we think that it is necessary to make some recommendations regarding the reduction of the number of non-performing loans.
Although non-performing loans in Kosovo are well managed and are at a lower level than those of the region, it is still very important to be careful with some factors that may affect the increase in the number of non-performing loans, an example is the loan interest rate which should be lower than it is at this point, because this can greatly affect the borrower's difficulty of repaying loan installments. Such difficulties are reflected when loans begin to be classified into different categories such as: B, C and D where, in these cases, in most banks in Kosovo, the lender initially only collects interest and the rest of the principal remains unpaid, which means that the bank receives revenue but the client's principal debt is not decreased, only interest is repaid and now calculated as default interest. All this prevents the loan repayment and causes such loans to become non-performing loans.

19.8 References

Acharya, V.V. and Richardson, M., 2009. Causes of the financial crisis. Critical Review, 21(2-3), pp.195-210.

Aktan, B. and Bulut, C., 2008. Financial performance impacts of corporate entrepreneurship in emerging markets: A case of Turkey. European Journal of Economics, Finance and Administrative Sciences, 12(8), pp.1530-2275.

Alalaya, M. and Al Khattab, S.A., 2015. A Case Study in Business Market: Banks Profitability: Evidence from Jordanian Commercial Banks (2002-2015). International Journal of Business Management and Economic Research (IJBMER), 6(4), p.2015.

Allen, F. and Santomero, A.M., 2001. What do financial intermediaries do?. Journal of Banking & Finance, 25(2), pp.271-294.

Boudriga, A., Boulila Taktak, N. and Jellouli, S., 2009. Banking supervision and nonperforming loans: a cross-country analysis. Journal of financial economic policy, 1(4), pp.286-318.

Brownbridge, M., 1998, March. The causes of financial distress in local banks in Africa and implications for prudential policy. United Nations Conference on Trade and Development.

Das, A. and Ghosh, S., 2007. Determinants of credit risk in Indian state-owned banks: An empirical investigation.

Das, A. and Ghosh, S., 2007. Determinants of credit risk in Indian state-owned banks: An empirical investigation.

Diamond, D.W. and Rajan, R., 2009. The credit crisis: Conjectures about causes and remedies (No. w14739). National Bureau of Economic Research.

Diamond, D.W. and Rajan, R., 2009. The credit crisis: Conjectures about causes and remedies (No. w14739). National Bureau of Economic Research.

Diamond, D.W., 1984. Financial intermediation and delegated monitoring. The review of economic studies, 51(3), pp.393-414.

Diamond, D.W., 1991. Monitoring and reputation: The choice between bank loans and directly placed debt. Journal of political Economy, 99(4), pp.689-721.

Diamond, D.W., 1997. Liquidity, banks, and markets. Journal of Political Economy, 105(5), pp.928-956.

Eatwell, J., Milgate, M. and Newman, P. eds., 1989. Allocation, information and markets. Springer.

Flamini, V., Schumacher, M.L. and McDonald, M.C.A., 2009. The determinants of commercial bank profitability in Sub-Saharan Africa (No. 9-15 International Monetary Fund.

Global Financial Stability Report, International Monetary Fund, Washington, DC, - available at: www.imf.org/external/pubs/ft/GFSR/2007/02/index.htm - IMF - 2007

Gostineau, G.L., 1992. Dictionary of financial risk management, Swiss Bank Corporation, Chicago.

Grieser, S.G. and Wulfken, J. eds., 2009. Performing and non-performing loan transactions across the world: a practical guide. Euromoney Books.

Gurley, J.G. and Shaw, E.S., 1955. Financial aspects of economic development. The American Economic Review, 45(4), pp.515-538.

Heffernan, S., 1996. Современное банковское дело в теории и на практике (Modern Banking in Theory and Practice).

Keeton, W.R. and Morris, C.S., 1987. Why do banks' loan losses differ?. Economic Review-Federal Reserve Bank of Kansas City, 72(5), p.3.

Keeton, W.R., 1999. Does faster loan growth lead to higher loan losses?. Economic review-Federal reserve bank of Kansas City, 84(2), p.57.

Keynes, J. M., 1936. The general theory of employment, interest and money. London, 1936. KeynesThe General Theory of Employment, Interest and Money1936.

Kirkpatrick, C., Murinde, V. and Tefula, M., 2008. The measurement and determinants of x-inefficiency in commercial banks in Sub-Saharan Africa. The European Journal of Finance, 14(7), pp.625-639.

Matthews, K. and J. Thompson (2005), The Economics of Banking, Chichester, England: John Wiley and Sons.

Mishkin, F.S., 2007. The economics of money, banking, and financial markets. Pearson education.

Myers, S.C. and Rajan, R.G., 1998. The paradox of liquidity. The Quarterly Journal of Economics, 113(3), pp.733-771.

Newman, P., Milgate, M. and Eatwell, J. eds., 1992. The new Palgrave dictionary of money & finance (Vol. 1). Basingstoke.: Macmillan.

Pass, C.L., Lowes, B. and Davies, L., 1993. Unwin Hyman Dictionary of Economics. Unwin Hyman.

Pastor, J.M., 1999. Efficiency and risk management in Spanish banking: a method to decompose risk. Applied financial economics, 9(4), pp.371-384.

Pesta, F. (2010). Credit risk management in banking (Doctoral dissertation, uniwien). Wien, im Jänner 2010). Titel der Diplomarbeit. 'Credit Risk Management in Banking', p. p. 7.

Reinhart, C.M. and Rogoff, K.S., 2011. From financial crash to debt crisis. The American Economic Review, 101(5), pp.1676-1706.

Rime, B., 2001. Capital requirements and bank behaviour: Empirical evidence for Switzerland. Journal of Banking & Finance, 25(4), pp.789-805.

Sufian, F., 2011. Profitability of the Korean banking sector: Panel evidence on bank-specific and macroeconomic determinants. Journal of Economics and Management, 7(1), pp.43-72.

20 Demola – global Innovation Engine for effective Co-Creation

Pekka SILVÉN
Oulu University of Applied Sciences, Oulu, Finland,

Jukka KURTTILA
Oulu University of Applied Sciences, Oulu, Finland

Risto KIMARI
Oulu University of Applied Sciences, Oulu, Finland

20.1 Abstract

Co-creation is a process which brings different parties, including customers and other stakeholders together to jointly produce mutually valued outcome through new forms of interaction, service and learning mechanisms. Co-creation strives to generate new practical co-operation methods between different actors to foster interaction and interplay amongst them. Co-creation requires a new set of skills and capabilities in which companies and universities do not often have sufficient capacity or experience.

Currently, 28 cities have Demola node in 15 countries. Demola is operated by local teams and facilitators in every location with 56 university partners and has engaged more than 900 companies into co-creation with students.
Despite an existing and successful global co-creation network, there is an ongoing need to explore new opportunities to improve the co-creation expertise in the local and global scale in Demola network.

Demola has recently launched a global “co-facilitation” program to support different Demola nodes by providing co-creation facilitator experts to facilitate the multidisciplinary teams and company partners together with the local facilitators. Co-facilitation is a method and not an outsourced facilitation service replacing or taking away the role of the local facilitators. Co-facilitation brings in and integrates knowledge, insights and diverse skill sets to be part of the global co-creation ecosystem to benefit the teams, companies, and R&D.
Demola co-facilitation program has been reaching out internationally to research communities and R&D infrastructure providers into open innovation process to connect different players to increase the quality and outcome of the co-creation projects. With the co-facilitation program, Demola has generated new practical co-operation method between different actors to have a sustainable model for utilization of researchers and academic R&D facilities globally. Co-facilitated co-creation and learning environment is also recognized as an international education program and has a legal entity to provide ECTS credit points. The education program and credit points are not targeted only to university students, but it also serves as continuing education program for the participating staff of the companies.
The Demola co-facilitation program has been piloted in 10 countries, and it has shown to be effective where cooperation between universities and companies has been infrequent, and the collaboration models have been weak.

Keywords: Demola, Co-creation, Open innovation, R&D, Co-facilitation

20.2 Introduction

Co-creation is a concept closely linked to open innovation. It is a process which brings different parties, including customers and other stakeholders together to jointly produce a mutually valued outcome through new forms of interaction, service and learning mechanism [1]. Co-creation can lead to better, quicker and less risky innovations that are beneficial to customers and companies. Co-creation includes direct innovation outcomes, like increased speed to market, lower cost, resulting in increased profits for companies and reduced sales prices for customers, improved product quality and higher customer satisfaction, reduced risk of innovation efforts not meeting customer needs [2]. Demola is a platform to experiment and test new ideas effectively, but also to validate and solve problems. Demola project offers the possibility to work in a multidisciplinary, talented team in fully facilitated innovation environment consisting of university students, researchers, and various companies. The project team includes 4-6 university students and project partner. For both students, company mentors and university professors, Demola provides a common framework and an inspiring atmosphere of creative co-creation and new learning environment. At Demola, university students and professors develop product and service demonstrators together with companies and public sector and create new solutions to real-life problems, business ideas and start-up challenges in multidisciplinary teams.
The Demola model is operating in various countries and has especially proved useful where cooperation between universities and companies is infrequent, study programs lack practical aspects, and the collaboration models are weak, based on traditional internships. Currently, Demola operates in 15 countries running local teams in every location.

20.3 Opportunities for open innovation

Open innovation offers significant opportunities for companies and SMEs. It is an innovation process in which companies use external knowledge and external paths to market to advance and commercialize their technology. The open innovation paradigm addresses the need to increase linkages for innovation and speed up knowledge diffusion. The idea is related to the need to combine and integrate different technologies, various (often multidisciplinary) types of knowledge, and diverse skill sets[3]. IP is intimately linked to open innovation. Efficient management of intellectual property combined with business acumen can assist firms in developing effective open innovation strategies [4]. For research-intensive SMEs, open innovation processes provide new opportunities to license IP instead of having to develop them into own products and services. For innovation-driven SMEs, open source and co-creation are the basis for the development and exchange of knowledge

20.4 Lack of the co-creation culture and skills

SMEs do not usually facilitate thinking out of the box, which leads to closed innovation, subcontracting, etc. They lack understanding and skills of connecting to different knowledge providers and partners and perceive high risk in such partnership modes.
Companies lack how to design cases for co-creation. For the majority of companies, innovation and R&D processes are mainly organized around internal development and project-based subcontracting models. Co-creation requires a new set of skills and capabilities where companies, and especially SMEs, do not have sufficient capacity or experiences. Often limited resources of companies and their focus on today's business result ininsufficient effort and capabilities required to develop future approaches and opportunities. European economies are often dominated by SMEs, and thus their capacity for co-creative innovation is crucial for business renewal.
Co-creation as a process and relevant discipline engaging different parties, including changing the focus from company-centric to end user-consumer centric, has been identified as one of

key factors facilitating the overcoming of the above limitations and gaining an advantage for all kinds of SMEs [5].
One major challenge in the co-facilitated co-creation process is the companies' limited perception, skills, and knowledge about co-creation specific aspects. The co-facilitation will raise awareness and increase the knowledge among the companies about the potential of co-creation processes, which will increase the absorptive capacity of companies in general and provide a methodology for formulating the companies demands for innovative ideas.
Demola projects create a novel approach to engage companies and improve their capacity for co-creation and to utilize under-leveraged research output. Efficient global linkages and matching of end users, innovative firms and research partners for team co-creation, and access to other resources such as knowledge and prototyping facilities is a critical success factor for co-creation scale-up and growth.
Transnational linkages are a mean that allows organizations to tap into a broader base of ideas and technology, find complementary expertise, and pool competencies to overcome barriers, such as lack of management resources and technological competencies. New ideas emerge from the combination of existing knowledge from various sources and, therefore, the diffusion of innovations is critical for future progress [6]
This approach includes elements focusing on the design of viable co-creation cases, customer and researcher involvement and linkage with innovation system stakeholders and research facilities. The co-facilitation program is based on the ideas of co-creation and open innovation that by definition mean "innovating together." Co-creation and open innovation strive to generate new practical co-operation methods between different actors to foster interaction and interplay amongst them [7]

20.5 Cross-disciplinary multi-stakeholder co-creation project teamwork

The local teamwork is facilitated by team facilitator and supported by co-facilitator expert engagement at specific project milestones to support the co-creation. Knowledge sharing and innovation management is key to successful process development and sustainability. The social network-based community of team facilitators already exists in Demola network, with online communication, dedicated taskforce groups, and annual meetings. Demola co-facilitation provides experienced facilitators while using a proven Demola model as a core process with essential co-creation elements. While utilizing the existing resources and knowledge, the co-facilitation includes access and connection to a vast knowledge base and numerous innovation actors in other Demola locations and regions outside the local project partnership. The model is mature enough to match end users, companies, research, and to build teams of various stakeholders, talents, and experts to meet innovation demands globally. Business, academia, government and public work together in end-user demand focused teams to co-create the future and drive structural changes far beyond the scope of what any one organization or person could do alone. This model also encompasses user-oriented innovation models to take full advantage of ideas' cross-fertilization leading to experimentation and prototyping in a real-world setting, The co-facilitated co-creation flow of knowledge is cross-cutting through all sectors and can easily be transferred to other countries. The methods developed and piloted in the project can be utilized in finding solutions to companies as well as applied to solve grand societal challenges, and will, therefore, contribute to increasing the socio-economic value for citizens. The co-creation process has also proven to be very successful regarding increasing students' learning capabilities which is also a socio-economic benefit. Working on multidisciplinary teams equips students with valuable skills for working life. Also, they learn cross-discipline collaboration which improves their employment opportunities [8].
The co-facilitation program will add a new element to the co-creation process by developing methods for involving researcher communities and piloting international mechanisms to connect relevant research to the co-creation process. The co-facilitation program will also

enhance the change of the mindset of companies and faculties at the universities, and create a win-win-situation where more companies will get involved in cross-disciplinary co-creation and create an interdisciplinary approach at the universities. Ultimately, the co-facilitation program is about a paradigm shift concerning the origins of innovations: The concept of the innovation ecosystem stresses that the flow of ideas, technology, and information among people, enterprises, and institutions is the key to a vibrant and productive innovation environment.

20.6 Conclusions

Demola co-facilitated Co-creation project program builds on quadruple helix notion with the aim to bring innovation system actors, including businesses, end-users (whether citizens, businesses, government or NGOs), academia and government to co-create together. It is of great importance for a successful co-creation process that all stakeholders have the same level of knowledge and understanding what are the specific issues and challenges of partnering with others in end-user centric co-creation, follow the same process and engage with trust and clear commitment. Demola provides a systematic method with clear roles and responsibilities for the co-facilitated co-creation platform, which is managed by experienced, well-connected and trusted Demola facilitators. A legal framework defining the goals, major milestones in the process, intellectual property (IP) rights, allocated resources and other specific issues is a crucial foundation for building commitment and trust.
One of the key concepts in Demola is based on a notion that universities are an essential source of knowledge and ideas for companies. However, the company's range of means to exploit university-based know-how is limited and therefore underutilized [9].
The Demola multi-disciplinary concept enables efficient collaboration between universities and industry, running concrete co-facilitated co-creation activities between companies, public sector, university students, and professors. Demola platform presents a cost-effective way for companies and public sector organizations to broaden their R&D bases and develop alternative avenues of access to the market.
International partnership in co-creation and business activities can open for firms a broader geographic market. By creating an active co-facilitating service that matches relevant links at international level increases the economic impacts of co-creation.

The co-facilitated co-creation flow of knowledge is cross-cutting through all sectors and can easily be transferred to other countries. The methods developed and piloted in the project can be utilized in finding solutions to companies as well as applied to solve grand societal challenges, and will, therefore, contribute to increasing the socio-economic value for citizens.

20.7 References

[1] Prahalad, C.K.; Ramaswamy, V. (2004) "Co-Creation Experiences:
The Next Practice in Value Creation". Journal of Interactive Marketing. Volume 18, Number 3.

[2] New pathways to value through co-creation (2009).
LSE Enterprise & Promise

[3] OECD and the World Bank. 2013a.
What sorts of Linkages can Can Foster Innovation?" Innovation Policy Platform

[4] OECD and the World Bank. 2013b.
Innovation Networks and Clusters." Innovation Policy Platform.

[5] Co-creation design as a new way of value creation.
Case study 14, Business Innovation Observatory, February 2014

[6] Innovation Policy Platform
What sorts of linkages can foster innovation*?*
"https://www.innovationpolicyplatform.org/content/what-sorts-linkages-can-fosterinnovation? topic-filters=12071

[7] M. Curley and B. Salmelin,
Open Innovation 2.0: The big picture — Open Innovation 2.0: A New Milieu, 2014

[8] Demola Tampere.2016. "For students" Demola Tampere
Open Innovation Platform for Students and Companies. http://www.demola.net/students

[9] Chesbrough, H.W. 2006. "Open Innovation: Researching a New Paradigm.
ed. H.Chesbrough, W. Vanhaverbeke and J. West, 134-45. New York: Oxford University Press.

21 Tourism Policies for Communicating World Heritage Values: The Case of the Old Town of Corfu in Greece

Sofia Maria POULIMENOU
Ionian University, Corfu, Greece

Polyxeni KAIMARA
Ionian University, Corfu, Greece

Agnes PAPADOPOULOU
Ionian University, Corfu, Greece

Georgios MILIOTIS
Ionian University, Corfu, Greece

Ioannis DELIYANNIS
Ionian University, Corfu, Greece

21.1 Abstract

The use of multimedia tools for the promotion of cultural heritage and the creation of interactive gamification environments can support learning and have been in the center of mixed reality research for years. This paper presents a work-in-progress that has been designed for deeper access to cultural knowledge, with the use of different technologies and addressed to different user categories. The "360º interactive visual Corfu guide" is a tool aimed for visitors that focuses at the cultural and historical familiarization with monuments and offers high interactivity with several points of interest, with no physical visit necessary. The project utilizes 360o videos in order to create immersive and authentic experiences.

21.2 Introduction

World Heritage Sites are highly touristic destinations that welcome several kinds of visitors on a yearly basis. Before travelling, a visitor usually prepares the visit by searching information about the destination beforehand either from a website, a travel guide or some other traditional promotional means. The amount and kind of information seeking depends on the level of knowledge the visitor wishes to acquire according to different tourist typologies. Tourist behavior analysis has shown that when visiting a cultural destination, the interest to gain deeper knowledge of the destination's culture increases, as the mankind's inherent curiosity and desire to explore cultural identities across the world is one of the main motivations of tourism [see 1]. According to tourist typologies, visitor behavior has been categorized based on the visitor's travel experience and motivation for holiday-taking into the above: the purposeful, the sightseeing, the casual, the incidental and the serendipitous [see 2&3].

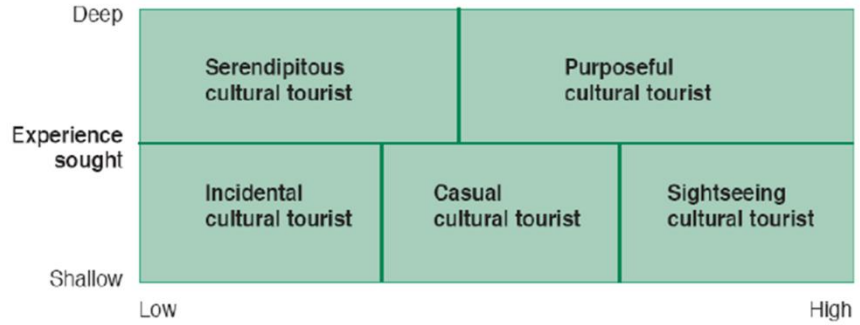


Figure 1: *Tourist typologies according to the importance of cultural tourism*

The purposeful cultural tourist commonly has a primary motivation to live a deep experience of the destination's culture. The serendipitous cultural tourist usually experiences sightseeing gaining some knowledge of the destination's culture. The casual and incidental tourist usually choose a destination due to other reasons, such as sea, sun, sports, etc, yet while visiting they are engaged to some cultural activity and get a shallow knowledge of the destination's culture. There are two basic dimensions in the segmentation of the cultural tourism market: (i) the importance of cultural motives in the decision to visit a destination and (ii) the depth of experience [see 2]. Visitor behavior seems to be determined by their attitudes, actions and motivations [see 3].

21.3 Worldschooling and incidental learning in travelling

Learning is a continuous process not only referring to students or academic learners. Anyone can be a potential learner, because learning can be formal, non-formal and informal [see 4]. When referring to travelling, a new pedagogical approach for learning rises, which is called "worldschooling". This term was first mentioned by Gerzon [see 5] who is a traveler and writer, and defines it as "... when the whole world is your school, instead of school being your whole world". Worldschooling, regardless of demographic characteristics and personal interests, promotes human development at three areas: social and personal development, and experiential academics [see 6]. For the personal development which is related to the cultivation of everyday life skills and lifelong learning, knowledge is constructed through out-of-classroom experiences.

Toward this direction, travelling can be educational because it broadens the mind as people learn and interpret experiences [see 7]. There are also many times when a visitor travels without having planned visits to museums or archaeological sites, and without intention to learn deeply about the place he visits but travels solely for purposes of recreation or relaxing. This visitor can come across many interesting sites and coming in contact with new environments he can learn effortlessly without having sought it at first. This process is called "incidental learning". As in incidental learning there is a sense of unplanned process without existing a specific intention to learn, purpose and goal-driven [see 8], the "learner" learns through an activity quite unrelated to the educational process and thus not directly perceived by the learner himself but also by others [see 9].

21.4 Smart education, learning and smart technologies

When Aristotle was referring to techne, episteme, and phronesis, defined the theoretical framework for learning and travel [see 10]. Techne is the knowledge of craftsmanship, episteme is the propositional knowledge, and phronesis is the wisdom. A visitor can meet all three of these elements in the new places he discovers. The opportunity of travel promotes skills and cutting edge technologies can forward, and reinforce the random or incidental learning, and transform it into deliberate learning. Thus, travelling can be emerging as the platform supporting the new pedagogy of the 21st century, which focuses to the ability to learn, communicate, collaborate, participate, explore and create. These skills are known as "the 4 Cs": critical thinking, communication, collaboration, and creativity [see 11]. In the service of 4 Cs, the current trend of education, "Smart Education", offers through technological development, smart learning environments providing experiences to learners [see 12&13]. There are many different types of technology used to sustain, and enhance "smart" learning. Devices, and technologies are inextricably linked [see 12]. Smart devices, which are small, portable, and affordable (e.g. smartphones/tablets, laptop, Google glasses etc.), support learners anytime, and anywhere and smart software provides adaptability, and flexibility. Thus, learning can be succeed easily and effortlessly, as most people always carry small portable

devices such as mobile phones and tablets, especially the latest technology that supports "smart" technologies.

21.5 Learning from technology in tourism and travelling

Nowadays, culture and tourism sectors are constantly looking for new means of visitor engagement [see P14]. Especially in the field of cultural heritage tourism, the utilization of new and innovative technologies enhances the learning experience of the visitor [see 15] and maximizes user satisfaction and understanding of a destination [see 16]. Web-based applications in cultural tourism make cultural heritage accessible to all [see 17] offering interaction with different options and different levels of information according to one's interest. Travellers, generally, have their mobile phones to communicate and/or take pictures. In Smart Cities, i.e. the cities which represent an environment where technology is embedded within the city [see 18], it is very likely to find points of interest with QR Codes. Mobile apps based on virtual and augmented reality allow visitors by shooting a QR Code or an exhibit to discover other information. There is also the possibility for visitors to add their own information and their own content and from simple visitors to transform themselves into product designers as expert content, a process that activates the principles of learning by design. Thus, symptomatic learning is transformed into deliberate and systematic. Learning by Design is not simply an exercise in applying the new digital media to learning but is an attempt to create social relations of learning and collaborative relations of pedagogical design [see 19&20].
The uses of Digital Cultural Products, which are basically constructed with interactive 3D models, are autonomous and offer interactive experience, creating new conditions for cultural tourism. This interaction takes on elements of game experience [see 21]. Such Digital Cultural Products is the Virtual Guide for physical visitors which will be able to learn by exploring, guided by virtual agents [see 22], and Virtual Tours, aimed at remote visitors - internet users [see 23]. 3D-holograms and telepresence devices promise to eliminate geographical distance enabling travellers to be virtually present in any location at any time. An interactive system with virtual tours does not just offer visitors -physical or remote - a dynamic tour experience but the opportunity to get to know the presence of a robot that is programmed for guided tours [see 24].

21.6 Visual Interactive Guide for access to cultural information

The above research on the connectivity between travelling, use of technologies, user experience and learning led to the creation of a case study visual guide for Cultural Sites that utilizes 360º videos for general tour inside the room and offers interactivity with several points of interest. The user interacts with the points of interest and gets access to different levels and kinds of information for each point of interest, according to their interest. The case study has been implemented at the Town Hall of Corfu, situated in one of the most visited public squares of the Old Town of Corfu, a World Heritage Site inscribed at UNESCO's List since 2007. The Town Hall of Corfu is the former San Giacommo Theatre, a 16th century building and one of the most historic places in Corfu, with high cultural value but not normally accessible to visitors as it hosts the official Mayor's Office.
In the used methodology the first step was to choose the place and theme. After having chosen the place (Town Hall of Corfu and the Mayor's Office) the points of interest had been decided and the scenario was created for the general tour and for the presentation of each point of interest. Then, the design of the gamification experience was created in order to support incidental learning (no questions, no forced content, simply incidental learning at the first level) and the recording of the video with the use of 360º camera followed. Two kinds of videos were recorded, one that simply covered the room and one with the assistance of a professional tour

guide that presented both the room and each point of interest with information that occurred during the historical research.
The relevant documentation (photos, texts, audio and videos) was imbedded at the points of interest that had been marked with special graphics created for the case-study and the system was finally competed with the addition of interaction with the points of interest using UNITY 3D game development application. When a visitor is looking a point of interest, which have been signed with graphics, the access to extended information is presented. The information is either a short presentation, for example a guided tour of the room, photo galleries or other type of multimedia/content descriptive information.

Figure 2: *360º video capture of the Mayor's office showing a PoI [F2]*

Visitors can explore the room physically by moving their heads and the audio experience is directional. For the case of distance visiting, a specific point outside the building has been chosen and by scanning on it with a mobile device it shows the option of interactive guidance. In that case someone can virtually visit the room while being on the outside of the building. Finally, issues of usability and aesthetics have also been taken into strong consideration, as those kinds of applications apply to wide audiences with a wide range of abilities [see 25] and need to be relevantly adjusted.

Figure 3: *Capture of the professional guide presenting the room [F3]*

At the moment the case study is being expanded to both operability and content. The content expansion aims at including other important sites of the Old Town of Corfu. Special focus will be given to buildings with cultural importance but not normally visited by tourists and to buildings under protection where visits are restricted due to safety reasons. In this manner accessibility will be offered to otherwise hidden treasures of the local cultural heritage, without risking the deterioration of the monument. In terms of operability, the design expert is working on elaboration customizable hotspots per scenes and alternative presentations of the available content such as video pop-up overlay, full scene change and floating controls. The next goal is to create a fully functional interactive guide for the monument ensemble.

21.7 Conclusions

It is evident that 360º videos can create highly immersive video environments that offer an increased sense of real presence to the users either locally or remotely. In particular augmented, virtual reality and 360º technologies provide with unique opportunities for the tourism destination market to assist the communication between specially targeted markets by

offering a rich environment to potential visitors. Despite the fact that technology itself does not replace the need for human guidance, it may help personalize the experience and make it more engaging and direct. When referring to monuments and sites, the use of such technologies also suggest a protective role as they provide with an alternative way of experiencing a place and help to prevent overcrowding at a protected Site.

21.8 References

[1] http://www2.unwto.org/publication/tourism-world-heritage-sites-challenges-and-opportunities, last accesses 28 March 2018

[2] Bob McKercher, Robert McKercher, Hilary Du Cros , "Cultural Tourism: The Partnership Between Tourism and Cultural Heritage Management", Routledge, 2002

[3] Teo Carol Boon Chui, Mohd Khan Rita Noor, Rahima Faizah Hj. Abd, "Understanding Cultural Heritage Visitor Behavior: The Case of Melaka as World Heritage City", Accepted paper at the 4th International Conference on Marketing and Retailing 2013, INCOMaR 2013

[4] Danielle Colardyn, Jens Bjornavold, "Validation of formal, non-formal and informal learning: Policy and practices in EU member states", European journal of education, 39(1), 69-89, 2004

[5] Eli Gerzon, "Worldschooling", 2007, Retrieved April 1, 2018 from: http://eligerzon.com/worldschooling.php, accessed 28th March 2017

[6] Aimee Ferraro, "Evaluation of a temporary, immersive learning community based on worldschooling", Journal of Unschooling and Alternative Learning, 10(20), 2016

[7] Mathew J. Stone, James F. Petrick, "The educational benefits of travel experiences: A literature review", Journal of Travel Research, 52(6), 731-744, 2013

[8] Michael J. Spector, "The potential of smart technologies for learning and instruction", International Journal of Smart Technology and Learning, 1(1), 21-32, 2016

[9] Victoria J. Marsick, Karen E. Watkins, Ellen Scully-Russ, Aliki Nicolaides, "Rethinking informal and incidental learning in terms of complexity and the social context", Journal of dult Learning, Knowledge and Innovation, 1(1), 27-34, 2017

[10] Joh H. Falk, Roy Ballantyne, Jan Packer, Pierre Benckendorff, "Travel and learning: A neglected tourism research area", Annals of Tourism Research, 39(2), 908-927, doi:10.1016/j.annals.2011.11.016, 2012

[11] National Education Association (NEA), "Preparing 21st century students for a global society: An educator's guide to the four C's", 2012, https://goo.gl/NV8Adt, accessed 23 March 2018

[12] Begona Gros, "The design of smart educational environments", Smart Learning Environments, 3(1), 15. doi.org/10.1186/s40561-016-0039-x,2016

[13] Zhi-Ting Zhu, Ming-Hua Yu, Peter Riezebos, "A research framework of smart education", Smart Learning Environments, 3(1), 4. doi.org/10.1186/s40561-016-0026-2, 2016

[14] Joanna Kempiak, Lynsey Hollywood, Peter Bolan, Una McMahon Beattie, "The heritage tourist: an understanding of the visitor experience at heritage attractions", International Journal of Heritage Studies, 23:4, 375-392, DOI: 10.1080/13527258.2016.1277776, 2017

[15] Timothy Jung, Claudia Tom Dieck, Natasha Moorhouse, Dario Ton Dieck, "Tourists' experience of Virtual Reality applications", 2017 IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, NV, pp. 208-210, doi: 10.1109/ICCE.2017.7889287, 2017

[16] Sameer Hosanya, Girish Prayag, “Patterns of tourists' emotional responses, satisfaction, and intention to recommend”, Journal of Business Research 66(6), DOI: 10.1016/j.jbusres.2011.09.011, 2013

[17] Alex Deffner, Eva Psatha, Nicolaos Bogiantzidis, Neoklis Mantas, Elena Vlachaki, Polyxeni Ntaflouka, “Accessibility to culture and heritage: Designing for all”, Conference AESOP 2015, Definite space – fuzzy responsibility at Czech Technical University, Faculty of Architecture, 2015

[18] Dimitrios Buhalis, Aditya Amaranggana, “Smart tourism destinations”, Information and communication technologies in tourism 2014 (pp. 553-564). Springer, Cham, 2015

[19] Janet Kolodner, Cindy Hmelo, Hari Narayanan, “ Problem-based learning meets case-based reasoning”, Proceedings of the 1996 international conference on Learning sciences (pp. 188-195), International Society of the Learning Sciences, 1998

[20] Mary Kalantzis, Bill Cope, “Introduction: learning by design”, E-Learning and Digital Media, 7, 198. http://dx.doi.org/10.2304/elea.2010.7.3.198, 2010

[21] Sofia Poulimenou, Polyxeni Kaimara, Ioannis Deliyannis,

[22] George Lepouras, Costas Vassilakis, C, “Virtual museums for all: employing game technology for edutainment”, Virtual reality, 8(2), 96-106, 2004

[23] Nadja De Carolis, Cristina Gena, Tsvi Kuflik, Joel Lanir, “Special issue on advanced interfaces for cultural heritage”, https://doi.org/10.1016/j.ijhcs.2018.02.007, 2018

[24] Daniele Colardyn, Jens Bjornavold, “Validation of formal, non‐formal and informal learning: Policy and practices in EU member states”, European journal of education, 39(1), 69-89, 2004

[25] Ioannis Deliyannis Georgios Papaioannou, “Combining Interaction Design and Gaming Technologies for the Development of Interactive Archaeological Content Presentation Systems”, Int J Adv Technol 8: 178. doi:10.4172/0976-4860.1000178, 2017

[F1]https://www.researchgate.net/profile/Janos_Csapo2/publication/224830622/figure/fig2/AS:302789457661984@1449202040991/The-typology-of-cultural-tourist-by-McKercher-and-Du-Cros.png

22 Drafting the individualized education plan for students with ADHD: Can ICT assist with inattentive learning?

E.Ch. KYRIAKOU
University of Nottingham and University of West Attica, Greece

M.E. PAPANIKOU
University of Nottingham and University of West Attica, Greece

K. AFANTENOU
Aristotelian University of Thessaloniki, Greece

P.H. YANNAKOPOULOS
University of West Attica, Greece

22.1 Abstract

Nowadays, the number of children identified as having specific learning difficulties is rising. This fact highlights the possibility of having children with these difficulties in every class (Macintyre, 2003). Specific learning difficulties (SPLD) is an umbrella term used for Dyslexia, Attention Deficit Hyperactivity Disorder (ADHD), Developmental Dyscalculia (DD), Dyspraxia and Specific Language Impairment and appears approximately at the 7-10% of the population. These children have difficulties in learning and are diagnosed according to the discrepancy criterion (Reid, 2009; Bishop, 2004) which indicates a discrepancy between good intelligent and pure academic performance.
Primary intervention for children with SPLD is crucial and for that reason significant effort has been made to develop educational tools with the use of ICT, suitable for children with special educational needs as children can benefit from the use of new technology. Examples of the use of ICT and a currently running research are presented.

