Zbornik 20. mednarodne multikonference

INFORMACIJSKA DRUŽBA - IS 2017

Zvezek D

Proceedings of the 20th International Multiconference

INFORMATION SOCIETY - IS 2017

Volume D

Kognitonika
Cognitonics

Uredila / Edited by
Vladimir A. Fomichov, Olga S. Fomichova

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9.–13. oktober 2017 / 9–13 October 2017
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PREDGOVOR MULTIKONFERENCI INFORMACIJSKA DRUŽBA 2017

Multikonferenca Informacijska družba (http://is.ijs.si) je z **dvajseto** zaporedno prireditvijo osrednji srednjeevropski dogodek na področju informacijske družbe, računalništva in informatike. Letošnja prireditev je ponovno na več lokacijah, osrednji dogodki pa so na Institutu »Jožef Stefan«.

Informacijska družba, znanje in umetna inteligenca so spet na razpotju tako same zase kot glede vpliva na človeški razvoj. Se bo eksponentna rast elektronike po Moorovem zakonu nadaljevala ali stagnirala? Bo umetna inteligenca nadaljevala svoj neverjetni razvoj in premagovala ljudi na čedalje več področjih in s tem omogočila razcvet civilizacije, ali pa bo eksponentna rast prebivalstva zlasti v Afriki povzročila zadušitev rasti? Čedalje več pokazateljev kaže v oba ekstrema – da prehajamo v naslednje civilizacijsko obdobje, hkrati pa so planetarni konflikti sodobne družbe čedalje težje obvladljivi.

Letos smo v multikonferenco povezali dvanajst odličnih neodvisnih konferenc. Predstavljenih bo okoli 200 predstavitev, povzetkov in referatov v okviru samostojnih konferenc in delavnic. Prireditev bodo spremljale okrogle mize in razprave ter posebni dogodki, kot je svečana podelitev nagrad. Izbrani prispevki bodo izšli tudi v posebni številki revije Informatica, ki se ponaša s **40-letno** tradicijo odlične znanstvene revije. Odlične obletnice!

Multikonferenco Informacijska družba 2017 sestavljajo naslednje samostojne konference:

- Slovenska konferenca o umetni inteligenci
- Soočanje z demografskimi izzivi
- Kognitivna znanost
- Sodelovanje, programska oprema in storitve v informacijski družbi
- Izkopavanje znanja in podatkovna skladišča
- Vzgoja in izobraževanje v informacijski družbi
- Četrta študentska računalniška konferenca
- Delavnica »EM-zdravje«
- Peta mednarodna konferenca kognitonike
- Mednarodna konferenca za prenos tehnologij - ITTC
- Delavnica »AS-IT-IC«
- Robotika

Soorganizatorji in podporniki konference so različne raziskovalne institucije in združenja, med njimi tudi ACM Slovenija, SLAIS, DKZ in druga slovenska nacionalna akademija, Inženirska akademija Slovenije (IAS). V imenu organizatorjev konference se zahvaljujemo združenjem in inštitucijam, še posebej pa udeležencem za njihove dragocene prispevke in priložnost, da z nami delijo svoje izkušnje o informacijski družbi. Zahvaljujemo se tudi recenzentom za njihovo pomoč pri recenziranju.

V 2017 bomo petič podelili nagrado za življenjske dosežke v čast Donalda Michija in Alana Turinga. Nagrado Michie-Turing za izjemen življenjski prispevek k razvoju in promociji informacijske družbe bo prejel prof. dr. Marjan Krisper. Priznanje za dosežek leta bo pripadlo prof. dr. Andreju Brodniku. Že šestič podeljujemo nagradi »informacijska limona« in »informacijska jagoda« za najbolj (ne)uspešne poteze v zvezi z informacijsko družbo. Limono je dobilo padanje slovenskih sredstev za akademsko znanost, tako da smo sedaj tretji najslabši po tem kriteriju v Evropi, jagodo pa »e-recept«. Čestitke nagrajencem!

Bojan Orel, predsednik programskega odbora
Matjaž Gams, predsednik organizacijskega odbora

FOREWORD - INFORMATION SOCIETY 2017

In its **20th year**, the Information Society Multiconference (http://is.ijs.si) remains one of the leading conferences in Central Europe devoted to information society, computer science and informatics. In 2017 it is organized at various locations, with the main events at the Jožef Stefan Institute.

The pace of progress of information society, knowledge and artificial intelligence is speeding up, and it seems we are again at a turning point. Will the progress of electronics continue according to the Moore's law or will it start stagnating? Will AI continue to outperform humans at more and more activities and in this way enable the predicted unseen human progress, or will the growth of human population in particular in Africa cause global decline? Both extremes seem more and more likely – fantastic human progress and planetary decline caused by humans destroying our environment and each other.

The Multiconference is running in parallel sessions with 200 presentations of scientific papers at twelve conferences, round tables, workshops and award ceremonies. Selected papers will be published in the Informatica journal, which has **40 years** of tradition of excellent research publication. These are remarkable achievements.

The Information Society 2017 Multiconference consists of the following conferences:

- Slovenian Conference on Artificial Intelligence
- Facing Demographic Challenges
- Cognitive Science
- Collaboration, Software and Services in Information Society
- Data Mining and Data Warehouses
- Education in Information Society
- 4th Student Computer Science Research Conference
- Workshop Electronic and Mobile Health
- 5th International Conference on Cognitonics
- International Conference of Transfer of Technologies - ITTC
- Workshop »AC-IT-IC«
- Robotics

The Multiconference is co-organized and supported by several major research institutions and societies, among them ACM Slovenia, i.e. the Slovenian chapter of the ACM, SLAIS, DKZ and the second national engineering academy, the Slovenian Engineering Academy. In the name of the conference organizers we thank all the societies and institutions, and particularly all the participants for their valuable contribution and their interest in this event, and the reviewers for their thorough reviews.

For the fifth year, the award for life-long outstanding contributions will be delivered in memory of Donald Michie and Alan Turing. The Michie-Turing award will be given to Prof. Marjan Krisper for his life-long outstanding contribution to the development and promotion of information society in our country. In addition, an award for current achievements will be given to Prof. Andrej Brodnik. The information lemon goes to national funding of the academic science, which degrades Slovenia to the third worst position in Europe. The information strawberry is awarded for the medical e-recipe project. Congratulations!

Bojan Orel, Programme Committee Chair
Matjaž Gams, Organizing Committee Chair

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Invited lecture

AN UPDATE FROM THE AI & MUSIC FRONT

Gerhard Widmer
Institute for Computational Perception
Johannes Kepler University Linz (JKU), and
Austrian Research Institute for Artificial Intelligence (OFAI), Vienna

Abstract
Much of current research in Artificial Intelligence and Music, and particularly in the field of Music Information Retrieval (MIR), focuses on algorithms that interpret musical signals and recognize musically relevant objects and patterns at various levels -- from notes to beats and rhythm, to melodic and harmonic patterns and higher-level segment structure --, with the goal of supporting novel applications in the digital music world. This presentation will give the audience a glimpse of what musically "intelligent" systems can currently do with music, and what this is good for. However, we will also find that while some of these capabilities are quite impressive, they are still far from (and do not require) a deeper "understanding" of music. An ongoing project will be presented that aims to take AI & music research a bit closer to the "essence" of music, going beyond surface features and focusing on the expressive aspects of music, and how these are communicated in music. This raises a number of new research challenges for the field of AI and Music (discussed in much more detail in [Widmer, 2016]). As a first step, we will look at recent work on computational models of expressive music performance, and will show some examples of the state of the art (including the result of a recent musical 'Turing test').

References
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Getting Closer to the Essence of Music: The Con Espressione Manifesto.
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FOREWORD

Since October 2009, the biannual international scientific conference on Cognitonics ("Kognitonika" in Slovenian) is a part of the international scientific multiconference "Information Society" (Slovenia, Ljubljana, Jozef Stefan Institute).

The first objective of cognitonics, or the science about the human being in the digital world, is to explicate the distortions in the perception of the world caused by the peculiarities of information society and globalization. The second, principal objective of cognitonics is to cope with these distortions in different fields by means of elaborating systemic solutions for compensating the negative implications of the kind for the personality and society, in particular, for creating cognitive-cultural preconditions of the harmonic development of the personality in the information society and knowledge society and for ensuring the successful development of national cultures and national languages.

Cognitonics formulates a new, large-scale goal for the software industry and Web science: to develop a new generation of culture-oriented computer programs and online courses intended for supporting and developing positively-oriented creativity, emotional intelligence (EI), communication culture, social responsibility, the appreciation of the roots of the national cultures, the awareness of the integrity of the cultural space in the information and knowledge society and for supporting and developing symbolic information processing and linguistic skills, associative and reasoning abilities of children, adolescents, and university students.

From the standpoint of educational practice, cognitonics proposes an answer to the following question: what precious ideas and images accumulated by the mankind, at what age, and in what a way are to be inscribed into the world's conceptual picture of a person in order to harmonize his/her intellectual and spiritually-coloured emotional development and to contribute to the successful development of national cultures and national languages?

Being a relatively young scientific discipline, cognitonics both is of high social significance just now and has great prospects of the kind. It is due to the fact that it suggests new, deep and constructive ideas, new angles of look and original, effective solutions to a number of socially significant problems emerged in adjacent fields, including education. The examples of such solutions are as follows.

During last decade, big international companies, fulfilling the casting of the specialists for vacant positions, have been paying a high attention to the level of EI of the pretenders. Cognitonics suggested a highly effective system of teaching methods aimed at supporting and developing EI of the learners. This system includes, in particular, a many-staged method of early children's socialization in information and knowledge society and a method of developing creativity, figurative thinking, the skill of integrating information from numerous dispersed sources.

Cognitonics enriched psychology by means of introducing the notion of Thought-Producing Self and of suggesting the most deep today (on the world level) model of developing conscious control in the childhood: control of thought, emotions, and actions.

Art cognitonics - one of the most developed branches of cognitonics - makes a considerable contribution to cultural studies and theory of up-bringing. It develops a complex method of using the works of art for

positive development of the child's, adolescent's, and university student's personality. Art cognitonics suggests a new paradigm of delivering lectures on art.

The goal of the conference is to combine the efforts of the scholars from numerous scientific fields and educators in order to establish a new synergy aimed at ensuring the harmonic, well-balanced development of the personality, national cultures, and national languages in the modern information society and knowledge society and, as a consequence, to compensate a number of broadly observed negative distortions.

The Program Committee has accepted for the conference 16 long papers and one short paper from 16 countries of three parts of the world: Asia (PR China, Lebanon, India, Japan, Pakistan), Europe (Croatia, Cyprus, Finland, Italy, Macedonia, Poland, Russia, Slovenia, Sweden, United Kingdom), and North America (USA).

The editors would like to thank the authors of the papers for their contributions and the members of the Program Committee for their precious comments ensuring the high quality of the accepted papers and making the reading as well the editing of this volume a rewarding activity.

Vladimir A. Fomichov, Olga S. Fomichova

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Terror: The lack of ethos and the initiation into a distorted mythology

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ABSTRACT

The goal of this study is to question the myth of martyrdom that is publicly attributed to suicide terrorism attacks, by proposing that the root of this phenomenon is on the contrary the lack of mythology and ethos. Located in a society without recognizable rituals, unable to relate stories depicted in their minds with an alien environment, suicide attackers are initiated to the rituals of gangs and internet communication channels. The demythologized world of economics, combined with the constant flow of news of destruction and violence replaces the sanctification of the local landscape, an organic synergy of mythology that is no longer functional [1]. The new myth lacks connotations and becomes their distorted metaphor.

General Terms
Security

Keywords
Ethos, mythology, violence.

1. INTRODUCTION

In Ancient Greece Ethos primarily had the meaning of the usual place of residence to be developed later to the meaning of habit, custom and finally to character. The dual meaning of the word reflects a cause and effect semantic relation. The landscape and residence give birth to the customs that create the character that is inseparably rooted in its source. Ethos as a synthesis of environmental and internal physiognomies activate maturity and character development [2]. Ethos vitalities the process of self-actualization [3]. However, the moral and spiritual traditions of modern individual are separated from his/her life and the void come to fill economics, violence, destruction and alienation. This disorientation is reinforced by the separation of the individual from his/her meaningful mythological landscape resulting in moral and social decay [4].

It is common in modern age for cultures to try to identify themselves in the void between broken traditions and a mosaic of contemporary perceptions and in this new environment, together with other vital rites, the rite of passage is lost, since it follows the changes of the community values [5]. In the new demythologized world, a distorted version of rite passage is being processed. All this is magnified in the case of migrants that in addition to the unclear picture of a dehumanized world, that ignores their values and customs, they have to deal with the separation from a natural landscape and their "unconscious identity".

Separated from their familiar mythological, cultural and religious norms, adolescents but also adults that have migrated away from their landscape find themselves separated from their ethos. They sometimes mentally return in the comforting past, dream of their symbols and supernatural forces, they nurture obligations to the dead and experience feelings of anxiety and anger [6].

The virtual internet cosmos resembles rituals in metaphor as they are transformed in a psychological atmosphere that is monitored by the communication channels that use this distorted metaphor for the recruitment of suicide attackers. The rules of propaganda find their perfect medium: an audio-visual space, the messages of which can be reproduced innumerable times "for the deliberate and systematic pursuit of an individual or group to control the attitude of other individuals or groups by using any possible means of communication and purposefully provoking a desired for the source behaviour of the target" [7]. The suicide attacker is not experiencing the hero myth liberated, ready to contribute to the achievements in a useful life. Dissociated from his/her identity, he/she is initiated in a distorted scene of an altar full of as many victims as possible.

2. THE HOMELAND OF OUR SYMBOLS

As infinite as its mother nature, our psyche appears in fragments of a mosaic, the archetypal symbols, full of connotations, that are depicted in our collective unconscious [8]. Narrated in our myths, our dreams, literature, religions, folklore, the story of our psyche, from its source to its developed form, is carried forward, tied on the familiar chariot of our initiatory images. The wisdom of our mother land functions through metaphors that embroider the patterns in the paths of which, we follow the steps of our course in the world. And as small parts of a living organism we reflect the form of our unity with all our past generations. Supported by our enlarged icon, as individuals we are called to save our collective body [9].

Our stories are not merely shaped as the landscape that is our home, they participate in the existence of the landscape, as the sphere of nature and humans are not separated [10].

2.1 Living at the end of an era

The time when the individual was embodied in the cosmic reality, when all phenomena were for him/her the comprehensible "thou", has become today the alien, inexplicable "it" [11]. Economics, violence, destruction consist an "it" that disintegrates humans from their tradition and this dissociation is a synonym to isolation.

The lack of the spiritual support of a consistent mythology, rite and symbolism create a vast void that is difficult to fill. The mythological symbols cannot be technically created, even if modern individual will keep trying to mentally touch them, even in his/her dreams. Sealed in the distant shadows of the past, the imprisoned cosmic energy of our existence can cause neurotic incidents, as we remain fixed to the frozen images of our infancy, unable to follow the passages to our adulthood [12].

When the conscious and the unconscious are separated the psychology of the individual reaches the line that distinguishes a healthy condition from psychological pathology [13].