Keywords: SPLD, ADHD, Developmental Dyscalculia, ICT

22.2 Introduction

22.2.1 Symptoms of Developmental Dyscalculia

The most significant symptom of DD is the mathematical anxiety; often these children suffer from stress when they deal with maths and usually they create negative emotions and perceptions about them (Shalev, 2004). Karagiannakis et al. (2014) grouped the symptoms into four categories:

a) Visio-spatial difficulties (in which belong children that have difficulties with mathematical symbols or understanding geometric shapes).
b) Retrieval difficulties (when children struggle to retrieve arithmetic facts, such as multiplication table).
c) Difficulties in estimating quantities and comparing and linking numerical contributions with quantity and numeracy, and
d) Difficulties in math reasoning (when children struggle to find which strategy is more appropriate in order to solve a mathematical problem).

Children may improve the acquisition of mathematical concepts and abilities such as calculation with appropriate teaching (Shalev, 2004; Rosselli et al. 2006). Students with DD often relate maths, numbers or even words related to maths, with negative feelings and anxiety. Rubinsten and Tannock (2010) in their research concluded that DD is strongly related

to math anxiety and fear; they also noticed that the felling of fear grow when there was time pressure.

22.2.2 Use of ICT in education for Developmental Dyscalculia

ICT and technology is integral in school programs nowadays and also it has been found that it helps children with Specific Learning Difficulties (SPLD).

According to Drigas and Ioannidou (2013) ICT can assist with teaching and learning. Computer games applied to pedagogical approaches can significantly help children that face difficulties at maths (de Castro et al., 2014; Coştu et al., 2009; Griffin, 2004). There is a variety of technological types that can help pupils with SPLD and especially those with DD, and divided into the following categories: mobile applications, computer games, assistive technology, software and virtual environments; all these, however, need support and the appropriate guidance from teachers.

Applications – software

According to Nagavalli and Fidelis (2015) there is a variety of applications that help children with DD and one of the mentioned ones in the research is “The Number Race” which can help the children to develop visual-spatial connection to numbers. Pupils through such applications can see and understand the relation of symbols to physical space and can also adjust to pupils’ level.

“Number Race” helps young children understand the basic number concepts and the older ones to conquer the sense of numbers and to be able to count, add, abstract and divide (www.thenumberrace.com, 2018). Wilson et al. (2006) also tested this specific application and concluded that children made significant progress in numerical cognition.

Another application is the “LongDivision” for iPods that help pupils solve long-division problems. While, at the same time, it animates all the steps that need to be done for the solution (division, multiplication, deduction) (Nagavalli and Fidelis, 2015).

Furthermore, Ariffin, Halim and Abd (2017) investigated the results of the mobile application “Calculic Kids” which is addressed to pupils with DD, in Malaysia. The researchers concluded that such applications could help and ease children with mathematical difficulties in order to learn mathematics efficiently and deeply understand the basic numerical system (decimal).

“TouchMath” is addressed to children of all ages beginning from pre-kindergarden years. It is based in multisensory math teaching and aims to deep comprehension of number facts, so that children do not guess but find the right answer and the way to solve a problem (www.touchmath.com, 2018). At the same time it helps children to form a size-quantity relationship while being asked to find, touch or draw numbers (Nagavalli and Fidelis, 2015).

Computer games

Research that dealt with an educational program based on computer games and tested on 7-year-old DD children, concluded that there was improvement of mathematics and numerical capacities of the students after their avocation with the programme in which pupils asked to execute arithmetic operations. In the same research the teachers’ perception about the usage of computers in teaching kids with DD was positive (Mohd Syah et al., 2016).

Another research concerning educational computer games investigated the attitudes of pupils towards this type of teaching and learning is in line with the above; children stated that they found it interesting, fun and very helpful and most of them agreed that this kind of technology should be used all the time in maths. The research also proved that there was reduction of mathematical anxiety and that children form a more positive attitude towards maths (Coştu, Aydin and Filiz, 2009).

Moreover, an example of such computer programmes is the “Number Shark” that consists of 45 computer games that try to improve step by step the mathematical skills of pupils, especially those with DD, and their comprehension and perception of the four basic mathematical operations, the number system and the sequencing percentages (Nagavalli and Fidelis, 2015).

22.2.3 Virtual environment and digital games

De Castro et al., (2014), studied the effect of virtual environment in mathematical skills of children 7 to 10 years old. The results showed improvement in mathematical skills of DD students and that this kind of environment worked as motivation and encourage these children to participate and try more. Tests showed improvement after the experiment in contrast to children that had not had computer based reinforcement. Students in this research also mentioned that this type of teaching was a more interesting and fun than the traditional one.
Furthermore, according to Laurillard (2016) digital games can also help in improvement of mathematical difficulties. Digital games are efficient in achieving independent learning; something quite important for DD students that usually need more time and active engagement in order to comprehend the subject and the sense of the teaching.
All the above cannot replace the teaching of mathematics but they can help children with mathematical difficulties to deeply understand the meaning of numbers and encourage them to try and getting over these difficulties while at the same time they can have fun(Mantzana and Nikolopoulos, 2017).

22.2.4 Individualized learning plan/ intervention program

Educators should take into account the needs and weaknesses of each child and the possibility of the co-occurrence of SPLD (co-occurrence of dyscalculia and ADHD) for this reason an individualized plan is necessary. Educators should take into consideration the anxiety that these children present when they have to do with maths, as it is a factor that can exist either as a symptom or as a cause of the impairment (Shalev, 2004).
Consequently, teachers have to help students to minimise their stress. According to Wadlington and Wadlington (2008) the positive reinforcement is significant. The use of computer games such as the “NumberShark” can reduce students’ stress and form positive attitudes towards maths.
Students participating in research stated that they found the “NumberShark” fun, interesting and helpful (Coştu, Aydin and Filiz, 2009). Using this game in teaching students with DD helps them to see the relation between numerical facts.
It is essential for the teachers to break down the lessons into smaller parts and move on progressively and step by step and present the teaching material well organized (Plemmenou and Nikolopoulos, 2017; Wadlington and Wadlington, 2008; Sharma, 2003; Kay and Yeo, 2003). Moreover they should be given small volume of homework and the assignments or the mathematical problems should be broken into smaller parts, in order to be easier for the pupils to process and store in their memory, efficiently mathematical facts (Wadlington and Wadlington, 2008). It is significantly helpful to receive feedback for each part (Laurillard, 2016). The student could be encouraged with computer games such as “AdaptedMind Math”, as students can start from the simplest operation and progressively continue to more complicated when at the same time they have immediate feedback.
However, when DD coexist with dyslexia educators should work on vocabulary, especially maths vocabulary. That means that teachers should focus on the explanation of words and symbols of maths using examples from children's everyday life. For example, they could create with the children their own mathematical dictionary and slowly, but progressively, add new words to it, which will have first been worked in classroom. Also children could use these words into their own examples in sentences, for teachers to know what they have learned (Wadlington and Wadlington, 2008). Teachers could use “MathisFun”, an online math dictionary where virtual representation objects progressively turned into symbolic representation e. g. 3 - 1 = 2. It might be helpful if children write their own problems, or the teachers give them problems that are directly related to their daily life (Plemmenou and Nikolopoulos, 2017; Wadlington and Wadlington, 2008; Payne and Turner, 1999). However, in children that present mostly memory and retrieval difficulties teachers need to first work with the sense of the material that pupils have to memorize. In order to do so, breaking the material into chunks is one of the solutions. By this way children could see the relation between numerical facts, to understand, for example, that 8*2=2*8. It has been proved that children with mathematical and retrieval

problems were helped by putting the facts into music or give them rhythm (Edelson and Johnson, 2003). Finally, it has been proved that these children were helped also by systematic repetitions (Sharma, 2003) and by explaining out loud the steps they took to solve a mathematical problem (Witzel et al, 2001).

22.2.5 The case of ADHD

Symptoms

According to the American Academy of Paediatrics guidelines (2000) the main symptoms of Attention – Deficit Hyperactivity Disorder (ADHD) are inattentiveness, impulsivity and hyperactivity. ADHD is also generally typified by lack of continuing task involvement and disorganized or poorly modulated behavior. A person can be predominantly inattentive (often referred as ADD), predominantly hyperactive – impulsive, or a combination of these two. Typically, ADHD symptoms are first exhibited in early childhood and continue to be present throughout adolescence and adulthood (Weiss & Hechtman, 1993). In order to make a diagnosis, Diagnostic and Statistical Manual of Mental Disorders – IV (DSM – IV) is widely used as long as there is not any objective standardized test or any identified aetiology for ADHD. Studies indicate that children diagnosed with ADHD also display comorbid psychiatric conditions such as childhood anxiety, conduct disorder, mood disorders etc. Comorbid conditions must be observed and evaluated as they could "influence severity, daily functioning, treatment and prognosis and thus complicate the diagnosis, treatment and prognosis of ADHD (Connor, 2003, Waxmonsky, 2003).

ADHD cannot be considered as a disease nor a neurobehavioral condition but a collection of core symptoms (inattention, impulsivity and over – activity) that comorbid with other mental health conditions. An initial evaluation that would include an interview with the parents, the use of standardized rating scales, school information and teachers' remarks, a psychiatric assessment and a complete physical examination is best recommended (Greenhill et al., 2002).

According to Pavlidis and Giannouli (2013), there is a significant comorbidity of ADHD and special learning difficulties, especially with dyslexia. The correlation between the inattentive type of symptoms of ADHD and dyslexia is stronger than the hyperactive – impulsive ones. The hyperactive – impulsive symptoms are often associated with behavioral problems. In general, students with ADHD and dyslexia display slower naming speed, processing speed, working memory deficits, inhibition deficits and face more difficulties in "estimating the duration of a task". Furthermore, they appear to be forgetful, they are easily distracted and disorganized and because of them they are missing social cues, they get into fights or frequently involved to accidents due to the hyperactivity.

22.2.6 Individualized learning plan/ intervention program

The U.S Department of Education (2008) suggested that the teacher chooses among different educational practices that are "associated with academic instruction, behavioral interventions, and classroom accommodations that are appropriate to meet the child`s needs."

Improving academic performance

The first step towards forming an individualized educational program is effective academic instruction. Students with ADHD are in need of a carefully structured academic lesson linked to previous knowledge and with new distinct skills to be achieved. Ainsworth (2006) says that constructing a representation rather than just interpreting one, can lead to a deeper understanding of the situations. The use of audiovisual materials is essential. Greenwood et al. (1991) describe peer tutoring as the instructional strategy where in two students collaborate in an academic activity, with one student providing assistance, instruction and feedback to the other. Task modification also enables students with ADHD to reach higher levels of academic performance (DuPaul et al., 1998).

22.2.7 The use of ICT in education for ADHD

Significant efforts have been made in order to develop educational tools that offer the use of ICT, suitable for children with special educational needs. There is a growing literature which indicates that students with ADHD can benefit from the use of new technology. Drigas and Tourimpampa (2014) point out the fact that ICT enhance systematically the investigation on mental disorders field, as they are hot topics in children's lives and present more accurate and valid measurements.

Computers generally enhance students' learning ability as they provide learning at the individual's pace, they promote constructivist learning with instant reinforcements and feedbacks. Moreover, the presentation of information visually, auditory and kinaesthetically appears to be stimulating and motivating, especially for students with attention problems and/or hyperactivity – impulsivity. When students with ADHD symptoms work on computer, they spent longer time practicing and completed a twofold amount of exercises than they would if paper – and – pencil tasks were used (Solomonidou et al., 2004).

Ford et al. (1993) concluded that students were more attentive when using gaming software linked to the curriculum, especially when reply time was unlimited.

Furthermore, computerized cognitive – training programs proved to be effective tools for the management of ADHD symptoms, aiming to increase attention and reduce impulsivity. (Navaro et al., 2001)

Solomonidou et al. (2004) stated that when students dominated the use of computer, paid more attention and were less energizing. In addition, when they had to actively engage with the software program, students with ADHD behave similarly as students without ADHD. The above mentioned researchers emphasized on the fact that students with ADHD symptoms react typically under certain circumstances of using computer and multimedia: they prefer watching videos and pictures, listening to short narration items, reading short texts and above all working individually, unless they work collaboratively in highly interactive constructivist – type software.

As stated by Raggi and Chronis (2006), Computer Assisted Instruction (CAI), with specific instructional objectives such as apportionment of content, multisensory provision and immediate feedback improved students' attention and working attitude. Schrieber and Scheifert (2009) examined the use of handheld computers/PDAs by students with learning difficulties and ADHD. They confirmed their premise that the devices helped students with their organizational and memory related difficulties enabling them to concentrate on their tasks and improve their self – esteem. The use of a computer assistive software intervention, that Hecker et al. (2002) proposed, improved reading speed and simultaneous attention while enhancing positive attitudes towards school settings in students with attention disorders. Ota and DuPaul (2002) also promoted the use of game formats as an additional resource in order to amplify the teaching of the curriculum, especially in mathematics. Shalev et al. (2007) worked on creating a computerized progressive attentional training (CPAT) program which improved attention levels in children with ADHD. The intervention program proved to help in reducing behavioral disarrangements.

22.2.8 The example of Atentiv

Atentiv uses a child's "cognitive signature" of EEG brainwave activity to measure attention, every second. Children play the specialized video game on a computer or mobile device. The game illustrates a desired action or behavior to achieve a stated goal. The child instantly modifies his/her actions to set a path toward the goal. The AV headset amplifies and sends electrical brain activity to the tablet via Bluetooth. When the player is focused, the avatar moves forward. When the player is not focused, then the avatar stops moving. (Atentiv.com, 2018)

Three pilot studies examining "Atentiv" have been completed and more than 50 children (aged 6 to 12) participated. Children received 8 to 10 hours of training per week for 8 to 10 weeks and ADHD symptoms improved by approximately 30% to 50% in 80% of the subjects as rated by parents and clinicians. Behavioral improvements were sustained for three to four months

following training, which was as long as the researchers followed the children. (Hamadicharef et al., 2009, Lee et al., 2013 and McDermott et al., 2016).

22.3 Bibliography

Abraham, A., Windmann, S., Siefen, R., Daum, I. and Güntürkün, O. (2006). Creative Thinking in Adolescents with Attention Deficit Hyperactivity Disorder (ADHD). Child Neuropsychology, 12(2), pp.111-123.

Adaptedmind.com. (2018). AdaptedMind Math. [online] Available at: http://www.adaptedmind.com/gradelist.php?grade=2 [Accessed 20 Feb. 2018].

Ainsworth, S. (2006). DeFT: A conceptual framework for considering learning with multiple representations. Learning and Instruction, 16(3), pp.183-198.

American Psychiatric Association. Task Force on DSM-IV. (1994). DSM-IV draft criteria. Amer. Psychiatric Pub Incorporated.

Ariffin, M. M., Halim, F. A. A. and Abd, N. (2017). MOBILE APPLICATION FOR DYSCALCULIA CHILDREN IN MALAYSIA.

Atentiv.com. (2018). ATENTIVmynd. [online] Available at: http://atentiv.com/ [Accessed 23 Feb. 2018].

Barkley, R.A. (1990). Attention defcit hyperactivity disorder: A handbook for diagnosis and treatment. New York: Guilford.

Badian, N. (1999). Persistent arithmetic, reading, or arithmetic and reading disability. Annals of Dyslexia, 49 (1), pp. 45-70.

Bdadyslexia.org.uk. (2018). Dyscalculia | British Dyslexia Association. [online] Available at: http://www.bdadyslexia.org.uk/dyslexic/dyscalculia [Accessed 2 Jan. 2018].

Bishop, D. V. M. (2004)."Classification of developmental language disorders: Theoretical issues and clinical implications." In L Verhoeven (Ed.), Specific Language Impairment Diagnostic dilemmas (pp. 309-326). Mahwah, NJ: Lawrence Erlbaum Associates.

Castro, M., Bissaco, M., Panccioni, B., Rodrigues, S. and Domingues, A. (2014). Effect of a virtual environment on the development of mathematical skills in children with dyscalculia. PloS one, 9(7), p. e103354.

Clinical Practice Guideline: Diagnosis and Evaluation of the Child With Attention-Deficit /Hyperactivity Disorder. (2000). PEDIATRICS, 105(5), pp.1158-1170.

Connor, D., Edwards, G., Fletcher, K., Baird, J., Barkley, R. and Steingard, r. (2003). Correlates of Comorbid Psychopathology in Children With ADHD. Journal of the American Academy of Child & Adolescent Psychiatry, 42(2), pp.193-200.

Coştu, S., Aydın, S. and Filiz, M. (2009). Students' conceptions about browser-game-based learning in mathematics education: TTNetvitamin case. Procedia-Social and Behavioral Sciences, 1(1), pp. 1848-1852.

De Visscher, A. and Noël, M. P. (2013). A case study of arithmetic facts dyscalculia caused by a hypersensitivity-to-interference in memory. Cortex, 49(1), pp. 50-70.

Drigas, A., & Tourimpampa, A. (2014). Processes and ICT Tools for ADHD Assessment, Intervention and Attention Training. International Journal of Emerging Technologies in Learning, 9(6).

Drigas, A. S. and Ioannidou, R. E. (2013). Special Education and ICTs. International Journal of Emerging Technologies in Learning, 8(2).

DuPaul, G. J., & Eckert, T. L. (1998). Academic interventions for students with attention-deficit/hyperactivity disorder: A review of the literature. Reading & Writing Quarterly Overcoming Learning Difficulties, 14(1), 59-82.

En.wikipedia.org. (2018). Shaping (psychology).[online] Available at: https://en.wikipedia.org/wiki/Shaping_(psychology) [Accessed 25 Jan. 2018].

Ford, Mary J., Virginia Poe, and Juanita Cox. "Attending behaviors of ADHD children in math and reading using various types of software." Journal of Computing in Childhood Education (1993).

Furman, L. (2005). What Is Attention-Deficit Hyperactivity Disorder (ADHD)?.Journal of Child Neurology, 20(12), pp.994-1002.

Greenhill, L., Pliszka, S. and Dulcan, M. (2002). Practice Parameter for the Use of Stimulant Medications in the Treatment of Children, Adolescents, and Adults. Journal of the American Academy of Child & Adolescent Psychiatry, 41(2), pp.26S-49S.

Greenwood, C. R., Maheady, L., & Carta, J. J. (1991). Peer tutoring programs in the regular education classroom. In G. Stoner, M. R. Shinn, & H. M. Walker (Eds.), Interventions for achievement and behavior problems (pp.179-200). Silver Spring, MD: National Association of School Psychologists.

Griffin, S. (2004). Building number sense with Number Worlds: A mathematics program for young children. Early childhood research quarterly, 19(1), pp. 173-180.

Gross-Tsur, V., Manor, O. and Shalev, R. S. (1996). Developmental dyscalculia: Prevalence and demographic features. Developmental Medicine & Child Neurology, 38(1), pp. 25-33.

Hamadicharef, B., Zhang, H., Guan, C., Wang, C., Phua, K.S., Tee, K. P. & Ang, K. K. (2009) Learning EEG-based spectral-spatial patterns for attention level measurement. In Circuits and Systems, 2009. ISCAS 2009. IEEE International Symposium on, 1465-1468. IEEE.

Hecker, L., Burns, L., Elkind, J., Elkind, K. and Katz, L. (2002) Benefits of assistive reading software for students with attention disorders. Annals of dyslexia, 52, pp 1-12

K12teacherstaffdevelopment.com. (2018). What are the Strengths of Students with ADHD? [online] Available at: https://k12teacherstaffdevelopment.com/tlb/what-are-the-strengths-of-students-with-adhd/ [Accessed 25 Jan. 2018].

Karagiannakis, G., Baccaglini-Frank, A. and Papadatos, Y. (2014). Mathematical learning difficulties subtypes classification. Frontiers in human neuroscience, 8.

Kay, J., Yeo, D. (2003). Dyslexia and Maths. David Fulton

Laurillard, D. (2016). Learning number sense through digital games with intrinsic feedback. Australasian Journal of Educational Technology, 32(6).

Lee, T.S., Goh, S.J.A., Quek, S.Y., Phillips, R., Guan, C., Cheung, Y.B., Feng, L., Teng, S.S.W., Wang, C.C., Chin, Z.Y., Zhang, H., Ng, T.P., Lee, J., Keefe, R. & Krishnan K.R.R. (2013). A brain-computer interface based cognitive training system for healthy elderly: A randomized control pilot study for usability and preliminary efficacy. PLoS One, 8(11).

Lewis, C., Hitch, G. J. and Walker, P. (1994). The prevalence of specific arithmetic difficulties and specific reading difficulties in 9-to 10-year-old boys and girls. Journal of Child Psychology and Psychiatry, 35(2), pp. 283-292.

Macintyre, C. Deponio, P. (2003) Identifying and supporting children with specific learning difficulties, London: Routedge.

Mantzana, A. and Nikolopoulos, G. (2017). Specific learning difficulties and digital gaming. Panhellenic Conference of Educational Sciences, 2016(1), pp. 565-591 (in Greek).

Mathsisfun.com. (2018). Definition of Subtract. [online] Available at: https://www.mathsisfun.com/definitions/subtract.html [Accessed 15 Feb. 2018].

McDermott, A.F., Rose, M., Norris, T. & Gordon, E. EEG feed-forward video game training leads to sustained improvements in attention and academic achievement. Journal of Attention Disorders. http://jad.sagepub.com/

Mohd Syah, N. E., Hamzaid, N. A., Murphy, B. P. and Lim, E. (2016). Development of computer play pedagogy intervention for children with low conceptual understanding in basic mathematics operation using the dyscalculia feature approach. Interactive Learning Environments, 24(7), pp. 1477-1496.

Nagavalli, T. and Fidelis, P. J. (2015). Technology for Dyscalculic Children.

Navarro, J., Ruiz, G., Alcalde, C., Marchena, E., & Aguilar, M. (2001). How to increase attention using a computer assisted teaching procedure. In International Conference on Education and Technology, Tallahassee, Florida.

Ota, K. and DuPaul, G. (2002). Task engagement and mathematics performance in children with attention-deficit hyperactivity disorder: Effects of supplemental computer instruction. School Psychology Quarterly, 17(3), pp.242-257.

Pavlidis, G. and Giannouli, V. (2013). Linking ADHD – Dyslexia and Specific Learning Difficulties. In: The SAGE Handbook of Emotional and Behavioral Difficulties.

Passolunghi, M. C., and Siegel, L. S. (2004). Working memory and access to numerical information in children with disability in mathematics. Journal of experimental child psychology, 88(4), pp. 348-367.

Payne, T., Turner, E. (1999). Dyslexia. A Parent‟s and Teachers‟ Guide.Multilingual Matters LTD

Pfiffner, L. J., & Barkley, R. A. (1990). Educational placement and classroom management. In R. A. Barkley (Ed.), Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment (pp. 498-539). New York: Guilford Press.

Plemmenou, S. and Nikolopoulos, I. (2017). Dyscalculia in Primary education, Case study. Panhellenic Conference of Educational Sciences, 2016(2), pp. 1117-1129 (in Greek).

Ramaa, S. and Gowramma, I. P. (2002). A systematic procedure for identifying and classifying children with dyscalculia among primary school children in India. Dyslexia, 8(2), pp. 67-85.

Raggi, V. and Chronis, A. (2006). Interventions to Address the Academic Impairment of Children and Adolescents with ADHD. Clinical Child and Family Psychology Review, 9(2), pp.85-111.

Rosselli, M., Matute, E., Pinto, N. and Ardila, A. (2006). Memory abilities in children with subtypes of dyscalculia. Developmental neuropsychology, 30(3), pp. 801-818.

Rubinsten, O., and Tannock, R. (2010). Mathematics anxiety in children with developmental dyscalculia. Behavioral and Brain functions, 6(1), 46.

Shalev, R. S. (2004). Developmental dyscalculia. Journal of child neurology, 19(10), pp. 765-771.

Shalev, L., Tsal, Y. and Mevorach, C. (2007). Computerized Progressive Attentional Training (CPAT) Program: Effective Direct Intervention for Children with ADHD. Child Neuropsychology, 13(4), pp.382-388.

Shrieber, B., and Seifert, T.: College Students with Learning Disabilities and/or ADHD Use of a Handheld Computer Compared to Conventional Planners. Proceedings of the Chais conference on instructional technologies research: Learning in the technological era. Y. Eshet-Alkalai, A. Caspi, S. Eden, N. Geri, Y. Yair (Eds.), Raanana: The Open University of Israel, 2009

Solomonidou, C, Garagouni-Areou, F. and Zafiropoulou, M. (2004) Information and communication technologies (ICT) and pupils with attention deficit hyperactivity disorder (ADHD) symptoms: Do the software and the instruction method affect their behavior? Journal of Educational Multimedia and Hypermedia 13.2: 109.

U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs, Teaching Children with Attention Deficit Hyperactivity Disorder: Instructional Strategies and Practices. Washington, D.C., 2008.

Sharma, M. (2003). Dyscalculia.

Thenumberrace.com. (2018). The Number Race - Teaching Arithmetic and Treatment of Dyscalculia. [online] Available at: http://www.thenumberrace.com/nr/home.php [Accessed 23 Jan. 2018].

Touchmath.com. (2018). TouchMath - Free materials. [online] Available at: https://www.touchmath.com/index.cfm?fuseaction=freestuff.welcome [Accessed 23 Jan. 2018].

Wadlington, E, and Wadlington, P. L. (2008). Helping students with mathematical disabilities to succeed. Preventing School Failure: Alternative Education for Children and Youth, 53(1), pp. 2-7.

Waxmonsky, J. (2003). Assessment and treatment of attention deficit hyperactivity disorder in children with comorbid psychiatric illness. Current Opinion in Pediatrics, 15(5), pp.476-482.

Wilson, A. J. (2006). Dyscalculia primer and resource guide. In Paris Conference.

Witzel, B., Smith, S.W. and Brownell, M.T. (2001). How can I help students with learning disabilities in Algebra? Intervention in school and Clinic, 37(2), pp. 101-104.

Wordshark.co.uk. (2018). Numbershark:. [online] Available at: http://www.wordshark.co.uk/numbershark.aspx [Accessed 11 Feb. 2018].

EDUCATION

23 Moodle Virtual Learning Environment (VLE) - Teachers' Experiences After the First Academic Year at the Oulu University of Applied Sciences

Jukka KURTTILA
Oulu University of Applied Sciences, Finland

23.1 Abstract

Blended learning, online teaching and - learning have increased rapidly in Oulu University of Applied Sciences (OUAS). Education technology solutions and pedagogic models of the online teaching have been consequentially developed. During the last few years attention has been paid to the choice of learning management systems (LMS) and to the cutting of overlapping systems. In the concentrating on one supported LMS the objective has been clear and high-quality solution which is seen as a clarity to the teachers and students.

In the fall of 2016 a Moodle learning environment was bought into use from a new service supplier. The new learning environment has been one whole school year in use. Teachers' opinions about Moodle and online teaching experiences were collected in a survey conducted in December 2017. From the point of view of the development work, the objective is to solve some technical challenges but especially the focus of the developing is on the pedagogical knowledge. One special subject of development will be utilizing of the learning analytics.
The objective of the survey was to explore how Moodle is used and especially what resources are used. The survey also gives information about the teachers' cooperative working with the course bases, use of different activities and the parallel use of different cloud services. The survey also clarified what kind of good experiences the teachers have from the use of the Moodle. At the same time problem sections and challenges were clarified. There also was an opportunity to give the free feedback.
The survey gave guidelines to the development work: how pedagogic developing can be supported near the teachers and students. Some results are gone through also with the service provider in whom the objective is a solution which functions technically irreproachable. Later the charting will be carried out for students as well.

Keywords: learning management system, virtual learning environment, education technology, e-learning, blended learning, technology-enhanced learning, online learning environment, online learning, online teaching

23.2 Introduction

The survey identified the teachers' experiences about Moodle LMS. The survey was answered by 100 teachers. In OUAS there are 350 teachers, so the response rate was about 30%. Next will be presented questions and responses charts. Open responses are classified.

23.3 Results of survey

23.3.1 Number of Moodle courses

Teachers were asked how many Moodle courses they have. Half of the teachers (46%) have over ten course bases. If there are lot of parallels course copies (the same course) it takes a

lot of storage capacity. There is a problem with increasing disk capacity because one user is allocated a certain amount of storage space. This can not be exceeded.
Some teachers use same course base with groups and it helps for example material updating. As a result, we instructed the teachers to remove old training courses and move to use groups. That´s why:

- teacher in a course can have several classes at a same time (teacher don´t need parallel course bases to every class or group)
- teacher can share a course with other teachers and no need to see the students from colleagues' classes
- teacher want to allocate a particular activity, resource or topic section to just one class or set of users and teacher don't want others to see it. [1]

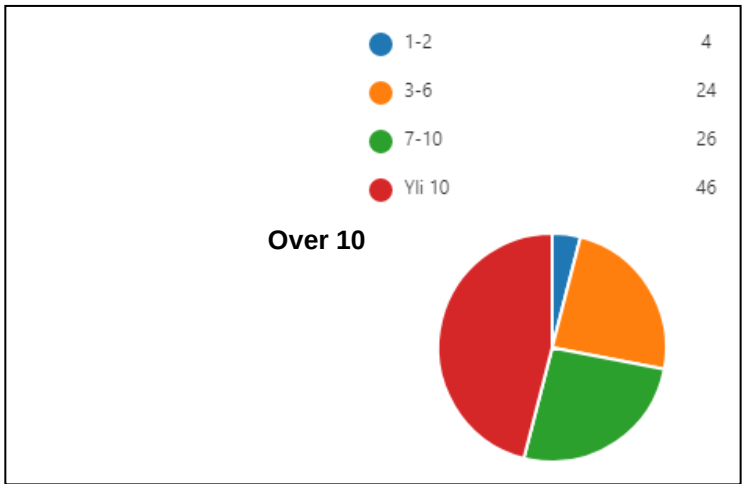


***Figure 1**: How many Moodle courses do you have?*

23.3.2 Common courses with other teachers

One important goal in OUAS is co-operation with teachers. So, we asked do teachers have common courses with other teacher. The result was consistent with the goal. Almost all teachers have common courses at Moodle.

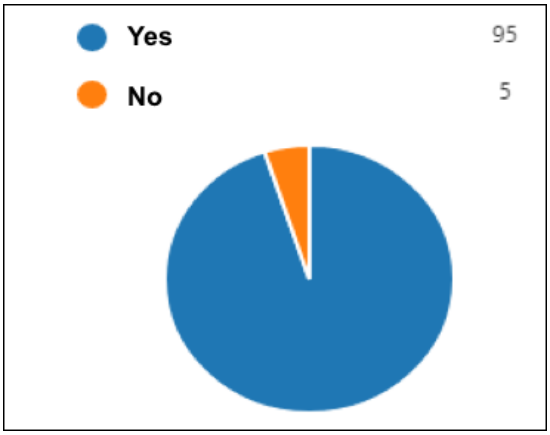


***Figure 2**: Do you have common courses with other teachers?*

23.3.3 Cloud services and Moodle

Users have been guided to make link between Moodle and Office 365 (O365) cloud service, but most have not linked O365 service to Moodle. This makes possible to keep files in the cloud and the materials used in Moodle are links to the cloud service. If contents are in cloud, materials are much easier to update. This saves also storage capacity on the Moodle server.

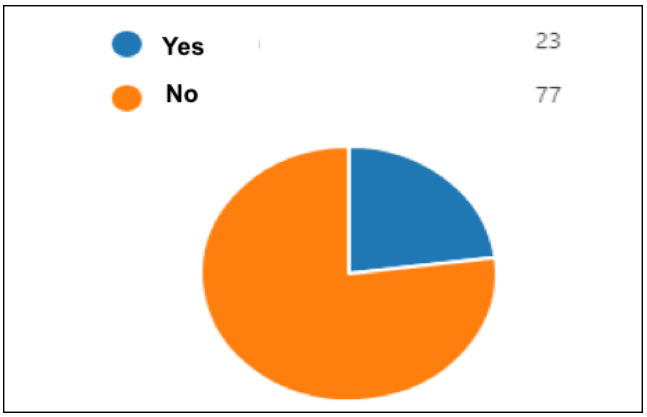


***Figure 3**: Linking Office 365 cloud service to Moodle*

Teachers download content and material to Moodle. As mentioned above this take a lot of storage capacity. If teachers have multiple course platforms and parallel course copies they have to download same file several times. As a result, we instructed the teachers to use O365 cloud and with videos for example YouTube channels.

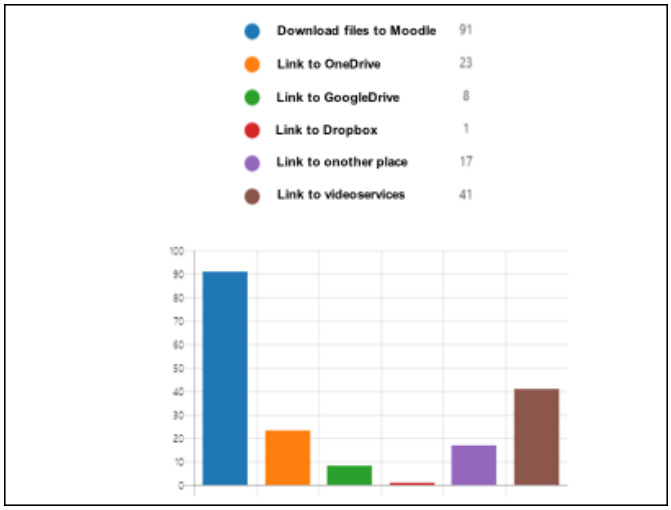


***Figure 4**: How do you link materials to Moodle?*

23.3.4 Moodle activities

An activity is a general name for a group of features in a Moodle course. Usually an activity is something that a student will do that interacts with other students and or the teacher. [2]
The survey was clear that *assignment*, *quiz*, *forum*, lesson, *feedback* and *group choise* are the activities used most by teachers. Over half of the respondents were in use forum (58%) and assignment (87%).
Forum area activity is commonly used to create interactive activities. The assigment with the activity collects student returns to one place. Activities can also return group tasks. The role of assignment activity in interaction is usually between a teacher and a student.