2.2 Rites and structure

The complexity of structure defines the complexity of life form. This axiom reflects the importance of structure in the line of evolution. From the innate, stereotyped functions to the open to imprinting mechanisms of human psyche that is embroidered by the culture of society, structure imports the development of our organizations. Rituals are the chariots that carry the imprinting of society to the accessible psyche of adolescents [14]. Rites in process reflect and are attracted by the archetypal myths of our distant shadow.

Hunger for structure is not weaker than the hunger for stimuli and recognition. We strive to structure our time with ritualistic interplay, aiming at the acceptance of our local environment. A historical, cultural and personal path leads us from the formal rituals to the semi-ritualistic interaction to the individual games [15].

2.3 The loss of the rites of passage

We are born adults and we remain adolescents lost in adolescent societies. Since early childhood we have access to all information. All is shallow and nothing goes deeper than our skin. Facebook is our Prometheus and we are offered the fire of its knowledge that has been transformed to information, even before we go to school. We do not remember ourselves in the memory-realization evoking moment of the rites of passage, we do not eavesdrop the rhythm of our nature, we pass by our rebirth [16]. Lertzman notes that the moments of transitional development should be emphasized by rites, creating a map that will help the individual not to lose his/her way on life's journey [17]. Van Gennep distinguished between physiological and social puberty [18].

An individual thrives in the context of the community. The community today is visible only to an astronaut fondly staring at the planet earth from his distant spacecraft. And our virtual community is as impersonal as the wire that kindly brings it to us. Today we are not only lost between lost communities. We are lost between a dying era and an era that is not yet born.

2.4 Without this dialogue homeostasis is unbalanced

The deep inner energy, painted in picture syllables and words, narrate our myths while in the contemporary. Outside world another alphabet is being developed. A harmonic dialogue between these two worlds is essential for the healthy development of the individual. Citizens that find themselves in alien environments find themselves unable to keep the balance between their inner truths and the outside realities. The natural homeostasis of their mythology dysfunctions. In defense, the individual can only choose the extreme ends.

3. LOST IN AN ALIEN LANDSCAPE OF AN ALIEN TIME

The loss of the collective identity is not caused during the lifetime of one generation. It can survive in generations to come, especially if it is as deeply rooted as religion that is dissipated in all levels of life and is facing a liberal secular society. After six centuries of scientific progress Islam stopped taking into account the collective energy of the community. Gender equality and sexual liberalization are areas where Islam and Western societies can't meet half way. Also, the Sharia law will challenge and will be challenged by democracy [19]. In addition, western Democracy and secularism in Europe is not free of values either [20]. It derives from a collective identity as strong and as deeply rooted. These factors differ according to the citizen's education, age, gender and income but the contradictions are very much present in the general public.

Of a vulnerable planet population, the most vulnerable are the ones who no longer live in a familiar region and are divided between a world that is lost and a world that is alien. They grieve and the cultural norms around them cannot help them deal with this grief. The loss of the sense of identity causes reactions rooted deeply in the unconscious and the results have negative names: guilt, thoughts of death, morbid thoughts and feelings of worthlessness, psychological dysfunction, hallucinations [21]. Eisenbruch invented a cultural bereavement interview in order to diagnose cultural bereavement and find ways of healing it [22]. But most of the cases of individuals lost in an alien landscape do not heal, on the contrary they are nurtured by the hatred that is constantly communicated through the Mass Media, that quite often validate rites, in contemporary form [23].

3.1 Gang prestige

A group that is organized, has a name and members that share a common criminal record is often the first small community that offers to the lost adolescent all that he/she needs: recognition, sense of belonging, support, personal relations, prestige. The gangs that welcome the individual who seeks to reaffirm his/her identity are usually affiliated with terrorists and function as a first stage of initiation towards the passage that will lead the counter-hero to the threshold of mass murder.

3.2 Games towards destruction

As substitutes to intimacy, games humans play fill the structured time until the final act that could lead to a miracle or death, or/and death. The more disturbed an individual is the harder he/she plays the game [24]. He/she will follow the game to its last drop falling into the dark waters of death and destruction. And the game has an organic truth: emotions are regulated.

3.3 Blue Whale

A recent example of a game that demonstrated the power of initiation, through the regulation of the emotions of an adolescent hungry for structure and games is the internet suicide game Blue Whale, that was mainly active in Russia, Kazakhstan and Kyrgyzstan but had also operated in Europe and other parts of the world. The game would begin with an initiator/Blue Whale curator explaining to the youth that once in the game there is no way out. The curator would guide the youth each time to a destructive act. The game ends with the youth committing suicide.

4. A VIRTUAL THRESHOLD LEADING TO THE ALTAR

The more distinctly a culture expects something in the future the more precise is the rite of passage that is exercised. In the same respect, a rite with a visible goal to be achieved in the future will create the right atmosphere by applying the right scenario to a metaphor. The virtual cosmos of internet resembles the ritual in metaphor, in the context of what Heim defines as "psychic framework" [25]. And the wrong people, using the right communication channels for the wrong reasons, create a distorted metaphor for the lost adolescent. A subjective reality, seen through the right lenses: mythology, culture, history, fear. Because terrorism is a psychological warfare and it needs the right tools. The distorted rite of passage can succeed only if it targets the most deeply rooted myths, fears and beliefs of the individual. Only then it touches the sphere of the collective consciousness. The computer screen starts its ritual. Radical Islamic motifs, songs, video recordings. The language orates: murders are "executions", criminals are "martyrs". The semantics create the right bonds. A whole virtual community is ready to witness this glorified rite of passage. You are being recruited, you belong somewhere [26]. While the channel of communication is transformed to a rite of passage, leading to the initiation of a murderer the rest of the world is watching the news, helpless in the streets of the western cities that have lost their safety. Is there a way out of this mess?

The Organization for Security and Cooperation in Europe (OSCE) and the United Nations try to raise international awareness of this dangerous tool of initiation to mass murder and to advise recommendations of action. Also, the same channels of communication could work backwards, showing the way back to the source that is spreading the propaganda. Young citizens are not trained to be able to recognize and nurture their abilities. They remain, fixated fossils, depicting some patterns of the past that are inexplicable to them.

The failure to reinforce the resistance of the audience by educating the public rests at a great extend to the fact that the same means, internet, websites, are not used for the cultivation of the opposite attitude. The media use the vocabulary the propaganda uses, thus adopting the desired concepts of the source. "Whoever learns the language of a nation secures himself from its evil" (Arab Prover) [27].

4.1 On the altar, he is not alone

In the hero myth, the hero is unable to find connotations to his/her adult world, unless he/she has managed to extricate himself/herself from the psyche and gain autonomy. The hero is aware, he is spontaneous, he can experience intimacy. The hero transcends all generalized classifications, he/she stands opposite the programming of the past and criticizes it, he is ready to be open and intimate. He/she must be liberated and deepen into the meaning of his/her consciousness, in order to live a useful life, contribute to society and achieve the feeling of self-distinction.

But the hero myth greatly differs from the initiation rite. For the hero strives to achieve his/her goal, he/she spears no efforts, he/she participates with all his/her will to accomplish his/her dreams. While the lost adolescent, the inflexible novice, ready for initiation and programming, is giving up all ambition, all hope and all desire and submits to the ordeal. He/she must be ready to die. He/she must be ready to kill. He/she must be ready to place on that altar as many victims as possible. The initiator said so.

5. ACKNOWLEDGMENTS

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The Student-Self Oriented Learning Model as a Paradigm for Supporting and Developing Emotional Intelligence and Creativity

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ABSTRACT

Proceeding from broadly accepted role of emotional intelligence (EI) in professional and personal life, the paper suggests a new learning model (LM) called Student-Self Oriented LM (SSOL-model). It is defined as the model being beneficial for self-cognition and self-construction through the prism of the acquired knowledge and life experience. A successful implementation of the SSOL-model is shortly described. It is the system of emotional-imaginative teaching (the EIT-system), developed by the authors in the 1990s and expanded in the 2000s. This system is underpinned by the authors’ Theory of Dynamic Conceptual Mappings (the DCM-theory). The EIT-system includes an original method of developing figurative thinking and creativity at the lessons of second language (English for Russian children)., literature and poetry in English and Russian, symbolic language of painting, and communication culture. It is stated that this method may be used as an effective starting framework for education in knowledge society. The DCM-theory and the EIT-system became the starting point for developing the foundations of a new scientific discipline called cognitonics. The significance of its well developed branch - art cognitonics for helping the learners to answer the encountered moral questions is indicated.

General Terms
Human Factors, Languages, Theory

Keywords
Emotional intelligence, art cognitonics, creativity development, serendipity, intelligent tutoring system, early socialization of children, theory of dynamic conceptual mappings, system of emotional-imaginative teaching, cognitive engagement

1. INTRODUCTION

The progress of science and technology in the end of the 20th – the beginning of the 21st century, globalization process underpinned by the stormy expansion of the Internet have posed new demands to education. Likely, the most significant demand is the formation of the preconditions of mastering several professions during the life: for the most part of people, it is impossible in knowledge society (KS) to have only one profession during the life. The second most significant demand seems to be the ability to quickly generate new knowledge, the skill of integrating knowledge pieces obtained from numerous dispersed information sources, the ability of creative thinking while processing new knowledge and its connections with available knowledge.

The analysis of the literature shows that the scholars from many countries consider the problem of supporting and developing creativity of the learners as a highly acute problem. Until the 2000s, the majority of publications on creativity studied the peculiarities of intelligent activity of outstanding scientists, painters, writers, poets, etc. (see., e.g., [16]). This kind of creativity is often called in modern literature “big C creativity” (BCC), this term was introduced in [21].

However, the realities of information society transforming in many countries into KS caused the emergence of the term “little C creativity” (LCC) [2]. The birth of this term reflects the demand of everyday creative thinking. The two criteria of BCC are the originality and high significance for big groups of people. Creativity demonstrated by children usually is subjective, it is determined by their prior knowledge. An important characteristic of children’s creativity is imagination.

The realities of KS demand to support and develop LCC in order to increase the proportion of the specialists possessing BCC. But it is not obvious how to achieve this global goal. The paper [20] analyses the results of a large scale study carried out in USA and focused on the evolution of average level of intelligence and creativity during two decades, since the early 1990s. The diapason of participants was from young children in kindergartens to 12th grade students and adults. The results of the study showed a steady decline of creative thinking from 1990 to 2008 among inhabitants of USA. This decline is especially considerable in kindergarten through third grade. Besides, the results of the study indicated that young children "are tending to grow up more narrow-minded, less intellectually curious, and less open to new experience" [20, p. 1]. Taking this into account, Kim [20] expressed the opinion that it is necessary to encourage creative thinking in preschool or before.

Parallelly with the term “creativity”, the notion “emotional intelligence” (EI) belongs to the set of concepts most often used in scientific publications in the field of education. According to [1], EI is the other kind of smart. The studies carried out during two decades after the birth of this notion in 1995 [17] have shown

that EI is the crucial factor distinguishing star performers of various professional roles among all performers of these roles.
EI determines the manner of a person to manage behavior, deal with social complexities, and make decisions leading to positive results. EI is the unity of four core skills forming two primary competences: personal competence and social competence. According to [1], personal competence is composed by two skills: self-awareness and self-management. The first skill is the ability of a person to accurately perceive his/her emotions and stay away of them as they happen. self-management is the ability of a person to use awareness of his/her emotions for staying flexible and for positively directing his/her behaviour. Social competence is defined by Bradberry [1] as the ability of a person to understand other people's moods, behaviour, and motives for improving the quality of his /her relationships.
During the last two decades, the psychologists have discovered a huge role of well-developed EI in taking successful business decisions. That is why now the big companies throughout the world pay a very high attention to the state of EI while hiring, promoting, and increasing qualification of their employees [18].
Since early 1990s, we have been looking for more effective principles of teaching and learning in comparison with the broadly used ones. The accumulated theoretical and practical experience shows that modern education as a whole underestimates the significance of basing on EI for making easier for the students grasping central ideas of theoretical materials to be learned.
The structure of this paper is as follows. Section 2 introduces a learning model (LM) aimed at supporting and developing EI and creativity. Section 3 considers two components of an original conceptual learning environment for studying second language (English for young Russian children). Section 4 gives a very short information about the System of Emotional-Imaginative Teaching (the EIT-system), being a successful implementation of the suggested LM. Section 5 interprets the EIT-system as a balanced approach to combined development of EI, reasoning skills, and creativity, outlines the significance of this approach for education in KS. Section 6 indicates the importance of art cognitonics and the methods of achieving cognitive engagement at the lessons of art for improving emotional well-being of the learners. Section 7 shows the broad prospects of using the developed educational methods.

2. STUDENT-SELF ORIENTED LEARNING MODEL

We believe that modern education may find the ways to effectively deal with numerous open problems as a result of accepting a new LM taking into account the significance of EI in professional and personal life.

The broadly accepted student oriented LM determines the activities launched by the goal to discover the world: acquisition of information, information processing, knowledge construction. The resulting activities are constructing a new text and constructing a new sense. Then the achieved cognitive-emotional state is as follows: a student is well-educated but not intellectually and spiritually mature.

Discovering the world is based on a brand-new culture on the basis of digital opportunities and ideology. Its essence is to catch up with new technologies (but not to find one's way and incorporate it into modern reality as a new vision). It is underpinned by the curiosity and strong aspiration to discover the digital world, on the one hand, and by the desire to emulate the grown-ups and become as smart and powerful as the grown-ups or even much smarter and much more powerful.
The concept of Self is based upon our images of ourselves. The Self develops as it interacts with the most important of environmental influences. Through this social interaction the Self defines itself as a social being, which influences, and is influenced by others [22] .
Student-self oriented learning model (SSOL-model) is defined as the model being beneficial for self-cognition and self-construction through the prism of the acquired knowledge and life experience.
Natural language is the tool for constructing social reality [26]. The Self develops through the social interaction and co-creative work, because creative work suggests personal involvement and is underpinned with strong emotions (e.g., inspiration). The process is always emotionally coloured.
Under the framework of standard model, the process of knowledge acquisition often seems to the students to be first gloomy (no interest, no personal involvement), then pleasant and afterwards filled with never-ending delights. In case with the SSOL-model, the process of learning seems to the students to be pleasant and curious from the very beginning. Afterwards it is filled with never ending delight. The new model helps to exclude from the perception of educational process such characteristics as "gloomy". As a result, it arises the interaction with the environmental influences and causes cognitive engagement of the students.
This idea is intuitively clear to very many experienced lecturers. EI suggests Self, because Self is always emotionally coloured. One is never tired when the subject of the conversation (or lecture) touches his/her Self in a positive and curious way. You are never tired if we are speaking about you and want to know your life experience, you are in the centre of attention.

Strength of materials (or mechanics of materials) is known as one of most difficult disciplines for the university students – future engineers. However, 61 years ago one scientist found a thrilling way to introduce basic ideas of his discipline. This scientist is Charles Seim, he wrote the article "A Stress Analysis of a Strapless Evening Gown" in the year 1956. This article was published in the book "A Stress Analysis of a Strapless Evening Gown and Other Essays for a Scientific Age" (Robert A. Baker, 1969, 212 pages). The translation of this book under the title "The physicists are joking" became very popular in Russia in the 1970s.