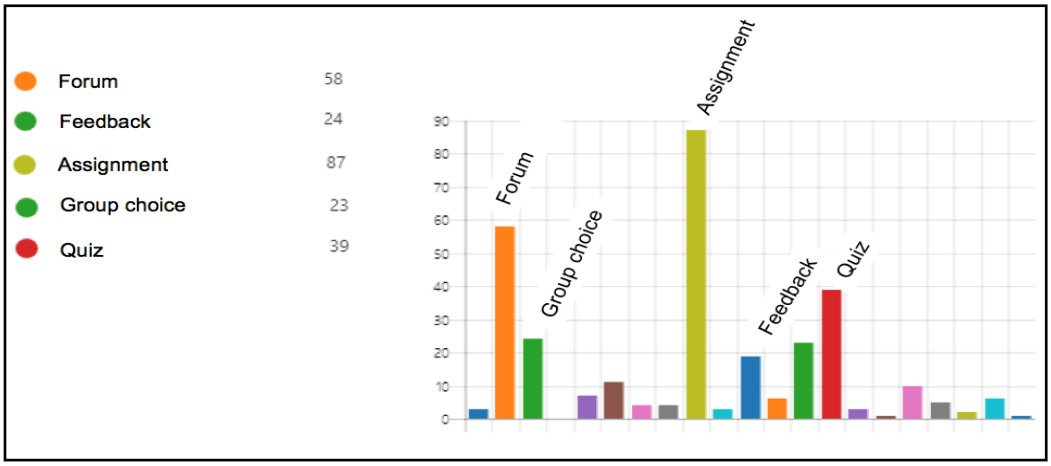


Figure 5: *What activities are used in Moodle?*

Based on the most used activities, it can be noticed that cognitive depth and social breadth of learning are in the middle of the graph. These are right trends if we are looking for our organizations pedagogical goals.

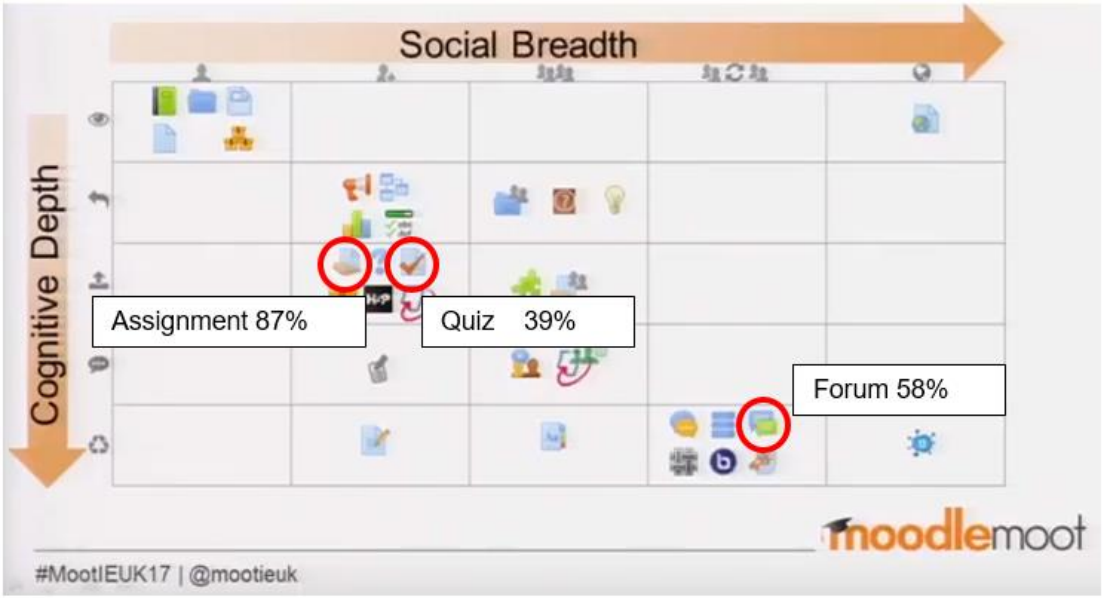


Figure 6*: How do you generally do files with Moodle (Learning Analytics through Machine Learning: Project Inspire | Gavin Henrick at #MootIEUK17)* [3]

23.3.5 Open questions: Good experiences

Teachers have lot of good experiences about using Moodle. Some respondents compared the environmental features of the previous products and considered the new solution more versatile, easy to use, clearer, more visual and stylish. Learning material is easy to share and update. The Collaborate Video Conferencing Tool received good feedback. Quiz and Assignment activities get good feedback and tools to informing students. Teachers also like Moodle's Gradebook, because they don´t need excel worksheets for assignments any more. IT-support works and eCampus-team´s trainings and workshops were specifically mentioned.

23.3.6 Open questions: development needs

Development needs were also found. The system (Moodle) is sometimes slow which causes problems. File management should be easier and Quiz activity is good but making questions takes time.

23.4 Conclusions

The survey showed development needs and strengths that should be further developed. Teachers are doing cooperate and they use Moodle's activities versatile. OUAS IT-support and good instructions was seen important as well as eCampus-team´s pedagogical trainings and workshops. Technical problems and challenges need to be resolved with cooperate the service provider. This work has already begun and also workshops with teachers, where contents has been downloaded to cloud services. Unnecessary and overlapping course platforms have been removed.

23.5 References

[1] Moodle Community, "Moodle Docs," 24 8 2017. [Online]. Available: https://docs.moodle.org/33/en/Groups.

[2] Moodle Community, "Moodle Docs," 27 1 2018. [Online]. Available: https://docs.moodle.org/34/en/Activities

[3] G. Henrick, "Learning Analytics through Machine Learning," 5 11 2017. [Online]. Available: https://www.youtube.com/watch?v=_-PPp1LdE5c.

24 The Advantages of Creating a New Account in Moodle by Users Themselves and not by the Administration

Basri AHMEDI
University "Kadri Zeka", Gjilan, Kosovo

Xhevdet THAQI
University "Kadri Zeka", Gjilan, Kosovo

Ekrem HALIMI
University "Kadri Zeka", Gjilan, Kosovo

24.1 Abstract

We live in a time when e-Governance experiences development. All its fields such as e-Commerce, e-Business, e-Bank, e-Medicine, e-Learning etc. they are now becoming independent. The most important role in this direction is the application of ICT. Some key prerequisites for e-Governance advances are: good computer network infrastructure, web technologies, databases, communication security, etc. All this is done to use the various applications created specifically for actions in the areas of economy, health, security, education etc. These applications are products that are directly used by citizens. In e-government in various forms, all layers of citizens with different levels of ICT skills are involved. To meet the requirements of these applications during the creation and configuration phase, the level of users is also determined.

Keywords: e-Governance, e-Learning, different levels of ICT skills

24.2 Introduction

In e-Learning there are various platforms that are very important tools that contribute to the quality of teaching and learning. Here users are mostly students. Such applications where the user is in solid preparation in the use of ICT are configured so that some actions are left to the student. This was done during the configuration of Moodle 3.2 at Kadri Zeka University in Gjilan in the Republic of Kosovo.
Here the student himself makes the process of membership and confirmation, himself participates in the respective course, receives materials that the professor places, sets homework, communicates within the group etc. This contributes directly to system maintenance and enhancement of culture for the use of the Moodle app. The administrator is thus downloaded from many actions that the students do themselves. This way of dividing actions of three levels of users such as students, teachers and administrators has proved to be very successful in the 2 year experience at Kadri Zeka University in Gjilan despite the centralized form where the administrator is heavily charged. This form of Moodle configuration and use continues its life even further in UKZ by providing input to all actors with their actions for updating the e-learning system and the advantages are obvious.

24.3 Optimal conditions for using Moodle 3.2

For the application of Moodle and the use of the opportunities provided by this platform for e-learning, some minimum conditions are required. These conditions can easily be provided today in each educational institution. Their cost is not high. In the public university Kadri Zeka of Gjilan those conditions have been created. They are:

- computer and internet network infrastructure
- server installation,
- installing and configuring Moodle 3.2 and
- teacher training.

***Figure 1**: Logo of Moodle 3.2 [F1]*

After installing the Windows Server 2008 R2 operating system, now within the server are created conditions for installing the Moodle Platform. After a few steps successfully installed the Moodle 3.2 platform. Moodle Configuration is done by maintaining the form of a pilot project that has been operational two years ago in Public University Kadri Zeka and has gained a good experience from a number of students and teachers.

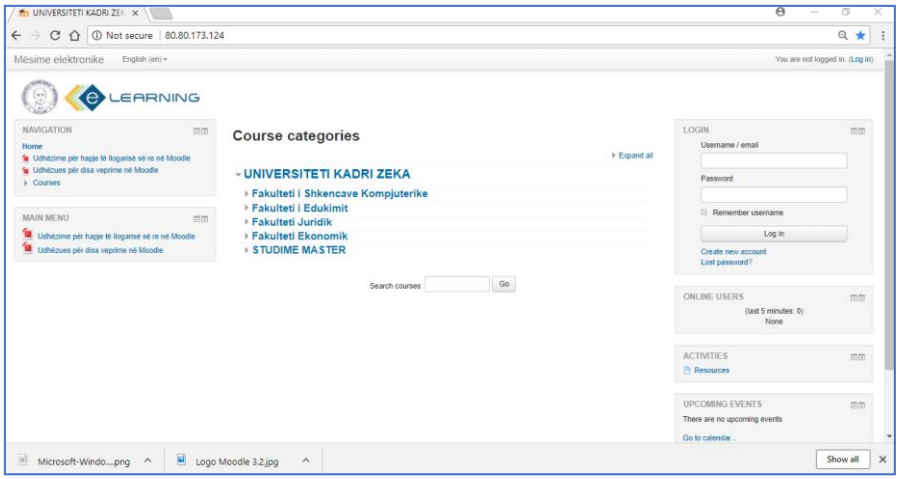


***Figure 2**: The login page for Moodle at the Public University Kadri Zeka [F2]*

24.4 Student, teacher and administrator users

Moodle is more used by students and teachers [see 1,2,3]. These users have a higher utilization of ICT skills than the rest of the population. For this reason at universities it is best that configuration is done in such a way that all actors contribute to updating data in Moodle. Here too, the responsibility is shared with all participating actors in Moodle 3.2 and the system is maintained by the users themselves. These actors are:
-Students
-professors and
-administrator.
Everyone does their job and have the responsibilities and obligations of the e-learning system. Such applications where the user has solid preparation in the use of ICT are configured so that some actions are made by the student himself, some other actions are made by the professor and fewer jobs remain for the user Administrators. This was done during the configuration of Moodle 3.2 at Kadri Zeka University in Gjilan in the Republic of Kosovo. Here the student himself does the following:

- the membership and confirmation process,
-vest participates in the respective course with key assignment,
- accepts the materials that the professor places,
-put homework,
- communicates within the group etc.

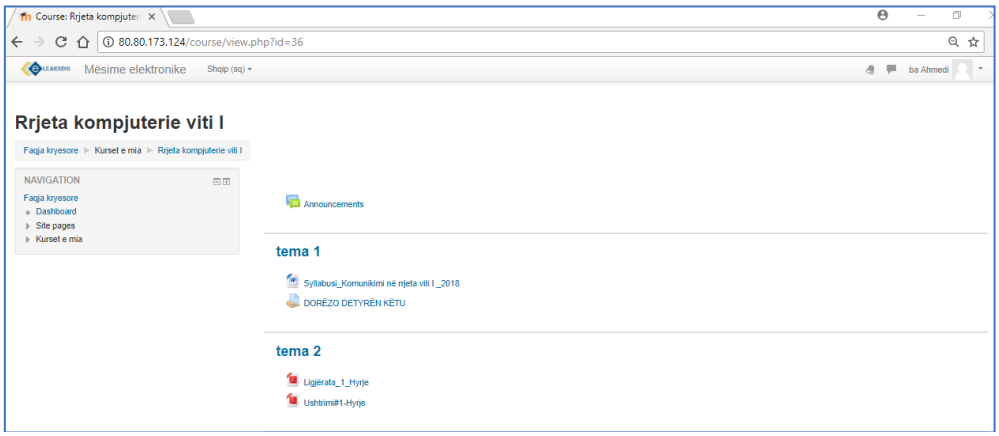


***Figure 3**: User Student Interface [F3]*

The second important actor is Teacher. He did these actions within the system:
-Even Teacher itself participates in the system and confirms it
-It gives you the key to student entrance
-Send material per student every week
-Clean folder for setting up homework
-Controls home assignments
-Extract announcements and test results
The teacher user has the Admin appendix that performs the actions within her course. This option does not have the student user as seen in the figures.

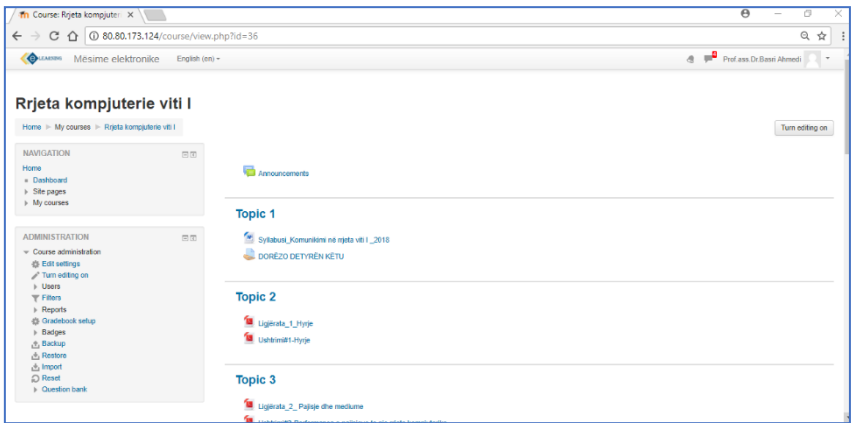


***Figure 4**: User Teacher Interface [F4]*

The user who has all the rights to the system is the Administrator. This can configure and design Moodle according to the needs of the institution. The administrator creates new categories and sub-categories. Creates courses through generated categories. Set limits on access to courses through the keys. The administrator can also delete categories, subcategories, courses, keys, and so on. The administrator user except Cours administration also has Site Administration that other users do not have.

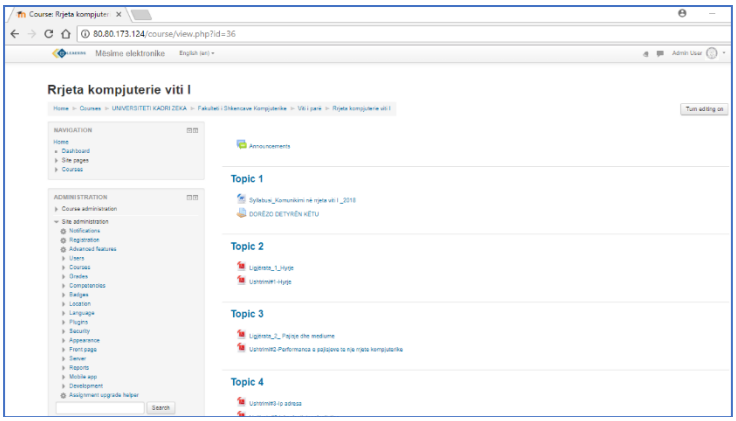


Figure 5: *User Administrator Interface [F5]*

24.5 Conclusions

This configuration directly contributes to maintaining the system and enhancing the culture of using Moodle. So the administrator has been downloaded from many actions because students and the teacher do it themselves. This way of dividing the actions of three levels of users such as students, teachers and administrators has been very successful in 2 years of experience at Kadri Zeka University in Gjilan despite the centralized form where the administrator should engage permanently. This form of Moodle configuration and use continues its life even further in UKZ by providing and obtaining data for all actors with their actions to update the e-learning system and the advantages are apparent.

24.6 References

[1] Caroline Haythornthwaite, Richard Andrews, Jude Fransman and Eric M. Meyers "The SAGE Handbook of E-learning Research" (2nd edition), Sage Publications Ltd., 2016

[2] Karen Hyder, Ann Kwinn,Ron Miazga, Matthew Murray " The eLearning Guid's Handbook on Synchronous e-Learning", Santa Rosa, 2007

[3] Ruth Colvin Clark • Richard E. Mayer, "e-Learning and the Science of Instruction", Published by Pfeiffer, San Francisco, 2011

[F1]https://www.google.com/search?q=Logo+of+Moodle+3.2&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwij-c2NyK_bAhXJEiwKHeUXAZcQ7AkIPw&biw=1280&bih=614#imgrc=HfYv9dgjo5BIsM:

[F2] http://80.80.173.124

[F3] http://80.80.173.124/course/index.php?categoryid=20

[F4]http://80.80.173.124/course/view.php?id=36

[F5] http://80.80.173.124/course/view.php?id=36

25 Can Learning really be Managed – Big Data and the Future of the Learning Management Systems

David EVANS
JME Associates, UK

This paper begins where the Netties 2017 Conference in Athens concluded, with the work of Greek philosophers. I'll then look at how theories of learning have developed more recently, along with new ideas about styles of learning before moving to look at attempts, using computers to capture, measure, manage and control learning. This has culminated in the current era of big data, where huge quantities of information about individuals are available to various private and public agencies which can be manipulated in a bewildering variety of ways by those who know what they're doing. The implications are wide reaching and frightening. The current concerns about the nefarious use of data in political persuasion are highly visible - more wide-ranging concerns about the use of data in health, medicine and finance are also developing. How will these debates play out, and what will happen when big data really hits education?

Many of our current ideas about learning began in Greece around 2500 years ago. Although the invention of writing was obviously important, Socrates, the first Greek philosopher wrote nothing down. In his discussions of the mythical origins of writing in Ancient Egypt, Socrates (through Plato) is concerned that it will introduce forgetfulness, because people will not practice using their memory. Real learning comes through discussion, argument and self-reflection, or what we would now call rationalism. It was left to Plato's student Aristotle to suggest more engagement with the real world. Aristotle was the first empiricist - using his senses to look for knowledge and learning by attempting to categorise and measure things in the real world. One can assume however that none of them would have been great fans of learning management systems.

With the ancient Greeks also began the distinction between what we might call liberal and vocational education – learning to think and learning practical skills. Although liberal education in philosophy and the arts was considered superior, vocational education did take place, and what we now call the apprenticeship system developed alongside the school system as alternative methods of learning. Indeed there are plays, 5th century comedies by Pherecrates and Nichomachus about the training of cooks. These two parallel approaches to education and training continued into the Roman empire.

Compared with the timespan between Ancient Greece and the present day, the development of theories of learning, attempting to measure learning and the capability of doing so are of much more recent origin. It wasn't until the development of psychology as a discipline in the late 19th century that empirical approaches to the learning process itself began to develop. Until that time, learning had been assumed to take place using the methods barely changed since Plato's academy at the top end - the elite universities - and mass schooling methods which originated in Prussia from the 18th century onwards for the masses. Within the limits of their time, both these systems seemed to work, and were widely emulated. There was no need to be further concerned about or to try to measure what, if anything, people were really learning.

However, on the other side of the world, Ancient China had introduced the first standardized tests, the imperial examination to select candidates for governmental positions in about 600 AD. Examinations for entry in to the British Civil Service, modelled on the Chinese system were introduced in 1806, and there were similar schemes in other countries. Written examinations didn’t begin to be used in British universities until the 1850s, although oral exams had been used since the middle ages. In the early 20th century, the mass conscription associated with the First World Wars led to an expansion of standardised testing, the US Army making extensive use of the recently invented Stanford-Binet IQ system for this purpose.

When the psychological study of learning really began in the early 20th century, it led to a further dichotomy - between the behaviourists, who saw it as a largely mechanical process, the same in pigeons and human beings - simply learning to do things - and the cognitivists, who saw it as slightly more complicated than that, an internal process that occurred within the minds of learners who each had to construct their own knowledge. At the same time, in the wake of rapid expansion in science and all forms of knowledge and the development of mass schooling, the need for learning to be more efficient, wide ranging and cost effective became paramount.

There has also been much debate in recent decades about whether different people learn in different ways - issues of 'learning styles' (visual, auditory or kinaesthetic; theoretical, practical or pragmatic), sometimes connected to what Howard Gardner calls 'multiple intelligences'. These approaches have both zealous advocates and unimpressed critics, so I won't dwell on them here, except to observe that in constructing any form of learning experience, it's usually a good idea to recognise that different people learn in different ways and where possible, appreciate choices in both how to undertake and if necessary, how to demonstrate their learning

At this stage, we need to recognise that the distinction between behaviourism and other theories of learning was more than just a scientific debate. It had implications for how, if at all, anyone could really measure learning. For learning to have taken place, the individual who has learned should be able to demonstrate that learning. For the most part, this involved exams or tests - but in the last resort, these always imply a behaviourist approach, as they merely demonstrate that someone can do something, or regurgitate something in a controlled environment within a time limit. They don't really show that he or she actually knows anything - or will remember it tomorrow, next week or in a few years' time. Even now, attempts to measure or capture this kind of information are rare – Kirkpatrick's four stages of evaluation usually stop at stage 1.

In the aftermath of the second world war, theories of learning developed in parallel with the explosion of computing power. Although mechanical teaching machines had already been around since about 1920, the first systems for computer aided instruction, Plato (programmed logic for automatic teaching operations at the University of Illinois) wasn't developed until the early 1960s. This was followed by a plethora of Computer Based Learning or Training systems, particularly in the military and specialist areas such as aviation - and there were also early experiments in Computer Managed Learning. CAI, CBT and CML continued through a series of largely incompatible systems, moving onto PCs during the 1980s before the invention of the World Wide Web in the 1989 led to the prospect of managing learning much on a much larger scale. This was a time when wild predictions were being made about all education being online within five years. As John Chambers of Cisco systems said in 1999 in an often quoted remark, "education over the Internet is going to be so big it is going to make e-mail usage look like a rounding error".

The Aviation Industry Computer Based Training Committee's work in the 1980s led to the US military Advanced Learning Initiative SCORM (Sharable Content Object Reference Model) framework around 2000. Both were designed to promote interoperability of learning content, which would otherwise be locked into incompatible formats with a correspondingly short shelf-life. This was when training management and record keeping systems, or what are misleadingly called Learning Management Systems first developed. In industry, the LMS is increasingly seen as a legal requirement to ensure compliance training has been undertaken, and it's also used for talent management and succession planning. In universities and schools, the emphasis is a bit more on helping students to learn, although whether students see it in that way is open to debate.

The problem with SCORM is that in the last resort, all it really measures is the amount of time a learner had spent nominally using, or logged in to a piece of learning content, and / or the score he or she had achieved in a specific test. Some other bits of other information can be tracked and recorded though most LMS - but only activity that occurs with the purview of the LMS. Any other learning can't easily be included. The same issues also exist with face to face education - a student can sleep through a lecture, but will still be marked as having been present.

This was at a time when increasing attention was being paid to the fact that most learning appears to happen outside of any of the normal contexts within which it had traditionally been defined. The 70:20:10 model developed by Charles Jennings suggests that only 10% of learning actually occurs through formal courses. 20% occurs thorough other structured interventions, but 70% occurs informally, on the job, through interaction with fellow students or whatever. In other words, it isn't and can't be tracked or measured through SCORM

Jennings talks of learning as a continuous process, artificially broken into discrete events. Learning management is therefore really learning process management – but in many organisations, around 2005, learning effectively became the LMS, and LMS vendors made a lot of money. A lot of these organisations are now trying to extricate themselves from bad LMS deals. An LMS is useful for process automation, training administration, regulatory and compliance testing. It's less good for actually helping learners. The question is should we extend or limit its role – should we aim for total learning management, or simply better learning analytics?

In the early 21st century, Jennings suggests, the 2,000 year old model of the school was overturned, through the development of blended learning, and what's sometimes called the flipped classroom. At the same time, work has been changing rapidly – jobs requiring decision making over 40% in USA, increasing every year. The important thing is speed to competence – chunks or learning, not long theoretical courses, involving the growing use of video, social media, social learning and mobile devices.

In 2011, ADL recognized the need for a software specification that tracks learning experiences that occur outside of a LMS and a web browser. This led to the development of the Experience API, often known by its project name of Tin Can, which potentially allows for the capture of much more information on human performance, along with associated learning content or contextual information. It also enables dynamic tracking of activities from any platform or software system—from the traditional LMS to mobile devices, simulations, wearables and more, including the Internet of Things.

xAPI-enabled learning activities generate statements, or records of e-learning in the form of "I did this" or "Actor / verb / object". These statements are then stored in a Learning Record Store, which can be part of a learning management system (LMS), or a separate database, such as the open source Learning Locker. LRSs can communicate learner data with other systems, such as LMSs, sensor-enabled devices, mobile technology, and other LRSs. Importantly, xAPI statements are capable of being sent to multiple LRSs at once. With traditional LMSs, a learner's data stays with the organization that administers the LMS. With an LRS, the data can follow the learner - from job to job or from school to school. Individual learners can also have their own LRSs, or Personal Data Lockers, in which they store learning data for their own personal records.

LRSs offer the ability to create in-depth e-learning analytics because of the large amounts of much more wide-ranging, potentially “big” learning data they record and store. How can this emerging big data help learning? It supposedly helps shopping with Amazon suggesting that if we enjoyed one book, we might like another book on a similar topic, based on data collected from many thousands of customers. Until recently, such techniques could not have been used to improve the learning experience as individual educational institutions simply don’t have enough useful student data, but MOOCS are different? By observing thousands of students' patterns of behaviour online, can we help them learn more effectively?

Ken Cukier (in Learning with Big Data) describes an example from the University of Arizona: through monitoring keystrokes and hesitation patterns during a course, they noticed that in lesson 7, a lot of students return to lesson 2 slides to check on basic maths principles. This kind of thing enables intervention, courses redesign etc, to reduce dropout – and provides an economic incentive for universities and colleges to invest. He also cites Duolingo (where more people are learning Gaelic than the current number of native speakers), which earns revenue by selling correct translations to industry as a by-product of free online learning, as does Google translate.

Big data, whether from MOOCS or elsewhere is not generated by a research question – it’s simply there, as a by-product of interactions with the system. This is not the usual order of things in science, where a hypothesis, or research question would normally determine the data gathered. It’s more similar to using official statistics, collected for administrative purposes, but which can be used for social research.

With large-scale learning platforms, such as Coursera, EdX and FutureLearn, learning data does not have to remain merely local. If the learning design (the planning and management of learning activities) can be used by other teachers all collecting the same data from their students, it can be widely tested, with many independent peers able to review, advise and redesign for a better outcome. If many teachers run the same design through their local virtual learning environment (VLE), with students using the same digital tools to collect their performance data, you have effectively crowdsourced local data.

However, there are several problems. One is to involve real subject matter specialists in the process. Often, the field is dominated by technology professionals who are not educators and don’t do much teaching online – other than teaching about how to teach online. In the same way, much discussion about learning is dominated by learning professionals – real learners often aren’t so bothered about their styles or psychological processes. If more lecturers could be helped to collaborate and generate their own large-scale data collection and analysis, perhaps educational big data could really make a difference.

Big data offers new ways to socially sort with increasing precision. By combining huge data sets, a lot can be learned through ‘algorithmic profiling’, but it raises concerns about how little people know about how their data is collected. As we've seen with Facebook, data brokers can take vast sets of data and perform correlations, selling them on to other agencies for nefarious purposes. Low educational attainment is, for example, might be associated with greater propensity to gambling, higher spending on junk food, likelihood of being influenced by fake news and so on. There have been many cases of people whose credit ratings have been downgraded simply because others who shopped where they shop had a poor repayment history. ‘Creditworthiness by association’ could equally become educational attainment level by association.

There are numerous examples of data breaches in recent years. These can lead to identity theft, blackmail, reputation damage and distress. Most examples are of credit data - but health data and education data also vulnerable.

In addition, blacklisting and watch-lists sometimes simply identify people incorrectly. It has been found that being wrongfully identified in this case can negatively affect employment, ability to travel – and in some cases lead to wrongful detention and deportation.

We need to learn from these issues. While there are a range of individuals and groups developing ideas about how data harms can be prevented, there are others working in the opposite direction. Alexander Nix, who is currently suspended from his post as head of Cambridge Analytica, told an undercover BBC reporter that he wanted access to the US market 'while the data laws were still the wild west'. Researchers, civil society organisations, government bodies and activists have all, in different ways, identified the need for greater transparency, accountability, systems of oversight and due process, and the means for citizens to interrogate and intervene in the big data processes that affect them, including those concerned with learning. What is needed is the public pressure and the political will and effort to ensure this happens.

26 Higher education research and education fostered with knowledge sharing

Kari LAINE
Satakunta University of Applied Sciences, Pori, Finland

Matti LÄHDENIEMI
Tampere University of Technology, Pori, Finland

Olli MERTANEN
Turku University of Applied Sciences, Turku, Finland

26.1 Abstract

Higher education meets new requirements. Higher education and industry interaction requires multi science, up to date knowledge. On the other hand, higher education is required to renew itself and have up to date learning contents. It is not always possible or meaningful to create the needed knowledge. Therefore, adequate and fast access to quality knowledge is needed. What higher education institutions can and should do to be more open and to make more knowledge publicly available from their research and collaborative innovation processes with industry. What universities should do to be able to access quality knowledge to develop up to date education contents and make high quality research.
Companies need new knowledge to develop their business. Companies and public authorities create a big amount of data, but sometimes it is not up to date enough and not even at the level of knowledge. There are delays in collecting the data, modifying it, making summaries and making data publicly available. Artificial intelligence is a future tool that can combine data and evaluate information to knowledge. In the present paper the following topics will be discussed and analyzed: Participatory R&D, BaltSe@nioR, and Robot Academy. The correlation of these also renews competences of Higher Education.

Keywords: knowledge sharing, research, higher education

26.2 Introduction

This paper concentrates on controlled and focused knowledge sharing in research, innovation and higher education. The authors have dealt with collaboration between higher education institutions (HEIs) and industry, knowledge intensive entrepreneurship and the role of HEIs in digitalization in context of big data. The current paper is also based on researchers' diverse experience on the field. [8 and 13-17]
Open data and big data are close to access to data, usability and enrichment towards knowledge. Enrichment of data to knowledge is a requirement of added value and benefits. All this is also related to access to knowledge and selection of the knowledge.
In this paper data turns into information when it is processed. This means grouping, selecting or in other ways enriching the content. Information turns into knowledge when we create understanding what the information means or how it can be used. Knowledge has a life cycle when it turns from unknown to known [1]. As an effect of digitalization, the knowledge cycle is fastened. The knowledge comes faster available for various actors.
Innovation processes can be closed or open. Closed innovation process means that an organization creates innovations with own resources. In Open innovation processes resources form outside the organization are used in creation of the innovations and in commercializing the results. Open innovation processes can share costs and risks of innovation. More resources also mean faster solving of wicked problems. There are different actors working in

networks. There are business actors, public actors like research organizations and their combinations. [13,14,15] In principle, the more actors there are the more views and knowledge there is. But business creates also limitations to knowledge sharing due to tight competitiveness thinking and immaterial rights.

There is already plenty of knowledge available from internet, research organizations and enterprises. Therefore, free and uncontrolled data sharing may lead into confusion. Small and medium sized enterprises (SMEs) can't use raw data. They need help in searching focused knowledge for their needs. They may also need help in interpreting the research knowledge. All this means that we need a focused and selected or controlled sharing of knowledge in means to benefit from it. The biggest challenge in research and R&D networks may be selection, enrichment and controlled sharing of the knowledge.

26.3 Accelerating scientific progress

EU has estimated that it could create 40 billion euros benefits annually with better sharing of knowledge. Research knowledge is one part of the knowledge that should be shared. Scientific activities are increasingly undertaken through global collaboration on the internet, using large data collections, computing resources and visualization. e-science (research enabled by e-infrastructure/ICT) is essential for meeting the challenges of the 21st century in scientific discovery and learning. The data used come from simulations, digital instruments, sensor nets, and observatories. [4, 5]

The data is important for science and its potential to change the very nature of scientific process. Wide access to scientific data will for example help researchers in different domains to collaborate on the same data set, to engage in entirely new forms of scientific research and to explore correlations between research results.
The change in the scientific process can increase amount of results published. It can also create new and perhaps also unexpected solutions to societal challenges. In addition to this, the cross-field interaction between publicly funded research and industry can increase the pace and impact of innovation.
However, there are barriers to promote research data management and open access to the research data in HEIs. According to European University Association the top six barriers are: different scientific cultures within the university, lack of polices or guidelines on national level, limited awareness of benefits, legal concerns, technical complexity and lack of incentives. [6, 7]
During last years, alternative metrics have been introduced to measure research efforts in addition to citation counting. These alternative metrics can be bookmarks, links, blog posts, tweets, likes, shares, press coverage and similar. This is because research is also published in various forms and various platforms like social media. It may be also popularized and shortened to be able to publish on these new platforms. It may be easier to understand for various readers, but it may contain only part of the knowledge. [3]

Higher education also tries to engage itself with its environment, offering collaboration for enterprises in research, innovation and education. Universities must combine and build their knowledge into the form of a service process or even service product to make successful collaboration with enterprise clusters. Real identification skills of universities are needed to satisfy enterprise needs. This is realistic only in the case of long time co-operation at the level of strategic partnership. [8] It also requires knowledge sharing between HEIs and industrial partners. In the following chapters we will introduce three cases to explain how knowledge is shared and what effects we have in those contexts.

26.4 Case Participatory R&D

This chapter describes the participatory R&D development in ship building. The ship building process is a large process. The design phase alone can involve 40 companies and 200 people in a global network. It is obvious that good sharing of knowledge is a necessity to complete the design process. However, the good sharing of knowledge can be limited to necessary knowledge that is needed in the process. There may be some essential knowledge that could improve the design or could be used in next design, but this kind of knowledge is not shared because the participants want to protect their future work. Therefore, there is no access to knowledge although it exists in the network. Challenge is, how to share knowledge that is protected.

The same phenomenon can happen in single large organization. Needed knowledge exists somewhere in the organization but the person or team who need it is not aware of it or does not have access to it. The one who has the knowledge can lead the process where it is used. Knowledge is power and creates options for future actions.

There are several needed types of knowledge to share during the ship building life cycle. For example, sub contractor's load is one of them. In life cycle business the knowledge is developing and enriched during the ships life cycle. The knowledge should be enriched together and shared during the process. Also, analysis of ended project gives valuable knowledge that can be used in other projects. Research indicates similarities between open source software and open knowledge. Similar types of rules could be used for knowledge sharing as there is used for code sharing.

26.5 Case BaltSe@nioR

Number of aging population is growing in developed countries. The challenges have not been properly recognized or they have not been taken into consideration early enough. The number of products that are focused for elderly people is low, and choices are fragmented. It is the last moment to react. On Baltic Sea region the problem has been noticed and collaboration and cross sectoral actions are created. The challenge of aging is turned into a promising opportunity for business life.

Baltic Sea region is a creative environment and it offers a unique platform for fostering new innovations and improve quality of life of safety of elderly people. BaltSe@nioR project creates furniture solutions for aging population and strengthens age friendliness and business opportunities on Baltic Sea region. The project shares knowledge of leading actors on the field, and it creates collaboration between existing significant knowledge on fields of furniture manufacturing and design, ICT, robotics and technology industry, business and social sciences.

BaltSe@nioR project offers innovative ICT solutions, databases and tools for SMEs. These tools are created with multifield scientific collaboration. Multi field scientific collaboration is basis also for creative working methods that are created in the project. These methods can be utilized in product design and development. The methods help in developing the safety and reliability of the furniture. They also help to recognize the needs of aging population and to remove less aging friendly elements from the furniture. The project particularly creates synergy between furniture and ICT sectors. It develops competitiveness, inspiring identity, improves innovation capability, creates knowhow, creates prerequisites to act in international environment and creates intelligent products for aging population.

Sharing of knowledge and modeling of the innovation process were essential parts of the project plan. Academic actors are familiar with knowledge haring and modeling. Therefore, the modeling was a quite easy part of the project. There is still some work left as the knowledge databases, platforms and possibilities of the project should still be marketed for SMEs. Project will last till 2019 so all results of the project will be seen then. [9, 10]

During the project the researchers noticed that there would be need for a systematic literature review as a service to support innovation processes. Also, all organizations need other

competencies related to innovation, like how to use research knowledge as a starting point for an innovation process and how to use research knowledge to make the "right" choices during the innovation process. Development competences are also needed to create a constant flow of development based on knowledge.

26.6 Case Robot academy

Satakunta University of Applied Sciences in Finland started the Robot academy to respond to future technology and knowledge challenges. In the robot academy different age groups like children, young people and adults can study and learn on level that fits their competence. They also run technology development projects. Interesting learning tasks and inspiring learning environments also add attraction of technology studies.
Students from comprehensive school and vocational school are familiarized with new technologies with concrete exercises in the laboratory of Satakunta University of Applied Sciences. At the same time the teachers of comprehensive schools learn how to program Lego robots. They can teach programming for their students later. All actors are familiarized with technologies, step by step. They get positive memories related to robotics and programming.
Visiting students spent a “technology action day” at the University of Applied Sciences by programming robots and testing virtual reality and 3D printing with the researchers. Virtual reality and corroborative robots have been most interesting according to the students. Two handed robots have been challenging to program so far.
Engineering students are also participants of the robot academy. They perform their studies and graduate by running technology development studies in teams. Project themes and goals come from the local industry. Also, research projects of the University offer possibilities to participate into large R&D projects. The industry benefits from competence of the students, and their enthusiasm as well. Challenges are seen from various views and there are opportunities for new types of solutions.

Students have several roles in projects. They can act for example as a project manager, 3D designer, developer responsible of the motion control. They can have experience about roles and learn different competences according to their roles. Teachers are coaches and give guidance in the learning processes. Students see that studies are more practice oriented in Robot Academy. Learning is wider, and processes are longer than single study units in traditional studies. Studies in Robot Academy require commitment. They see it reminds working life. It requires initiative from the students, but the learning is deeper at the same time. Robot academy is a developing model that is modified in time. New leaning tools and methods are developed to better fill the learning needs and technology development needs of the local industry. Small groups and taking into consideration the levels of the participants have more impact in learning. Interaction is based on discussions and analysis between students, teachers and researchers. All are encouraged to comment on other’s ideas and to bring their own idea into discussion. There are mixed methods in learning, like collaborative, project and problem based learning, and learning by developing. Students can act as a bridge towards industry. There is a knowledge flow from HEI to comprehensive and vocational schools. They create positive attitudes towards technologies and studies in higher education. SMEs open their challenges and may have solutions created for them and have competent employees in the future. [11]. So, the knowledge is shared for different actors and for reasons on purpose.

26.7 Discussion

Innovation is extremely dependent on the availability of knowledge. Therefore, the complexity created by the explosion of richness and reach of knowledge have to be recognized and managed to ensure successful innovation. [20]. Innovation in build on need knowledge and technological solutions knowledge [19]. Even neighboring disciplines fail to learn from each other [2]. This research implies, that access to knowledge is shared in many ways and for

many reasons. Knowledge is also protected for commercial reasons. Better solutions could be created to knowledge sharing by evaluating the knowledge sharing processes during and after project execution. In addition to knowledge organizations need new competences to benefit from the knowledge. These are innovation and development competences [12]. Some organizations need help in knowledge management for innovation. On individual level motivation to change institutionalized practices, interest in change, experience in the field, multi embeddedness, authority to act, and the strategic use of social networks are needed [18]. Not only amount of knowledge, but also accuracy and validity of the knowledge matters in the innovation processes. This requires critical thinking of research and education when using the knowledge.

26.8 Conclusions

In addition to knowledge sharing, many organizations also need to enhance their culture and create new competences to utilize the new knowledge. The research suggests the following. There is need for more intelligent use and multifield combination of knowledge in research, innovation and educations processes. SMEs also need help in interpreting research knowledge and enriching it to their needs in the context of their development. Knowledge sharing in ended projects should be evaluated systematically and best practices, methods and results should be fully utilized in next projects and actions. Open science requires new culture, but so does this kind of controlled and focused knowledge sharing, presented in this paper. Organizations, SMEs and public organizations but also HEIs, need innovation and development competences in addition to new knowledge to utilize the knowledge for their innovation processes. Critical thinking and change of culture is needed. Future research should focus also on new multi science methods to change research and education cultures towards openness.

26.9 References

[1] Julian Birkinshaw and Tony Sheehan, “Managing the Knowledge Life Cycle”, MIT Sloan Management Review, Fall 2002

[2] Andrew Davies, Mannig, Stephan and Jonas Söderlund. ”When neighboring disciplines fail to learn from each other: The case of innovation and project management research”. Research Policy, Vol. 47, 5, pp. 965-979, 2018

[3] Open Science Handbook. Chapter Open Peer Review, Metrics, and Evaluation. https://open-science-training-handbook.gitbooks.io/book/content/ . Accessed 24th April 2018

[4] European Union. “Riding the wave. How Europe can gain from the rising tide of scientific data”

Final report of the High Level Expert Group on Scientific Data. A submission to the European Commission, October 2010

[5] European Union, “Open data: An engine for innovation, growth and transparent governance”,

2012. https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0882:FIN:EN:HTML Accessed 29th June 2018

[6] European University Association. “Towards Full Open Access in 2020. Aims and recommendations for university leaders and National Rectors’ Conferences”, 2017 http://eua.be/Libraries/publications-homepage-list/towards-full-open-access-in-2020-aims-and-recommendations-for-university-leaders-and-national-rectors-conferences . Accessed 26th April 2018

[7] EUA 2018. “Open Access 2016-2017 EUA Survey Resuts”. Referred 26th April 2018. European University Association.

http://eua.be/Libraries/publications-homepage-list/open-access-2016-2017-eua-survey-results.pdf Accessed 29th June 2018

[8] Matti Lähdeniemi, Olli Mertanen, and Kari Laine. ”Collaborating University and Business Networks Fostering Rapid Value Creation”. Aristotelian Thinking: Impact on the Technological Evolution and Social Progress. 15th NETTIES Conference (Network Entities) Piraeus University of Applied Sciences (P.U.A.S), Athens May 4 - 6, Vol. 5. Chapter 22, IAFeS edition, 2017. ISBN 978-3-9503983-3-2.

[9] Andrew Sirkka, Sari Merilampi and Sirpa Sandelin. ”Towards a generic design frame for ageing-friendly development for seniors”. Proceedings of the XXVIIIth International Conference “Research for Furniture Industry”, 2017.

[10] “BaltSe@nioR, Innovative solutions to support enterprises in the Baltic Sea Region in product development aimed at raising comfort and safety of seniors living at home”. Project web pages at https://www.samk.fi/tyoelama-ja-tutkimus/hankkeet/ (in Finnish) Accessed 29th June 2018

[11] “Robot Academy” web pages at

https://www.samk.fi/en/research-and-cooperation/research-groups/ Accessed 29th June 2018

[12] Juan Marin-Garcia, Andres Andreu, Angelesb Ma, Lorenac Atares-Huerta, , Aznar-Mas, Lourdes Eb, Garcia-Carbonell, Amparob, González-Ladrón-de-Guevara, Fernandoa, Montero Fleta, Begoñab, Perez-Peñalver, M.Josed, Watts, Francesb. “Proposal of a Framework for Innovation Competencies Development and Assessment (FINCODA)” Working Papers on Operations Management. Vol. 7, Iss. 2 (119-126) ISSN: 1989-9068

http://dx.doi.org/10.4995/wpom.v7i2.6472 Accessed 29th May 2018

[13] Kari Laine, Mirka Leino and Matti Lähdeniemi. ”Research Collaboration Fostering Mutual Value of Universities and SMEs”. Paper presented at University-Industry Interaction Conference, June 1-3, Groningen, Holland 2016

[14] Matti Lähdeniemi, Olli Mertanen and Kari Laine. ”University Networks Value Creation of Knowledge Transfer in Enterprise Clusters”. Science to Business marketing Conference. Winterthur (Zurich), Switzerland, 2014

[15] Kari Laine, Mirka Leino and Petteri Pulkkinen. ”Open Innovation Between Higher Education and Industry”. Journal of the Knowledge Economy: Vol. 6, Iss.3, pp. 589-610, 2015

[16] Kari Laine, Mirka Leino and Matti Lähdeniemi. ”Research Collaboration Fostering Mutual Value of Universities and SMEs”. Paper presented at 2016 University-Industry Interaction Conference, June 1-3, Amsterdam, 2016

[17] Kari Laine and Matti Lähdeniemi. ”Effective model for higher education and industry interaction” in David Gibson, Manuel Heitor and Alejandro Ibarra-Yunez (eds.) Connecting people, ideas and resources across communities, Purdue University Press, 2007

[18] Sandra Hasanefendic, Julie Birkholz, Hugo Horta and Peter van der Sijde. “Individuals in action: bringing about innovation in higher education”. EUROPEAN JOURNAL OF HIGHER EDUCATION, Vol. 7, Iss. 2, pp. 101–119, 2017 http://dx.doi.org/10.1080/21568235.2017.1296367

[19] Tim Schweisfurthad and Christina Raasch. “Absorptive capacity for need knowledge: Antecedents and effects for employee innovativeness”

https://www.sciencedirect.com/science/article/pii/S0048733318300246?_rdoc=1&_fmt=high&_origin=gateway&_docanchor=&md5=b8429449ccfc9c30159a5f9aeaa92ffb&dgcid=raven_sd_via_email Accessed 29th June 2018

[20] Marina du Plessis, "The role of knowledge management in innovation", Journal of Knowledge Management, Vol. 11, Iss. 4, pp. 20-29, 2007

https://doi.org/10.1108/13673270710762684

27 Educating elderly on new technologies

Georgios KOLOKYTHAS
Hellenic Open University, Athens, Greece

27.1 Abstract

Human being is characterized as an evolving species and this is the reason he thrives on our planet. Two are the main components of the evolution. Knowledge, which is produced by the continuous flow of information and technology, which aids people to their lives and is destined to make them easier. However, technology is moving forward in a rapid pace and there is not possible for everyone to attend and absorb it. The new generations of younger people are born within the technological advancements, therefore it is more natural for them to adopt to the evolving technological environment. Older people on the other hand are not so used of the technology and the pace necessary for them to absorb it is significantly lower. Various education programs, that are organized all-over the world, make effort to cover this gap as much as possible by introducing new technologies to elderly.
Focusing on the age group of elderly people, the aim of this paper is to identify the main attributes that characterize the educational programs on new technologies that are directed to this specific audience. As soon as a common ground on the most appropriate way of structuring such programs is set, some cases of on-going educational efforts from various countries are going to be mentioned. And along with the presentation of some statistics regarding the adoption pace of new technological advancements by older adults, the most popular assistive technologies are going to be analyzed. Finally, the role of artificial intelligence in this on-going process is going to be examined.

Keywords: elderly, education, older adults, programs, new technologies

27.2 Introduction

Human by his nature is characterized as an intelligent species, therefore he never ceases to seek knowledge in order to improve his way of living. The best way to reach to knowledge is through education. And by education we do not mean only the given knowledge we absorb from certain structures such as schools, but also every little pieces of knowledge that man can extract from his everyday experiences. Fortunately thanks to technology every form of education is now approachable by anyone. Education meets no barriers either of age or of disabilities and anyone that is really interested to seek knowledge can reach to it. Through internet people can access various databases of information, digital libraries and can form communities where they can exchange this information.
A hundred years before Socrates, Solon of Athens said “I never cease learning as I grow old” and this is exactly what people should always do. Both technology and social interaction can lead someone to all the necessary information in order to cultivate knowledge as an extension of himself. However, not everybody can comprehend and utilize technology in the same way. For young people that are born within the technological advancements the absorb rate is faster than the older adults, a fact that generates what it is known as the digital divide. With the proper guidance though and through the various educational programs that are being developed worldwide, older adults can become compatible with the new technologies and be able to pursue knowledge further.
The motivation of older adults to join such programs in order to learn how to handle the new technological devices is big enough, since this is the only way they can keep in touch with their families. It is not uncommon nowadays to see elderly have a successful video chat with their loved ones and it is mainly achieved through these organized learning sessions. The purpose of this paper is to try to locate the main characteristics that formulate such programs and since

the audience they are directed to be the older adults, the first thing that is going to be examined is how the right of education of adults is protected mainly in Europe. Then the proper way of structuring elderly education programs is going to be analyzed along with some practices that are being implemented all around the world. Moving on some statistics are going to be mentioned, coming mainly from Europe, and the most representative examples of assistive technologies for elderly are going to be exposed. Finally the way that artificial intelligence affects the efforts of bridging the gap of older adults with technology is going to be exploited.

27.3 Adults´ Education

The target group of this paper, senior citizens, belong to the wide age cluster of adults, therefore it is considered as crucial to offer a definition of the effort to educate adults, as well as to locate the pillars of the foundation that protects the right of adults in education.
When the term adult's education is being mentioned, it becomes clear that the learning audience is different from this of children and this is the reason it is mostly referred as andragogy. Unlike children, adults have the knowledge offered to them by their life experiences and they are eager to be instructed on the way to use this knowledge in the best way.
Adults' education is usually based on the philosophy that the attendants are willing to learn and take any responsibility that an activity like this may have. It is most commonly categorized in three domains, formal, non-formal and informal education. As formal is described any educational process taking place into specific structures, such as learning institutes. Non-formal is characterized the type of learning that is offered by the instructor of a particular team in the workplace, or in social events. And informal is the on-going process that engulfs the learning coming from daily experiences from the interactions of the adult.
In Europe the right of adults to education and knowledge is protected by the European Association for the Education of Adults (EAEA), which recently welcomed the proclamation of the European Pilar of Social Rights that supports the right of anyone to be educated in order not to be socially rejected and must be set immediately on action. It also supports the European Education Area (EEA) act, which makes an effort to strengthen the moral of Europe by ensuring that learning is the target and not strictly education. And the reason is because most of the times the term education is used by European Council to describe the learning process as introduced by the formal structures of schools and universities. Instead the act intensifies the importance of the lifelong process of learning that encompasses all forms of learning for everyone.
In this context EAEA proposes that EEA should be linked with the existing policies in lifelong learning in order to certify that any learning effort engulfs flexible learning pathways and proper validation. With a target to increase adults' participation in lifelong learning to 25% by 2025, EAEA proposes that European Commission should form a governmental structure in order to ensure that member states engage in the most appropriate way all the stakeholders of lifelong learning. Furthermore this structure will make able for member states to increase the expenditure on lifelong learning programs, by contributing more to the Erasmus+ and European Social Fund that support the participation of adults in lifelong learning. It is also crucial to strengthen non-formal organizations on lifelong learning, as they are the constant providers of better education, training and lifelong learning systems that Europe needs.

27.4 Structuring Education for the Elderly

Senior citizens is a particular target group and anyone should bear in mind that they demand more time in order to get familiar with anything new, especially when this regards technology. Their pace of learning is by fact not the same as a younger person who is surrounded by technology from the early days of his life. Usually older people are reluctant to seek for help as they consider being taught by younger persons as humiliating. The best way to approach them is to try to identify the reasons they want to use the technology, which most of the times is to maintain contact with close friends and relatives, therefore this could be a very good

starting point of introducing them to new technologies. Also older people may think that any technological advancement is not good not only for them but for everybody and thus show some denial in the usage of it. Instructors should aid them overcome their fears of building on trust to technology step by step. Using suitable guides specifically made for this reason is the most appropriate way to help seniors get away from the shadow that their fear cast. Moreover it is crucial to avoid the use of technical terms because this will lead elderly to greater confusion and mistrust of the technology, which can be overcome by understanding their puzzlement and offering simpler explanations.
Generally in any effort to construct a suitable education program for elderly should be based on the following principals:

- Instruction should be broken up into small units with specific goals and the new information must be related to the existing knowledge of older adults
- Sufficient time between instructions should be allowed, for older adults to comprehend the new information
- More pauses during lectures should be provided so as to allow older adults make notes and any questions they consider necessary for their effort to understand the new technology
- Any reading during the instruction should be minimized
- Enough time for practicing each unit should be allowed
- Sitting and equipment should be set in a way that is more comfortable to the senior citizen
- The selected computer programs must have graphical interface and readable font
- Older adults should be familiarized with online help features that accompany most computer programs
- Proper classroom environmental conditions should be set, like minimum necessary movement, right temperature and sufficient lighting

27.5 Practices around the Globe

27.5.1 United States of America

It is considered of great importance to keep elderly well educated on technology and the use of it in order to be able to keep in touch with their families, especially in America where the distances are spacious and there are cases that the young ones live in a different state. Every state organizes seminars trying to make older adults feel more comfortable with technology. The initial idea is to present them things that they will trigger their interest, like how to make a video-call through Skype so as to keep in touch with friends and family, how to search interesting topics on various sites like the Pinterest, how to use Facebook effectively and other features that can make their lives more comfortable. In some states the classes to the elderly are free of charge, like in New York where Older Adults Technology Services (OATS), a non-profit organization in Brooklyn, makes an effort to familiarize elderly with the new technology.
Most of these programs are adoptable to the particularities of every single one of the attendants. For example they are equipped with technology that can offer to people with hearing loss the same experience on the Internet that any other older adult can taste. Apart from the OATS program in New York there are several local classes and workshops organized all around US, like the Oasis Connections and AARP TEK Workshops which are free of charge and cover various technological aspects. Also Lifelong Learning Institutes in affiliation with universities and colleges offer educating programs for older adults free of charge as well. The organization SeniorNet offers online computer courses in more than thirty cities, however, there is a minimum subscription fee that is required. Similarly there are other Online Instructional Services provided to anyone that is willing to pay a minimum amount of money in order to attend some online courses on various technological subjects. Furthermore in the bookstores anyone can find plenty of How-To Books that include analytical steps and pathways on using the technologies.

Finally worthy of mentioning is the fact that in some states local educating facilities and schools offer to older adults the chance to be educated by students, so as to make the first ones understand more things on technology. Like in California where a group of teenagers from Carmel High School sets up private or group forty-five minutes sessions, in order to train the elderly on the use of new technologies like the iPads or smartphones. Through these sessions the teenagers are feeling that they are offering for a good purpose and also can enhance their understanding and relationship with senior citizens.

27.5.2 Singapore

In June of 2017 Infocomm Media Development Authority in Singapore released a portal including online guides, eBooks, videos and seminars, aiding seniors in their efforts to use mobile and digital technology. The structure of the site is really simple, so as to be exploitable by anyone, and the font buttons are large enough, as well as the instructions are pretty clear. The portal cooperates with People's Association Active Ageing Council and is actually the outcome of a successful series of classes on technology that began in 2007.

27.5.3 Europe

As in the rest of the world the problem of Europe is its ageing population, which is increasing in a really fast pace. Therefore the goal of any successful program is to assist the population into ageing well. This is the purpose for the Active and Assisted Living Program, which makes an effort to equip seniors in Europe with the necessary knowledge on how to operate with the new technology. In order to keep older adults active AAL introduces a series of projects, like "We Care" that targets in getting elderly to participate more in online and off-line social networks. The seniors who attend these projects tend to commit more to the target of it, so as to enjoy a healthy and active social life. The projects cover all European countries and they expanded to Canada and Israel.
AAL represents a collective form of action, but apart from this each European country has also developed programs of local character aiming to enhance the knowledge and involvement of elderly in new technologies and social life in a greater extend. In the following section we are going to see some practices that take place in some of the European countries.

27.5.4 Czech Republic

Young students pay home visits to seniors, so as to assist them with Internet and other technologies, in an effort to join the world of the young people with this of the seniors. Usually each older adult have one young instructor so as to build trust and strong relationship and make them feel comfortable to ask any questions that they cannot understand or they cannot comprehend very quickly. For this purpose students are closely supervised and take advice from their teachers, in order to organize a successful slow pace teaching course.

27.5.5 Finland

Very popular in Finland are the courses by young instructors on how to use cellular phones, covering the basics of the communication by cellular phone, and in more advanced levels other features are being introduced, like wireless LAN and camera. Also there are courses about internet banking as the banking sector in Finland is very narrow, therefore people have to learn to complete their transactions online. Finally students are encouraged to be involved in the generation of online broadcastings especially for elderly, with the goal to make the young students feel that they offer to a good purpose, as well as to engage older adults in various kinds of activities.

27.5.6 France

Through various gaming platforms elderly can participate into activities and even compete with each other, maintaining in this way their good health and mentality. Furthermore street workshops gather the memories of elderly either in a written form or captured in a video, audio

even in a photo in order to make a great collection and later on create a story. Also through these workshops elderly are introduced into the use of various digital technologies.

27.5.7 Germany

All over the country computer courses are organized for seniors, covering at least basic search on the Internet, how to create holiday greeting cards, safety in using the Internet, as well as how to use e-mails and operate with links. In addition there are the “Café mit Anschluss” meetings where elderly can learn how to create a website and how to use other digital technologies, like GPS and smart phones. Also some fieldtrips take place to some factories and libraries in order to cooperate with the stuff there and learn interesting things.
Moreover there are the multigenerational homes that act as people hubs for exchanging of ideas and skills and thus close a little bit the generation gap. In these places elderly can boost their social and interactive abilities and become more confident about themselves. Also the German National Association of Senior Citizens Organizations (BAGSO) among its other publications of increasing awareness on the needs of elderly, have published a booklet for seniors introducing them to the digital world.

27.5.8 Poland

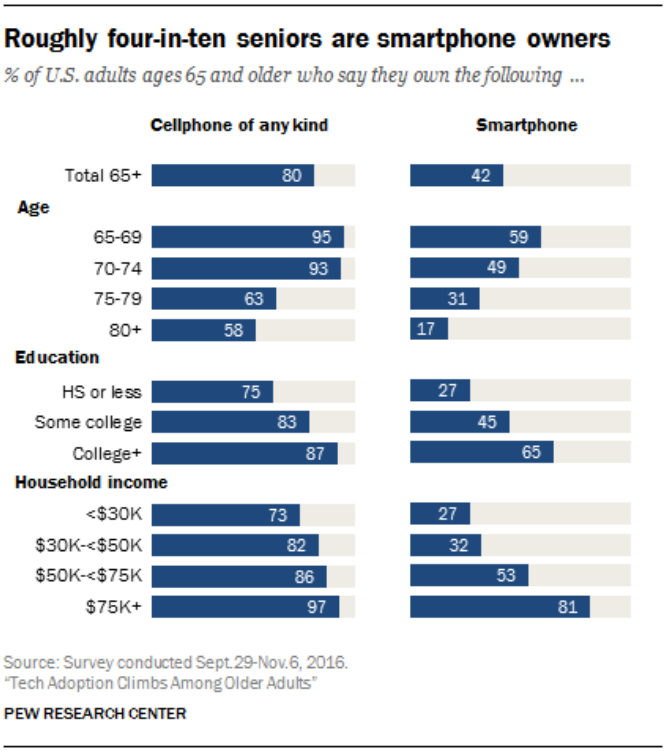
The Regional Public Library in Krakow organizes a successful series of computer courses, as well as other seminars with several subjects, among which is the world of new technologies and information society. They aim to improve the inter-generation dialogue, to stimulate the active life of senior citizens and increase their participation in the social life and finally to promote their interest in knowledge and transform it to creativity through the use of Information and Communications Technology.

27.5.9 Greece

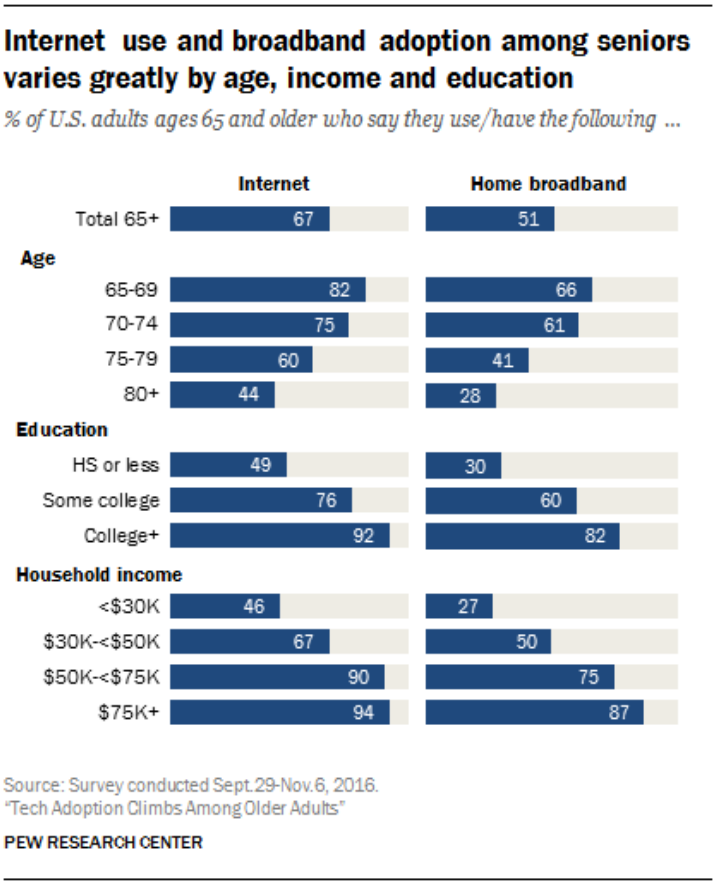
Apart from the computer courses that are organized by each municipality, two are the worthy to be mentioned initiatives in the area of Athens, the free computer courses settled by the Stavros Niarchos Foundation Cultural Center (SNFCC) and the successful 50+ project of Cosmote, a major telecommunications company. At SNFCC people over sixty-five years of age who are technology rookies, can attend the computer courses that cover all the basic needs through simple steps. As for the project 50+ of Cosmote it involves the teaching to elderly by the use of a tablet, in order to make them get familiar to the technology necessary for their communication. The attendants can learn not only how to effectively use tablets but also how to browse the Internet, as well as how to use some other applications.

27.6 Internet Usage by Elderly

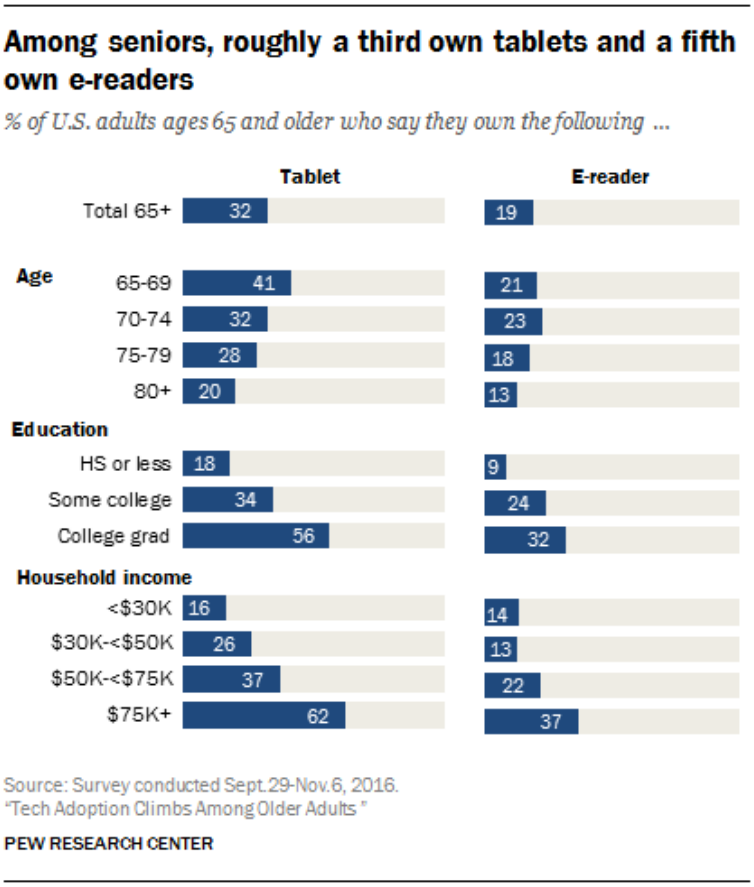
Even though seniors seem to be a little bit intimidated by technology and how quickly it progresses, there is an increased tendency all over the world for older adults to use various means of modern technology, not because they like it, but by force, as technology is the only way to keep them in touch with their families, as well as to maintain a good mental and physical health. More and more people of this specific age group join computer and technology courses in order to keep up with the rest of the world. With a slow but steady pace seniors learn how to use a smartphone and even own one.



The features of a smartphone may be difficult for them to comprehend but at least they enjoy better communication. Also there is an increase in the percentages of elderly who are able to use the Internet.



A tendency is also observed in the increase of tablet ownership among senior citizens, as the tablet is larger than a smartphone and have larger application icons that they can clearly see, so as to use them more easily.



Apart from the above statistics that come from the US, we can point out that also in Europe we can find the above tendencies. Especially people from the Scandinavian countries are more privileged, since there lies the heart of the technological development of Europe.

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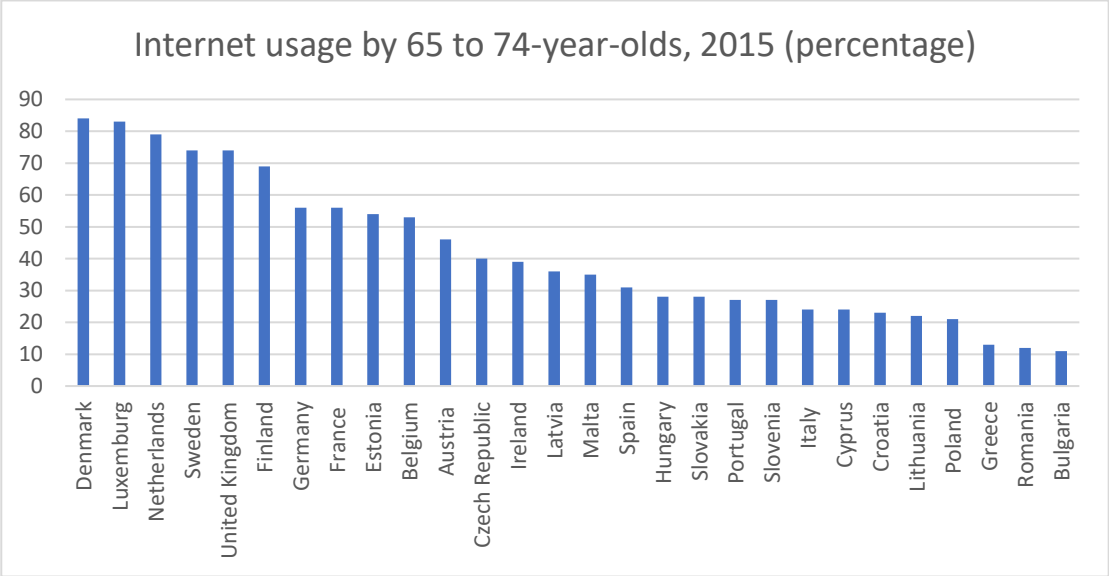
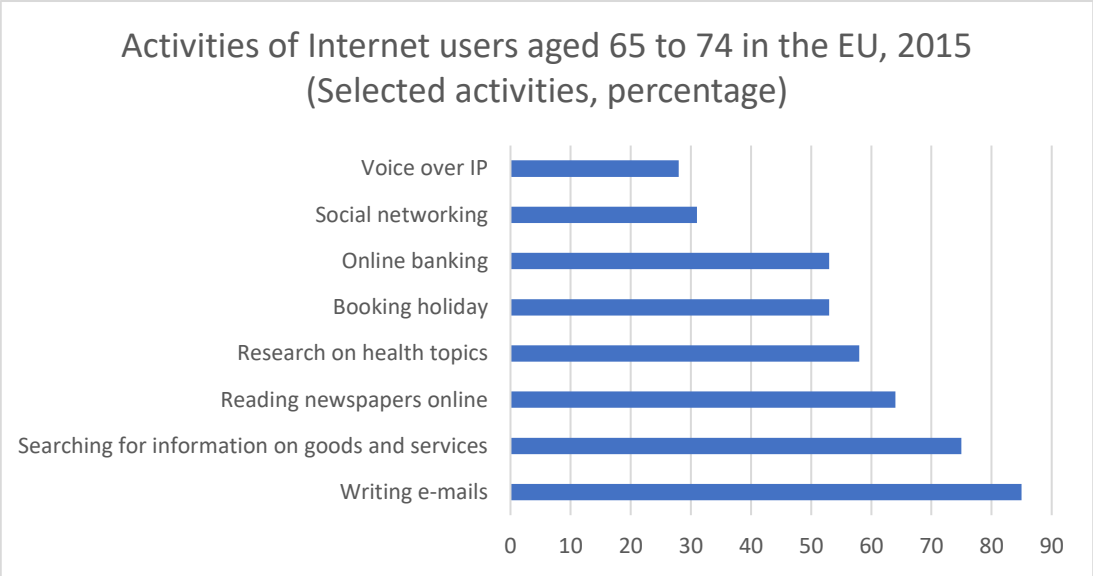


Regarding now the activities senior citizens tend to use online in Europe most of them rely to just sending e-mails, as well as searching the Web for various topics that interest them.