The core of the proposed model consists of self-cognition, self-construction, and self-regulation of self-conscious emotions. Let's explicate these notions. Self-cognition is active transfiguration but not passive reflexion. Self is constructed through the interaction with the world (through the discovery of the world). The particular facets of the personality are improved as a result of new experience and as a result of processing the semantic trace left by a strong emotion caused by that new experience (it is the improvement of emotional experience). Self is always coloured by emotions. That is why this semantic trace deepens the emotional experience and, as a consequence, improves the emotional intelligence of the student [23] .
Firstly, the realization of this new model leads to Student – Digital World balanced partnership. It means the spiritual maturity and cultural level of the student become equal to the outstanding breakthrough in digital technologies. Secondly, the realization of the new model leads to the improvement of serendipity and turns information into serendipitous information

(unexpected but desirable). Serendipity is the ability to make pleasant and unexpected discoveries entirely by chance [19]. It leads to much higher level of socialization and to much higher level of responsibility.

To sum up, the suggested model determines the humanistic filling of education in the digital world. The new model suggests:

- a conceptual learning environment instead of a memorization-based one (it means making emotionally coloured the concepts to be learned and, as a consequence, making much easier grasping these concepts);
- the methods of achieving cognitive engagement of the students;
- a system of self-oriented questions in the process of knowledge acquisition;
- the methods of encouraging the students to discover the world aimed at self-cognition and self-construction;
- a method of teaching the students how to process serendipitous information.

3. EXAMPLES: A CONCEPTUAL LEARNING ENVIRONMENT FOR STUDYING SECOND LANGUAGE

Example 1. The experience shows that it is very difficult for five - six year old Russian students to understand why they should use in simple phrases different words "am", "is", "are" and how one should combine these words with the words "I", "you", "he", "she", "it", "we", "they". Our approach to this problem is as follows. Assume that a teacher knows that her young student Julia has a beautiful dress for theatre, a dress for kindergarten, and a dress for a bathroom. Julia agrees that she never doubts what dress to wear. Then the words "am", "is", "are" may be called the different dresses of the verb "to be" (children at this age have very vivid imagination). Besides, "am" may be called a dress for visiting the house where the word "I' lives, "are" - a dress for visiting the house where the words "you", "we", "they" live, and "is" - a dress for visiting the house where the words "he", "she", "it" live [5].

Example 2. In English grammar we have the Present Continuous Tense. We propose a new approach to explaining this Tense, the motive is that our many year experience has shown that this approach provides the possibility to minimize the number of errors. The peculiarity of this piece of grammar for Russian learners is the lack of similar tense in the grammar of Russian language. This tense is very important tense, because it reveals the emotional state of an interlocutor and emotionally colours the speech. It is possible to call it the Emotional Tense – the tense which reveals our emotions. For example, saying “Look, she is reading”, we attract somebody’s attention to something or somebody, because we are not indifferent to it. When we are talking and drinking in a cafe, we say: “I am readying an interesting book now”, it means that we are carried away by the book (at least we are not indifferent towards it if we mention it while talking and drinking). We use this tense speaking about the weather, about changing situation, irritation (“You are always wearing my slippers”), to express admiration (“What a nice hat you are wearing!”), personal arrangements, etc.

This tense shows emotionally coloured attitude towards something, it doesn’t just state the fact, doesn’t denote something which is true in general. The personal involvement is high, the state of minute is obvious (when somebody scoops a precious, significant, or just a particular minute out of the river of time). Due to the usage of the proposed approach at lessons of English as a second language (SL), the Russian students begin to employ this tense eagerly while speaking. It makes the lessons of English grammar socially coloured and more interesting for the students. Besides, this method reveals the essence of the English character.

4. THE SYSTEM OF EMOTIONAL-IMAGINATIVE TEACHING AS A SUCCESSFUL IMPLEMENTATION OF THE SSOL-MODEL

In early 1990s we came to the conclusion that educational potential of young learners (5-6-7 years old) is much higher then it was broadly accepted to believe. The key to more effective realization of this potential should be the ways of establishing a correspondence between a piece of material to be studied and a certain *bright* fragment of the learner’s conceptual picture of the world. We called such correspondences *dynamic conceptual mappings* [4]. That is why we started in early 1990s a study aimed at finding more effective ways of teaching and learning due to systemic basing on young learners’ emotional experience accumulated, in particular, during the breakfasts and lunches, the walks in gardens and parks and along a river, while visiting school and theatres, playing various games, sport activities, etc.

Step by step, we obtained several scientific and practical results of high social significance, and these results stood apart from the principal trends in education of the 1990s and early 2000s [15]. It was done due to our original *Theory of Dynamic Conceptual Mappings* (*the DCM-theory*) [4 - 7, 12] and our *System of Emotional-Imaginative Teaching* (*the EIT-system*), based on the DCM-theory. The EIT-system is aimed at systematic development of EI, reasoning skills, sound creativity, language skills, and communication culture at the lessons of language - mother tongue and SL, literature and poetry in two languages (on the example of Russian and English), symbolic languages of painting, sculpture, garden-park art, classic dance. We have accumulated the 27-year-long successful experience of using the EIT-system in extra education in Moscow, Russia. Many aspects of the EIT-system are described in our papers published in the proceedings of the First – Fourth international conferences on cognitonics (see, in particular, [11, 13, 14]) and in the papers [3 - 10, 12].

Let’s consider now such aspects of the EIT-system that concern basing on and developing EI and Self of the students.

Self is always creative, because it is a personal way of viewing the world, based on the world’s conceptual picture of the beholder and his/her estimation of the events.

Example. The famous Russian poet Boris Pasternak gives the picture of the early spring, writing:

- Is it only dirt you notice
- Does the thaw not catch your glance?

We ask the students what makes Pasternak think that the thaw is beautiful. The answers of young students (7 years old) are as follows:

- The thaw is like a herd of dapple grey deer basking in the spring sun;
- It is like a surface of the moon dotted with craters;
- A table served for breakfast with blue cups and black ice tea with a piece of Sun.

This approach helps young students to understand and penetrate the very essence of beautiful poetical lines written by the great poet. Besides, it expands their way of viewing the world, makes the surrounding world much more colourful, and their way of viewing it much more creative. This approach helps them also to understand painting (and modern painting, in particular).

An acute educational problem is early socialization of children in KS. Let's illustrate the approach of the EIT-system to solving this problem.

Example. In the fairy-tale "Snow White" the Queen asks: "Looking-glass on the wall who is fairest of us all?". The students are asked whether it is a question in fact or she is sure that she is beautiful. The young students give the following explanations:

- If she wants to know as a researcher, she wouldn't be furious.
- She does it every morning simultaneously with having coffee or brushing her hair. It means that she is sure in the answer.
- She is selfish and she doesn't think about the good for the others, even the King. That is why she can't be beautiful. May be attractive, like Cinderella's sisters, but not beautiful.
- When the hunter promises to take Snow White into the woods, he doesn't promise to kill her. But the Queen is sure that he does. It is a cognitive trap: she doesn't expect anybody to protest, to disagree, to disobey her. It is one more prove that she is selfish and doesn't listen to anyone. It will mislead her.
-

Our educational results obtained in the 1990s due to the EIT-system were retrospectively interpreted during last decade as a significant contribution to *developmental psychology* and to *positive movement in psychology* [3, 10].

5. A BALANCED APPROACH TO COMBINED DEVELOPMENT OF EMOTIONAL INTELLIGENCE, REASONING SKILLS, AND CREATIVITY

Showing the diminishment of creativity level in USA during two last decades, Kim [20] indicated the necessity of starting the development of creativity in kindergartens. An important role in achieving this goal is to be played by calm, free, friendly atmosphere at lessons.

We believe that now, as a whole, cognitive potential of five-seven year olds is underestimated. The analysis shows that the DCM-theory and the EIT-system may be interpreted as an effective theoretical framework for starting education in KS.

The principal advantages of our approach to creating the preconditions of effectively starting education in KS are as follows. Young learners (five-seven years old) get accustomed to the beauty expressed in various ways. It is well known that it is highly important not only for the painters, sculpturers, poets, dress designers but also for mathematicians, physicists, designers of ships and airplanes to have a well developed feeling of harmony, feeling of beauty. That is why our approach is of high value as a starting mechanism for education in KS.

As a consequence of getting a developed figurative reasoning (due to several kinds of intellectual games, intellectual competition), children get a developed creativity. Our approach to early creativity development excellently correlates with the opinion of

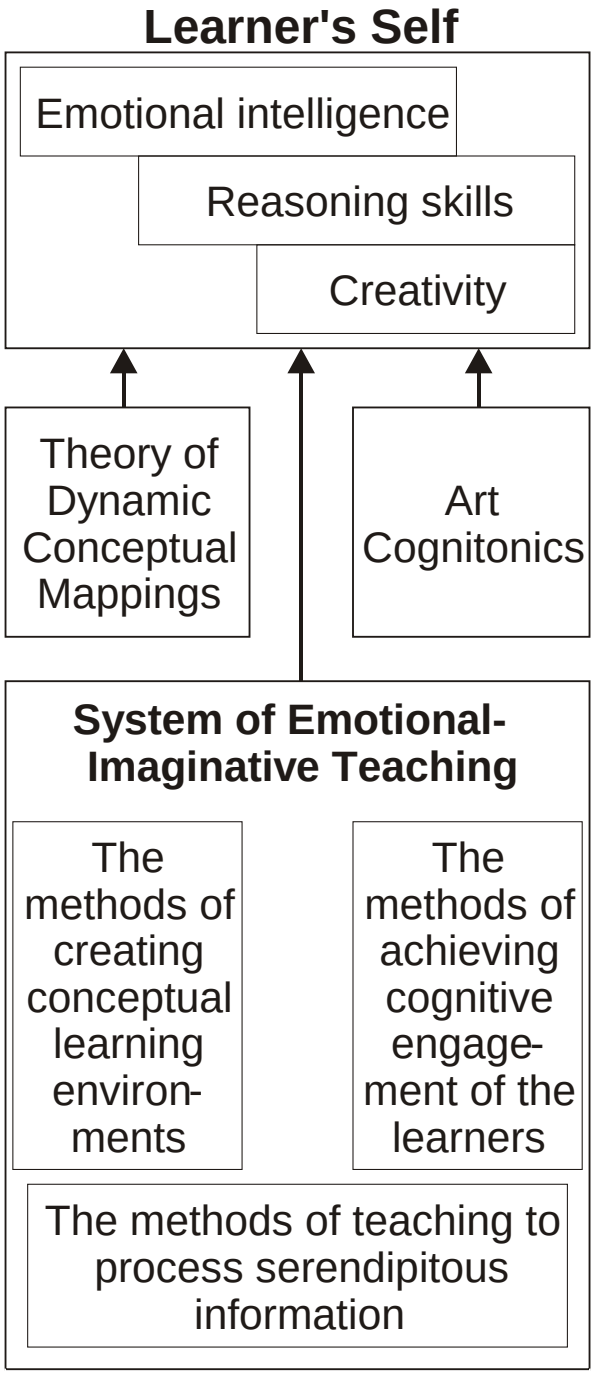

Figure 1. A scheme of a new look at combined development of emotional intelligence, reasoning skills, and creativity.

Piaget [24] about the significance of "reflective abstraction'. i.e., about the crucial role of processing and constructing knowledge in the course of mental actions performed on the perceived and imaginary objects and causing generation of new ideas.

As for early socialization, the young students became careful, tactful, thoughtful, they acquire the feeling of empathy and start appreciating the harmony in everything, including human relationships. It is important to do before the age of "teen", when children are ready to discuss and follow the social rules. In this case, beauty becomes the core of their system of values [3, 9, 10], and it helps a lot at the moment they are twelve and are going on thirteen – the transition age. Figure 1 illustrates a new look at combined development of EI, reasoning skills, and creativity.
The EIT-system includes the original methods of teaching to process serendipitous information. According to Kim [20], a very large scaled study carried out in USA showed that during last decade of the XXth century and first decade of the XXIst century children became less able to connect seemingly irrelevant things. That is why our methods of teaching how to process serendipitous information are very topical.

Well developed feeling of beauty creates for the student the preconditions of being successful at arts lessons. It is broadly accepted to believe that art education supports and develops creativity of young children and teenagers, develops emotional intelligence, improves emotional well-being, self-confidence, and life skills of the students [25].

A fundamental significance of our approach for education in KS is determined also by the formulation of the cognitive precondition of the situation when it is possible to start systematic acquaintance of children with the computer. It is the realization of the Thought-Producing Self of the child [7, 8, 12].

6. ART COGNITONICS AND COGNITIVE ENGAGEMENT AT ARTS LESSONS

Art cognitonics (AC) [11] is one of the principal branches of cognitonics, or the science about the human being in the digital world [8 - 11, 13, 14]. The DCM-theory and the EIT-system belong to the constructive core of cognitonics. AC aims at tuning the EI of the young children and adolescents with the help of well-known works of art. The goal is to create a bright semantic trace in the world's conceptual picture of the learner corresponding to an idea explaining or illustrating a moral value, communicative situation, a situation of making a decision, cognitive process itself, the process of self-cognition and consideration, the seething cocktail of emotions, a way of viewing the world around, etc.

AC establishes the links between the objects, situation, processes, views of a person (a beholder) and the work of art that becomes a metaphor or a vivid illustration (vivid mental representation) of something the beholder is considering about. That is why the consciousness of the beholder receives a considerable impulse to developing the ability of establishing diverse analogies and consequently to finding a new look at a situation [11].

Example. For enriching the colour of their canvases, the impressionists made use of what is know as division of colour and optical blending. E.g., to represent a green meadow, they put little tabs of blue and yellow on the canvas which are supposed to be combined to form green in the eye of the beholder – a far more intense green than one taken straight from the artist's palette. That is why it is impossible to understand the idea of a picture standing close to the canvas. We have to step aside and look at it from a certain distance to enjoy it and to have the desired effect.

The same situation we have in every-day life. "Multiple debs, reflections" prevent us from grasping the sense of what is happening. As in case with impressionists' canvases, we have to have a look at the situation from a distance, and distance in this case is equal to time distance. We need some time to better understand what has happened, and this will help us to cope with the situation (see another examples in [11]).

The paper [9] contains an algorithm of resisting emotional attacks from social networks by means of transforming the negative emotions into the positive ones. This algorithm is based on the idea described immediately above.
Cognitive engagement (*CE*) is defined in [10, 14] as the process of highly motivated intellectual activity when the interest towards the subject under discussion is so strong that the students loose the track of time and, as a result, they are not tired. The students' interest determines the level of involvement. The emotional response is very close to inspiration, because they are making their own discoveries, and their mental efforts are appreciated. It helps to provide a conceptual learning environment instead of a memorization based one and enhances the motivation. CE is created mainly by the components called in [10, 14] *focused attention*, *positive effect*, *aesthetics*, *endurance*, *novelty*, *motivation*.

7. BROAD PROSPECTS OF USING THE DEVELOPED EDUCATIONAL METHODS

The EIT-system has been mainly realized at lessons of English as a SL for Russian-speaking children and at the lessons of poetry and literature in English, at lessons devoted to explaining the symbolic language of painting, the culture of communication, and the symbolic language of classical dance. These kinds of lessons are considered in numerous countries as highly appropriate for young children and teenagers. The carefully selected collection of texts used at lessons is provided by a number of classical, world-known fairy-tales and novels, in particular, "Snow White", "Cinderella", "Sleeping Beauty", "Pinocchio", "Pollyanna", "The Life and Adventures of Santa Claus" by L. Frank Baum, "Alice in Wonder Land" by Lewis Carroll, "The Wind in the Willows" by Kenneth Grahame, "The Hundred and One Dalmatians" by Dodie Smith, etc. That is why the EIT-system may be used (after a certain adaptation requiring a small time) in English-speaking countries and in numerous countries where the English language is learned as a SL.

8. CONCLUSION

We believe that the proposed SSOL-model possess the properties enabling its usage as a paradigm for education in KS. The focus on the student's Self at the lessons means that the lessons are emotionally coloured, and this very much contributes to the success of the learning process.

Now there is at least one successful implementation of the SSOL-model, and it is our EIT-system, tested during 27 years in Russia. The principal distinguishing features of the EIT-system are an effective, many-staged method of sustaining and developing creativity in young children and adolescents, supporting and developing EI, basing on EI for making much easier the grasping of the materials to be studied.

Our numerous publications in English describe many aspects of the EIT-system. The scholars from various countries do have the

possibility to develop their original implementations of the SSOL-model with respect to their mother tongue and national culture.

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The Methods of Cognitonics as the Basis for Designing Intelligent Tutoring Systems Developing Emotional Intelligence of the Learners

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ABSTRACT
The constructive core of cognitonics, or the science about the human being in the digital world, includes the system of the methods of emotional-imaginative teaching (the EIT-system). This system is aimed at systematic development of emotional intelligence (personal competence and social competence), reasoning skills, sound creativity, language skills, and communication culture at the lessons of language (mother tongue and second language), literature and poetry in two languages (on the example of Russian and English), symbolic languages of painting, sculpture, garden-park art, classic dance. The goal of this paper is revealing to the designers of intelligent tutoring systems (ITSs) the broad prospects of constructing a new generation of ITSs opened by the EIT-system. The principal peculiarities of the discussed new generation of ITSs are to be: (a) taking into account emotional intelligence of children as the basis for designing ITSs; (b) as a consequence, making much easier for children and adolescents the grasping of the pieces of theoretical materials to be learned; (c) for the majority of the systems belonging to this new class, contributing to early socialization of children.

General Terms
Design, Human Factors, Languages, Theory

Keywords
Emotional intelligence, social competence, cognitonics, creativity development, intelligent tutoring system, early socialization of children, theory of dynamic conceptual mappings, system of emotional-imaginative teaching, cognitive engagement

1. INTRODUCTION

During last decade, information society in many countries has been transforming into knowledge society (KS), or smart society. Its main distinguished features are effective knowledge processing, generation of new knowledge, establishing the links between remote knowledge fields, the possession by the specialists in various spheres of creating thinking and the ability of integrating information from numerous dispersed sources.

One of the terms being most popular in the sphere of education is smart learning (SmL). At the first sight, it may seem that SmL is a new stage of education satisfying the demands of KS. However, in fact this term is interpreted in the scientific literature much more narrowly: as learning with broad use of mobile devices: tablet computers, androids, etc. This definition reflects the focus on technical means of learning. There are reasons to believe that the dominant part of the scholars don’t notice the fundamental problem of perfecting, improving the principles of teaching and learning.

We suggest here a much broader definition of SmL, taking into account the significance of basing educational methods on emotional intelligence (EI) and of supporting and developing EI of the learners (see [11]). We believe that SmL is a collection of theoretical ideas and practical methods of teaching and learning developed by smart specialists in education theory, information and communication technologies, mathematics, humanities, arts, and many adjacent fields for creating cognitive-cultural and technical preconditions of up-bringing young generation being personally and professionally successful in smart society.

The analysis of scientific literature shows that a high proportion of elementary, middle, and high school students encounter considerable difficulties as concerns grasping the main ideas of the pieces of theory to be studied. Let’s consider the main social consequences of this situation.

1. The US Public Health Service prepared in the year 2000 a report on children’s mental health [20]. According to this report, approximately one fifth of children and adolescents experienced problems showing their need for mental health services. One of the main reasons for this need is the intellectual and emotional obstacles on the way of successful learning faced by the school students in conditions of too short time for relaxation and refreshing the brain as a consequence of many-hour interaction with the Internet, in particular, with computer games.
2. Rather often, the breaks of discipline at lessons encountered by the students in the process of grasping the materials to be learned cause the growth of aggressiveness towards the teachers and the classmates with higher grades. The breaks of discipline negatively influence the total learning result of the class. Besides, these breaks and the aggressiveness of some students towards the teacher prevent a considerable part of gifted persons with the abilities of good educator from choosing the profession of teacher for himself/herself.

3. The negative consequences of students' aggressive attitude towards their classmates may be very severe (posting in social networks false information about a classmate, false erotic pictures, etc.) and even tragic in cases of cyber bullying [21].
4. In many cases, the attacks of young hackers against socially important technical systems may be explained as a result of expressing the aggressiveness. The intelligent power of applied computer systems is being permanently increased. That is why the negative consequences of the hackers' attacks promise to be increasing too. Taking this dangerous tendency into account, and, besides, the aggressiveness of some students towards their classmates and the teachers, a socially very significant task is to find the ways of making easier for the students the grasping of the pieces of theory to be learned (there are reasons to believe that, very often, the experience of success in the process of learning eliminates the student's aggressiveness).
5. In KS, many countries encounter the problem of insufficiently developed social lifts. The following scientific fact says about the high significance of solving this problem: in different strata of people living in one country, various gifts are distributed approximately in the same way. That is why it would be important to have the situation when the adolescents from different social-economic strata possessing the gifts being crucial for a certain socially significant profession (a medicine, a lawyer, etc.) would enter a university for mastering this profession. Unfortunately, in many countries the real situation is quite opposite. E.g., it applies to UK. As it is shown in [16], the Organisation for Economic Co-operation and Development (OECD) describes the United Kingdom's troubling social mobility problems: more than 50% of youngsters will grow up to have the same salary as their father [18]. The Sutton Trust[19] shows that 53% of the UK's most influential people were independently educated, including 24% of university vice-chancellors, 32% of Members of Parliament, 51% of medical consultants, 54% of top journalists, 70% of High Court judges when only 7% of the UK population are.

During last twenty years, the intelligent tutoring systems (ITSs) have been broadly used throughout the world for helping children and adolescents to grasp theoretical materials. The big subclasses of ITSs help to study (a) second language (SL), (b) mathematics. However, one has been able to find in the literature only separate examples of the systems oriented at developing the personality of the learners. In particular, the interactive multimedia courseware package CITRA is a tool for moral values education using traditional Malay oral narratives [17]. Two collaborative videogames described in [1, 2] not only develop mathematical and language skills of the eight – ten year old children in Mexico but also support and develop in Mexican children the skill of effective collaboration in a team, hence develop social competence.

Our paper [11] introduces a new learning model (LM) called Student-Self Oriented LM (SSOL-model). Its principal distinguished feature is basing on EI and developing EI of the learners. We believe that the SSOL-model may be interpreted as a paradigm for education in KS, i.e., as a paradigm of SmL in the expanded sense of this term. The SSOL-model has at least one successful implementation - the System of Emotional-Imaginative Teaching (the EIT-system), it belongs to the constructive core of cognitonics, or the science about the human being in the digital world (see [7-10]).

The aim of this paper is revealing to the designers of ITSs the broad prospects of constructing a new generation of ITSs opened by cognitonics. More exactly, these prospects are opened by the EIT-system [3-10, 12-15] (see also next section). The principal peculiarities of the discussed new generation of ITSs are to be as follows: (a) taking into account EI of children as the basis for designing ITSs; (b) as a consequence, making much easier for children and adolescents the grasping of the pieces of theoretical materials to be learned; (c) for the majority of the systems belonging to this new class, contributing to early socialization of children.

The structure of this paper is as follows. Section 2 sets forth a rationale for creating the foundations of cognitonics. Section 3 sets forth a script (a collection of instructions) of designing an ITS contributing to the socialization of young children. The system is based on using the world known fairy-tale "Sleeping Beauty". Section 4 indicates the significance of using in the ITSs the vocabulary and images extracted from young children's speech. Section 5 outlines the possible directions of future research.

2. THE RATIONALE FOR FOUNDING A NEW SCIENTIFIC DISCIPLINE – COGNITONICS

In early 1990s we started a study aimed at finding more effective ways of teaching and learning due to systemic basing on young learners' personal experience, including emotional experience accumulated, in particular, during the breakfasts and lunches, the walks in gardens and parks and along a river, while visiting school and theatres, playing various games, sport activities, etc.

Our main motive was the feeling that educational potential of young learners (5 - 7 years old) is much higher than it was broadly accepted to believe. As a key to more effective realization of this potential, we saw the ways of establishing a correspondence between a piece of material to be studied and a certain fragment of the learner's conceptual picture of the world. We called such correspondences *dynamic conceptual mappings* [4].

In three - four years, we obtained several scientific and practical results of high social significance, and these results stood apart from the principal trends in education of the 1990s and early 2000s. It was done due to our original *Theory of Dynamic Conceptual Mappings* (*the DCM-theory*) [4-6, 14, 15] and due to the EIT-system, based on the DCM-theory.

The EIT-system is composed by (a) several complex methods combing teaching/learning with the development of the student's personality and (b) an original program of extra-scholastic humanitarian education covering 12 years of continuous studies, where the starting age is five – six – seven years. The system is aimed at systematic development of EI (personal competence and social competence), reasoning skills, sound creativity, language skills, and communication culture at the lessons of language (mother tongue and SL), literature and poetry in two languages (on the example of Russian and English), symbolic languages of painting, sculpture, garden-park art, classic dance. We do have accumulated the 27-year-long successful experience of using the EIT-system in extra-scholastic education in Moscow, Russia [3-6, 8, 12-15].

We mean here, first of all, the following four scientific and educational results that stood apart from the principal trends in education of the 1990s and early 2000s:

1. An original and effective method of supporting and developing figurative thinking of five-six-seven year old children was proposed. Its essence is teaching young students to decode and to compose metaphors. This method may be interpreted as the foundation of an original, many-staged method of developing creative thinking of young children and adolescents and realizing their Thought-Producing Self (the same mechanism does function in case of both foreign language and mother tongue) [3, 6, 7, 15].
2. In the 1990s and 2000s, according to the generally accepted methods of learning SL by young children (five - seven year old), young learners were taught short poems, songs, and the usage of fixed phrases in standard communication situations. They didn't generate speech from lexical units. Our original approach based on EI of children enabled us to teach young children to read complex texts in English (fairy-tales) with understanding and to generate speech while discussing various situations. The speech of children demonstrated the command of constructing sentences in SL (English) in Present Simple and Past Simple tenses and building questions in Present Simple [4-6, 12-14].
3. A discovery: the consciousness of five-six-year old children demands a very rich language for representing the emotions from the pictures of nature [6, 8].
4. One of the most precious distinguishing features of the EIT-system is no problem with discipline at lessons. This applies both to the lessons with five-six-year old and seventeen-year old students. This phenomenon is a consequence of highest cognitive engagement at lessons due to the basing on EI of the learners [10].

In early 2000s, we realized that it is possible and desirable to do much more for the development of the child's personality (reasoning skills and EI, including social competence) than it is broadly accepted to do throughout the world. This conclusion was drawn in the context of numerous observed negative implications of the Internet's stormy progress and the globalization process underpinned by it.

After thoroughly thinking over this situation, we came to the conclusion that it is necessary to create a new scientific discipline for combining the efforts of the scholars throughout the world for compensating negative implications for the personality development of the Internet's stormy expansion and for creating cognitive-cultural preconditions of successful personality's development. We suggested to call this new discipline "cognitonics" [7]. Later we interpreted cognitonics as the science about the human being in the digital world.

From the standpoint of educational practice, cognitonics proposes an answer to the following question: what precious ideas and images accumulated by the mankind, at what age, and in what a way are to be inscribed into the world's conceptual picture of a person in order to harmonize his/her intellectual and spiritually-coloured emotional development and to contribute to the successful development of national cultures and national languages?

Cognitonics formulates a new, large-scale goal for the software industry and Web science: to develop a new generation of culture-oriented computer programs and online courses (in the collaboration with educators, linguists, art historians, psychologists) - the computer programs and online courses intended for supporting and developing positively-oriented creativity, EI, the appreciation of the roots of the national cultures, the awareness of the integrity of the cultural space in the information and smart society, and for supporting and developing symbolic information processing and linguistic skills, associative and reasoning abilities of children and university students. In October 2009, 2011, 2013, 2015, four international scientific conferences on cognitonics (Cognit-2009 – Cognit-2015) took place under the framework of the international scientific multi-conferences "Information Society" (IS-2009, IS-2011, IS-2013, and IS-2015, Slovenia, Ljubljana, Jozef Stefan Institute). The access to the proceedings of the conferences Cognit-2009 – Cognit-2015 is open, see https://is.ijs.si/proceedings.php. A part of cognitonics-based scientific and practical results is presented in the Second Edition of the International Encyclopedia of Social and Behavioral Studies [3].

3. A SCRIPT OF AN INTELLIGENT TUTORING SYSTEM CONTRIBUTING TO EARLY SOCIALIZATION OF THE LEARNERS

The analysis shows that the methods of cognitonics open broad prospects for the development of a new generation of ITSs. Their principal distinguished features should be orientation at culture, at developing EI of the learners.

New, culture-oriented scripts under the framework of cognitonics may be divided into three main groups.

Group 1: Socialization-oriented scripts.

Group 2. Improvement of the language (mother tongue and SL) as a tool of thinking in order to oppose the phenomenon of poor language and, as a consequence, poor cognitive process, that is, an underdeveloped tool of constructing social reality.

Group 3. The scripts aimed at demonstrating the possibilities of expressing the same idea by means of different languages, for instance, by means of natural language and the language of painting. The goal is the development of the ability to see something extraordinary in an ordinary thing or situation, to find a new look at an object of interest and to make a discovery, to develop the ability of processing serendipitous information.

Let's consider a script of a culture-oriented ITS based on the idea of social conventions. The literary source of this script is the fairy-tale "Sleeping Beauty". The script is associated with two aims. The first aim is to explain how it is possible for the student to escape in the life the meeting with the 13th fairy. It means not to make a person act in a provocative way. The reason is that such kind of behaviour would make harm both to an initiator and to a person. In case of the considered fairy-tale, a fairy turned into a witch, because she could not cope with emotions and gave way to hatred. The second aim is to develop the Ecological Self of the student.

Instruction 1 for the designers.

Construct a dwelling (a hut, a castle, a palace, a cottage, etc.) appropriate for a King and a Queen and for the 13th fairy.

Put the dwelling into appropriate surrounding (garden, park, edge of the forest, etc.).

Choose the interior revealing the characters of the story.