27.7 Assistive Technology for Elderly

As soon as the elderly manage to overcome their fear of new technologies they can find that they are pretty helpful in various aspects of their everyday life, like keeping truck of their health status, organize their medication and appointments, help them keep their home environment in a good condition and many others. Slowly seniors are getting involved in the use of devices like smartphones and tablets equipped with GPS and transportation apps, as well as Skype or Facetime, so as to stay in touch with their loved ones, smart watches and fitness truckers, so as to be able to maintain a healthy body status and medication monitors. All the above mentioned technologies are part of the daily routine of every human being, therefore older adults are forced in a way to learn how to use them. Apart from all of these the most characteristic assistive technologies for elderly are:

- Liftware is a specially made kind of cutlery, in order to help people with disability on their hands, or people who suffer from diseases like Parkinson's, by keeping it steady and cutting the appropriate proportions of food, but it can also be used by elderly so as to ease their life.
- USB Dolphin SuperNova Magnifier is a USB device that if attached to any computer can magnify the operating system as well as other features, in order to be clearer for senior citizens and select the proper tool.
- Claris companion is a simple to use tablet that can operate also as a digital picture frame, mobile phone and remote monitoring system, allowing elderly to easily get used to modern technology, with a simple interface and large features icons, so as to help seniors write and send e-mails and use video conferencing easily.
- Roomba is a robotic vacuum cleaner that can be controlled by a smartphone and is a great assistant in house cleaning, not only for elderly.
- Reminder Rosie is a senior-orientated voice-controlled clock which can record up to twenty five different messages and broadcast them at various times of the day.
- Amazon Alexa is a perfect aiding device for people suffering physical limitations either due to age or due to illness. Some of its abilities are reading news aloud, ordering supplies when necessary, displaying the weather forecast, playing music and controlling other smart devices around the house.
- BeClose is an innovative aging in place technology that with wireless sensors can help caregivers and families stay in touch with older adults and monitor them through a secure webpage.
- Firbit Ultra Wireless Activity Tracker is a smart device that displays real-time activity stats in order to make it easier to reach goals.

- A variety of sophisticated software are produced by Independa, aiming to help caregivers that are mostly remote from seniors to keep track of their daily routine, as well as display reminder messages to elderly.
- TabSafe medication management system is not only a place where seniors can organize their medication, but it can also display reminders for their proper treatment. It is also connected to the personal pharmacist, so as to alert them about the proper medication to be prescribed.

27.8 Artificial Intelligence leading the Way

Technology is rapidly evolving and it affects every aspect of human activity. One brilliant example comes from the healthcare sector, where robotic assistants have been successfully established at most hospitals of Japan and China. Especially with artificial intelligence modern technology can even take the form of a human being. Indeed android robots with human facial and body characteristics have been developed in order to solve the homecare problem of elderly, who especially in Eastern Asian societies are not living in the same place with other family members. In this way elderly can enjoy the illusion of having someone near them and that they are not totally abandoned. However, we are still far from the point of artificial intelligence substituting humans in the healthcare sector. So far they are valuable tools.

27.9 Conclusions

The rapid growing environment of technology is intimidating for older adults, who are not used to the modern technology and they cannot comprehend it as fast as the newer generations. But there are nowadays efforts of elderly to use modern technological equipment, mostly because they are forced to do it as a means to stay in touch with their family and people they care about. All over the world various initiatives are being developed aiming to teach to elderly the main features of modern technology that are important for them. Furthermore continuous advancements introduce necessary technological products that support people in the caring of senior citizens. Only a little bit of encouragement is necessary so as to motivate older adults in using of modern technological means.

27.10 Internet Sources

http://www.eaea.org/media/policy-advocacy/eaea-statements/2017_eaea-response_social-pillar-and-eea.pdf

https://en.wikipedia.org/wiki/Adult_education

https://files.eric.ed.gov/fulltext/EJ990630.pdf

https://myageingparent.com/technology/communication/how-to-help-elderly-use-computers/

https://www.brookdale.com/en/brookdale-life/blogs/2017/04/tech-tips-10-tips-for-teaching-technology-to-seniors.html

https://www.nytimes.com/2016/03/12/your-money/making-technology-easier-for-older-people-to-use.html

https://newoldage.blogs.nytimes.com/2013/05/03/helping-seniors-learn-new-technology/

https://www.huffingtonpost.com/jim-t-miller/helping-seniors-learn-new_b_7584758.html

http://www.dailygood.org/story/839/perfect-pairing-young-people-teaching-seniors-about-technology-dennis-taylor/

http://www.straitstimes.com/singapore/imda-launches-new-portal-for-seniors-to-learn-digital-and-mobile-tech

https://www.hastac.org/blogs/toupronga/2017/12/01/technology-elderly

http://aal.challenges.org/

http://www.eseniors.eu/Best%20practices.htm

https://www.snfcc.org/visitors-center/events/2017/12/computer-courses-1212/?lang=el

https://www.techpress.gr/index.php/archives/120044

http://www.pewinternet.org/2017/05/17/technology-use-among-seniors/

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5694030/

https://www.bmfsfj.de/blob/113952/83dbe067b083c7e8475309a88da89721/aeltere-menschen-in-deutschland-und-in-der-eu-englisch-data.pdf

https://money.usnews.com/money/retirement/articles/2015/11/16/10-essential-tech-tools-for-older-adults

http://www.makeuseof.com/tag/assistive-technology-devices-seniors/

https://www.washingtonpost.com/news/theworldpost/wp/2017/10/18/artificial-intelligence-could-improve-how-we-age/?utm_term=.918adb11f701

https://www.forbes.com/sites/sarahsu/2017/10/28/can-china-win-the-artificial-intelligence-race-by-serving-the-elderly/#5cdada625be4

28 Collaborative Innovation – A Role-Model for Higher Education Institutions

Hannes RAFFASEDER
St. Pölten University of Applied Sciences, St. Pölten, Austria

Gabriele PERMOSER
St. Pölten University of Applied Sciences, St. Pölten, Austria

28.1 Abstract

After a brief discussion of open innovation and platform-based companies this paper discusses the changing role of universities in today's knowledge society. It outlines a holistic approach of integrating the three missions, higher education, research and knowledge transfer towards a platform for collaborative innovation and presents St. Pölten University of Applied Sciences' roadmap. It gives an overview of its steps promoting applied research, encouraging interdisciplinary collaboration, facilitating knowledge transfer in a broad sense, pushing innovative learning and teaching methods and supporting innovation and entrepreneurship. Focusing on the universities' main fields of action - encouraging faculty innovation and promoting student innovation and entrepreneurship – the paper refers to examples and discusses intermediate results.

Keywords: open innovation, interdisciplinarity, academic entrepreneurship, innovation education, third mission

28.2 Introduction

It is widley recognised that innovation is a very important key to master difficult, complex and inter-related societal and economic challenges in our fast changing world (European Commission, 2015; U.S. Department of Commerce, 2013; OECD, 2009; Vinnova, 2009). From responsible citizens to governments, from global enterprises to small regional companies and start-ups, a wide range of stakeholders is increasingly interested and dependent on new concepts and methods to push innovative thinking and creative ideas leading to new products or processes. Finding overlaps and using synergies between different needs of various stakeholders has become more and more important for sustainable success. Thus, interdisciplinary skills, creativity and collaboration are widely accepted as important driving forces for innovative ideas, products and processes necessary to keep up with an accelerating global and digital society and to overcome and prevent societal and economic crises. Rapidly growing interest and demand triggered an ongoing evolution of innovation processes, creative environments and collaborative methods. Of course innovation ecosystems have been developed inside companies, traditional networks and communities, but even more important trends and interesting issues like fablabs, maker spaces, coworking spaces, creative labs, crowdfunding, open source and social innovation have come up off the beaten tracks. In recent years a speedy rise of innovation hubs as a new type of organization can be observed. As these hubs incorporate functional elements of research labs, science parks, communities and networks of practice or incubators and accelerators, they appear unique and new in the way they combine tried and true methods with networking and community-based ideas. By embracing fluidity and diversity, focusing on impact, encouraging serendipity, creating a sense of community, intensifying collaborative innovation, dynamising the innovation process and enabling, rather than forcing innovation, hubs allow for new combinations of existing knowledge bases that otherwise would not happen. (Gryszkiewicz & Friederici, 2014)

28.3 Open Innovation and Platform-Based Companies

Without doubt several interdependences between different innovation ecosystems can be observed, as for instance start-ups need capital from investors while global enterprises need new ideas and business models from succesful start-ups. But all too often they only coexist with little interaction and knowledge is still held within defined communities or organisations, with their own language, culture of business and ways of working. Organizations are increasingly recognizing that value from products and processes they once developed only within their own structures can be significantly enhanced if they integrate the innovative capabilities of customers and collaborators, as there is not only limited capacity of companies to perform research and development in their own R&D departments, but the best ideas do not necessarily come from the companies' own employees either. Henry Chesbrough suggested the concept of open innovation as the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation (Chesbrough, 2006). Open innovation can be understood as the antithesis of the traditional vertical integration approach where internal R&D activities lead to internally developed products that are then distributed by the firm. Chesbrough discusses two facets of open innovation: The “outside in” aspect, which includes all ways of integrating ideas, concepts, processes or technologies from outside, either from the customers or the collaborators, from academia or from other institutions into the innovation process of an organization. The other, less commonly recognized aspect is the “inside out” part, where organisations allow ideas, concepts, processes or technologies to go outside to be incorporated into others’ innovation processes.

Closely related with Open Innovation a worldwide shift from product to platform-based companies can be observed. Instead of simply selling a product, organizations such as Google, Uber, eBay or Airbnb establish multi sided platforms to manage relationships with various stakeholders and enable direct interactions between them. (Hagiu & Wright, 2015). As nowadays more and more platform-based companies succeed product-based companies, these transitions have a major impact not only on business models, but on the organization of work and everyday life as well.

28.4 HEI as Plattforms for Collaborative Innovation

Universities may be regarded as product-based providers of higher education and research offering study programmes and degrees to students as well as scientific publications or prototypes, patents and other research outcome to industry and society. However, they have strong potential to develop themselves into platform-based innovation hubs. According to Housers (2014) there are not many platforms besides the university that provide such a vehicle for individuals from different disciplines to interact with each other on such a regular basis.

Higher education institutions commonly not only attract ambitious and smart people, but also assemble various disciplines that deal with societal and economic challenges from various perspectives. Finding overlaps and using synergies between different needs of the various stakeholders, disciplines, societal and economic challenges is key to sustainable success in this context. Higher education institutions’ platforms for collaborative innovation have to include and interact with

- a diverse variety of institutions and organizations, such as global companies as well as regional SMEs and start-ups, NGOs, schools and training centres, science centres and museums, co-working spaces and innovation hubs, accelerators and incubators, science and business parks, research labs and other higher education institutions, regional and federal governments, interest and pressure groups, funding agencies and others

- a diverse variety of ambitious and smart individuals, such as pupils, students and alumni, lecturers, scientists and developers, artists, practioniers and industry experts, business angels and investors, decision makers, responsible citizens
- a diverse variety of various disciplines and industrial sectors
- a diverse variety of business models and processes as well as learning, teaching, research and innovation methods especially emerging from digital technologies

As an obvious precondition towards such platforms, higher education institutions truly have to open the ivory towers of traditional academic disciplines and promote interdisciplinary skills, collaboration and creativity. At MIT Media Lab Joichi Ito (2016) promotes an antidisciplinary approach as a specific field of study with its own particular words, frameworks, and methods as it is about working in spaces that simply do not fit into any existing academic discipline. Ito points out that bringing together design and science can produce a rigorous but flexible approach that allows to explore, understand and contribute to science in an antidisciplinary way.

According to Altmand and Tripsas (2015) organizations that have historically defined themselves as creative and innovative may have trouble accepting a platform-based context. While the inside-out approach of open innovation is in general more difficult for the industry, higher education institutions tend to have more problems with the outside-in approach where outsiders engage in much of the creative activity. As organizational identity can also influence whether and how organizations become platform-based, Altman and Tripsas (2015) propose that organizations must question elements of their existing identity and actively modify it to become consistent with their new approach. Thus, higher education institutions have to re-think their mission, vision and strategy as well as their performance indicators to succeed in their transition towards a platform-based institution.

28.5 A Roadmap for a small University of Applied Sciences

Founded in 1996, St. Pölten UAS is still a young and - with about 3,000 students - a comparatively small higher education institution in the capital of Lower Austria.

However, up to now St. Pölten UAS has taken several important steps in its development towards a platform for collaborative innovation:

- establishing study programmes in various disciplines
- pushing innovative learning and teaching methods
- promoting applied research
- encouraging interdisciplinary collaboration
- facilitating knowledge transfer
- supporting innovation and entrepreneurship

Since its founding, St. Pölten UAS has developed and established more than 20 bachelor and master degrees in the fields of Media and Economics, Media and Digital Technologies, Computer Science and Security, Rail Technology and Mobility, Health Sciences and Social Sciences.

Accompanying efforts have been put to push didactic concepts with innovative teaching and learning. The university has not only integrated research based methods, project oriented and student-centred education in the curricula but is amongst the Austrian pioneers of innovative teaching and learning methods, such as inverted classroom and game-based learning.

More than ten years ago, the university started to put a strong strategic focus on applied research. These efforts not only led to numerous scientific publications and a wide range of projects funded by federal institutions and the European Union, but also to contract research for several industry partners. Research institutes and groups were established in the departments, offering a framework for individual ideas, concepts and developments. Today the university generates about 10% of its total revenue from applied research, and is amongst the most successful universities of applied sciences in terms of research in Austria.

An interdisciplinary approach with three well-defined main topics – “Media, Information and Communication”, “Society in the Digital Age” and “Integrated Mobility” – not only strengthens the cooperation between the six departments and helps reach a critical mass within the research groups but attracts the attention of co-operation partners as well. Interdisciplinarity, collaboration and innovation play a key role in new study programmes, too.

Strong efforts have been made to attract a wider public’s interest in research. For four times since 2011 an expert jury selected St. Pölten UAS to host Austria's contribution to the European Researchers’ Night. The wide attraction of these European Researchers’ Nights benefited the university's reputation and led to intensive collaborations with various stakeholders (e.g. regional and federal governments, other universities and research institutions, companies and interest groups).
At about the same time the university started to push interaction with industry. Advisory boards for departments and study programmes were established in addition to more informal collaborations.

To support these developments knowledge transfer became the third important pillar in St. Pölten UAS strategy from 2012 on. Rather than regarding the three missions as separate fields of action, the university puts a strong focus on their integration towards a platform for collaborative innovation.
The start of the new bachelor programme in “Smart Engineering” in 2015 marks a very important milestone within the university’ interaction with industry, as it is one of the first cooperative study programmes in Austria, combining theoretical studies at the university with practical projects at collaborating companies. So far more than twenty companies have signed cooperation agreements with this study programme.
Another big step within the university’ research activities as well as its industry interaction was the opening in 2015 of the Josef Ressel Centre for Unified Threat Intelligence on Targeted Attacks (TARGET). This research centre, the first of its kind in the region of Lower Austria, is funded half by the Christian Doppler Society and half by a number of industry partners for at least 5 years (Target, 2016).

In recent years, St. Pölten UAS has started to promote and support innovation and entrepreneurship focusing on two areas:

- encouraging faculty innovation (Raffaseder & Permoser, 2016)
- promoting student innovation and entrepreneurship (Raffaseder & Permoser, 2016; Permoser, 2016)

28.6 Conclusions and recommendations

Since St. Pölten UAS decided to focus on applied research and add knowledge transfer as a third mission to higher education not only a significant rise of various key performance indicators, but also a strong improvement of the university's reputation can be observed every year. Although there is still a long way to go towards the suggested platform for collaborative innovation, several indicators already prove the success of this holistic and open approach to various interactions with divers stakeholders. The concept of a platform seems to be appropriate to include the three missions of higher education and to find the overlaps and synergies between the different needs of collaborators. Up to know the most important learned lessons can be summed up as follows:

- rather enable and support highly motivated individuals instead of trying to force performance through to narrow defined objectives and indicators
- enable and support interdisciplinary collaboration across the boundaries of departments and instituts
- do not take too many steps at once
- facilitate interaction of science with society and promote science communication with a wider public
- establish a diverse set of collaboration and interaction with the industry ranging from informal meetings to strategic long-term partnerships
- once developed, act along the institutions' own vision and strategy instead of reacting to every upcoming trend or new buzz word
- learn from the best institutions not only in higher education, but in industry as well, and have a close eye on ideas and concepts to be developed off the beaten tracks outside or on the brink of common academic ecosystems, study and maybe adopt their structures and concepts, but don't try to copy them

28.7 References

[1] Altman, E. J. and Tripsas, M. (2015). Product to Platform Transitions: Implications of Organizational Identity. In C. Shalley, M. Hitt & J. Zhou (Eds.), Oxford Handbook of Creativity, Innovation, and Entrepreneurship: Multilevel Linkages. Oxford, UK: Oxford University Press.

[2] CARMA, (2016), CENTER FOR APPLIED RESEARCH IN MEDIA ASSISTED HEALTH AND SOCIAL CARE [ONLINE] AVAILABLE FROM HTTP://CARMA.FHSTP.AC.AT/ [23 AUGUST 2018]

[3] CHESBROUGH, H. (2006) OPEN INNOVATION: THE NEW IMPERATIVE FOR CREATING AND PROFITING FROM TECHNOLOGY. BOSTON: HARVARD BUSINESS SCHOOL PUBLISHING CORPORATION

[4] EUROPEAN COMMISSION (2015): STATE OF THE INNOVATION UNION 2015. [ONLINE] AVAILABLE FROM HTTP://EC.EUROPA.EU/RESEARCH/INNOVATION-UNION/PDF/STATE-OF-THE-UNION/2015/STATE_OF_THE_INNOVATION_UNION_REPORT_2015.PDF [23 AUGUST 2018]

[5] GRYSZKIEWICZ, L. AND FRIEDERICI, N (2014): LEARNING FROM INNOVATION HUBS: FLUIDITY, SERENDIPITY, AND COMMUNITY COMBINED, HTTP://WWW.INNOVATIONMANAGEMENT.SE/2014/12/15/LEARNING-FROM-INNOVATION-HUBS-FLUIDITY-SERENDIPITY-AND-COMMUNITY-COMBINED/ [23 AUGUST 2018]

[6] HAGIU, A. AND WRIGHT, J. (2015): MULTI-SIDED PLATFORMS, HARVARD BUSINESS SCHOOL WORKING PAPER. BOSTON, MA: HARVARD BUSINESS SCHOOL.

[7] HOUSERS, C. (2014) WHY THE UNIVERSITY IS THE IDEAL STARTUP PLATFORM [ONLINE] AVAILABLE FROM HTTPS://WWW.WIRED.COM/INSIGHTS/2014/02/UNIVERSITY-IDEAL-STARTUP-PLATFORM/ [23 AUGUST 2018]

[8] ITO, J. (2016) DESIGN AND SCIENCE [ONLINE] AVAILABLE FROM HTTP://JODS.MITPRESS.MIT.EDU/PUB/DESIGNANDSCIENCE [23 AUGUST 2018]

[9] OECD (2009), FORWARD-LOOKING RESPONSE TO THE CRISES: FOSTERING AN INNOVATION-LED SUSTAINABLE RECOVERY [ONLINE] AVAILABLE FROM HTTPS://ERA.GV.AT/OBJECT/DOCUMENT/398/ATTACH/110DSTI-IND-STP-ICCP20091-ENG.PDF [23 AUGUST 2018]

[10] Permoser, G. (2016). 7 Ways to Start-up - The St. Pölten University of Applied Sciences' Way to Promote Student Entrepreneurship and Innovation and University-Industry Interaction; invited talk at the International Triple Helix Conference 2016, Heidelberg, Germany.

[11] Raffaseder, H. and Permoser, G. (2016): Towards a Platform for Collaborative Innovation: A Roadmap for a Small University of Applied Sciences, In: Kliewe, T. And Meerman, A. (eds.)(2016): Practitioners Proceedings of the 2016 University-Industry Interaction Conference: Challenges and Solutions for Fostering Entrepreneurial Universities and Collaborative Innovation. Amsterdam: UIIN 2016

[12] Target (2016) The Josef Ressel Center for Unified Threat Intelligence on Targeted Attacks (TARGET) [online] available from https://www.fhstp.ac.at/de/forschung/josef-ressel-center-target [23 August 2018]

[13] VINNOVA (2009): FIGHT THE CRISES WITH RESEARCH AND INNOVATION? – ADDITIONAL PUBLIC INVESTMENT IN RESEARCH AND INNOVATION FOR SUSTAINABLE RECOVERY FROM THE CRISIS VINNOVA ANALYSIS VA 2009:14 VINNOVA –VERKET FÖR INNOVATIONSSYSTEM /SWEDISH GOVERNMENTAL AGENCY FOR INNOVATION SYSTEM [ONLINE] AVAILABLE FROM HTTPS://WWW.VINNOVA.SE/CONTENTASSETS/96C5103282E74BF49DBF9EDB0ECC92C9/VA-09-14.PDF [23 AUGUST 2018]

29 All those New Words: Now You See Them, Now You Don't

Catherine KANELLOPOULOU
Ionian University, Corfu, Greece

Andreas GIANNAKOPOULOS
Ionian University, Corfu, Greece

29.1 The importance of vocabulary acquisition in language learning

Originally, language was conceived as a package of two areas of study: grammar and lexis. Learners, then, had to master a set of grammar rules on the one hand and a list of words on the other. Over the years, the grammar-lexis distinction has been discarded, as there were items, such as idioms, that did not fall well into either of the two areas, and has been replaced by a more realistic view of language as a continuum from simple to more complex units of language (Langacker, 1991). While approaches and methods to vocabulary teaching and learning differ, what most instructors agree upon is that the extent of students' understanding of a text has a close and vital relationship with their knowledge of the vocabulary it contains (Anderson & Nagy, 1991; Baker, Simmons, & Kameenui, 1998; Ouellette, 2006). The reason is simple: if students do not know the words in a text, they cannot decipher its meaning. Vocabulary is, therefore, critical for understanding and communicating effectively in a language. Deliberately teaching vocabulary may be one of the least efficient ways of developing learners' vocabulary knowledge, it is nonetheless an important part of a well-balanced vocabulary programme (Nation, 2005). Teachers should pay attention to the ways in which learning style preferences might affect vocabulary learning. Students who struggle to acquire new vocabulary may have generalized linguistic deficiencies, memory deficits, poor word learning strategies, or any combination of the three (Baker, Simmons, & Kameenui, 1995). Cultural and ethnic differences in learning styles may be very important and should be considered in understanding how people learn vocabulary. Sensory preferences, such as visual, aural, tactile, and kinesthetic, should be assessed (see Reid, 1987). Learners with a visual style are likely to enjoy visual imagery and semantic mapping, while aural learners might prefer aural imagery and the keyword, and kinesthetic-tactile learners might opt for physical response or physical sensation.

29.2 What is a word and what makes it easy or difficult to learn?

Words are the most important element in the human system of communication but it seems that while most people think they know what a word is, few of us actually consider their central role in everyday communication (Joannopoulou, 2000). A first difficulty lies in the ambiguity of the term 'word'. For example, a word may be seen as a form, either spoken or written, or it may also be considered as an expression combining both form and meaning. A first attempt to define the word concept has to do with the distinction of words as tokens or types (Lyons, 1995). The following well known expression "To be or not to be?" may be considered to contain either six words (to, be, or, not, to, be) or four words (to, be, or, not) since 'to' and not' and occur twice. The first case is an example of words operating as tokens (actual instances of items) and the second case can be thought of as words operating as types (items which don't have similar identities). In everyday life, it is relatively straightforward to distinguish which sense of a 'word' is intended in everyday communication, for example, when discussing an SMS that consists of 50 words, it is clear to everyone that a reference is made to tokens and

not types. One of the definitions of a word comes from Carter (1987) who focuses on meaning and defines a word as 'the minimum meaningful unit of language'. On the other hand, Bloomfield's definition of the word (1984) as 'a minimum free form' stresses the distributional independence of words; a 'word' is a word if it can stand in isolation, if it can be a one word utterance. In this paper, the term 'word' will be used in the sense of a lexical item or a unit of meaning, that is, a phrasal or an idiom will be considered as one 'word'. The study of vocabulary is an essential part of language learning and the question of how much vocabulary a learner needs to know to achieve a particular purpose remains an important area of research and discussion. Whether the number of words in a modern language is 50,000 or 500,000 or somewhere in between, as variously claimed by different researchers using different counting units and methods, either of these numbers is daunting to an L2 learner. Acquiring a second lexicon is a daunting task for language learners, especially if the goal is to achieve literacy in the second language. But the task becomes more manageable if we know which words are more important to learn than others, or which words are most useful to know as a precondition to learning others. In English, computational studies of word frequency and text coverage, in conjunction with empirical studies of learner comprehension of texts with different lexical profiles, have provided valuable information for both course designers and independent learners. It has become clear that words of particular frequencies have predictable degrees of prominence in texts of particular genres. For example, the 1000 most frequent words, along with proper nouns, tend through repetition to make up about 90% of the running words in spoken conversations.

The vast majority of English words are found mainly in written texts, while a relatively small handful are encountered in daily conversation and watching television. This means that for the many learners who achieve conversational fluency in an L2 rather than full literacy, the vast majority of words are simply inaccessible for learning through naturalistic acquisition. (Cobb & Horst, 2004) From the learner's point of view, a crucial factor in L2 vocabulary acquisition regardless of word frequency, is word 'learnability'. This is the ease or difficulty with which a particular word can be acquired. (Bogaards & Laufer, 2004) Main factors regarding a word's learnability can be organized in four areas:

29.2.1 Phonological factors

Pronounceability: Levenston (1979) provides evidence through his research, which involved adult learners, to support the hypothesis of avoidance of phonologically difficult words. And although one could argue that this kind of avoidance might hinder only the production of words, but not their comprehension, evidence to the contrary can be found in the work of Gibson and Levin (1975). The result of their experiment on nonsense words showed that the pronounceable words were perceived more accurately than the unpronounceable ones. Phonological regularity, therefore, is a facilitator in comprehension. A foreign language learner, then, will have a better chance to perceive and produce words that follow a familiar phonological pattern and can be easily pronounced.

Length: it would seem reasonable to argue that the longer the words are, the more difficult they would be more difficult to learn. Research here is not conclusive and the answer seems to be heavily dependent on other factors. For example, Philips (1981) found that length did have a significant influence on learning but this decreased with the increase of the learner's proficiency. And in Stock's study (1976), three syllable Hebrew words had a higher retention of two syllable ones.

29.2.2 Grammatical factors

Part of speech: it is often supported that certain parts of speech are more difficult to learn than other. By experience, nouns seem to be the easiest, adverbs the most difficult; verbs and adjectives somewhere in between. In the previously mentioned experiment, Phillips found that nouns were easier to learn than verbs or adjectives but, again, this decreased as the learner's proficiency increased.

Inflexional complexity: Certain inflexional features can make an item more difficult to learn. Most common examples of this are the irregularity of the plural, or the gender of inanimate nouns.
Derivational complexity: the morphology of a word can often serve as a facilitator in the recognition of a new word and the subsequent production of it. So if learners are familiar with the suffix –ship and the word friend, they will be able to recognize the word friendship. However, lack of regularity with which morphemes can or cannot combine to create meanings can certainly be a source of difficulty. Moreover, there is also the case of 'deceptive transparency' which is a special case of morphological difficulty in comprehension, in which learners erroneously think they can interpret meaning from its parts because they look familiar. For example, under often means at a lower position of something and it is so in underpass, underground and even underclothes, but learners would have difficulty with undertake, underage and undergraduate or come to wrong conclusions about their meaning.

29.2.3 Semantic factors

Abstractness: Allen and Vallette (1972) report "Concrete words are the easiest to learn. Neither young, nor older students have trouble in learning numbers, days of the week, colours, names of objects and the like." However, in certain cases, where there is lack of distinction between two words in a learner's L1, there is a greater degree of difficulty in learning those two words in L2, for example two different kinds of 'blue' in Hebrew L2 would create difficulty in English L1 learners (Stock, 1976) and vice versa. So concreteness in itself cannot assure ease in learning, but it does seem to be a facilitator in this direction.
Specificity: in their study of simplification, Blum and Levenston (1978) conclude that "learners will prefer words that can be generalised to use in a larger number of contexts. In fact they will overgeneralise such words, ignoring register restrictions and collocational restraints, falsifying relationship of hyponymy, synonymy and antonymy." From the learner's point of view, of course, it is safer to use more general lexical items that cover a larger area of meaning and, thus, the risk of making a mistake with the choice of a more restrictive area of meaning and use is smaller.
Idiomaticity: intuitively teachers would confirm that idiomatic expressions are much more difficult to for learners to understand than their non-idiomatic equivalents. Certain researchers go as far as supporting that idioms are the biggest obstacle to fluent comprehension in the L2, be it written or oral (Marton, 1977, Bensoussan & Laufer, 1984). Surprisingly enough, idiomaticity seems to present a difficulty even when the L1 and L2 are similar in the use of the idiom. In Kellerman's work (1978), with Dutch learners of English, even though the idioms investigated were semantically and formally equivalent in Dutch and English, there was only a limited facilitating effect of this similarity on learners' performance.

29.2.4 Usage

Register: Register has been defined as "a variety of language distinguished according to use" (Halliday, McIntosh & Strevens, 1964). They mention three parameters of register: field of discourse (subject of matter under consideration), mode of discourse (spoken or written) and style of discourse (determined by the relation among the participants). L2 learners are very often unaware that the lexical items frequent in one field of discourse or mode of discourse may not be normal in another and that words acceptable when used with certain addressees may be unacceptable with others. Not surprisingly, "neutral" words, which can be used in all registers will be easier to learn, and more register specific words will be more problematic. The selections of register appropriate words would require that the learner needs to familiarise with extra-linguistic phenomena, such as socially defined relationships within a community.
Multiple meaning: In an ideal language each form would have only one meaning and each meaning would have only one form (Lyons, 1968). In practice, however, one form may have several meanings and several meanings may be represented by different forms. The first case refers to polysemy whereas the latter to homonymy. Polysemy is the property of a single lexeme to refer to several meanings often related to each other, e.g. "eye" could be a number of things, from a part of the body to the hole in a needle. Homonyms, on the other hand, are

separate lexical items with distinct meanings unrelated to each other; for example, “shoulder” as a part of a body or the side of a road. It is very hard to distinguish which meanings are related and which ones are not. As expected, in their study, Bensoussan and Laufer found that polysemy induced the largest number of error in comprehension of words. One of the main reasons being that learners who are familiar with one meaning of the word often do not abandon this meaning even if it does not make sense in context. For example, “since” in the sense of “because” instead of “from the time when”.

29.3 Cognitive Load Theory and Learning Burden

Learnability factors determine how easy or difficult a word would be for a learner, and thus affect the cognitive load of a word. Cognitive load (Sweller, 1988) refers to the total amount of mental effort being used in the working memory. Cognitive load theory was developed out of the study of problem solving and is based on a number of widely accepted theories about how human brains process and store information (Gerjets, Scheiter & Cierniak, 2009). These assumptions include that
a) human memory can be divided into working memory and long-term memory
b) information is stored in the long-term memory in the form of schemas (units of knowledge)
c) processing new information results in ‘cognitive load’ on working memory which can affect learning outcomes. (Anderson 1977; Atkinson & Shiffrin 1968; Baddeley 1983)
According to George Miller's information processing research (1956), short term memory is limited in the number of elements it can contain simultaneously (the magical number seven). Therefore what the Cognitive Load Theory implies is that because short-term memory is limited, learning experiences should be designed to reduce working memory ‘load’ in order to promote schema acquisition.
Cognitive load theory differentiates cognitive load into three types: intrinsic, extraneous, and germane. Intrinsic cognitive load is the effort associated with a specific topic. Extraneous cognitive load refers to the way information or tasks are presented to a learner. And, germane cognitive load refers to the work put into creating a permanent store of knowledge, or a schema. Heavy cognitive load can have negative effects on task completion, and it is important to note that the experience of cognitive load is not the same in everyone. The elderly, students, and children experience different, and more often higher, amounts of cognitive load. Children have less general knowledge than adults which increases their cognitive load. Cognitive load theory has many implications in the design of learning materials which must, if they are to be effective, keep cognitive load of learners at a minimum during the learning process.