Choose the time of the day, the season. Dress the characters up and choose some occupations for them.

Instruction 2.

According to the logic of Instruction 1, create a big album containing the photos of the characters in different situations. One part of the photos adequately illustrates the life of the personages.

Another part falsely illustrates the actions of the personages (in such cases an action or situation contradicts the properties of the character).

Motivate the students to select the photos for the album of each character. The aim of this subsystem of the ITS is to develop the ability of the student to correctly associate the actions of a character with the essence of this character.

Instruction 3.

Create a subsystem motivating students to construct a dynamic picture showing the extensive preparations in the Kingdom for the Christening Party.

Step 1: The construction of a picture showing all kinds of the living beings (in particular, the carpenter, the animals, and the birds) in the Royal Park.

Step 2: Ask the student to select the living beings for active preparation for the Christening Party.

Step 3: For each considered living being, select one of four-five actions.

Example. It is possible that for the birds a student will select the action "sing the songs".

Instruction 4.

In general terms, the task is to realize the step explicating the essence of social responsibility. The details of this step are as follows.

The King should be sure that every guest has received the invitation and has accepted the invitation. In order to be sure, the King is to receive a confirmation from every guest that the guest has received and has accepted the invitation. The violation of the rule leads to misunderstanding. In our case, the 13th fairy didn't receive the invitation, though the King had sent an invitation, and regarded the lack of invitation as a mark of disrespect on his part.

Instruction 5. Explain to children how the violation of etiquette will mislead them. Preventing a violation of etiquette means not to make a person act in a provocative way. The reason is that such kind of behaviour would make harm both to an initiator and to a person. In case of the considered fairy-tale, the fairy turned into a witch, because she could not cope with emotions and gave way to hatred. Consider possible examples.

Example 1. One meets a classmate but doesn't greet him/her. It may lead to offense.

Example 2. One may take a pencil of a classmate without the permission. The classmate may become cross with him/her.

Example 3. One may eat a cake without expressing his/her gratitude to a classmate. The classmate may think that he/she is not polite.

Example 4. When he/she does something wrong and doesn't apologize, then the classmate may think that he/she is rude with him/her.

Example 5. When a classmate brings a mouse, though he/she knows that the girl is afraid of mice, it means that he/she is selfish, because he/she doesn't take into account the peculiarities of the girl.

Instruction 6. The essence of this step is to construct the chains revealing the behaviour of the character of the book who is thinking and acting in terms of public good.

Example 1. The 12th fairy was attentive and ready to help, she made up the situation and tried to make not only the princess but the whole kingdom fall asleep. The motive of the fairy was not to make the princess lonely when she woke.

Example 2. The people of the kingdom were ready to help, and they brought their spindles to the square to make a fire. They were ready to sacrifice the necessary things and not to have new clothes, because they would not have the spindles to spin.

Instruction 7.

Preliminary stage. Ask five-six-seven-year-old children being acquainted with the fairytale "Sleeping Beauty" to describe the preparations in the Kingdom to the birth of a princess. Construct a collection containing all proposed creatures and their actions of the kind.

Main stage. Ask children to select the creatures and their preparations to the birth of a princess.

4. CHILDREN'S SPEECH AS A SOURCE OF VOCABULARY AND IMAGES FOR THE DESIGNERS OF TUTORING SYSTEMS

The inner world's picture of young children is very different from the picture of adults. Young children have a vivid imagination, and they easily go from the reality into the world of fantasy. That is why it is very important for the designers of ITSs to use in the computer systems the vocabulary and images extracted from children's examples collected at the preliminary stage of developing a system.

We have collected, in particular, the following examples given by children:

Preparation of gifts

(1) The gardener prepares fountains and flower beds; (2) the carpenter makes the cradle shaped like (a) a swan, (b) dolphin which always rescues, (c) see-shell in which the princess will be like a pearl, (d) a flower which opens its petals at dawn; (3) the beasts prepare (a) milk taken from forest plants, (b) pick up glow-worms; the birds sing songs; the kittens are purring a lullaby; the baby-squirrels have picked up nuts; the mother-dogs are knitting mittens; the mother-squirrels are sewing the dresses for the dolls of the princess.

Preparation in the palace

(1) The birds are bringing in the beaks the field flowers; (2) the chipmunks are bringing the baskets with drops of dew in order to water field flowers; (3) in the evening the star peeps through the curtain to light the room; (4) the little angel descends in order to fill the nursery with kind dreams and to kiss the princess good night.

5. POSSIBLE DIRECTIONS OF FUTURE STUDIES

The considered script allows us to get an initial impression about the possibilities of using the methods of emotional-imaginative teaching as the basis for developing ITSs of a new generation. This script may be compared with a single piece of a big, complicated mosaic picture to be created. The EIT-system provides original effective methods for designing ITSs solving the following tasks:

- developing imagination, creativity by means of teaching to decode metaphors and invent metaphors;
- contributing to early socialization of the learners on the example of etiquette as a social agreement (etiquette makes the behaviour of the humans predictable, it is very important for understanding

each other and in order not to heart the feelings of people);
- making thrilling the mastering of SL grammar (on the example of English);
- teaching the learners to integrate information dispersed in various sources and to establish time-causal relationships between the extracted facts;
- revealing cross-culture differences for avoiding misunderstanding during communication.

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To Fear or Not to Fear the TOR Communication System

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ABSTRACT
Whenever a user tries communicating with another recipient on the Internet, vibrant information is sent over different networks until the information is intercepted or normally reaches the recipient. Precarious information crisscrossing networks is usually encrypted. In order to conceal the sender's identity, different implementations have proven successful - one of which is the invention of anonymous communication systems. There are many anonymous communication systems developed but, the Onion Router (Tor) is the greatest organized anonymous communication system, which offers online anonymity and privacy. There are a vast number of obstacles in security that have to be considered when deploying Tor. This paper thoroughly investigates and presents these security issues in Tor.

Categories and Subject Descriptors
C.2: [Computer-Communication Networks]: Network Architecture and Design, Network Operations

General Terms
Security

Keywords
Tor, onion routing, design and non-design objectives, and security issues.

1. INTRODUCTION

Tor is a network of implicit channels that enables a user to connect to a manager with heightened confidentiality via the Internet [1]. Remote hosts can be introduced by using Tor from learning a user's location (IP address). The basic working of Tor is that it routes the outgoing connections from a client's computer via "onion routers". "To create a confidential structure - passageway - with Tor, the software of the user/client increasingly makes a circuit of networks, which are encrypted on the net through the servers. The circuit, which is created, is then lengthened through one jump at a time and each server only knows from where the data is coming from and to whom will it be transferred to. None of the servers ever knows the complete path. For each jump, the client uses a set of encryption keys, which are separate, so that each jump should not be traced as these links are passing through [2]. When a circuit is constructed, different forms of data can be traded and different types of software (applications) can be utilized over the Tor network [3].The use of traffic inquiry - to link the networks destination and source - cannot be done because in the circuit each server cannot see more than one hop, (neither by an adversary nor a malicious server).

To help protect everyday confidentiality by letting on the user to be anonymous, Tor acts as an excellent system for those who want to make outbound links that prohibit the use of certain protocols. Tor is one of the best services which provide anonymity online [4]. It routes data, packed into equally sized frames, along a (cryptographically) secured path called onion routers. The routing follows the principles of CSN (circuit-switched networks), from where the terminology is provided to Tor. Each router only knows the predecessor and successor. This is achieved by limiting the perspective of onion routers on a circuit, which in return gives a high level of anonymity. In every jump a "coating" of cryptography is removed or added which depends on the direction of flow. A client, who wants to connect to a remote server anonymously, uses Tor as a proxy. All the connections and messages go through Tor first, then to the server. Thus, the client is hidden by the server because the server believes that the connection is coming from Tor. The Tor system is made up of a network of relays. Each relay is a volunteer machine. The client picks three relays from the network to form a circuit: the entry node, the middle node, and the exit node. The client establishes a connection with the entry node, then using the entry node as a proxy, extends that connection to the middle node, and finally, extends the same connection to the exit node**.** Currently, there are more than 500, 000 users in Tor and more than 6,000 relay nodes [5].

At first sight, the anonymity of navigating through the Internet may be used mainly by people with malicious intentions. However, the analysis shows that the real situation is much more complex.

The relative technical easiness of recording the navigation routes of numerous Internet users creates the preconditions of getting to know and accumulating their interests of various kinds. This information may be used by malicious people (probably, acting with the help of intelligent robots) for inventing the ways of making attractive for certain categories of Internet users some actions (purchases, donations, etc.) resulting in a considerable damage for these users.

That is why the use of anonymous communication systems like TOR protects very many Internet users from the attacks of people with malicious intentions. As a consequence, the usage of TOR by normal people contributes to their harmonic existence in knowledge society, and this corresponds quite well to basic objectives of cognitonics [6].

The premise of anonymity provided by Tor relies on the three relays used by the client to be non-colluding. Moreover, the

identity of the three relays used by a client to connect to a server is hidden. If an adversary could somehow identify the three relays used by a client, this breaks some of the anonymity of the client as it reveals which three Tor relays the client chose, as after the Tor relays in the circuit have been identified, and the identity of the client is also leaked. Thus, de-anonymizing the three relays used by a client is the first step towards identifying which client is communicating with which server. This has a colossal tremble on Tor as the anonymity of any Tor user can be compromised [7].

This paper takes a deeper look at Tor, and highlights its security and other open issues. The remainder of the paper is organized as follows. Section 2 provides a background of Tor. The design and non-design goals are presented in section 3. Sections 4 and 5 provide the research and open issues in TOR. And section 6 concludes the paper.

2. BACKGROUND

The Onion Router (Tor), as depicted in Figure 1, is a circuit-based, low latency, overlay network which provides anonymity and privacy. It is the most deployed/available anonymous communication system in present era. Its users are in hundreds of thousands, e.g. military, intelligence agencies, journalists etc. and in more than 75 countries with over 6000, relays to provide online anonymity and privacy. The idea inside Tor is of "onion routing". David Goldschlag, Paul Syverson , Michael Reed developed it in the mid-1990s. It is funded by the U.S. Naval Research Laboratory.

For anonymous communication anonymity over computer/internet is provided by Onion Routing (OR). Messages are encrypted and then forwarded to nodes known as onion routers. A header is peeled and the instructions for routing to next router are performed. This process occurs in repetition. No initial node or intermediate nodes know where the message is being passed send or received [8]. There are three nodes/relays in Tor as depicted in Figure 1: entry node, middle node, and exit node. As a communication system, there are four basic components in Tor: sender, receiver, onion routers and directory servers.

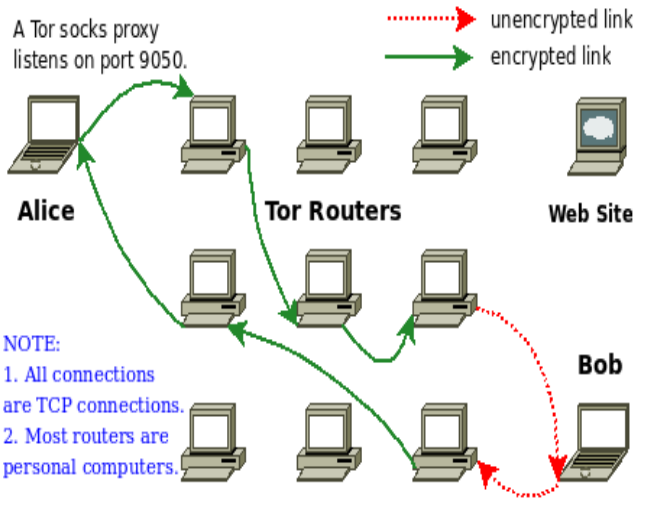

Figure 1.TheTor architecture [9].

3. DESIGN GOALS/NON-GOALS OF TOR

The following are the design goals/non-goals of Tor:

Goals(Table 1):Anonymous systems are designed for low–latency. Tor defends against attackers from connecting as communication companions and its users from connecting to multiple communications.

Table 1: Design goals of Tor

Design	Developments
Open/simple	Tor is open source; simple protocol; with security parameters paving the way for its defense
Accessibility on different platforms	Tor is easily accessible on different platforms (e.g., Windows, Linux, Mac, etc.)
Design is deployed	Tor is deployed in the real world and volunteers are willingly making it possible
Flexibility	Tor's flexible and well-identified protocol makes it a hotspot for future research

Non-goals(Table 2): Tor's deployable and simple design left unsolved questions, which need to be addressed.

Table 2: Non-design goals of Tor

Work required in its design	
Protocol	As like Privoxy or Anonymizer, Tor does not provide protocol normalization
End-to-end attacks	Traffic confirmation or end-to-end timing attack requires attention in the Tor community
Steganography	Steganography is not concealed in a Tor network
No peer-to-peer	A Tor network is non-peer-to-peer

4. RESEARCH AREAS IN TOR

The current areas of research in TOR include:

Security: A traffic confirmation attack [10] is possible when an attacker is controlling the relays on both ends of a Tor circuit and comparing traffic timing, volume, and other characteristics. This makes it possible to locate that the two relays are in on the same circuit. If the first (entry guard)and last relays (exit node) know the direction of the destination and the source in the circuit, then together they can de-anonymize it, which demolishes the security of the data as well as the IP of the server and the destination. More work need to be done to avoid these types of attacks so that security is guaranteed.

Confidentiality: Overall, Tor networks are susceptible to numerous attacks. A path selection attack is an example of one such broad category of attacks. In Tor, the initiators choose the nodes on the circuit so the last nodes cannot be combined. The length of the circuit is three by default. Because of this, latency is

kept to a minimum. This opens the door for connected attacks, which include congestion of the genuine Onion Routers to a point where they cannot require a fresh circuit to be built.

The Tor last nodes pose a risk to confidentiality, since anybody can offer to route a Tor node. An assailant would have full admittance of data which is being routed if the assailant occurs to route the last node in a circuit. While in MITM (Man in the middle attack) [11] the exit nodes can similarly transmit attack by mentioning back a false text for the site the originator wants to join.

Authentication: Each onion router keeps Transport Layer Security (TLS) connection with all other onion routers. Tor uses TLS cipher suites with ephemeral keys. All TLS connections use short-term ephemeral keys. Short-term ephemeral keys are Onion encryption keys. Every onion router issues a router self-key. Moreover, directory servers keep a long term, authority self-key (stored offline) and a medium term authority signing key (3–12 months). The Onion Proxy does not have any identity keys. Tor uses a number of nodes located around the Internet to protect users' privacy.

It is important that originator can guarantee that his/her communications with the many nodes is authenticated: if a malicious man-in-the-middle attack functioned or cooperated with one node to connect to the first node, then authentication is lost.

Performance: Many works have been done to improve the performance of Tor [12-13]. This led to improving the performance of Tor and moving it from a high latency to a low latency network. However, due to the constant processing of cryptographic modules, Tor is slow in performing these actions. For the improvement of Tor, more work needs to be done.

Anonymity: Tor is free of cost software for enabling online anonymity. This feature makes it viable for users to search and surf the Internet, making them untraceable (activity and location) by government agencies, corporations, or anyone else. However, more work is needed for improving anonymity (online) and defending against attacks.

Censorship resistance: Censorship circumvention systems such as Tor are highly vulnerable to network-level filtering. Because the traffic generated by these systems is disjoint from normal network traffic, it is easy to recognize and block; and once the censors identify network servers (e.g., Tor bridges) assisting in circumvention, they can locate all of their users. Due to this, Skype-morph [14] was introduced, but there is more work which is needed to avoid the blocking of Tor relays/bridges.

Scalability: Tor's insistence on deployability and simplicity of design has led to the adoption of a clique topology and semi-centralized directory that made the network model completely visible to client knowledge. These properties cannot scale past a few hundred servers, but implementation experience will be useful to learn the relative importance of these bottlenecks.

Path selection/circuit creation: A Tor client initially contacts Directory Authorities to fetch the consensus. As a Tor client gathers information about existing relays, it tries to build circuit paths. The paths are created according to the following rules [15]:

- The guard node should be the first node.
- For the same path, routers should not be identical in a Tor family.
- Un-valid or non-running router/relays are not selected. If their configuration is proper, then it is allowed to be connected in network.

5. OPEN QUESTIONS IN TOR

The following is a list of open issues in Tor:

* The previously discussed issues are based on active and passive measurements (circuit latencies) as well as throughput estimations for improving the performance of anonymous communication channels provided by Tor. Work needs to be done on viable significance of new methods on security and anonymity of the system.

* The Circuit Clogging Attack [16] can be used to identify all the Tor relays used in a circuit; however, it is an open question to identify which of the relays are the entry, middle, and exit relays.

* There needs to be work done on the basis of onion proxies; i.e.,to prevent compromised onion proxies to send false information so that they can obtain high scores. Also needed is the maintenance of Tor performance when the mechanism for optimizing Tor node store and output mode reduces the choice of relay nodes.

* Current algorithms may be modified to optimize performance by improving classification of the bulk traffic and considering alternative strategies for distinguishing web from bulk connections. Additional approaches to rate-tuning are also of interest. For example, it may be possible to further improve web client performance using proportional fairness to schedule traffic on circuits.

* Reliable relay of information is very important for building paths with better performance; therefore, a Relay Recommendation System (RRS) is needed for Tor to offer reliable relay material with better performance for building paths, ease low-resource attacks, and enable operators to explore the compromises among anonymity and performance based on their needs.

* The importance of the Tor network, as an online tool, is to safeguard the confidentiality and to try to improve the performance of applications for interactive users. To do this, researchers proposed Personal Computer Transmission control Protocol or PC/TCP (IPsec over TCP for the circuit), a new transport mechanism for Tor anonymous communication that allows you to design circuits protected by IP sec [17] TCP connection. There are some areas for improvement in this very aspect.

* The use of the path length is the key factor of path selection to provide flexible and easily deployed tunable options for users. It is an open research to design more options utilizing more potential factors in Tor to provide fine-grained tunable functions.

* Simple strategies are used to improve the selection method for relays with high bandwidth and TCP advertised window sizes. Bandwidth is a key factor in Tor design and path selection. Anopen research question is to work on this inadequate balance in

the load distribution to enhance Tor circuit and the efficiency of performance.

In (LASTor): A Low-Latency AS-Aware Tor Client, a technique is used by agreeing on a value of 0 for low-latency and 1 for high-anonymity for parameter selection. An operator can select a suitable trade-off among anonymity and latency. An open research question that needs to be further investigated.

* The nodes which are under the same person/organization are called family nodes. There are many open research questions regarding family nodes: examining Tor family's influence, or Tor performance, availability and anonymity especially when family nodes are under attack.

Moreover, one needs to look deeper into Tor's family mechanism and discovering potential family misconfigurations in the Tor network.

6. CONCLUSION

Tor isfree software which empowers censorship resistance and provides online anonymity. In this paper, many research areas in Tor were analyzed and described:performance, security, anonymity, censorship resistance, scalability, and circuit creation/path selection. In recent years, Tor has become a research hotspot in the anonymous communication systems research community. Future work involves conducting a detailed study to compare Tor with other anonymous communication systems.

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Dilemmas Connected With Preservation of Contemporary Art

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ABSTRACT
Art is a reflection, testimony and testament of its time. Re-evaluations that have taken place in the arts and in our daily life, tremendous dynamics, diversity, and availability of new technology and materials have given artists the tools and capabilities they have never had before. Art ceased to be an object hanging on the wall or standing on the pedestal; through the use of various disciplines, it became a piece engaging the viewer, absorbing, stimulating all their senses. If we want such complex art to survive, we must take proper care of its preservation. The paper presents the present standing of contemporary art, the role it plays, and why is it different form the traditional one. Considerations included issues related to the change in technique, technology and materials, affecting its durability and, consequently, the entire subject matter of care and conservation.

General Terms
Documentation, Performance, Design, Theory, Verification.

Keywords
Art, preservation and conservation of contemporary art, modern materials, theory and practice of conservation

1. INTRODUCTION
The times we live in are full of uncertainty, transitions in ideological, ethical formats, prevalence and common acceptance of post-truths, post-politics, populism, virtual reality taking on the actual one, the "liquid reality", as the Polish philosopher Zygmunt Bauman put it. What will remain of us? If there is something to remain, we should look after and take care of it now. This includes culture and art. Upbringing lacking constant contact with culture and art results not only in the terrible lack of taste in everyday life, but also in a narrow perception of the world, the lack of sensitivity, focus on material needs. Countries in which every child has contact with art (for example, playing an instrument) show a much higher rate of innovation and creativity, contributing to high development of individuals and the society as a whole. I believe that every person, regardless of the degree of education, social affiliation, or affluence, needs an aspect of life capable of moving them into another dimensions, and art is here a great tool. Contemporary art has involved the audience to a greater degree, introducing a separate reality created by the artist; it requires interaction, it is founded in stimulation of all senses, to leave an impression, experience, memory. Contemporary works bond together, synthesize values of various disciplines: visual arts and theater (Tadeusz Kantor, Józef Szajna), stage design (Jerzy Grzegorzewski), provincial art (Władyslaw Hasior) and others. We experience synesthesia: a simultaneous perception of multi-sensory experiences, a perception of colors, sound, scent, space - in recent years taken up in neuroaesthetics research, inspired by the cognitive science.[1]

Turning away from the needs of an individual and looking more globally and prospectively, it could be said that culture and art have always been the reflection, testament, and legacy of its age, usually drawing on the full potential of the times. On one hand, reassessments that have taken place in the arts, on the other our daily life, tremendous dynamics, diversity, availability of new technology and materials presented artists with tools and capabilities they have never had before. The effects of their use determine our times.

2. PRESERVATION OF CONTEMPORARY ART AS A CHALLENGE OF OUR TIME
Some reject contemporary art as overly hermetic, others say it so simple that "their kid would do it better". Many prophesy "the end of art", but it must be remembered that such a claim appeared already on the occasion of the first exhibition of impressionists, and then successively accompanied following genres of visual arts. And art continues to be, reflecting civilization, technological and social change. And it remains a major part of our cultural

[1] D. Folga-Januszewska, *Synestezja jako proces. Jak dokumentować i rekonstruować doznania? (Synesthesia as a process. How to document and reconstruct emotions?)*, in: *Sztuka w procesie/proces w sztuce. Ku nowej filozofii ochrony dziedzictwa kultury (Art in the process/ Process in art. Towards a new philosophy of the culture care)*, eds. I. Szmelter, Wydawca Akademii Sztuk Pięknych, Warsaw 2016.

heritage. It ceased to be just an object hanging on the wall or standing on the pedestal, that evoked emotion or aesthetic pleasure, it began to absorb and engage the viewer. Artists started to use materials and measures that were not considered artistic or simply were not there before (e.g. plastics, multimedia).

Figure 1. Old works of art are full of palimpsest, having its own history, painter unknown, *Saint Antonii*, XVI/XIX, photo M. Jadzińska.

Our ancestors are evaluated mostly by what they left behind. If we want the current and future generations to assess us and our times in terms of culture and art, we have to ensure their survival. Conservation of modern and contemporary art has become a real challenge of our times. The extreme variety of means of expression does not allow use of established rules. Cultural changes have generated new needs. New forms of art came into being, breaking away from the customary artistic disciplines in the sphere of ideas and their representation, as well as their technology, materials and their durability. A work of visual art could then be everything: an object, but also a concept, performance, space, smell, taste, process, and could be created with anything, including materials which were intentionally or accidentally unstable, low quality, used in an experimental way or with no actual knowledge of their properties.

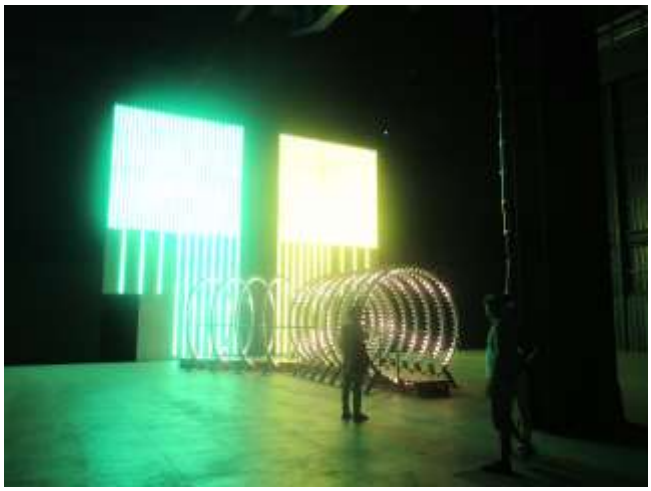

Figure 2. Contemporary art could be everything (light, sound, material) involving a viewer, Carsen Höller, *Doubt* (2016), Pirelli Hangar Bicocca, Milan, photo M. Jadzińska.

3. MATERIAL BODY OF ART

This is of particular importance in the case of unconventional art or art made with materials that turn out to be less durable than traditional ones. Like plastics, known and used in every field of life for more than a hundred years, in art cause tremendous problems due to their impermanence, bad state of preservation, and terrible prospects for future.

3.1 Changing the technique and technology of works of art and its impact on sustainability

In traditional art throughout the ages the rules of materials, technique and technology were rationally and systematically improved, and artists' subordination to them ensured durability of their works. Since the end of the nineteenth century (and according to some researchers even earlier), the situation began to change, to change dramatically in the twentieth century. Knowledge of the technique and technology, durability and immutability of material in the twentieth century began to be recognized by artists as unnecessary burden that inhibited their creativity. Since the futurists non-durable materials got into use, without reflection of the future of works developed with them. This happened even before - in 1881. Degas made his Little Dancer of Fourteen Years of wax, gauze, silk and hair. Of course, such materials have been used in folk performances or, for example, in Spanish images of Madonna. However, beginning from the Cubist collage, artists adopted a program of inserting "scraps of everyday life", worn-out already at the time of being used by the artist. Such materials have had a dramatic effect on durability of the objects which already after leaving the studio exhibited signs of wear and tear, increasing over years due to improper conditions of storage, transport and exhibition.

3.2 Modern materials in art

One type of materials used in art and presenting greatest conservation problems are the already mentioned plastics. Today artists reach for plastics more and more eagerly. A large number of works made in whole or in part of plastics can be seen at every major exhibition of modern and contemporary art, such as Venice Biennial (2013), Documenta in Kassel (2012), international art

shows in Basel. Objects involving plastics have been incorporated into major contemporary art collections (Tate Gallery, London), museums of art (MOMA in New York), or art and design (Victoria and Albert Museum, London, Pinakothek der Moderne, Munich), and private collections, where they constitute greater and greater share. Objects created from modern materials have also been present in public space. They have become a major part of our cultural heritage and a testament of social life over the last century. Artists appreciated diversity and application of plastics, such features as their plasticity, possibility to obtain a wide range of colors using different methods, transparency, and variety of forms - from foams and thin films, to plates of different thickness. They have used them as the main means of expression, as structural materials, but also in combination with traditional materials, such as wood, metal, plaster or stone. Often these combinations are destructive to objects (for example, a combination of plastic and metal).

Seemingly plastics are a durable and resistant material, however actually oftentimes they undergo ageing processes at a faster pace than the traditional ones. Moreover, we know much less about them, and free use of plastics by artists can only raise legitimate concerns about future of their works. Improper storage, transportation, and exhibition conditions, lack of knowledge and understanding of how these "young", and at the same time very sensitive materials are to be handled, contribute to the process of destruction. Many valuable objects of art and design have already disappeared and disintegrated.

4. PROTECTION AND CONSERVATION OF CONTEMPORARY ART

Works of new art require protection both in their material, conceptual layer, but also in terms of the creator's intention, context, function, form, space, place, time, history and creation process. Therefore, analyzes and queries preceding conservation activities are indispensable. The ephemerality of works of contemporary art and their processual nature require a different approach and careful archiving of works. Conservation of contemporary art is complex in nature.

4.1 Dilemmas related to the protection of works of contemporary art

In the old art conservation pertained to a material object of a particular stratigraphic structure, created according to established rules, from the best possible raw material, known or at least identifiable one. The assumption that works of art are stable comes from the Renaissance, along with a belief in the "original condition" of the object, despite the fact that the object over many centuries could have undergone radical and multiple changes.

Figure 3. The old art works' conservation and restoration pertained to a material object of a particular stratigraphic structure, created according to established rules, photo M. Jadzińska.

Today we are confronted with objects that we can call "complex". Complex art gives rise to many dilemmas. Some of them are technical in nature, but a lot of them must be considered in terms of ethics and philosophy. How should a work that is intended to self-destruct (objects from plants, ice and other ephemeral materials) be preserved? What about the authorship of an object made according to the artist's concept but not by the artist themselves? How can we preserve performance art, land art, art created using new, rapidly aging technology (time-based media) or materials that turn out to be dramatically unstable for future generations? How should we preserve "original" elements of a work when the artist mentions that at the next exhibition of a work, some or all of them (as is often the case with installation art) can be replaced? The current theory and practice of conservation mainly refers to the traditional arts.

Figure 4. Today we are confronted with objects that we can call "complex" art of works. Tadeusz Kantor, *Umarła klasa (Dead class)*, 1975/89, photo M. Jadzińska.

4.2 Paths for modern conservation and restoration

The complexity of contemporary art is a big challenge for conservators. Environment, assemblage, kinetic art, installations, performance arts, and video require separate conservation procedures. These works are often unconventional, they result from experimental artistic concepts, and their matter is made of non-durable materials or ready-made items. The protection of new art requires a broad recognition of the work in both material and conceptual terms, and determining its value. A modern approach must be adapted to the nature of the work and allow for preservation methods such as making replicas, reconstruction, emulation or re-enactment. Therefore, taking care of contemporary art calls for empowering the conservator to involve in recording, conserving, curating and ensuring integrity of works and their compatibility with the author's message.

Conservators, often thoroughly educated, with extensive experience, fluent in modern methods and technologies, try to prevent degradation of a monument (conservation) and restore its artistic and aesthetic value (restoration). They adhere to the established paradigms, impartially maintain the matter within the object, apply the rule of minimal intervention, refute replacement of original parts, and retain the postulate of reversibility of all treatments. In the case of modern visual arts, this is not always the goal. These unconventional, conceptual and physical hybrids make routine conservation practices irrelevant. They require thorough insight and interpretation based on holistic research using tools and instruments of chemistry, biology, microbiology, material science, history, history of art and culture, and other sciences and the humanities.