29.3.1 Learning burden

Turning to vocabulary teaching, the main problem is that only a few words and a small part of what is required to know a word can be dealt with at any one time (Nation, 2005). This limitation also applies to incidental learning from listening or reading, but it is much easier to arrange for large amounts of independent listening and reading than it is to arrange for large amounts of teaching. Teaching can effectively deal with only a small amount of information about a word at a time. The more complex the information is, the more likely the learners are to misinterpret it.
Part of effective vocabulary teaching involves working out what needs to be taught about a word. This is often called the learning burden (Nation, 2005) and is closely related to the cognitive load theory mentioned earlier. Naturally, learning differs from word to word according to the ways in which the word relates to first language knowledge and already existing knowledge of the second language and/or other known languages. The way to work out the learning burden systematically is to consider each aspect of what is involved in knowing a word. Table 1 (Nation, 2005) lists the kinds of questions that can be asked to discover the learning burden of a word. When asking the questions it is necessary to have a particular L1 in mind. If the teacher has a class of learners with a variety of L1s or if the teacher has no knowledge of the learners’ L1 then the best that can be done is to think if the word fits into

regular patterns in the L2. For example, is it regularly spelled? Does it fit into the same grammatical patterns as other L2 words of similar meaning? Does it have a narrow range of senses with a clear underlying core meaning?

Meaning	Form and meaning Concept and referents Associations	Is the word a loan word in the L1? Is there an L1 word with roughly the same meaning? Does the word fit into the same sets as an L1 word of similar meaning?
Form	Spoken form Written form Word parts	Can the learners repeat the word accurately if they hear it? Can the learners write the word correctly if they hear it? Can the learners identify known affixes in the word?
Use	Grammatical functions Collocation Constraints on use	Does the word fit into predictable grammar patterns? Does the word have the same collocations as an L1 word of similar meaning? Does the word have the same restrictions on its use as an L1 word of similar meaning?

Table 1

29.4 Vocabulary learning techniques – context oriented

Once a teacher has decided upon how many words are to be taught and which those words should be; another issue arises, that of how these should be taught. What is crucial about "knowing an L2 word" involves not just the ability to recognize the word or to match it with its L1 counterpart, if such exists; but also involves being able to use the L2 word communicatively in any of the four main language skills. So, to use Anderson's distinction (1980), it goes beyond merely "knowing that" (declarative knowledge of facts, definitions, or relationships) and includes "knowing how" (procedural knowledge, in this case the communicative use of L2 words). So what techniques should be used in order to achieve the best possible results?
The following techniques, by which vocabulary instruction has been handled, mishandled, or avoided almost entirely by L2 teachers, all have their advantages and disadvantages in L2 learning. They are classified into three groups: decontextualizing, semi-contextualizing, and fully contextualizing (Oxford, & Crookall, 1980). Decontextualizing techniques are those that remove the word as completely as possible from any communicative context that might help the learner remember and that might provide some notion as to how the word is actually used as a part of language. Semi-contextualizing techniques allow some degree of context but fall short of full contextuality; thus, new words may be linked with something that is meaningful to the learner, but they are not used as part of naturalistic communication. Fully contextualizing techniques are those that embed the new words in a more or less normal communicative context. These three types of techniques are not discrete but could instead form a continuum of contextuality.

29.4.1 Decontextualizing Techniques

The three techniques that seem to be the most decontextualizing are word lists with or without their L1 equivalents, flashcards, and conventional dictionary use. However, it is sometimes possible to modify these techniques to inject a bit of context.

29.4.2 Semi-contextualizing Techniques

A number of semi-contextualizing techniques exist for learning L2 vocabulary: word grouping, word or concept association, visual imagery, aural imagery, keyword, total physical response, and semantic mapping.

29.4.3 Fully contextualizing Techniques

Reading and Listening Practice

L2 reading practice can involve a vast variety of material: comic strips, advertisements, letters, articles, stories, newspapers, magazines, books, jigsaw reading exercises (Crookall & Watson, 1985), and so on. Some theorists believe that through reading practice students will absorb and retain vocabulary by osmosis, i.e., merely by reading words in context without any special training in either vocabulary learning or reading. For instance, Krashen (1982) recommends that students do "massive amounts of reading for pleasure," which he suggests will automatically increase their vocabulary (Krashen, 1988). He concedes that it is indeed possible to make small gains in vocabulary knowledge through large amounts of special vocabulary learning effort, but says that this is not worth the time involved and that better results can come through massive reading alone. However, though learners might be able to infer the meaning of a word read in context, this does not guarantee that the word is completely learned or known.

Writing and Speaking Practice

Some L2 teachers may feel that students learn vocabulary most effectively by practicing it through speaking or writing. Sufficient exposure to the new target language word in meaningful, communicative, oral or written contexts is no doubt essential. Simulation/gaming, small group discussions, project work, and other communicative techniques provide naturalistic, motivating practice in speaking and writing (Jones, 1982; Crookall & Oxford, 1990; Crookall & Saunders, 1989). The ability to productively use new vocabulary is extremely important.

Practicing the four language skills of reading, listening, speaking, and writing can provide full context. As teacher we might expect that practice is at the very core of L2 vocabulary learning techniques, and that nothing else might be necessary. There are indeed theories supporting that L2 practice, particularly naturalistic practice, is automatically equivalent to vocabulary learning. This has mostly been referring to the reading area, but the assumption also implies the other three skills.

29.5 Words as Tools – Engagement and motivation

The problem is that practice alone is not sufficient for vocabulary growth and retention. What is certainly also required is the learner's genuine personal interest in challenging tasks and activities that create the need for expansion of vocabulary, along with specific vocabulary learning techniques adapted to the person's needs and learning style. This adaptation should take into account the degree of difficulty of each task which, according to Csíkszentmihályi's "Theory of Flow" (1996, 2008), should balance the learner's skill with the challenge that a task presents. Flow is an optimal psychological state that people experience when engaged in an activity that is appropriately challenging to one's skill level, often resulting in immersion and concentrated focus on a task. This can result in deep learning and high levels of personal and work satisfaction. Flow is one of eight mental states that can happen during the learning process. In addition to flow, these mental states include anxiety, apathy, arousal, boredom, control, relaxation, and worry; they result when a learner experiences a combination of skill and challenge levels of a task in non-optimal combinations.

In their work on learning strategies for idioms, Boers, Demecheleer & Eyckmans (2004) concluded that vocabulary retention may also be enhanced by positive affect, for example when the learner finds the etymological explanations of a certain idiomatic expression that are offered surprising and/or relevant to the learning process. In sum, whether or not a particular idiom is retained well under etymological elaboration may depend on the complex interplay of at least three dimensions:

(1) degree of cognitive effort,
(2) likelihood of dual coding, and
(3) affect (e.g. motivation, engagement)

Dual-coding theory is a theory of cognition hypothesized by Allan Paivio in 1971. In developing this theory, Paivio used the idea that the formation of mental images aids in learning (Reed, 2010). According to Paivio, there are two ways a person could expand on learned material: verbal associations and visual imagery. Ellis and Beaton (1993) support that verbs are more abstract than other categories and that is why they pose more problems than nouns. They state that vocabulary learning is greatly facilitated by the fact that learners create and use images when they learn new words and this is especially evident in the acquisition of nouns, but what is the case with other parts of speech or more complex lexical items?

As teachers we would like to engage learners in activities and genuinely enhance their personal interest. Intuitively, teachers would say that the more learners engage with a new word, the more likely they are to learn it. Certain researchers go as far as to support that the minimum number of contextual reading encounters for a new word/meaning to be learned is around ten (Saragi, Nation, & Meister, 1978). Craik and Lockhart's (1972) Depth/Levels of Processing Hypothesis laid the basic groundwork by stating that the more attention given to an item, and the more manipulation involved with the item, the greater the chances it will be remembered. According to Nation (2014), the two most important conditions supporting learning are spaced repetition and the quality of attention given to items. Similarly, Hulstijn and Laufer (2001) contend that the more the three components of hypothesis, i.e. need, search, and evaluation, are involved in a given task, the better it will result in word retention. Need, as one of the components, is defined as the requirement for a linguistic feature in order to achieve some desired task, such as needing to know a particular word to understand a passage. Search is the attempt to find the required information, for example, looking up the meaning of that word in a dictionary. Evaluation refers to the comparison of the word, or information about a word, with the context of use to determine if it fits or is the best choice. They also reviewed a number of studies and noticed that the tasks with relatively more need, search, and evaluation elements were more effective. However, there is a range of other factors such as increased frequency, attention, exposure, noticing, intention, interaction spent on the lexical items that recur throughout the literature as facilitating vocabulary learning.

Aristotle described all men as having an inborn desire to know. In social learning, Vygotsky cited the child's interests as the best source of engagement, going so far as to say that the child's interests should be our allies. Ausebel et al. (1978) believed that "motivation, although not indispensable for limited and short-term learning, is absolutely necessary for the sustained type of learning involved in mastering a given subject-matter discipline [with its effects] largely mediated through…attention, persistence, and increased frustration tolerance" (p. 397 in Weibell, C. J. 2011)). Words cannot be conceived of as mere signals of something but also as tools that allows us to operate in the world (Borghi, A. M. & Cimatti, F., 2009). Nagy and Townsend (2012) use the metaphor 'words as tools' in their understanding of academic vocabulary instruction where words are means of communicating content. According to McCarthy (1990) "no matter how well the student learns grammar, no matter how successfully the sounds of L2 are mastered, without words to express a wide range of meanings, communication in an L2 just cannot happen in any meaningful way". Through activities that stimulate an interest in words as tools for expressing opinions, knowledge and wonderings, students can be supported in developing a disposition towards examining word parts and how words are used in academic contexts—what they call 'word consciousness' by Scott and Nagy (2004).

"Vocabulary is not an end in itself but a rich vocabulary makes the skills of listening, speaking, reading, and writing easier to perform." Nation, P. (1994).

29.6 References

Allen, E.D. & Vallette, R. M. (1972) Modern Language Classroom Techniques: a Handbook. Harcourt, Brace, Jovanovich Inc., New York

Anderson, J. R. (1980) Cognitive psychology and its implications. San Francisco, Freeman

Anderson, R. C. (1977) Schema-directed processes in language comprehension. In: Lesgold A.M., Pellegrino J.W., Fokkema S.D., Glaser R. (eds) Cognitive Psychology and Instruction. Nato Conference Series, vol 5. Springer, Boston, MA

Anderson, Richard C. & Nagy, W.E. (1991) Word meanings. In Rebecca Barr, Michael L. Kamil, Peter B. Mosenthal & P. David Pearson (eds.), Handbook of Reading Research (vol. 2) 690-724. New York: Longman

Atkinson, R. C., & Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. In K. W. Spence & J. T. Spence (Eds.), The psychology of learning and motivation. Vol 2, NY: Academic Press.

Ausebel, D.P., Novak J., Hanesian H. (1978) Educational Psychology: a cognitive view. New York, Holt, Rinehart and Winston

Baddeley, A.D. (1983). Working Memory. Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences. The Royal Society Publishing

Baker, S.K., Simmons, D.C. & Kameenui, E.J. (1998) Vocabulary Acquisition: Synthesis of the Research. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement, Educational Resources Information Center.

Baker, S.K., Simmons, D.C., & Kameenui, E.J. (1995) Vocabulary acquisition: Curricular and instructional implications for diverse learners. [On-line]. Available:

Bensoussan, M. & Laufer, B. (1984) Lexical guessing in context in EFL reading comprehension. Journal of Research in Reading Vol 7, UKLA

Bloomfield, L. (1984) Language. University of Chicago Press

Blum S. & Levenston E. A. (1978) Universals of lexical simplification. Language Learning, Vol 28 Issue 2 University of Michigan

Boers, F., Demecheleer, M., & Eyckmans, J. (2004) Vocabulary in a second language: selection, acquisition, and testing. John Benjamins B.V.

Bogaards, P., Laufer, B. (2004) Vocabulary in a second language: selection, acquisition, and testing. John Benjamins B.V. Publishing Company, Amsterdan/Philadelphia

Borghi, A. M, & Cimatti, F. (2009). Words as Tools and the Problem of Abstract Word Meanings. Proceedings of the Annual Meeting of the Cognitive Science Society, 31. Retrieved from https://escholarship.org/uc/item/58m9n8rp

Carter, R.A. (1987) Vocabulary: Applied Linguistic Perspectives. Allen and Unwin, London

Cobb, T. & Horst, M. (2004) Is there room for an academic word list in French? John Benjamins Publishing Company, Amsterdan/Philadelphia

Craik, F., & Lockhart, R. (1972) Levels of processing: A framework for memory research. Journal of Verbal Learning and Verbal Behavior, 11, 671 – 684

Crookall, D., & Saunders, D. (1989) Communication and simulation: From two fields to one theme. Clevedon and Philadelphia: Multilingual Matters

Crookall, D., & Oxford, R. (1990) Language learning through simulation/gaming. New York, Newbury House/Harper & Row

Crookall, D., & Watson, R. (1985) Some applied and theoretical perspectives on a jigsaw reading exercise. International Review of Applied Linguistics Vol 69

Csíkszentmihályi, M. (1996). Flow and the psychology of discovery and invention. New Yprk: Harper Collins. Chicago

Csíkszentmihályi, M. (2008). Flow: The psychology of optimal experience. New York, NY: Harper Perennial.

Ellis, N. & Beaton, A. (1993) Psycholinguistic Determinants of Foreign Language Vocabulary Learning. Language Learning, Vol 43, University of Michigan

Gerjets, P., Scheiter, K. & Cierniak, G. (2009) The Scientific Value of Cognitive Load Theory: A Research Agenda Based on the Structuralist View of Theories. Educational Psychology Review Vol 21

Gibson, E. J. & Levin, H. (1975) On the perception of words: an application of some basic concepts. in The Psychology of Reading. MIT Press, Cambridge MA

Halliday, M., McIntosh, A. & Strevens, P. (1964) The Linguistic Science and Language Teaching. Longman, London

http://idea.uoregon.edu/~ncite/documents/techrep/tech14.html.

Hulstijn, J. H. & Laufer, B. (2001). Some empirical evidence for involvement load hypothesis in vocabulary acquisition. Language Learning, 51, 539-558

Joannopoulou, M. (2000) The second language mental lexicon: some evidence from Greek advanced learners of English. PhD - Aristotle University

Jones, K. (1982) Simulations in language teaching. Cambridge: Cambridge University Press

Kellerman, E. (1978) Giving learner a break: native language intuitions as a source of predictions about transferablility. Working Papers in Bilingualism 15 Ontario Institute for Studies in Education

Krashen, S. (1982) Principles and practices in second language acquisition. Oxford, Pergamon

Krashen, S. (1988) Research on second language spelling and vocabulary acquisition. Presentation at the Symposium on Research Perspectives on Adult Language Learning and Acquisition, The Ohio State University, Columbus, OH

Langacker, R.W. (1991) Foundations of Cognitive Grammar. Volume II: Descriptive Application, Stanford University Press

Levenston, E. A. (1979) Second language acquisition: issues and problems. Interlanguage Studies Bulletin 4

Lyons, J. (1968) Introduction to Theoretical Linguistics. Cambridge, Cambridge University Press

Lyons, John. (1995) Linguistic semantics: An introduction. Cambridge, Cambridge University Press

Marton, A.V. (1977) Foreign vocabulary learning as problem No1 of language teaching at the advanced level. Interlanguage Studies Bulleting Vol 2, Sage Publications LTD

McCarthy, M. (1990) Language Teaching: A Scheme for Teacher Education. Oxford: Oxford University Press

Miller, G.A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. Psychological Review, Vol 63, 81-97

Nagy, W., & Townsend, D. (2012). Words as tools: Learning academic vocabulary as language acquisition. Reading Research Quarterly, 47, 91-108. doi:10.1002/RRQ.011

Nation, P. (2005) Teaching Vocabulary. Asian EFL Journal Volume 7

Nation, P. (2014) What do you need to know to learn a foreign language? Available from http://www.victoria.ac.nz/lals/about/staff/paul-nation

Nation, P. (1994). New Ways in Teaching Vocabulary. TESOL

Ouellette, G. (2006) What's meaning got to do with it: The role of vocabulary in word reading and reading comprehension. The Journal of Educational Psychology 98(3), 554-566.

Oxford, R. & Crookall, D., (1980) Vocabulary Learning: A Critical Analysis of Techniques. TESL Canada Journal, Volume 7, Issue 2

Paivio, A. (1971) Imagery and verbal processes. New York. Holt, Rinehart, and Winston

Phillips, T.A. (1981) Difficulties in Foreign Language Vocabulary Learning and a Study of some Factors Thought to be Influential. M.A Project, Birkbeck College, University of London

Reed, S. K. (2010) Cognition: Theories and application. Belmont, CA, Wadsworth Cengage Learning

Ried, J.M., (1987) The Learning Style Preferences of ESL Students. TESOL Quarterly, Vol 21, Issue 1

Saragi, T., Nation, I. S. P., & Meister, F. (1978) Vocabulary learning and reading. System, 6, 72–78

Scott, J.A. & Nagy, W. E. (2004). Developing Word Consciousness. In J. F. Baumann & E. J. Kame'enui (Eds), Vocabulary Instruction: Research to Practice (pp 201-217). New York: The Guilford Press.

Stock, R. D. (1976) Some Factors Affecting the Acquisition of a Foreign Language Lexicon in the Classroom. University of Urbana, IL

Sweller, J. (1988) Cognitive Load During Problem Solving: Effects on Learning. Cognitive Science Vol 12

Weibell, C. J. (2011). Principles of learning: 7 principles to guide personalized, student-centered learning in the technology-enhanced, blended learning environment. Retrieved July 4, 2011 from [https://principlesoflearning.wordpress.com]

30 Digital Literacy Skills for the High-Performance Society and Economy of the 21st Century

Sofia VLACHOU
Ionian University, Corfu, Greece

Petros KOSTAGIOLAS
Ionian University, Corfu, Greece

30.1 Abstract

In today's' societies and economies the need for digital information literacy skills and knowledge is omnipresent. "Information literacy" incorporates the ability of a person to recognize his/hers information needs, seeking motives, information evaluation skills and thereafter effective and efficient utilization of the available information within his/hers work and/or life practices. Indeed, digital information literacy becomes very important for professionals of all economic sectors as well as for people occupied with their life roles. This paper provides some theoretical evidence based on a review of the literature, for an initial theoretical exploration of how information literacy skills support professional and social roles. Some important theories of social and employee information seeking behavior are presented.

Keywords: digital information literacy, skills, work roles, everyday life, information seeking, information literacy.

30.2 Introduction

People interact with digital information both at their workplace and in their everyday activities. Indeed, the digital information environment heavily impacts our lives in many different ways. Broadly speaking the concept of information literacy places information in workplace (professional roles) and everyday life contexts (citizenship, health, leisure etc.). A vital aim of information literacy is to support lifelong learning and personal development [see 1].
The purpose of this paper is to theoretically investigate the relationship between information, information seeking behavior and information literacy within professional and social spaces.

30.3 Information needs and information literacy dimensions

A "need" is usually defined as an "inner motivational state" that drives an individual to act and seek information [see 2]. According to Coles' view, which Case stated as follow "an information need is a requirement that drives people into information seeking" while personal actions are related to internal needs [see 3 in Case 4]. According to UNESCO definition [see 5], a "well-informed" person, is the person who has the ability to determine the breadth of its information needs. Moreover, is the person who knows how to seek information, to judge and evaluate the available information resources, to integrate information into his or her existing field of knowledge, and finally use it effectively to achieve a goal [see 6].

Figure 1: *Seven Pillars of Information Literacy [see F1]*

Information needs recognition initiate the information seeking behavior and constitute an integral part of information literacy. Indeed, the Standing Conference of National and University Libraries (SCONUL) have developed a framework of seven dimensions, named “seven pillars” of information literacy [see P7] starting from information needs recognition as an essential skill, and thereafter moving to more complicated information literacy skills such as information synthesis and information creation. In each “pillar” a person could develop from “novice” and “beginner” to “expert” as they progress through his/ her learning life [see 7]. To our view, the above mentioned model provides an excellent structure for understanding information literacy. However, digital information literacy (DIL) according to Bawden is defined as “a set of attitudes, understanding and skills to handle and communicate information and knowledge effectively, in a variety of media and formats” [see 8]. The basic competencies of digital literacy include internet searching (information retrieval), hypertext navigation (browsing), knowledge assembly and content evaluation [see 8].

30.4 Social and professional roles within information seeking theoretical frameworks

The recent literature gravitates towards studying the contribution of digital information literacy in our life activities and roles e.g. citizens, parents, students, consumers and hobbyists etc. [see 4]. However, each social and/or professional role may require distinct and/or overlapping digital information literacy skills. Moreover, individual characteristics (e.g. personality traits, internal motivation factors, attitudes towards the roles) also affect the development of the proper set of individuals’ digital information literacy skills for social and/or work activities [see 9], [see 10]. Therefore, digital information literacy skills should relate to their specific information seeking behaviour patterns and preferences. To our view, “information seeking behaviour” is the other side of the coin in relation to “information literacy” within the information seeking phenomenon. Hence, two prominent theoretical frameworks are presented bellow for information seeking behaviour, and thereafter are used for exploring digital information literacy.

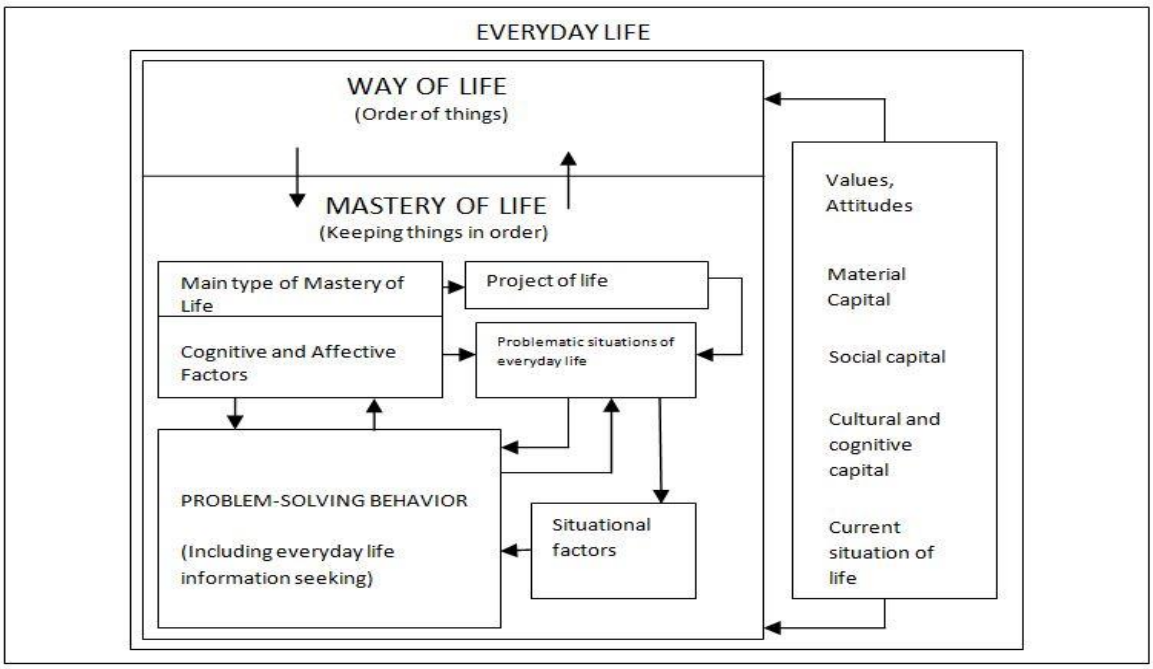


Figure 2: *Everyday Life Information Seeking (ELIS) Model [see F2].*

The first model is referred to as “Everyday Life Information Seeking” (ELIS model, Figure 2) proposed by Reijo Savolainen [see 10]. This model is motivated by the study of information seeking behavior within social and everyday life-line roles and is based on the “way of life ”concept which aims in keeping the “order of things” or, as characteristically it is stated, aims in “mastery of life” –which is the ability of incorporating information seeking, evaluation and utilization when addressing daily problems. The model has been applied when studying hobbies e.g. photography, blogging, travelling, shopping [see 9]. The ELIS model place emphasis on peoples’ cognitive and affective aspects of their way of life [see 10]. Also suggests that emotions, values and context and other circumstances of life affect their “way of life” and their ability to “master life” [see 10].

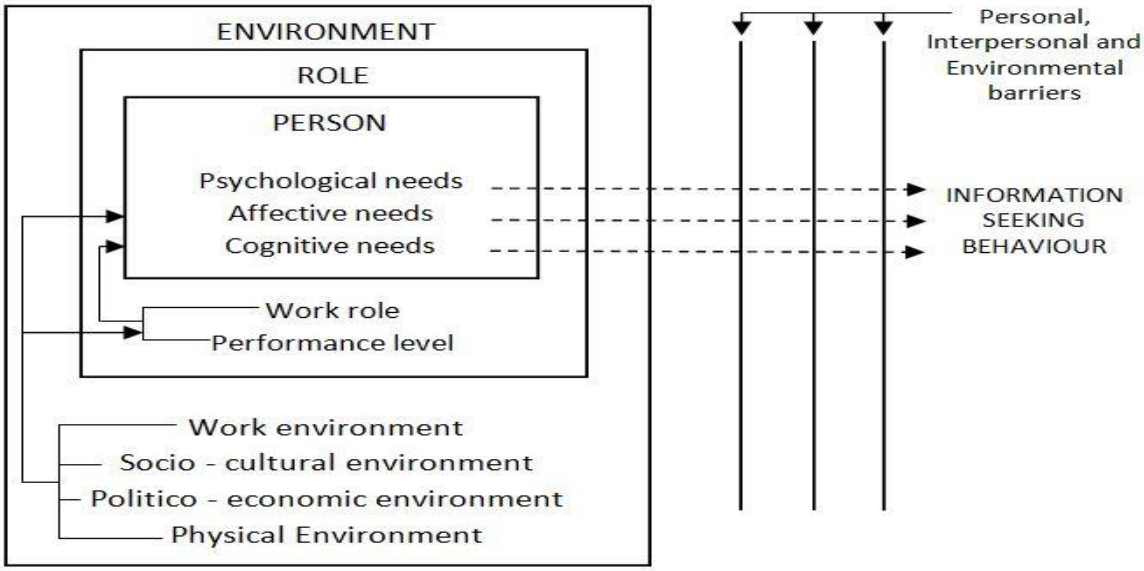


Figure 3: *Wilson’s 1981 model of information-seeking behaviour (revised) [see F3].*

The second theoretical model which is named after its founder (Wilson's theoretical model, Figure 3), address information seeking behavior within professional/work roles e.g. scientists, journalists, artists, lawyers, doctors etc. [see 11]. Professionals should integrate digital literacy skills into their everyday practices and thereafter link the retrieved information into their existing professional knowledge [see 11]. Wilson's model point out that individual work roles relate to human needs (e.g. physiological –food, shelter, clothing–, emotional –success, reward– and cognitive needs) which generate information needs which in turn are addressed to specific information resources for their satisfaction [see 13]. Decision making within the often hazardous work-environment frequently requires usage of specific information resources e.g. specific scholarly journals, archive material, digital libraries etc. Therefore, the appropriate information literacy skills are required for effective and efficient use of complex online information resources [see 12]. In that sense, Wilson's model aims at "uncertainty reduction" when making work-related decisions through the professional's "information needs satisfaction" concept.

30.5 Discussion

Proper information enhances social and professional roles' performance. Trusted, reliable and high quality information has a positive impact on society and economy as a whole. The available literature clearly suggests that the appropriate information plays a critical role in economic, social, and political life at a national and international level [see 14]. On the other hand, although this is clearly suggested in the literature, the underlying behavioral patterns (e.g. peoples' information seeking behaviors) and/or the necessary information literacy skills are rather understudied. The considerations related to "information economy" and "information society" needs to include the abovementioned facets. Indeed, although information is regarded as an important economic resource or asset for most (if not all) economic sectors, the information seeking behaviors of the corresponding professionals or the required information literacy skills have not been yet been studied in detail. Moreover, the public space is bursting with digital information. Digital information usage is intense for both the public and for the professionals. For example, citizens seek information in order to exercise their civil rights and duties, and the general population sought for information in order to make better choices as consumers of products and/or for leisure, to socialize and in general to "master" their lives [see 15].

We have briefly identified that society and economy are linked with the digital literacy skills of individuals, which boost their productivity and encourage social interaction [see 15]. On the other hand, the lack of digital literacy skills may often lead to unreliable information utilization or increased anxiety. Thus, new research, theories, educational programs (professional or non-professional) and activities are required in order to stress the integral role of information in all disciplines and/or roles. In consistent with that, it's also important to measure the impact of information literacy in different roles, to distinguish how they may affect the economy and society as a whole. Finally, situational and cultural factors need also to be studied for the new digital information environment.

30.6 Conclusions & further research

This study has underlined some core theories which determine the successful information seeking and the role of information literacy in society (life roles) and economy (work roles). Moreover, in a non-static sense, information seeking and information skills impacts on politics, economic climate, education and online communication realization (e.g. social media). Future work could explore some aspects of the above mentioned phenomena and exhibit the objectives and activities related to the full understanding of the importance of information as structural components of our lives.

30.7 References

[1] Information Literacy Competency Standards for Higher Education, American Library Association, 2000

[2] James Grunig, Publics, audience and market segments: Segmentation principles for campaigns. In C. Salmon (Ed.), Information campaigns: Balancing social values and social change, Sage, 1989

[3] Charles Cole, Information need: A theory connecting information search to knowledge formation, NJ: Information Today Inc, 2012

[4] Case O' Donald, Lisa M. Given, Looking for Information: A survey of research on information seeking, needs and behavior, Emerald Group Publishing Limited, 2016

[5] Woody F. Horton, Understanding Information Literacy: A primer, UNESCO, 2008

[6] Sheila Webber, Bill Johnston, "Conceptions of Information Literacy: New Perspectives and Implications", Journal of Information Science, Vol. 26, No.6, 2000.

[7] The SCONUL Seven Pillars of Information Literacy, Core Model For Higher Education, SCONUL Working Group on Information Literacy, April 2011.

[8] David Bawden, "Origins and concepts of digital literacy", Digital Literacies: Concepts, Policies and Practices, 2008

[9] Stephen Abram, "Workplace Information Literacy: It's Different" In Developing People's Information Capabilities: Fostering Information Literacy in Educational", Workplace and Community Contexts, Vol. 8, 2013

[10] Rejo Savolainen, "Everyday Life Information Seeking: Approaching Information Seeking in the Context of 'Way of Life", LISR, Vol. 17, 1995

[11] Tom D. Wilson, "Journal of Documentation", Models in Information Behavior Research, Vol. 55, No. 3, 1999

[12] Hemmig S. William, "The information-seeking behavior of visual artists: a literature review", Journal of Documentation, Vol. 64 No. 3, 2008

[13] Brenda Dervin, "On studying information seeking methodologically: The implications of connecting metatheory to method", Information Processing and Management, Vol. 35, No. 6, 1999

[14] Rafal Zelazny, "Information Society and knowledge economy- essence and key relationships", Journal of Economics and Management, Vol. 20, No. 2, 2015

[15] Nick Moore, "The Information Society", World Information, Report 1997/98, UNESCO, 1997

[F1] Sheila Webber, Bill Johnston, "Conceptions of Information Literacy: New Perspectives and Implications", Journal of Information Science, Vol. 26, No.6, 2000.

[F2] Rejo Savolainen, "Everyday Life Information Seeking: Approaching Information Seeking in the Context of 'Way of Life", LISR, Vol. 17, 1995

[F3] Tom D. Wilson, "Journal of Documentation", Models in Information Behavior Research, Vol. 55, No. 3, 1999

31 Philosophy, Authority of Knowledge and Ingenuity in Education

Susie MICHAILIDIS
Webster University Athens, Greece

31.1 Abstract

Like any other part of humankind's intellectual achievements, knowledge and ingenuity in Education need to be written and rewritten in terms of what is of importance to present-day literati. Philosophy of Education itself develops in specific contemporary historical and cultural contexts. It presumes to deal with problems that have had various expressions since even ancient times. The history of intelligence does not describe a simple linear progression from Plato and Aristotle to our present intellectual situation. The displays of philosophical issues that arise in different disciplines are mainly insightful about matters of ethics, aesthetics, ontology or logic. Developments in areas such as medieval epistemology, or phenomenology and hermeneutics provide some of the problems that have had to be thought through, as well as using historical materials as guides and aids. These proposed explanations provide new lenses or studying and interpreting the past, and this revised version of the past then provides some new ways of looking at the importance of knowledge in education at the present. Therefore, understanding ingenious education should involve both formal settings (schools/universities) and informal settings (families, communities, libraries, workplaces, civic organizations, unions, sports teams, campaigns and elections, mass media, and so on). It seems reasonable to suggest that, following the Athenians of the Classical Age; an effective education will coordinate if not integrate these formal and informal settings. That is, formal creative education is a term reserved for the organized system of schooling that aims, as one of its primary purposes, to prepare future well-educated citizens for participation in public life.