5. CONCLUSION

Culture and art, in times of globalization, conflicts, the sense of danger, the omnipresence of modern technology and the virtual world, appear as a value for us, and a trace of our times for future generations. Not indispensable, but necessary. As Jean-Paul Sartre said: "Art is indeed not the bread, but the wine of life," and wine and art must be properly taken care of.

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A Cognitonics Methodology for Artificial Persons

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ABSTRACT
Organisations (artificial persons) such as Facebook and Google, use organizational intelligence to offer social networking platforms for free, alongside for-profit business services for businesses who wish to influence the users of their networks. While many customer-influencing activities are essentially harmless, there are a few, such as the process of influencing a person's voting intentions during an election campaign, where the activity becomes a matter of concern for such disciplines as cognitonics. This paper will explore aspects of the organizational intelligence of Facebook over the years 2014-2017, where it developed tools in algorithmic artificial intelligence and applied them in electoral voting settings, and will propose a means of introducing a cognitonics methodology for organisations in the information society.

General Terms
Management, Measurement, Reliability, Experimentation, Security, Human Factors.

Keywords
Organisational intelligence, cognitonics, artificial person, information society, Chinese Room.

1. INTRODUCTION
Incorporated (embodied) Business Organisations are created by societal legal instruments: the owners of the business (shareholders) are declared, and the business organisation's rights and obligations as a person under the law are established. Consequentially, the business organisation is recognised as a person under the law: an artificial person. Shortly after incorporation, an artificial person develops its own organisational intelligence: its ability to comprehend and use knowledge that is relevant to its business purpose. Organisational intelligence[1]–[4] is the possession of an artificial person; is constructed from many contributory elements, procedural, algorithmic and human; and is creatively interpreted and used[5]–[7]. With organisational intelligence a personhood emerges[8]: artificial persons individuate, self-organise, and affect the world around them as they pursue their business interests and serve their customers.

Cognitonics [9] has been applied to areas of child development [10] and harmonic development of the personality [11]. Regarding cognitonics for organisations, there has been some work on how organisations can work to improve harmonic human development in education[12], and how a harmonic relationship can be established between natural persons (humans) and artificial persons (organisations)[13]. This paper will explore the possibility of global ICT companies developing their own cognitonics methodology so that their business activities and products can be monitored in such a way as to allow any imbalances in societal development to be addressed, while at the same time protecting the company's own financial security.

We ask if it would be possible for artificial persons to adopt a cognitonics methodology, particularly in pursuit of three key goals of cognitonics[9]:

1. Resisting the preference for commercial values over human values,
2. Resisting the subordination of national cultures to globalization,
3. Recognition of the importance of emotional and spiritual values in the human condition.

We hope to show that it would be remiss for global ICT artificial persons not to adopt a cognitonics methodology.

2. A NEED FOR COGNITONICS IN SOCIAL NETWORKING BUSINESSES
We will look at the organisational intelligence of Facebook over the years from 2014 to 2017, as presented by Chief Executive Officer, Mark Zuckerberg, in his quarterly earnings call transcripts In his 2014 transcript Mark Zuckerberg described 3, 5 and 10 year plans for Facebook[14]:

1. Over the next three years, our main goals are around continuing to grow and serve our existing communities and businesses and help them reach their full potential;
2. "Over the next five years, our goals are around taking our next generation of services, Instagram, Messenger, WhatsApp and Search and helping them connect billions of people and become important businesses in their own right."
3. For the next 10 years our focus is on driving the fundamental changes in the world that we need to achieve our mission, connecting the whole world, understanding a world with big leaps in AIs and developing the next generation of platforms, especially in computing.

In 2016, two elections that were surprising to general observers - the Brexit vote of June 2016, and the US presidential elections of November 2016 - saw criticisms levelled at Facebook for its new Artificial Intelligence tool, Facebook for Politics, which allows real-time targeting of custom chosen audiences. The tool works by addressing each targeted custom audience member's

psychological profiles to achieve a cognitive change in the person's voting intentions. A premium is attached to altering the voting intentions of users on social networks who have followers who they will then influence. In his 2017 Q2[15] results presentation meeting, Zuckerberg said, "Now you can put a creative message out there, and AI can help you figure out who will be most interested. A lot of the time you don't even need to target now because AI can do it more precisely and better than we can manually. This makes the ads that you see more relevant for you and more efficient for businesses. Those are just a few of the reasons why I'm optimistic about how AI is going to improve our core services over the next few years."

There are questions that have been raised regarding the ethics of allowing businesses to influence voters in national elections. Those questions become more difficult to explore when we are faced with the black-box algorithms of companies such as Facebook and Google who have business reasons for protecting their proprietary AI algorithms. At the same time, people need to be able to discursively unpick unacceptable practices of such tools. We will explore how to deal with such systems.

3. FACEBOOK AND CHINESE ROOMS

Searle's Chinese room Searle[16](p115) says:

"Imagine a native English speaker, let's say a man, who knows no Chinese locked in a room full of boxes of Chinese symbols (a data base) together with a book of instructions for manipulating the symbols (the program). Imagine that people outside the room send in other Chinese symbols which, unknown to the person in the room, are questions in Chinese (the input). And imagine that by following the instructions in the program the man in the room is able to pass out Chinese symbols which are correct answers to the questions (the output). The program enables the person in the room to pass the Turing Test for understanding Chinese, but he does not understand a word of Chinese."

In Searle's room, the key activity is in translating text with semantic integrity, and the person inside it is merely an operative. Searle's task was to show that no intelligence is encompassed in a computer program which employs algorithmic artificial intelligence to solve a language translation problem.

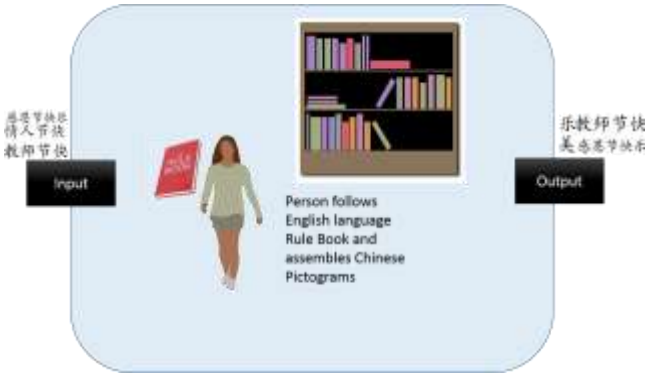

Figure 1: Translating by Following Rules and Using Signs

Searle argued that an embodied algorithmic artificial intelligence could not be considered a minded-entity. The concern here is with another type of room, one that has been prepared by organisational intelligence. We will focus on a Facebook tool which has been used to alter the voting intentions of customers to the room in democratic elections for the purposes of fulfilling a business model. Consider for a moment the political targeting tool that has been the source of speculation regarding the 2016 United States of America presidential election. The tool is provided by Facebook and requires high-level information with which it can work.

The stages of application of the tool involve:

1. A political campaign (artificial person) compiles an email list of voters which it would like to target – this is absorbed into Facebook as a "custom audience". The custom audience is delivered to Facebook along with any other information that the campaign may have on each individual voter, such as what their political habits are, what their real name is, their address, phone numbers, etc. This is the "intelligence" which the political campaign has already gathered on the people they wish to influence. The intelligence on each individual is merged with the knowledge that Facebook has accrued. This connection gives political operators access to some of the various forms of psychological knowledge that Facebook has of members within the Facebook universe. Custom audience members may be placed somewhere on the Openness-Conscientiousness-Extraversion-Agreeableness-Neuroticism (OCEAN) scale. Facebook will share task-specific access to its knowledge while endeavoring to keep other valuable information of the Facebook Universe from the political customer. This information, along with other AI tools can be used to identify such things as who are the political influencers in the custom audience, and to make recommendations for ad content (based on psychological profiling) that will have maximum impact on each custom audience member.

2. At the second stage, Influential contact is established with the custom audience members, in 2014 this was via a Facebook Exchange advertising tool (FBX), and since November 2016, a Dynamic Product Ads (DPA) interface tool. At this stage there is a real-time working together of the custom audience influence packages with the social networking activity of targeted customer audience members for the purposes of influencing each as agreed in the customer-sales agreement between Facebook and the political campaign. This work takes place over the time that is allocated to the campaign, and may take place over the whole election campaign, with reports being delivered to the business customer intermittently.

3. At the completion of the influencing period, a final report on the work that was done in the Facebook Universe along with evidence of change activity over the period of the campaign is presented. This information becomes part of the voter information which the campaign has amassed on the candidates which it has on their list. Although Facebook encrypts this data and does not maintain it after the duration of the commercial contract, the data passed to the political campaign, and consequently any person the political campaign shares the information with, could be used as the basis of further influential work in a related business area.

Our observation is that each of these stages describes a Searleian Chinese Room type of cognitive activity, and each may be a firm focus of philosophical inquiry. There are difficult philosophical and ethical issues to be explored, and all three stages involve a high degree of organisational intelligence (the intelligence of the artificial person), which is designed to be of the organisation, and for which no individual person is responsible. Wherever algorithmic artificial intelligence is used, it is scaffolded by the organisational intelligence.

Organisational intelligence may be the most successful form of artificial intelligence that is operational in the world today, and we will adapt Searle's metaphor to view Facebook activities, with its voter product[17], in Cognitonics terms.

4. ARTIFICIAL PERSONS, CHINESE ROOMS AND COGNITONICS

The organisational intelligence that we have become concerned with is non-human, subtly-embodied, perfectly reasonable intelligence, applied for the benefit of various businesses, and may be very difficult to address except poetically. The difficulty of addressing this organisational intelligence aside, it is clearly more embedded within the real-world than algorithmic artificial intelligence is.

We explore how Facebook's organisational intelligence can strike the right balance between respecting people as voters, guaranteeing them the space to make up their own minds on election issues, and the company determination to support a business organisation or network that wants to influence the voting intentions of individuals on mass.

We also ask how, in the face of a large-scale error in human harmonic development, an organisation such as Facebook could humanely address the issue and seek to remedy any harm that may have been caused as a consequence of its business activity, organisational intelligence or corporate tools.

In the first instance, a philosophical basis for a methodology of cognitonics for an organisation Cogitonics might be:

1. Information and communication technologies (ICTs) are being developed and deployed extremely quickly and have been penetrated pervasively, not only into every workspace, but also into every societal space and every family environment;
2. it is morally responsible and ethical for an artificial person to engage the power of modern ICT in order to promptly address any negative distortions in society that are ICT-induced, and to comprehensively disseminate effective methods to compensate for those distortions, wherever they appear: either in personality development or in the evolution of national cultures throughout the information society.

With a philosophical background in place, it would now be valuable to explore how work could be done. As a company such as Google (with its search engine) and Facebook with its dynamic advertising products, perform their functions while not allowing a casual user access to the details of the algorithms that are involved, they are effectively building advanced algorithmic tools which only allow input/output access, in the same way as Searle's Chinese Room does. Searle's Chinese Room paradox has a particular attraction in this regard. We will describe any hidden algorithm which performs a human-like function as one that is embedded in a Chinese-Style-Room.

It seems clear that some of the activities that take place in such rooms can be much more impactful than the task of translation that was envisaged by Searle. Consequently, we need to be able to look at some of the actions of the room from a Cognitonics perspective, while not causing an organisation any compromise of its proprietary technology.

Some fundamental questions for explorations of Chinese-Style-Rooms:

1. What is the Internet to companies such as Facebook? Is it a room? A workspace, only? Should companies working in human spaces be forced to observe norms and laws of human interactivity? That being said, how open should an organisation such as Facebook be regarding the operation of problematic Chinese-Style-Rooms?
2. Organisations have been designed to have limited financial liability – they are now achieving limited cognitive liability. How can we personalize the activities of companies such as Facebook to ensure that liability for inappropriate business behavior is accepted? Regarding algorithms, how can we granularise algorithmic activity sufficiently so that we can explore the human dimensions of tools that manipulate the cognitive intensions of large numbers of mostly unsuspecting people who use Facebook for other purposes.
3. Although translating languages is interesting. Should some human activities (such as electoral voting) be off-limits to businesses who accrue profits from social networking activities in digital business environments? There is a larger question of what are the social networking activities where it is not appropriate to allow business activities to interfere with their development? If a discussion were to take place of questions such as this, how best could an appropriate discursive setting between a global company such as Facebook, its users and other societal stakeholders be facilitated? Would the stakeholders be represented by appropriately constructed artificial persons?
4. Who would be in the appropriately constructed artificial persons? And how could we ensure that it's organisational intelligence would be sufficient to the task in hand and powerful enough to be heeded? How could a global organisations legitimate business purposes be protected and encouraged alongside healthy human development?
5. How could we disentangle the relationships between governmental executives and busineses for the benefit of ordinary people? What human body could take on such a task of overseeing difficult discussions between business artificial persons and societal artificial persons? Would it be the United Nations? Or the Red Cross? Or would some other global body be required?

5. CONCLUSION

We have looked at the exciting period of artificial intelligence development in the organisation of Facebook over the period 2014 to 2017, and have found there to be relevant Cognitonics questions to be raised over the use of tools to alter voter intentions during election campaigns. As a consequence, we have explored how Cognitonics might offer a set of principles for an organisation to follow that would allow them to pursue their legitimate business interests while safeguarding the harmonic development of human beings and national cultures.

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Logical Characteristic of Analogy and its Classification

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ABSTRACT

Analogy has a distinct logical structure, which has been ignored. In this paper, analogy is reinterpreted as the synthesis of typical inference forms. By this analysis, three kinds of analogy are confirmed, and under these criteria several examples of analogy are classified into each category. Thus we can get broader understanding of the analogical thinking.

Keywords

Induction, deduction, logic, classification of analogy

1. INTRODUCTION: THE MEANING OF ANALOGY

The identity sign (=) is one of the greatest inventions in human intellectual history, because it reminds us of oneness of more than two seemingly different things. And the same evaluation can be applied to the sign of similarity ($\approx$). The concept of 'not the same but similar' expands itself beyond that of identity to almost everything in nature and society. The universe is overlapped by similarity.

Analogy is about everything, for everything has some similarity to other things, from certain points of view. So that analogy can be used as general method of thinking which can explain a lot of phenomena around us.

Analogy, as a way of thinking, is a logic based upon similarity, but it seems to have been thought to be illogical and unscientific; analogy is analogy, which is about two similar things, nothing more or less.It gives us impression something like an intuitional correspondence from one thing to the other things. And it gives us only a rough, and at best, a comparative understanding through similarity.

Nevertheless it is a logic and the synthesis of logics. In the background of analogy, two typical concepts of logical inference are structuralized about which no other studies had made clear explanations.

In this paper, I try to expand the logical characteristic of analogy, reasoning with inference rule, with simple figures. I suggest conceptual, structural character of analogy as the logic, which is shown in [3] by applying the basic concepts of the particular and the general, as well as deduction and induction, and classify it into three categories with their examples.