Keywords: Philosophy, Knowledge, Education, Ingenuity, Intellectuality

In the 20-21th centuries, the university faced a principally new type of cultural development and transformation to get adapted to new conditions. Change of Cultural epochs lead to a change in criteria and principles conditioning the university education system. Largely it affected "externally invisible and inaudible" factor, "the fluid of spiritual life" of the university, "human immaterial sub-basis" of its existence (Jaspers, 2006) - its humanitarian meaning. This can nowadays indicate that existence of the traditional university is challenged. The goal of providing courses that meet employers' changing demands dominates discussions about higher education these days and informs many university system initiatives. Values of Education develop in specific historical and cultural contexts. It presumes to deal with problems that have had various expressions since even ancient times. The history of intelligence, knowledge, ingenuity does not describe a simple linear progression from Plato and Aristotle to our present intellectual situation and studying and interpreting the past provide some new ways of looking at the importance of knowledge in education at the present. According to the ancient understanding, there are five virtues of knowledge: technê, episteme, phronêsis, sophia, and nous. Various translations have been offered for each of these terms. Most often, technê is translated as craft or art. While epistêmê is generally rendered as knowledge, in this context, where it is used in its precise sense, it is sometimes translated as scientific knowledge. The full account of epistêmê in the strict sense is found in Posterior Analytics, where Aristotle says that we think we know something without qualification (epistasthai…haplôs) when we think we know (gignôskein) the cause by which the thing is, that it is the cause of the thing, and that this cannot be otherwise. As though to emphasize the necessity of what is known, he most

frequently uses geometry as an example of epistêmê. In this regard, it should be pointed out that Aristotle uses the notion of cause (aitia) in a broader sense than it usually has in contemporary thought. However, one must not confuse this usage with our contemporary understanding of knowledge and science, which include experimentation and some of our contemporary assumptions about the relation between theories (the domain of 'knowledge') and practice (the concern of 'craft' or 'art'). Conducting experiments to confirm hypotheses is a much later development. Rather, translating epistêmê as scientific knowledge is a way of emphasizing its certainty. In any event, as soon as Aristotle introduces these five terms, he turns to the distinction between the first two virtues. First, he defines epistêmê, as he says, in its accurate sense and leaves aside its analogous uses. Outside of modern science, there is sometimes skepticism about the application of theory to practice because it is thought that theory is conducted at so great a remove from reality, the province of practice, that it can lose touch with it. In fact, at the level of practice, actual experience might be all we need. In addition, within science, theory strives for a value-free view of reality. As a result, scientific theory cannot tell us how things should be — the realm of 'art' or 'craft'. Therefore, we must turn somewhere else for answers to the insightful, but still practical, questions about how we should live our lives. However, some of the features of this contemporary distinction between theory and practice are not found in the relation between epistêmê and technê. Therefore, understanding inventive education should involve both formal settings (schools/universities) and informal surroundings (families, communities, libraries, workplaces, civic organizations, unions, sports teams, campaigns and elections, mass media, and so on). It seems reasonable to suggest that following the Athenians of the Classical Age, an effective education will coordinate if not integrate these formal and informal settings. That is, formal creative education is a term reserved for the organized system of schooling that aims, as one of its primary purposes, to prepare future well-educated citizens for participation in public life. The study of knowledge importance in education has closely paralleled the study of wisdom. Aristotle distinguished between two different kinds of wisdom, theoretical wisdom and practical wisdom. Theoretical wisdom is, according to Aristotle, "scientific knowledge, combined with intuitive reason, of the things that are highest by nature" (Nicomachean Ethics, VI, 1141b). For Aristotle, theoretical wisdom involves knowledge of necessary, scientific, first principles and propositions that can be logically deduced from them. Aristotle's idea that scientific knowledge is knowledge of necessary truths and their logical consequences is no longer a widely accepted view. Thus, for the purposes of this discussion, I will consider a theory that reflects the spirit of Aristotle's view on theoretical wisdom, but without the controversy about the necessary or contingent nature of scientific knowledge. Moreover, it will combine scientific knowledge with other kinds of factual knowledge, including knowledge about history, philosophy, music, intelligence. There are many views in the historical and contemporary philosophical literature on wisdom that have knowledge, as opposed to humility or accuracy, as at least a necessary condition of wisdom Aristotle Nichomachean Ethics VI, ch. 7), Descartes (Principles of Philosophy), Richard Garrett (1996), John Kekes (1983), Keith Lehrer & Nicholas Smith (1996), Robert Nozick (1989), Plato (The Republic),Valerie Tiberius (2008), Dennis Whitcomb (2010) and Linda Zagzebski (1996) for example, have all defended theories of wisdom that require a wise person to have knowledge of some sort. All of these views very clearly distinguish knowledge from expertise on a particular subject. Moreover, all of these views maintain that wise people know "what is important." The views differ, for the most part, over what it is important for a wise person to know, and on whether there is any behavior, action, or way of living, that is required for wisdom. An alternative approach to wisdom focuses on the more positive idea that wise people are very knowledgeable people. Many scholars who were concerned with matters of knowledge and intelligence also focused on manifestations of talent and creativity such as Kant, William James, to name just a few.Issues of talent and creativity in education has attracted the attention of thinkers for thousands of years, especially as there are complex issues in great quantities that have great philosophical interest. Even a brief review reveals that they touch on some but by no means all of the issues that have generated dynamic debate down the ages. Restated more explicitly in terms familiar to philosophers of education, the issues, and the discussion flitted over are:

- Education as transmission of knowledge versus education as the development of inquiry and reasoning skills that are conducive to the development of autonomy (which, roughly, is the tension between education as conservative and education as progressive, and also is closely related to differing views about human “perfectibility”—issues that historically have been raised in the debate over the aims of education).
- The question of what this knowledge, and what these skills, ought to be;
- The questions of how creative learning is possible, and what it is to have learned something;
- The distinction between creative educating versus teaching versus training versus indoctrination.

The interrelationship between intelligence, knowledge, ingenuity and creative teaching continues today. Intelligence theory influences the way we identify and assess students, our attitudes toward giftedness and gifted students, the models upon which we base our programs and interventions, and many other aspects of creative knowledgeable education. Yet with the surge in new creativity and intelligence theories, many of these theories and their potential applications remain under examined.

However, how to organize the multitude of intelligence theories? Both Sternberg (1990) and Gardner, Kornhaber, and Wake (1996) propose classification schemes in their texts on intelligence, knowledge and creativity in education. Sternberg suggests that we view intelligence theories in terms of the metaphors on which they are based: geographic, computational, biological, epistemological, anthropological, sociological, and systematic.

Graduate and undergraduate education programs with an intelligence and ingenuity focus have been significant enrollment (and profitability) growth areas for universities. The rapid program development to meet both end-user requirements and student interest has been fueled by a variety of creative solutions. This phenomenon exists in spite of the fact that there remains no consensus on whether there is or should be an academic intelligence in teaching. The need for creative and intelligence educational programs is both real and time-critical. The purpose and the work at the universities are to close the gap between current (and projected) intelligence requirements and the supply of creative and quality education and research. The experience has shown that there are three critical components that must be factored into the development of any creative and intelligence education program in order to successfully close this gap. These three components follow:

1. Pedagogical foundations: Intelligence education is a new academic field, even as it is a combination from mature disciplines in policy, science, technology, as well as operational use. The sustained national/international interest in security and intelligence provides the impetus to take advantage of this creativity by starting with a clean slate to develop a solid pedagogical foundation based on the new knowledge from learning research. Such a foundation should include

- Programs built on both individual student and programmatic learning outcomes
- Coherent assessment methods using both direct and indirect means that determine if the program and the students are achieving the outcomes
- Programs that accommodate different learning styles, allowing the program to adapt around the student rather than around the professor
- Active learning and team-building components that engage students and teach team-skills
- Use of technology to not only maximize efficiencies, but to provide value added learning strategies

2. Multi-discipline approaches for a diverse set of students: The creative and intelligence education field requires a multi-discipline approach to meet customer demand from a variety of operational, policy and research requirements. Effective creative education must be prepared to deliver programs to assist policymakers with technical appreciation and understanding;

- Provide future professionals or business leaders with a solid foundation of key intelligence issues, including policy implications, emerging solutions, and opportunities for their engagement
- Offer brainpower and security technologists a more holistic view of the intelligence operating space and its supported and supporting fields

3. Research and Innovation: Effective research becomes creative in education.

Moreover Science education continues to be a field in the making and as such is characterized by the coexistence of a number of different approaches to (or, perhaps, styles of) teaching and learning. These questions form the background against which the present paper presents the field starting with reflection on science/technology from Greek Antiquity to the rise of contemporary philosophy of science education in the mid-19th to mid-20th century. This is followed by a discussion of the present state of affairs in the field of ingenuity education.

For centuries, the study of logic has inspired the idea that its methods might be connected in efforts to understand and improve thinking, reasoning, and argument as they occur in real life contexts: in public discussion and debate; in education and intellectual exchange; in interpersonal relations; and in law, medicine and other professions. Informal logic is the attempt to build a logic suited to this purpose. It combines the study of argument, evidence, proof and justification with an instrumental outlook which emphasizes its usefulness in the analysis of real life arguing.

The pedagogical and practical interests that characterize informal logic are already evident in ancient times. The First Sophistic is a movement motivated by the notion that one can teach the art of logos in a way that can be useful in public discussion and debate. Aristotle's rhetorical and logical works are especially notable for their systematic attempts to understand and teach the principles of real life arguing. Within informal logic and argumentation theory, his views and general outlook remain relevant today.

Competency-based education turns the traditional model on its head. Instead of awarding credits based on how much time students spend learning, this model awards credits based on whether students can prove they have mastered competencies—the skills, abilities, and knowledge required in an area of study.Competency-based education combines an intentional and transparent approach to curricular design with an academic model in which the time it takes to demonstrate competencies varies and the expectations about learning are held constant. Students acquire and demonstrate their knowledge and skills by engaging in learning exercises and activities. It is also important for a student to endeavor to be a professional in a special field. Being professional isn't something easily defined but teaching students professional behavior is part of the instructional agenda. Sociological use of word professional is more rigorous. Profession is an occupation requiring extensive, systematic knowledge of or training in arts and sciences.Professions are distinguished from other occupations by several characteristics: Professionals form associations that regulate their profession's internal affairs and represent their interests to outside bodies.

- Responsibility

Professionals deal in matters of vital importance to their clients and are therefore entrusted with grave responsibilities and obligations. Given these inherent obligations, professional work typically involves circumstances where carelessness, inadequate skill, or breach of ethics would be significantly damaging to the client and/or his fortunes.

- Accountability

Professionals hold themselves ultimately accountable for the quality of their work with the client. The profession may or may not have mechanisms in place to reinforce and ensure adherence to this principle among its members. If not, the individual professional will (e.g. guarantees and/or contractual provisions).

- Specialized, theoretical knowledge

The skill of professionals is based on systematic, theoretical knowledge, not merely on training in particular techniques Professionals render specialized services based on theory,

knowledge, and skills that are most often peculiar to their profession and generally beyond the understanding and/or capability of those outside of the profession. Sometimes, this specialization will extend to access to the tools and technologies used in the profession (e.g. medical equipment).

- Institutional preparation

Professions typically require a significant period of hands-on, practical experience in the protected company of senior members before aspirants are recognized as professionals. After this provisional period, ongoing education toward professional development is compulsory.

- Autonomy

Professionals have considerable autonomy over their work. Professionals have control over and, correspondingly, ultimate responsibility for their own work. Professionals tend to define the terms, processes, and conditions of work to be performed for clients (either directly or as preconditions for their ongoing agency employment).

- Ethical constraints

Due to the other characteristics on this list, there is a clear requirement for ethical constraints in the professions. Professionals are bound to a code of conduct and ethics specific to the distinct profession (and sometimes the individual). Professionals also aspire toward a general body of core values, which are centered upon an uncompromising and un-conflicted regard for the client's benefit and best interests.

- Merit-based

In a profession, members achieve employment and success based on merit and corresponding voluntary relationships rather than on corrupted ideals such as social principle, mandated support, or extortion (e.g. union members are not professionals). Therefore, a professional is one who must attract clients and profits due to the merits of his work. In the absence of this characteristic, issues of responsibility, accountability, and ethical constraints become irrelevant, negating any otherwise-professional characteristics.

- Professional Associations

Professionals form associations that regulate their profession’s internal affairs and represent their interests to outside bodies

Based on the discussion a classification can be constructed of three principal ways of regarding Knowledge, Professionalism, Ingenuity Education and Creativity:

- As the systematic clarification of the nature of Logic and as an element and product of human culture
- As the systematic reflection on the consequences of technology for human life
- As the systematic investigation of the practices of engineering, invention, designing and making of things. A guiding idea in this approach to Education is that the design process constitutes the core of Creativity, such that studying the design process is crucial to any project that attempts to understand Competency and Education.

Creativity is in fact possible in any activity that engages our intelligence.

31.2 References

1. *Aristotle Nichomachean Ethics*
2. *Aristotle Posterior Analytics*
3. *Descartes Principles of Philosophy*
4. *Gardner, H. Frames of Mind: The Theory of Multiple Intelligences, Basic Books, NY, 1983*
5. *Jaspers, K. The Idea of the University. Minsk: Belarusian State University, 2006*
6. *Kekes J. The Illusions of Egalitarianism. Cornell University Press, 2007*
7. *Keith Lehrer & Nicholas Smith (Knowledge, Teaching and Wisdom Springer Netherlands,1996*
8. *The Oxford Handbook of Philosophy of Education*
9. *Plato The Republic*
10. *Scheffler, I. Reason and Teaching. Hackett Publishing, 1989*
11. *Sternberg, R S. Kaufman The Handbook of Intelligence Cambridge, 2011*
12. *Zagzebski L. Virtues of the Mind: An Inquiry into the Nature of Virtue and the Ethical Foundations of Knowledge. Cambridge University Press 1996*

32 Generalized uncertain Theory: Concepts and fundamental Principles

Xingguang CHEN
Jianghan University, Wuhan, P.R.China

32.1 Abstract

Although there are many mathematical theories to address uncertain phenomena however, these theories are presented under implicit presupposition that uncertainty of objects is accurately measurable while not considering that the measure of uncertainty itself may be inaccurate. Considering this evident but critical overlook, on the basis of reviewing and commenting several widely used mathematical theories of uncertainty, the fundamental concepts and axiomatic system of generalized uncertain theory (GUT) are proposed for the purpose of describing and analyzing that imprecision of objects has inaccurate attributes. We show that current main stream theories of studying uncertain phenomena, such as probability theory, fuzzy mathematics, etc., are the special cases of generalized uncertain theory. So the generalized uncertain theory could cover previous main stream theories of studying uncertainty. Further research directions and possible application realms are discussed. It may be a beneficial endeavor for enriching and developing current uncertainty mathematical theories.

Keywords: uncertainty mathematics, generalized uncertain theory, probability theory, fuzzy mathematics

32.2 Introduction

The real world is full of uncertainty. There are many events that people can't predict accurately from nature to human society, which has brought great difficulties and challenges to human beings. For example, long-time wether forecasting is very difficult,unexpected geological disasters could make huge casualties, spread of infectious diseases or financial crisis are often unpredictable.Sudden public safety accident, especial the effective prevention of terrorist attacks is becoming a worldwide problem. If we can predict these disasters only before a minor time, the loss of the accident maybe greatly be reduced, while it is very difficult to get the accurate and sufficient information until the accident happen. All these rise a critical question that how to understand the uncertainty properly?

The essential reason of uncertain emerging is because there are many factors affecting the development and change of things around the world, and it is hardly impossible for people to grasp all factors. Moreover, there are also a large number of complex interconnections between components consisting of system, as well as exiting mutual restriction between them. It is difficult for people to fully understand the interaction between these components.

In a sense, certainty is relative while uncertainty is absolute. Uncertainty is an essential attribute of the objective material world. Because of the universal existence of uncertainty in human society and nature, many theoretical tools have been developed to explore it, and the ability of understanding and controlling uncertainties is constantly enhanced from breadth and depth.

Mathematics could be classified as two categories from the uncertainty perspectives, the first is deterministic mathematics and the other is indeterministic mathematics. The first class include classical pure mathematics (analysis, algebra, geometry, number theory, etc.) as well as applied mathematics (optimization, discrete mathematics, combinatorial mathematics, mathematical physics, biological mathematics, etc.). The second type is mainly used to describe, analyze and deal with various uncertainties. There are some representatives such as fuzzy mathematics (Zadeh, 1965), unascertained mathematics (Wang, 1990), uncertain

mathematics (Liu, 2007), and the subjective probability theory (the basis of Bayes Statistics,representative scholar is British mathematician Bayes), the objective probability theory (this type probability is based on the frequency, which is originated by the middle of the seventeenth century by French mathematician Pascal, Fermat, Holland mathematician Huygens, Swiss mathematician Bernoulli and so on), grey system theory (Deng, 1982), rough set theory (Pawlak, 1982). Furthermore, all these mentioned uncertain mathematics branches could be classified as two categories with regard to the uncertainty coming from subjective and objective nature of cognition. The first type involves fuzzy mathematics, unascertained mathematics, uncertain mathematics and subjective probability theory, and the second type involves objective probability theory, grey system theory and rough set theory.

All these mentioned theory has a common point that the uncertainty is described by employing a one real number. But in many cases, the uncertainty itself is also uncertain and inaccurate. Using one real numerical scalar to describe the uncertainty maybe far away from the essential characteristics of many situations. To admit that the size of the uncertainty could be accurately known is an ideal approximation of many cases. Indeed,The description, analysis, processing and expression of uncertainty should be considered as two levels, one is the size of the uncertainty can be accurately given, that is, there exists uncertainty for studying objects, while the amount of the uncertainty is deterministic. For example, although it is impossible to predict which surface will appear in advance in random dicing experiments. In ideal case, the probability of each face is 1/6, which is deterministic. The second level is the amount of the uncertainty is also indeterministic. For example, in everyday life, we often say that a thing happens less than 50%, that means the possibility of something happening is between 0~50%; the possibility that something happens is at least 80%, which indicates that the possibility of something happening is between 80%~100%, and so on. From this point of view that the degree of uncertainty is uncertain, the concept of generalized uncertainty measure is developed, which the uncertainty itself and degree of uncertainty of the studying objects can be described at the same time. On this basis, a generalized uncertain axiom system is proposed, and several basic results are taken out. An example of uncertain decision-making is carried out to demonstrated the effectiveness and rationality of GUT.

32.3 Fundamental Concepts

Definition 1 (Generalized uncertain measure,GUM). Let Ω be a nonempty set, and let Γ be a σ- algebra over Ω . For every element $e_i \in \Gamma$, if G satisfy three conditions as below:

(1) (Generalized non-negativity) $G(e_i) = [a_i, b_i] \subseteq [0,1]$;

(2) (Generalized normalization) $G(\Omega) = 1$;

(3) (Generalized countable additivity) For arbitrary sequences $e_1, \cdots, e_n$, we have

$G(e_1 \bigcup e_2 \bigcup \cdots \bigcup e_n) \le \sum_{i=1}^{n} G(e_i) := [\sum a_i, \sum b_i] \subseteq [0,1], i \in \{1,2,\cdots,n\}$. Specially, if $\{e_i\}$ is incompatible, i.e., $e_i \cap e_j = \varnothing$, then we have

$G(e_1 \bigcup e_2 \bigcup \cdots \bigcup e_n) = \sum_{i=1}^{n} G(e_i) := [\sum a_i, \sum b_i] \subseteq [0,1]$. here the number of set element n could be finite or infinite. Then G is said to be generalized uncertain measure and triples $\{\Omega, \Gamma, G\}$ are its corresponding generalized uncertain space, here $a_i, b_i \in [0,1]$.

For event e , it's generalized uncertain measure is denoted as $G(e) = [a, b]$, if $a \le b$,then the left point a indicates the minimum value of event being true, and the right point b indicates the maximum value of event being true. From the definition of generalized uncertain measure, if and only if $a = b$, the probability of even is deterministic. When Ω is random sampling set, generalized uncertain measure is equivalent to probability measure. When Ω is fuzzy set,

then generalized uncertain measure degenerates to degree of membership of fuzzy theory. When Ω is uncertain set, then generalized uncertain measure will be uncertain measure derived by uncertain theory.

Definition 2 (Inverse interval). [a,b] is ordinary interval on real number space, i.e., $a, b \in$ □ ,then [b,a] is the inverse interval of [a,b].

Definition 3 (GUM of complementary set). Assume the generalized uncertain measure of set A is $G(A) = [a, b]$,then the generalized uncertain measure of complementary set of A is $A^c = [1-a, 1-b]$.

Definition 4 (Arithmetic operation of GUM). Let generalized uncertain measure of two set e_1, e_2 be $G(e_1) = [a_1, b_1] \subseteq [0,1], G(e_2) = [a_2, b_2] \subseteq [0,1]$ respectively. Then

(1) $G(e_1) + G(e_2) = [a_1 + a_2, b_1 + b_2]$;

(2) $G(e_1) - G(e_2) = [a_1 - a_2, b_1 - b_2]$;

(3) $G(e_1) \times G(e_2) = [a_1 \cdot a_2, b_1 \cdot b_2]$;

(4) $G(e_1) \div G(e_2) = [a_1 / a_2, b_1 / b_2]$, where $b_1 \neq 0$ and $b_2 \neq 0$.

Definition 5 (Generalized uncertain independent set). We said set A and B is independent, if $G(AB) = G(A)G(B)$.

Definition 6 (The comparison of GUM).
Assume two interval $I_1 = [a_1, b_1]$ and $I_2 = [a_2, b_2]$, where $a_1 \leq b_1$ and $a_2 \leq b_2$. Then there exist three relations between I_1 and I_2. i.e., (1) separation relationship (R1): if $b_1 < a_2$, denoted as I_1 □ I_2; (2) interlaced relationship (R2): if $a_1 \leq a_2 \leq b_1 \leq b_2$, denoted as I_1 © I_2; (3) inclusion relationship (R3): if $a_1 > a_2$ and $b_1 < b_2$, denoted as $I_1 \subseteq I_2$.
Let generalized uncertain measure of two set e_1, e_2 be $G(e_1) = [a_1, b_1] := I_1 \subseteq [0,1]$, $G(e_2) = [a_2, b_2] := I_2 \subseteq [0,1]$ respectively. (i) If and only if I_1 and I_2 satisfies relation R1, it is said that generalized uncertain measure of set e_1 is strongly smaller than e_2, denoted as $G(e_1) < G(e_2)$; (ii) If and only if I_1 and I_2 satisfies relation R2,it is said that generalized uncertain measure of set e_1 is weakly smaller than e_2, denoted as $G(e_1) \leq G(e_2)$; and (iii) if and only if I_1 and I_2 satisfies relation R3, it is said that generalized uncertain measure of set e_1 is partly smaller than e_2, denoted as $G(e_1) \preceq G(e_2)$ .On the contrary, it is said that strongly greater, weakly greater, and partly greater, which are denoted as >, $\geq$ and $\pm$ respectively.

Definition 7 (The uncertainty degree of GUM). It is said that the length of interval of GUM to be taken as the uncertainty degree of GUM of set e, which is denoted as $\mathrm{gud}(e) = [b-a]$, where $G(e) = [a, b]$ is GUM of set e.

Definition 8 (Low order uncertain system and high order uncertain system). For two uncertain system S_1 and S_2, if GUM of S_2 is greater than GUM of S_1, i.e., $G(S_2) > G(S_1)$,then we said S_2 is a higher order uncertain system than S_1.

Definition 9 (Generalized uncertain function and variable). Let triples (Ω, Γ, G) be generalized uncertain space, if for arbitrary element $\xi \in \Gamma$, there exists a function family $\mathbf{f}(\xi) = \{ f(\xi) : f_1(\xi) \le f(\xi) \le f_2(\xi) \}$,where $f(\xi)$ is ordinary function which is defined on Γ, and value domain is [0,1], i.e., $f(\cdot) : \Gamma \mapsto [0,1]$, then function family $\mathbf{f}(\xi)$ is defined as generalized uncertain function (GUF)and $f(\cdot)$ is core function of generalized uncertain function. $f_1(\cdot)$ and $f_2(\cdot)$ are taken account as lower core function and upper core function of $\mathbf{f}(\cdot)$ respectively, ξ is said to be generalized uncertain variable.

Definition 10 (δ neighbour between generalized uncertain variables). For non-negative real number $\delta \ge 0$, there are two generalized uncertain variables ξ_1 and ξ_2. Assume their GUMs are $G(\xi_1) = [a_1, b_1]$ and $G(\xi_2) = [a_2, b_2]$ respectively. We assert generalized uncertain variable ξ_1 and ξ_2 are δ neighbour each other, if ξ_1 and ξ_2 satisfy: $| a_1 - a_2 | \le \delta$ and $| b_1 - b_2 | \le \delta$.

Definition 11 (Generalized uncertain distribution function). The generalized uncertain distribution function are defined as $G_d(x) = G(\xi \le x)$, where $G(\cdot)$ is generalized uncertain function.

Definition 12 (Generalized uncertain density function, GUDF). We call function family $\mathbf{f}_\xi(s)$ is generalized uncertain density function, if function family $\mathbf{f}_\xi(s)$ satisfy that

$$G_d(x) = G(\xi \le x) = \int_{-\infty}^{x} \mathbf{f}_\xi(s) ds := [\min\{\int_{-\infty}^{x} f_\xi(s) ds\}, \max\{\int_{-\infty}^{x} f_\xi(s) ds\}] \subseteq [0,1] .$$

Definition 13 (Generalized uncertain mass function, GUMF). For discrete generalized uncertain variables $\xi \in \{x : x = x_1, \cdots, x_n\}$, we call $G_M(x) = G(\xi = x)$ is generalized uncertain mass function, the distribution law of discrete generalized uncertain variables is denoted as $\{G(\xi = x_i)\} = \{[a_i, b_i]\}$.

Definition 14 (Generalized uncertain expectation, GUE).
(1) GUE of discrete generalized uncertain variables: Assume the distribution law of discrete generalized uncertain variable ξ is $\{G(\xi = x_i)\} = \{[a_i, b_i]\}$, where $i = 1, \cdots, n$, then the GUE is $GUE(\xi) = [\sum_{i=1}^{n} x_i a_i, \sum_{i=1}^{n} x_i b_i]$;
(2) GUE of continue generalized uncertain variables:

$$GUE(\xi) = \int_{-\infty}^{\infty} x \cdot \mathbf{f}_\xi(x) dx := [\min\{\int_{-\infty}^{\infty} x \cdot f_\xi(x) dx\}, \max\{\int_{-\infty}^{\infty} x \cdot f_\xi(x) dx\}] .$$

Definition 15 (Generalized covariance of generalized uncertain variables). Assume (ξ_1, ξ_2) is two dimension generalized uncertain variables, if $GUE\{(\xi_1 - GUE(\xi_1))(\xi_2 - GUE(\xi_2))\}$ exists, then we call it is the generalized covariance of generalized uncertain variables ξ_1 and ξ_2.

Definition 16 (Generalized uncertain process). (Ω, Γ, G) is a generalized uncertain space, T is parameter set, where $T \subset \mathbb{R}$. For every $t \in T$, there exists one generalized uncertain variable $\xi(\omega, t)$, then set $\{\xi(\omega, t)\}$ are taken as generalized uncertain process defined on

(Ω, Γ, G). It could be denoted as $\{\xi(\omega, t); \omega \in \Omega, t \in T\}$ or $\{\xi(t); t \in T\}$, abbreviated as $\{\xi(t)\}$. All possible value space S of generalized uncertain variable ξ taken on parameter set T is said to be status of generalized uncertain process. Specially, if the parameter set T is discrete, then generalized uncertain process $\{\xi(t)\}$ is said to be as generalized uncertain sequences.

Definition 17 (Generalized uncertain limit, variation, derivative, and integral).
Assume generalized uncertain function $\mathbf{f}(\xi) = \{f(\xi): f_1(\xi) \le f(\xi) \le f_2(\xi)\}$,
(i) Generalized uncertain limit:
$\lim_{\xi \to \xi_0} \mathbf{f}(\xi) = [\min\{\lim_{\xi \to \xi_0} f(\xi)\}, \max\{\lim_{\xi \to \xi_0} f(\xi)\}]$,where $f(\xi)$ is core function of GUF $\mathbf{f}(\xi)$;
(ii) Generalized uncertain derivative: $\dot{\mathbf{f}}_{x=x_0} = \lim_{x \to x_0} \frac{\Delta \mathbf{f}}{\Delta x} = [\min\{\lim_{x \to x_0} \frac{\Delta f}{\Delta x}\}, \max\{\lim_{x \to x_0} \frac{\Delta f}{\Delta x}\}]$;
(iii) Generalized uncertain variation:
$\delta \mathbf{f} = \mathbf{f}(x + \Delta x) - \mathbf{f}(x) = [\min\{f(x + \Delta x) - f(x)\}, \max\{f(x + \Delta x) - f(x)\}]$;
(iv) Generalized uncertain integral: $\int_a^b \mathbf{f}(x)dx = [\min\{\int_a^b f(x)dx\}, \max\{\int_a^b f(x)dx\}]$.

32.4 Corollaries, Propositions and Algorithms

Corollary 1 (Conditional generalized uncertain measure). For set A and B,we have $G(A \mid B) = \frac{G(AB)}{G(B)}$.

Proof. Assume the total number of experiment is n. The number of event A occurs is $[\underline{n}_A, \overline{n}_A]$, which indicates the minimum number and maximum number of event A happening is $\underline{n}_A$ and $\overline{n}_A$ respectively.
It is an uncertain range from $\underline{n}_A$ to $\overline{n}_A$. Similarly,the number of event B occurs is $[\underline{n}_B, \overline{n}_B]$, and the number of event A and event B occur synchronously is $[\underline{n}_{AB}, \overline{n}_{AB}]$. Note, there is only the total number of experiment is determined. The conditional generalized uncertain measure $G(A \mid B)$ should be the number of event A and event B occur synchronously is divided by the number of event B occurs, i.e., $G(A \mid B) = \frac{[\underline{n}_{AB}, \overline{n}_{AB}]}{[\underline{n}_B, \overline{n}_B]} = \frac{[\underline{n}_{AB}, \overline{n}_{AB}]/n}{[\underline{n}_B, \overline{n}_B]/n} = \frac{G(AB)}{G(B)}$. □

Corollary 2. If the generalized uncertain degree $gud(A) = 0$,then the generalized uncertain measure of A is a real number.
Proof. From the definition of GUM, $gud(A) = l(G(A)) = b - a = 0 \Rightarrow a = b$, then we have $G(A) = [a, b] = [a, a] = a$, which means the assertion is true. □

Corollary 3 (Monotonicity of generalized uncertain measure). For arbitrary two generalized uncertain measurable sets A_1 and A_2, if $A_1 \subseteq A_2$,then the GUM of these two sets maybe two situations, (i)$G(A_1) < G(A_2)$, (ii)$G(A_1) \le G(A_2)$, while the third situation, i.e., partly smaller won't be came into existence.
Proof. Assume $G(A_1) = [a_1, b_1]$, $G(A_2) = [a_2, b_2]$, $A_3 := A_2 - A_1 = A_2 / A_1$, $G(A_3) = [a_3, b_3]$, then $A_1 \cap A_3 = \varnothing$. We have $G(A_2) = G(A_1 \cup A_3) = G(A_1) + G(A_3) = [a_1 + a_3, b_1 + b_3]$,then because $a_1 \in [0,1], b_1 \in [0,1]$, $a_3 \in [0,1], b_3 \in [0,1]$, and it is obvious that $0 \le a_1 \le a_1 + a_3 \le 1$ and

$0 \le b_1 \le b_1 + b_3 \le 1$, (i) if $b_1 < a_1 + a_3$, then $[a_1, b_1]$ and $[a_1 + a_3, b_1 + b_3]$ satisfy separation relationship (R1),which means $G(A_1) < G(A_2)$; (ii) if $b_1 \ge a_1 + a_3$,then $[a_1, b_1]$ and $[a_1 + a_3, b_1 + b_3]$ satisfy interlaced relationship (R2), which means $G(A_1) \le G(A_2)$. It is obvious that the third situation won't occur. The proof is completed. □

Corollary 4 (The additional formula of GUM). For arbitrary two generalized uncertain measurable sets A_1 and A_2, we have $G(A_1 \cup A_2) = G(A_1) + G(A_2) - G(A_1 A_2)$.

Proof. $A_1 A_2 \subseteq A_2 \Rightarrow A_2 = (A_2 - A_1 A_2) \cup (A_1 A_2)$, and $(A_2 - A_1 A_2) \cap (A_1 A_2) = \varnothing$ .So, $G(A_2) = G(A_2 - A_1 A_2) + G(A_1 A_2)$, then $G(A_2 - A_1 A_2) = G(A_2) - G(A_1 A_2)$. Furthermore, $A_1 \cup A_2 = A_1 \cup (A_2 - A_1 A_2)$, and $A_1 \cap (A_2 - A_1 A_2) = \varnothing$, so we have $G(A_1 \cup A_2) = G(A_1) + G(A_2 - A_1 A_2) = G(A_1) + G(A_2) - G(A_1 A_2)$. □

Proposition 1. For generalized uncertain set sequences $A = \{A_i; i = 1 \cdots n\}$, the GUM for every A_i is $G(A_i) = [a_i, b_i]$, and arbitrary two sets are incompatible, i.e., $A_i \cap A_j = \varnothing$. If the GUD of every A_i equals 0, i.e., $\mathrm{gud}(A_i) = 0$,then we have $G(A) = \sum_{i=1}^{i=n} a_i$.

Proof. From Corollary 2 we have $G(A_i) = a_i \in \Re$, furthermore, considering condition 3 of definition 1, we have $G(A) = G(A_1 \cup A_2 \cdots \cup A_n) = \sum_{i=1}^{i=n} G(A_i) = \sum_{i=1}^{i=n} a_i$. □

Proposition 2 (The correlation between probability and GUM). In independent repeated experiment, let n be the number of experiment performed. $P(A)$ is the probability that the event occurs in one stochastic experiment. The GUM of n th stochastic experiment is recorded as $G(A_n) = [a_n, b_n]$,and $\{G(A_n)\} = \{[a_n, b_n]\}$ is consist of a closed nested intervals. Then we have $P(A) = \lim_{n \to \infty} G(A_n)$, i.e., the probability is the limitation of generalized uncertain measure under this specific conditions.

Proof. From the closed nested interval theorem, there exists only one real number $\xi \in \Re$, which satisfy $\lim_{n \to \infty} a_n = \lim_{n \to \infty} b_n = \xi$, from the definition of probability, we have $P(A) = \lim_{n \to \infty} a_n = \xi = [\xi, \xi] = [\lim_{n \to \infty} a_n, \lim_{n \to \infty} b_n] = \lim_{n \to \infty} [a_n, b_n] = \lim_{n \to \infty} G(A_n)$. □

Solution 1 (Generation of generalized uncertain sequences).

A generalized uncertain sequence including k elements could be produced by random variables having arbitrary distribution. Assume there are random variables $X_1, \cdots, X_n$. Their distributions are $X_1 \sim f_1(\mu_1, \sigma_1^2), \cdots, X_n \sim f_n(\mu_n, \sigma_n^2)$, where the μ_i, σ_i^2 is mean and variance of random variable X_i. Below is brief introduction of algorithm processing.

Step 1. Produce k random number sequens by employing random number generator. The j th sequence is marked as $\boldsymbol{\eta}_j = \{X_{1j}, \cdots, X_{nj}\}$, the i th element obeys i th distribution, i.e., $X_{ij} \sim f_i(\mu_i, \sigma_i^2)$, let $j = 1$.

Step 2. Generate a integer 1,, l_j,, k, where l_j obeys uniform distribution between [1,k]. Then we select the l_j th elements which belongs to j th random number sequence η_j. It is marked

as $X_{l_j j}$. Then the mean of $X_{l_j j}$ is between $[\min \mu_j, \max \mu_j]$. So $X_{l_j j}$ could be taken as j th generalized uncertain number;

Step 3. Let $j = j+1$, if $j < k+1$, then return to Step 2, continue executing it. Otherwise, after totally k times operation, we can get an approximate generalized uncertain sequences $\xi = \{X_{l_1 1}, \cdots, X_{l_k k}\}$, where $X_{l_j j}$ is the generalized uncertain number which is generated at j th step.

Solution 2 (Plain fast classing algorithm based on δ neighbour). For $\delta > 0$, and generalized uncertain sequences $A = \{\xi_1, \cdots \xi_n\}$, the plain fast classing algorithm based on δ neighbour is articulated as below:

Step 1. Set integer $k = 1$, initial classing set $B_k = \{\xi_1\}$, object set $C = A$;

Setp 2. Go through object set C according to this process: take arbitrary element $\xi_i \in C, i \neq 1$,if ξ_i and ξ_1 is δ neighbour, then add ξ_i into set B, update $B = \{\xi_1, \xi_i\} := \{\xi_1^k, \xi_2^k\}$. After one time ergodicity, the classing set $B_k = \{\xi_1^k, \cdots \xi_{m_k}^k\}$;

Setp 3. $k = k+1$, update object set $C = A - (B_1 \cup B_2 \cup \cdots \cup B_{k-1})$, if object set $C = \varnothing$, then we get set sequences $\{B_1, \cdots, B_{k-1}\}$, classing is completed. Otherwise, we continue going through object set C to get new set B_k, then return Step 3 to repeat this step.

32.5 Applications of GUT on decision making

There are two kinds uncertain decision types, the one is uncertain type decision and the other is risk type decision. The feature of the first one includes (1) The states of nature is already known by decision maker, (2) The revenue under different nature is already known; and (3) The status of nature isn't determined and its probability distribution isn't known in advance. For classical uncertain type decision problems, there are five common decision criteria could be employed in theoretical or practical research, involving (1) pessimistic criteria; (2) optimistic criteria; (3) compromise criteria; (4) minimum maximum regret criterion and (5) equal possibility criterion. These five decision criteria could be described uniformly by employing GUT. Furthermore, classical uncertain type and risk type decision problems could be addressed by adopting GUT as well.

32.5.1 Principles of generalized uncertain decision

We assume the total number of possible natural status is n and it is denoted as $\{N_i : i = 1, \cdots, n\}$. Its corresponding generalized uncertain distribution is $G(N_i) = G(\xi = N_i) = [a_i, b_i]$,where $i \in \{1, \cdots, n\}$. Schemes set is $\{S_i; i = 1, \cdots, m\}$. Payoff matrix is $A = \{a_{i,j}\}$, where $i \in \{1, \cdots, m\}$, $j \in \{1, \cdots, n\}$. Here $a_{i,j}$ denotes the actor's payoff under j th natural condition when adopting i th scheme. The generalized expected utility adopting scheme S_i could be formulated as $GEU(S_i) = \sum_{j=1}^{n} a_{i,j} G(N_j)$. When $G(N_j) = [p_1, p_2]$ and $p_1 < p_2$, it is uncertain type decision in the classical uncertain decision making context, when $G(N_j) = [p_j, p_j] = p_j$, here p_j indicates the probability of natural status N_j occurs, then it could be taken as risk type decision in the classical uncertain decision making context. Corresponding decision criteria could be summarized as below: Firstly, select the strongly advantage scheme among $\{GEU(S_i)\}$; Secondly, if there doesn't exist strongly advantage

scheme, then select weakly advantage scheme among $\{GEU(S_i)\}$; Thirdly, if the strongly advantage scheme and weakly advantage scheme are both absent, which means inclusion relationship occurs between some schemes, then we make decision according below criteria: (i) If the decision maker is robust (risk aversion), we should select the scheme which has the smallest generalized uncertainty degree of GUM, i.e., $S_k = \min\{gud(GEU(S_i))\}$, where S_k is selected scheme; (ii) If the decision maker is radical (risk seeking), we should select the scheme which has the greatest generalized uncertainty degree of GUM, i.e., $S_k = \max\{gud(GEU(S_i))\}$. Below we'll elaborate this process by a brief decision example.

32.5.2 Examples of generalized uncertain decision

Assume there are totally four schemes to be selected, and natural circumstance has three distinct status respectively. The generalized distribution of natural circumstance, payoff matrix and scheme's GEU are listed in Table 1.

/	Status1	Status2	Status3	GEU	Comparison	
GUM	[0.1,0.2]	[0.2,0.3]	[0.5,0.7]	/	/	
S1	100	80	90	GEU1:[71,107]	/	
S2	120	130	110	GEU2: [93,140]	GEU2 GEU1	≥
S3	150	150	120	GEU3: [105,159]	GEU3 GEU2	≥
S4	160	90	140	GEU4: [104,157]	GEU4 GEU3	≤

***Table 1**. Payoff matrix and GEU of four schemes*

It is obvious that the GEU of scheme3 is the most weakly advantage among four GEUs, so the scheme3 could be selected as our final choice in this scenario.
If there is a new scheme which is noted as scheme5 added in scheme set, its payoff under three natural conditions are 0, 530 and 0 respectively. Similar as Table 1, the generalized distribution of natural circumstance, payoff matrix and scheme's GEU are listed in Table 2.

/	Status1	Status2	Status3	GEU	Comparison	
GUM	[0.1,0.2]	[0.2,0.3]	[0.5,0.7]	/	/	
S1	100	80	90	GEU1:[71,107]	/	
S2	120	130	110	GEU2: [93,140]	GEU2 GEU1	≥
S3	150	150	120	GEU3: [105,159]	GEU3 GEU2	≥
S4	160	90	140	GEU4: [104,157]	GEU4 GEU3	≤
S5	0	530	0	GEU5: [106,159]	GEU5 GEU3	$\preceq$

***Table 2.** Payoff matrix and GEU of five schemes*

First, from above analysis, we know that the third scheme, i.e., scheme3 is the optimal choice among scheme1 to scheme4. Second, because the GEU3 is partly smaller than GEU5, so according to the decision criteria presented in previous subsection, if the decision maker is risk aversion style, we should select scheme5, while if the decision maker is risk seeking style, we should select scheme3.

32.6 Concluding and Discussions

Although there are numerous mathematical tools to address uncertain phenomena, and whatever which theory is employed, the final attempt is to get one real number to describe the uncertainty accurately. An obvious but important overlook lies in that the measure of uncertainty itself may be inaccurate. Traditional processing approach that using a precise number to measure uncertainty could be an ideal assumption. In order to overcome these limitations, we develop a whole set of fundamental framework from theoretical perspective by reviewing some existing theory in uncertainty domains. Related concepts and axiomatic system of generalized uncertain theory such as generalized uncertain measure (GUM), arithmetic operation of GUM, generalized uncertain function and variable, generalized uncertain distribution, generalized uncertain process, generalized uncertain limit, generalized uncertain variation, and generalized uncertain derivative, etc., are derived in this framework. Some corollaries, propositions and algorithms are presented as well to extend the application scope of the theory. Furthermore, we give an elaboration about how to use the GUT to address complex uncertain and risk type decision making problems, and an example is carried out to demonstrate the effectiveness and rationality about our proposed theory. Being a novel mathematical theory, we have just started a little step, many theoretical or applications issues need to be further explored of course. Extending and incorporating the GUT into other realms, such as systems recognition, forecasting, optimization and control system evaluation, and system decomposition, etc.,are all future possible directions.

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32.7 References

[1] Deng Ju-Long “Control problems of grey systems “, Systems & Control Letters, Vol. 1, Issue 5, pp 288–294, Mar. 1982

[2] Liu Bao-Ding, “Uncertainty Theory”, 2nd ed., Springer-Verlag, Berlin, 2007

[3] Zdzisław Pawlak, “Rough sets”, International Journal of Computer & Information Sciences, Vol. 11, Issue 5, pp 341–356, Oct. 1982

[4] Wang Guang-Yuan, “Unascertained information and its mathematical treatment”, Journal of Harbin University of Civil Engineering (in Chinese), Vol. 23, Issue 4, pp 1–9, Dec. 1990

[5] Lotfi Aliasker Zadeh, “Fuzzy sets”, Information and Control, Vol. 8, Issue 3, pp 338–353. Jun. 1965

33 Biographical Notes on Contributors

33.1 AFANTENOU, Katerina

is a Speech and language therapist working with children and adults with communication, language and learning difficulties. PhD Cand., School of Philosophy, Aristotle University of Thessaloniki, Greece. Her research interests are in the field of Specific Language Impairment. Also she is interest in cognitive impairments arising after stroke or neuro-degenerative diseases in adults. Academically she is involved in curriculum development in her field, and in teaching in BSc and MSc programs.

33.2 ANDONE, Diana

Director of the eLearning Center, Politehnica University of Timisoara, Romania
diana.andone@cm.upt.ro, diana.andone@upt.ro

Diana Andone is the Director of the eLearning Center, responsible for planning and implementing eLearning. She runs the team who developed and assure daily integration of the university award winning Virtual Campus CVUPT. In 2017 she led the team in developing the first Romanian MOOCs platform, called UniCampus. She is also lecturer at the Politehnica University of Timisoara, in the area of multimedia and web technologies. She is passionate about the ubiquitous access to technologies and how they can be used to improve people's life. More professional information can be found at: http://elearning.upt.ro/
Diana Andone holds a PhD in Designing eLearning Spaces for Digital Students with University of Brighton, UK, an MA in European Studies, an "Learning about Open Learning", postgraduate distance education course at the Herriott-Watt University, Edinburgh, UK; an MSc in Artificial Intelligence at the Politehnica University of Timisoara, Romania. She attended different specialisations in universities in UK, France, Finland, Greece, Germany. Since 1998 she teaches course modules in universities from UK, France, Finland, Italy and Greece.
The publication list comprises 8 books and over 90 papers presented at international conferences, she is reviewer for 12 International Conferences, 3 journals, she received 8 best paper awards at different conferences and since 2010 Co-chair at the IADIS WWW/Internet International Conference. In the last years she was involved in 21 EU funded projects. In 2012 she received the EDEN Fellow Title (European Distance and E-Learning Network).
She is also involved extensively in several professional organisations and associations as well as acting in the Board of local Romanian NGOs (Pentru Voi Foundation) and a member of Rotary International.

33.3 ARVANITIS, Konstantinos

Professor, Dpt. of Natural Resources Management and Agricultural Engineering, Agricultural University of Athens, Athens, Greece
karvan@aua.gr
Dr. Konstantinos Arvanitis is a Professor in Agricultural University of Athens at the Department of Natural Resources Management and Agricultural Engineering. He holds an Electrical and Computer Engineering Diploma and a Ph.D. in the field of Automatic Control and Automation Systems. He has participated in several research and development projects and has authored numerous publications. He is also a member of various associations. His current interests include among others Applications of A.I. in Agriculture, Automation and Electrification in

Agriculture, Image Processing and Remote Sensing in Agriculture, ICT in Agriculture, Precision Farming, etc.

33.4 AHMEDI, Basri

Basri Ahmedi received a BSc degree from the Faculty of Natural Sciences Mathematics, Informatics at the University of Tetova, MSc in Computer Science from Seeu in Tetovo and PhD in Computer Science and Engineering Department at the Faculty of Technical Sciences at St. Clement of Ohrid, Bitola , Republic of Macedonia. He is currently Assistant Professor at the University Kadri Zeka at the Faculty of Computer Science in Gjilan, Republic of Kosovo. His research interests include Computer Networking, Graphic Theory and e-Learning. He has published in several scientific journals.

33.5 BOTTIS, Maria

botti@otenet.gr
Is an Associate Professor of Information law at the Department of Archives, Library Science and Museology of the Ionian University and a graduate of the Law Schools of Athens, Cambridge and Yale, also a Faculty Fellow of Harvard University. Her research interests include data protection, intellectual property, constitutional rights and access to information, civil law and information ethics. Maria is the Director of the International Society for Ethics and Information Technology and participates in a number of EU and national projects related to her work.

33.6 BRATENGEYER, Erwin

Dipl.-Ing. Dr., E-Learning Center, Danube University Krems
erwin.bratengeyer@donau-uni.ac.at
Erwin Bratengeyer has an educational background in philosophy and electronics engineering. He has over 20 years of experience in educational technologies. He works for Danube University Krems since 1996. He organizes conferences all over Europe and lectures internationally on new technologies.

33.7 CHEN, Xingguang

Associate Professor, School of Business, Jianghan University
cxg@nju.edu.cn
Xingguang Chen received his Ph.D. in Management Science from the Nanjing University in 2009. His main research interests are Modeling and Simulation of Complex systems, Decision Analysis, Organizational optimization, Uncertainty mathematical theory and its applications.

33.8 DELAMER, Amanda

Dipl.-Ing., MAS; IT Consultant; Solid-IT, University of Applied Sciences Wr. Neustadt,
amanda.delamer@fhwn.ac.at
Amanda Delamer qualified as an engineer specialising in microelectronics in Trinity College Dublin and later received an MAS in IT Consulting from the Danube University Krems. She has worked for over 30 years in the IT industry with international companies in different countries. Her work experience includes: hardware development, design/implementation of

telephone & data networks, consulting, and customer training. She has lectured in Project Management since 2006.

33.9 DELIYANNIS, Ioannis

Assistant Professor, Dpt. of Audiovisual Arts, Ionian University, Greece
yiannis@ionio.gr
Dr Ioannis Deliyannis is an Assistant Professor at the Department of Audiovisual Arts at Ionian University, Corfu, Greece. He holds a Computer Science Degree and a Ph.D in the field of Interactive Multimedia. He is a founding member of inArts research laboratory and his current interests include interaction design and new media.

33.10 EDELMANN, Felix

Ing. MAS / Helix IT consulting
edelmann@helix.at
Ing. Felix Edelmann, MAS has been working in the IT industry since 1972. In 1997 he completed a master's degree at the Danube University and founded his company Helix IT Consulting. Today he is focused on solutions in the areas of video surveillance, digital signage, mobility and cloud computing.

33.11 EVANS, David

E-learning Consultant, JME Associates, United Kingdom
david@jmea.co.uk
David Evans is a learning designer and elearning consultant who has worked with leading international financial institutions including Moody's, Lloyds Banking Group and Santander. For many years he worked in further and community education, and was contractor to and partner in several Tempus and Leonardo projects with 'Politehnica' University of Timisoara and other universities in Romania. His main interests are in the design of learning materials, online tests and the development of learning management systems.

33.12 GANATSIOU, Paraskevi

pganatsiou@gmail.com
Graduated from Greek Literature Department of Faculty of Philosophical Studies at Aristotle University of Thessaloniki - Greece and she also graduated from the Music Department of Fine Arts Faculty at the same University. She has master diploma entitled: *Managing cultural heritage and new technologies* (Archives, Librarianship and Museology Department of the Ionian University). Master thesis title: *The Archaeological Site of Delphi as an Open Air Museum: Museum – educational action's proposals and programs for high school students*. Now, she works on a PhD thesis at the Ionian University entitled: *Open Access in Literary, Philosophical and Historical Journals and Copyrights. Educational and Teaching* Effects.

33.13 GELBMANN, Matthias

Dipl.-Ing., Managing Director, Q-Success
matthias.gelbmann@q-success.com
Matthias Gelbmann studied computer science and applied mathematics at the Technical University in Vienna, Austria. He started his professional career as researcher in an artificial

intelligence lab. Since then he held several technical and managerial positions in a variety of IT companies. He is now Managing Director of a consulting company he founded in 2001.

33.14 GIANNAKOPOULOS, Panagiotis

Professor of University of West Attica, Department of Computer Systems, has published 35 scientific papers in international refereed journals, 96 papers in international conferences and 11 in Greek ones. He was a member of the Governing Body of the University (2012-17) and has organized a conference of NATO on «Nuclear Radiation Nanosensors and Nanosensory Systems", (2014, Tbilisi). He is the Academic Coordinator of a graduate program with the University of Nottingham. Author of four academic books. He has participated in several national and European research programs (FP7, KA2).

33.15 GÜNTHER, Johann

Prof., Dr., Jianghan University, Wuhan, China, Saint Petersburg State University for Telecommunications, Russia, Visiting Professor at Danube University Krems, Austria
johann@johannguenther.at
Secretary General IAFeS (International Association for eScience)
2010 and 2011 vice chancellor University of Buraimi (foundation rector/president)
2007 – 2010 Director of Agency for European Integration, Office Prishtina, Kosovo
2004 – 2007 Executive Director University of Applied Sciences St.Poelten, Austria
1999 – 2004 Vice-president Danube University (Austria)
1996 – 2004 dean of “Telecommunication, Information and Media“
1979 - 1996 lectures at the University of Vienna
1986 professor of the State University of Telecommunication in St. Petersburg
After studies at University Vienna in several positions in industry.
Publications: more than 50 books, 2 in seven languages, participation in more than 60 compendiums and more than 200 articles in specialist journals.

33.16 KAIMARA, Polyxeni

PhD Candidate, Dpt. Audiovisual Arts at Ionian University, Corfu, Greece
x_kaimara@yahoo.com
Polyxeni Kaimara holds a Philosophy, Education and Psychology Bachelor’s Degree, a Master's Degree in Developmental and Educational Psychology (Aristotle University of Thessaloniki), a Master's Degree in Public Health in the field of Behavioral Studies (National School of Public Health) and a degree in Counselling and Guidance (Postgraduate Diploma of ASPETE-National School of Pedagogical and Technological Education). She currently works as a psychologist at a Centre for Education, Social Support and Training for People with Disabilities. Her research focuses on the design and development of interactive educational-entertainment systems (edutainment) in Inclusive Education

33.17 KAVVADIA, Alexandra

lavra@ionio.gr
Alexandra Kavvadia was born in Corfu. She graduated from the Department of Law, Faculty of Law Science, Aristotle University of Thessaloniki. She received a Master’s degree in “History and Documentation“ from the Department of History, Ionian University, Corfu. Currently she is a Ph. D. Candidate at the Department of Archives, Library Science and Museology at Ionian University in the scientific field: “Science of Archives“.She works as a member of Laboratory

Teaching Staff at the same Department, in the scientific field: “Records Management, Archives and Application of Law“. She has participated in several national and international conferences and she has written and published scientific papers and research articles in the above metnioned fields.

33.18 KIMARI, Risto

Risto.Kimari@oamk.fi
Lic. Eng., Security Director, Oulu University of Applied Sciences (OUAS) since 2017
Director of Premises and Security OUAS, 2016 -2017
Director of School in Engineering, OUAS, 1998 – 2009 and 2015
Vice rector, OUAS, 2009 -2015
Rector, Oulu Institute of Technology (OIT)
Pricnipal lecturer, OIT, 1990 – 1998
Former career in Helsinki Energy Board, 1977 – 1990
Member of Board EATA and later IAFeS since 1998

33.19 KOCH, Günter

Prof. Dipl. Inform., President of the Humboldt Cosmos Multiversity (www.humboldt-cosmos-multiversity.org), Puerto de la Cruz / Tacoronte, Tenerife, Spain.
Günter Koch has experienced several careers as a scientist, entrepreneur and top level manager, in five different European countries. He headed the international “European Software Institute” (ESI) in Spain, was Mng. Director of Austria’s largest R&D organisation, today called Austrian Institute of Technology (AIT), co-founded the think tank “New Club of Paris” as a spin-off of a High Level Exert Group on Intellectual Capital Reporting (“RICARDIS”) giving advice to the European Commission. Today he serves as the President of a “discourse platform” called Humboldt Cosmos Multiversity (HCM) located in Tenerife / Spain. Koch is an expert in designing models and methods.
eMail: guenterkochat@gmail.com

33.20 KOSTAGIOLAS, Petros

is an Assistant Professor of Information Services Management in the Department of Archives, Library Science and Museology, Ionian University, Greece. His research interests includes user information behaviour in various settings and can be found at Research Gate: https://www.researchgate.net/profile/Petros_Kostagiolas
Google Scholar: https://scholar.google.gr/citations?user=QHiIV-gAAAAJ&hl=el
Scopus:https://www.scopus.com/authid/detail.uri?authorId=35615203100&origin=AuthorEval

33.21 KURTTILA, Jukka

Master of Arts (Education) (M.A.), Senior Lecturer, Project Manager, Oulu University of Applied Sciences (OUAS), Information Technology eCampus-team, Finland
jukka.kurttila@oamk.fi
Experienced Teacher with a demonstrated history of working in the Finnish general education developing work to higher education industry (OUAS). 18 years of experience in working at City of Oulu, Educational and Cultural Services as a Advisory Teacher and Teacher Trainer (education technology). Education professional skilled in E-Learning, Educational Technology and Modern Educational Methodology. Project Manager in the field of Learning Analytics. Also experience the companies at educational technology industry (CEO and partner).

33.22 KYRIAKOU, Evangelia

is a primary school teacher certified in special education, working since 2014.She is an MA student in Education Sciences and Learning Technologies, University of West Attica and University of Nottingham. BA in Primary School Education, from University of Ioannina. Her research interests are in educational robotics (certified member of LEGO education academy) and in using technologies for special education.

33.23 LÄHDENIEMI, Matti

Tampere University of Technology, Finland
Matti Lähdeniemi is presently an Adjunct Professor at Tampere University of Technology and at the University of Turku. His special fields are automation, image processing, entrepreneurship, knowledge transfer, quality and impact evaluation and RDI processes. He is/has been the director and consulting tutor of numerous industrial projects, and a member of several groups evaluating the impact of RDI and quality at universities on a national level and RDI measures on a national and European level. He has prepared and analysed the international evaluation of RDI activities at Finnish Universities of Applied Sciences. He has written about 190 articles on the above-mentioned topics. Previous positions include Research and Innovation Director, Vice president and Dean (Satakunta University of Applied Sciences), professorships (Computer Science/Tampere University of Technology, Materials Science/University of Turku, Surface Physics/Humboldt-Foundation), project manager in different research and industrial projects in Finland, Sweden, Germany and Japan, and chairman or board member of several organisations and foundations.

33.24 LAINE, Kari

Dr. (tech) Kari Laine holds a position as Principal lecturer at Satakunta University of Applied Sciences, Finland. His research interests cover university industry interaction, innovation and entrepreneurship. He has published on these fields since year 2001. He also teaches electrical engineering and innovation management both in Batchelor and Professional Master programs.

33.25 LAVRANOS, Charilaos

Postdoctoral Researcher, PhD, MSc, BA, Ionian University
lavranos@ionio.gr
Charilaos Lavranos, Postdoctoral Researcher, holds a PhD from the Dpt. of Music Studies, Faculty of Music & Audiovisual Arts, Ionian University, Greece and MSc from the Dpt. of Archives and Library Science, Faculty of Information Science & Informatics, Ionian University, Greece. His work has been presented at national and international scientific conferences and published in international journals such as Journal of Documentation, Journal of the Association for Information Science and Technology, Information Research, Library Management, and others. His research interests include issues about information seeking behaviour and creative industries.

33.26 MERTANEN, Olli

Vice President, emeritus; Turku University of Applied Sciences.
He has long background as well in industry in the field of communications technology as in engineering education in the field of information technology. He received B.Eng in automation technology (1976) in Kotka Institute of Technology. He continued his studies in Tampere

University of Technology where he received M.Sc. in digital and computer technology (1979), Lic.Sc. in computer science and telecommunications (1985) and D.Sc. in computer communication (1992). His industrial background includes positions in Philips Data Systems and Ericksson telecommunications. During his university career he was mentioned among 100 finnish avantgardists in the field of industry and business and awarded the recognition of EIS / excellent educator in electronics. He also got an Achievement Award by INEER organization for his excellent work in the field of education and for his contribution to the creation of entrepreneurial spirit among future engineers. He has been active in the field of enhancing creation of innovations as a result of co-operation between industry and University and furthermore leading to entrepreneurship.

33.27 MICHAILIDIS, Susie

Being in the rank of full professor and Vice Chancellor for Academic Affairs at Webster University, Athens Campus, she has had excellent opportunities to be an educator with more than thirty years of teaching and management related experience.
As a researcher and Vice President of the Euro-Mediterranean Academy of Arts and Sciences, she has a record in scholarship and vast publications in the fields of philology, literature, literary criticism, philosophy, history and social sciences.
In her current position as a Vice Chancellor for Academic Affairs, she is providing leadership for the delivery of the Webster Athens academic programs' excellence and leadership in teaching and learning.

33.28 MILIOTIS, George

Special Technical Personnel, Dpt. of Audiovisual Arts, Ionian University, Greece
corfiot@ionio.gr
George Miliotis is specialized technical laboratory staff at the department of Audiovisual Arts, Ionian University, Corfu, Greece. He holds a MSc in Computer Graphics & Visualization and a BSc in Computer Science. His main interests include software development, complex system UX/UIs and systems administration.

33.29 PAJAZITI, Arbnor

Doctor of Science, Master of Science, University Professor, Department of Mechatronics, Faculty of Mechanical Engineering / University of Prishtina
arbnor.pajaziti@uni-pr.edu
Arbnor Pajaziti, born in 1961, Peja, Kosovo, is the university professor at the Faculty of Mechanical Engineering, University of Prishtina, Kosovo. He has published several scientific papers in the field of robotics to different International Conferences and Symposiums, including the application of several control schemes, neural network controllers, fuzzy logic controllers and genetic algorithms to industrial robots, mobile robots, legged robots and multiple robotic systems.

33.30 PAPADOPOULOU, Agnes

Special Research and Teaching Staff Member, Dpt. of Audiovisual Arts, Ionian University, Greece
a.papadop@ionio.gr
Agnes Papadopoulou has obtained a PhD in Theoretical Art Studies (Philosophy of Art, Visualization and Media), AUTH and is a Laboratory Teaching Staff Member (Art Teaching:

Principles and Practice, Art Didactics and Creative Technologies, Art and Education: Visual and Conceptual Structures) in the Department of Audio & Visual Arts, Ionian University,Greece. Her main research interests lie in the field of Art, Technology and Education.

33.31 PAPANIKOU, Maria

Kindergarten teacher. B.Sc., Degree in Early Childhood Education (National and Kapodistrian University of Athens), MA student in Education Sciences and Learning Technologies (University of Nottingham & Piraeus University of Applied Sciences) Her research interests are in the field of technology and its integration in education.

33.32 PEKKA, Silvén

M.Ed., Head of Demola Oulu, Oulu University of Applied Sciences, pekka.silven@oamk.fi
Pekka Silvén (M.Ed.), Head of Demola at Oulu University of Applied Sciences. Pekka Silvén has over 20 years of experience in international education. Previously he has worked as a director of the Professional Development Services, and a project manager and expert in several international and national projects.

33.33 PERMOSER, Gabriele

Mag., Section Head Innovation in Higher Education, St. Pölten University of Applied Sciences
Email. gabriele.permoser@fhstp.ac.at
Gabriele Permoser has studied political sciences and has a master degree from the University of Vienna. Since 2013, she is working at St. Pölten University of Applied Sciences; since 2017 as Section Head Innovation in Higher Education. In her work, she is focusing on innovation, R&D, internationalization, education and training and program development.

33.34 PIROMALIS, Dimitrios

Assistant Professor, Dpt. of Industrial Design and Production Engineering, University of West Attica, Egaleo, Greece
piromali@puas.com
Assistant Professor in University of West Attica at the Department of Industrial Design and Production Engineering. He holds an Automation Engineering Degree and a Ph.D. in the field of Wireless Sensor Networks and Embedded Systems. He has participated in several research and development projects and has authored numerous publications. He is also a member of various associations. His current interests include among others Internet of Things (IoT), Smart Cities, Cyber-Physical Systems and Smart Grid etc.

33.35 POULIMENOU, Sofia Maria

PhD Candidate, Dpt. Archives, Library Science and Museology, Ionian University
poulimenoufaye@gmail.com
Sofia-Maria Poulimenou is a PhD candidate in World Heritage Sites Management at the Department of Archives, Library Science and Museology, Ionian University, Corfu, Greece. She has studied International and European Relations at BA level and she obtained her Masters in International Law and Diplomacy. She is a researcher of the Museology Lab of the Ionian University (Corfu, Greece) working on heritage promotion and conservation.

33.36 RAFFASEDER; Hannes

FH-Prof. Dipl. Ing., Member of the Managing Board / Authorised Signatory, St. Pölten University of Applied Sciences
Email: hannes.raffaseder@fhstp.ac.at
Hannes Raffaseder has been Professor for Audio Design at St. Pölten University of Applied Sciences since 2004. He initiated several research projects, headed the master's program in digital media technologies was responsible for the creation of the IC\M/T Institute for Creative\Media/Technology and served as rector. Since 2014, he is an official representative and member of the management board with responsibility for research and knowledge transfer, international affairs and program development.

33.37 SYMEONAKI, Eleni

Ph.D. Candidate, Dpt. of Natural Resources Management and Agricultural Engineering, Agricultural University of Athens, Athens, Greece
esimeon@puas.com
PhD candidate in Agricultural University of Athens at the Department of Natural Resources Management and Agricultural Engineering. She has studied Automation Engineering at BA level and she obtained her Masters in Industrial Automation. She is employed as Laboratory Teaching Staff in the Department of Industrial Design and Production Engineering at University of West Attica (Egaleo, Greece). Her research field is Internet of Things and Cloud Computing Technologies for the benefit of Precision Agriculture.

33.38 TSELES, Dimitrios

Professor, Dpt. of Industrial Design and Production Engineering, University of West Attica, Egaleo, Greece
dtsel@puas.com
Dr. Dimitrios Tseles is a Professor in University of West Attica at the Department of Industrial Design and Production Engineering. He holds a Degree and a Ph.D. in the field of Physics. He has participated in several research and development projects and has authored numerous publications. He is also a member of various associations. His current interests include among others Data Acquisition, CAD/CAM, Industrial Automation and Communications.

33.39 VASIU, Radu

Professor, Dept. of Communications, Faculty of Electronics, telecommunications and Information Technologies, Politehnica University of Timisoara, Romania
Director of the Multimedia Research Centre
President of the Politehnica University of Timisoara Senate
radu.vasiu@cm.upt.ro, radu.vasiu@upt.ro

Radu Vasiu received his MSc and PhD degrees in Electronics and Telecommunications Engineering from the Politehnica University of Timisoara, Romania in 1982 and 1997, respectively. His research interests in the last years are in the area of open data, smart cities, mobile applications, e-learning, multimedia and web technologies. Since 1993 he was involved in more than 30 international projects (Tempus, Phare, Socrates, Leonardo da Vinci, Life Long Learning, FP6, etc), especially in the field of multimedia and e-learning, both as coordinator or as contractor.
He is now the President of the Politehnica University Senate and the Director of the Multimedia Research Centre.

He acted as invited professor in different universities from UK, Finland, France, Austria, Greece and Netherlands.
The publication list includes 12 books and more than 100 papers presented at different international conferences. He was involved in 32 research or international cooperation projects.
Currently, prof. Vasiu acts as President of the International Association for e-Science (IAFeS), that promotes at international level the use of ICT in science and technology.
He is also a member of IEEE Computer Society and IEEE Communications Society, European Association for Telematics Applications (EATA), European Distance and E-learning Network (EDEN), International Association of Science and Technology Engineers for Development (IASTED) and of the Commission for European Integration of the Romanian Academy, Timisoara branch.

33.40 VLACHOU, Sofia

is a PhD student of the Department of Archival, Library Science and Museology (DALM), Faculty of Information Science & Informatics, of the Ionian University in field of Management of Information Services. She holds a BSc (with scholarship from State Scholarships Foundation (SSF), and two performance awards from SSF and Ionian University) and a MSc from the DALM in “Management Cultural Heritage Documents and New Technologies” with specialization in LIS.

33.41 ZAHOU, Vihelmina

Born on August 7, 1972 in Corfu, I am a graduate of the Faculty of Classics, History and Philosophy of the University of Bari – Italy (1996). During the academic years 1997/2000 I successfully completed a three-years postgraduate program at the same university in the following subjects: "History in the Medieval South", "History and Teaching of History" and "Byzantine History and Art in southern Italy". In 2010 I was awarded a Ph.D. degree in the Department of Archives, Library Science and Museology of the Ionian University. From 2011 until today I am Adj. Lecturer of Medieval History, Latin Paleography and Latin Diplomatic at the same university.
vzahou@ionio.gr

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IAFeS
Biberstrasse 4/4
A 1010 Vienna
Austria

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Biberstrasse 4/4
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