2. THE LOGIC OF ANALOGY

2.1 Logical characteristic of analogy

Logic is the character of the statement, which can be used to judge true or false.According to Kant, judgement is the inclusion of the particular in the general. It is movement from premise (X) to conclusion (Y). The premise and the conclusion can be particular as well as general.

When the general is applied to the particular, it is called deduction. When the particular is included in the general, then it is induction. The statement is the linkage between the particular and the general, and we can build the inference table out of this linkage between two characteristics (Table 1).

Table 1. Inference table

Y / X	**Particular**	**General**
Particular	analogy	induction
General	deduction	

Analogy is, in a sense, the induction of one particular into the other particular. But it has the characteristic that it is necessarily mediated by the intervention of meta element.

The essential characteristic of induction is the probability of the premise-conclusion relation. And that of deduction is the necessity. Intrinsic problem of analogy is that this probability is necessitated. In other words, it is justified as the probability. It contains the possibility of error in the premise-conclusion relation, and it has the content which is probable, as much as the error is excluded. This is the possibility as well as the limitation, of the inference from the particular to the particular.Therefore, in the analogic possibility are concealed logical probability and necessity.

Analogy is the relevance of two entities as the whole and the parts. As the result, it has the significance of structuralism: the whole consists of the parts and the parts have its meaning in the whole. Similarity of the whole results in the correspondence of the parts. Therefore, in analogy, similarity is the necessary condition of correspondence, and correspondence is the sufficient condition of the similarity.

In analogy the total recognition precedes.Without the intuition of Knower (in Figure 1) that X (Known) and Y (Unknown) are similar[1], analogy does not begin. Total similarity relates to the generality of Knowledge. Basic principle of analogy is that specific similarity has the general commons. Here commons which mediate the similarity is called meta.

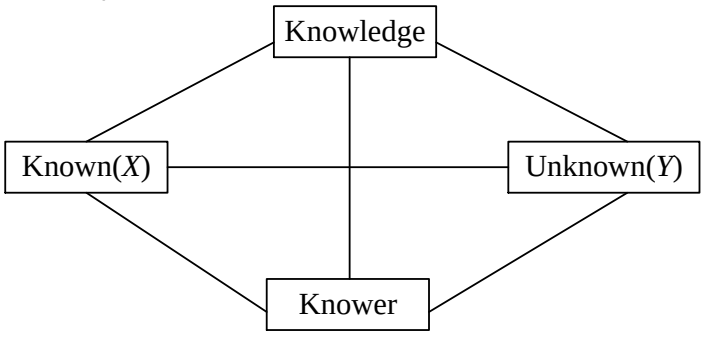

Figure 1. Knowledge structure related to analogy

[1]The term 'whole' is always only comparative (I. Kant) [4].

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2.2 Derivation of analogics[2]

As was shown by Kim[3], the logical process is drawn in Figure 2. $X \rightarrow A$ is inductive process, which has the movement from the particular to the general. And $A \rightarrow Y$ is the deductive process, which has the movement from the general to the particular. And finally, this process is concluded as $X \rightarrow Y$, which seems to show the movement from the particular to the particular.

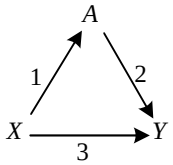

Figure2. The logic triangle

These logic vectors in the triangle are written, as below.

$$X \xrightarrow{1} A \xrightarrow{2} Y = X \xrightarrow{3} Y$$

This logic triangle is derived by using the method of elimination.

Here the two objects, X and Y , are basic starting points as the known and the unknown. By mediation of the meta elements, the relation of the three is established.

X is the known and Y is the unknown. We add A to X and Y to make the logic triangle.Then there appear 6 relationships between these three elements (A : the general, X and Y : the particular). The arrows designate these relationships. As the result it produces 6 relations between the three points. Each has the premise and the conclusion. The starting point of the arrow is the logical premise, and the end point is the logical conclusion.

The movement 3 is possible, but the reverse direction $Y \rightarrow X$ cannot take place, because from the unknown to the known cannot be deducted or inducted.

Logic vector 1 is the abstraction $X \rightarrow A$, which is inductive.ais the deduction $A \rightarrow X$. 2 is the deduction $A \rightarrow Y$ .b is the induction $Y \rightarrow A$, which is impossible because induction from the unknown cannot be imagined.

So finally there remains the flow of 1, 2 and 3, because a is meaningless in this flow from $X \rightarrow Y$, unless X and Y are known objects of comparison. We can have the logical relations as in the Figure 3. Here the analogy of the two objects, X and Y , is logically completed.

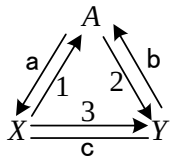

Figure 3. Logical possibilities

3. THE CLASSIFICATION OF ANALOGY AND ITS EXAMPLES

We cannot deduct (abstract) from the unknown, so that the direction of $X \rightarrow A \rightarrow Y$ is determined. And when we adapt logical character in comparing the two similar structures, three kinds of analogy appear. Let's call them analogy of the 1st kind, the 2nd kind, and the 3rd kind. Here we generalize the relationship of known – unknown in the 3rd kind, to that of base – target, so that Y can be redefined as known. As the result, Table 2 shows the classifications of three kinds of analogy and their characteristics. And in the figures below, the real line depicts the real movement, and the broken line depicts the metaphorical movement.

I try to confirm the logical structure of analogy described above, through several examples. These shows the proofs of general existence of particulars which have the meta logic in the background. Here examples are classified according to the 3 kinds of analogics. All the examples of classified analogic objects are synthesized in Table 3.

Table 2.Classification of analogy

Classification	X	Y	Characteristic
1st kind	Known	Unknown	Discovery
2nd kind	Known	Unknown	Adaptation
3rd kind	Known	Known	Comparison

3.1 Analogy of the 1st kind (Heuristic discovery=creative adaptation)

Analogy of the 1st kind is heuristic.

The general principle constructed by induction process 1 is adapted to Y (process 2), to reach a new conclusion which results in a creative discovery or prospectas process 3: $X \rightarrow Y$ (Figure 4).

Here the unknown element is decided by the known fact.

The similarity of the two objects results in the similarity of structures, and the structure of the objects makes the correspondence of the elements possible.

This can be called heuristic, because it includes a creative problem solving.

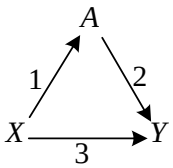

Figure 4. Analogy of the 1st kind

The examples of the 1st kind are listed below[3].

(1) Heuristic problem solving

Proportional correspondence of elements in the structure gives a solution for the unknown. Heuristic problem solving is the typical creative adaptation of analogical reasoning.

(2) Habitable zone in planetary systems

A planet far from us is the unknown world. But this terra incognita can be recognizable by expanding the facts and principles of the known, the earth.

Recently, we get many new information from astronomers, which show that similar physical or chemical conditions gives us the confidence there will be a possibility of life on the planets outside our solar system. Human being may be able to make a practical decision to send people to Mars, based upon the analogical conclusion that it is habitable.

(3) Concilience or interdisciplinary adaptation of theories

Economics and physics are similar in that they belong to applied mathematics and the principles of physics are often adapted to economic theories.

For example, price elasticity in economics resembles the elasticity laws in physics. Here price changes result in the change of demand

[2] I suggested new terminology "analogics" in [3] to emphasize the logical aspects of analogy, which has the composite logical characters in the background, as well as to evade the confusion when using "analogic", the adjective form of analogy.

[3] Some of these examples are explained fully by Kim in [3].

or supply quantity, and the size of this change is called the price elasticity of demand or supply. This is similar to the principle of elasticity between force and the change of matter in physics. The two disciplines share mathematical rate of change as the meta principle.
This kind of interdisciplinary similarity also forms the base of the concept 'concilience'.

3.2 Analogy of the 2nd kind (Adaptation=metaphorical interpretation)

Analogy of the 2nd kind is adaptive.
This kind has the characteristic of the 1stkind, but it has rather metaphoric interpretation than creative conclusion (Figure 5).
The 2nd kind is different from the 1st kind, in that it has little to do with the problem solving, but it widens and deepens our understanding of the unknown.Adaptability is the essence of both the 1st kind and 2nd kind, but the division line between them is whether they have creative finding or not.

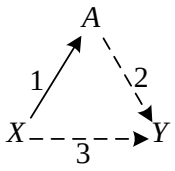

Figure 5. Analogy of the 2nd kind

(1) Parables and fables
Parable explains the metaphysical religious truth, using the daily episodes. It has analogical reasoning between the truth and the story. It goes without saying that a parable with the story is easier and softer to understand than mathematics.
Buddhist "Poor woman's lamp"and Christian "Widow's mite" have the same structure and are summarized in a mathematical ratio, which emphasizes more devotion than donation.
Fables have structural similarity between animal world and the human society. The truth is given by the animal story with human wisdoms, which are experienced mainly in nature world.The goose with the golden egg, the sun and the northwind, the hare and the tortoise and the ant and the grasshopper are famous titles of Aesop's fables.Fables have the same effects as religious parables.
This parable and fables are has successive structure: heaven - human world - animal world. And all these three worlds have the truth which is similar to each other. Religious truth is explained by human episode, and human world is paraphrased by animal words and deeds.
(2) Historical drama and contemporary politics
People have expressed their political opinions through metaphoric criticism for centuries. In many authoritarian states in the world, historical drama or films express metaphorically the reality of contemporary politics by showing the historical facts of ancient, medieval or modern eras, because the direct criticism of the government of the time is dangerous.
Here main figures of drama correspond to the contemporary politicians, and the flow and composition of the events in the past resemble the actual political structure in contemporary world. And the viewers of the drama guess their political situation.
It is often heard that history repeats itself. This proverb itself testifies the analogy of historic event in a new, modern version, in reality or in drama.
(3) Fractal analogy
A fractal is the structure which is similar in various levels of scale.
This means that in spite of the differences of scale, there exists one structure, which shows similar patterns.
The same pattern exists beyond big or small. So small structure is adapted to the big one, this is adapted again to the bigger one.

3.3 Analogy of the 3rd kind (Comparison=deductive confirmation ofinductive principle)

Analogy of the 3rd kind is comparative. This is different from the 1st and 2nd in that it is not the relation between the known and the unknown. It is the expansion of the Figure 2. Here Y is reinterpreted as known. Two facts are known and have a common principle, which is inductively confirmed.
This kind is mutual recognition of the two known objects. This is inductive inference to find a common principle or structure.This is aposteriori recognition that general principle is adaptable crossly to the other (Figure 6).
Therefore X and Y are compared, as the result to confirm their similarity under the principle A.
Here A in Figure6 is the relationship between objects of comparison and it means the basic concern of the observer.
We can find one general in many particulars as below.

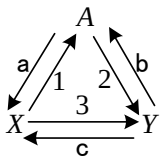

Figure 6. Analogy of 3rd kind

(1) Analogy in physics
Two physical phenomena have their own uniqueness.
Phenomena of different world are linked by the commonality of the flow in general. Material characteristics are different, but the meta principle of flow is applied generally.
Poiseuille's Law of water flow, and Ohm's Law of electric current can be analogized to each other ([2] Gust et al.).Flow and current are in general the same, regardless of their material particularity.
(2) Golden ratio
The fraction below is called the golden ratio, which is found in many natural, artificial creations. This number symbolizes the beautiful, stable structure of those phenomena.

$$\frac{a+b}{a} = \frac{a}{b} = \varphi \approx 1.618$$

Flower petals, seed heads, pinecones, tree branches, shells, spiral galaxies, hurricanes, fingers, animal bodies, DNA molecules[4] are some examples.
How can φ of the shell be the sameφ of the sunflower. How can the Fibonacci number be common to all these different phenomena? No one particular object can explain the others, because they are different. But by observing those objects we can abstract one definite number. This deepens our understanding of nature. This is the utility of the 3rd kind analogy, but the artificial adaptation of this ratio in art or construction,in pursuit of beauty and function, can be interpreted as the 1st kind.
(3) Exchange rate and turbulence
Hydrodynamic turbulence and foreign exchange market have the similar elements and structure, in spite of the specificity of energy and information [1], which are the elements of flow in each environment. Here information is metaphorically energy.

[4] http://www.livescience.com/37704-phi-golden-ratio.html

4. CONCLUSION: THE SIGNIFICANCE OF ANALOGICAL CLASSIFICATION

Analogy is a creative thinking with a strong logical structure. It is based upon the simple principle: everything is similar. This means again that analogy is a general method of thinking.

The fundamental task of analogy is; how a particular makes other particular possible, epistemologically. In other words, how can we find the significance or the meaning of a particular, in other particulars. So that analogy is quite important in itself beyond the logic or inferential process. It is a fundamental way of questioning and method of how we see the things.

The significance of analogy lies in that everything in the world is similar. We find ourselves in others. We are not different from others. From one fatherhood (meta theory) comes the brother and sister. Analogy means this brotherhood and sisterhood of things.

Similarity means not the same. A thing consists of the common of and the different from others. Everything exists as diversity, because it is not duplicated like clone, but it has something in common. Analogy is based upon this coexistence of diversity and commons. Analogy is a philosophy as well as a logic. This philosophy of analogy is universal, and so we face every day with the new similar things.And the logical structure of analogy, which was emphasized in this paper, signifies that the thinking of similarity is scientific.

The significance of analogical classification suggested in this paper is as follows:

1. It confirms again the meaning of logical characteristic of analogy, which is suggested in [3].
2. The classification is based upon the logical structure, not by approximate sorting of facts,
3. By clarifying the distinction of analogy groups, the logical application of analogic function can be more effective.

More precise application of analogy based upon this classification will lead to scientific use of analogical thinking.

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Table 3.Summary of analogy classification and the examples

Classification	**Phenomena**	X	**Meta principle**	Y
1st kind	heuristic problem solving	known fact	Common problem structure	unknown fact
1st kind	geological heuristics	e.g.) known elements of triangle	Common geological structure	e.g.) unknown elements of triangle
1st kind	consilience	science e.g.) physics	interdisciplinary principle or common intellectual structure	science e.g.) economics
2nd kind	parable	human episode	truth	religious lesson
2nd kind	fable	animal society	similar situation of daily life	human society
2nd kind	metaphor	Indirect expression	common semantic structure	reality
2nd kind	fractal	small form	Common morphological structure	large form
2nd kind	historical drama	past events,history	political, socialstructure	contemporary political situation
3rd kind	physics	electricity	flow	water flow
3rd kind	golden ratio	natural or social phenomena	$\varphi \approx 1.618$	natural or social phenomena
3rd kind	economic physics	turbulence	flow	exchange rate movement

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ABSTRACT

Mental health issues deriving from stress are ever more present in the lives of many people. However, due to lack of knowledge, stigmatization and high price of counselling, people often do not seek professional help and problems remain unsolved. One possible solution is an affordable and discrete professional psychosocial support. This paper presents an attempt to provide help through a virtual assistant named OSVET, based on expert knowledge and artificial intelligence algorithms. The assistant is capable of online personal counselling for people with stress overload. The application consists of an initial stress level diagnosis, detection of users' typical mental errors, personalized professional counselling dialogue, appropriate tasks definition and psychoeducation. The application is human-friendly using natural language communication. We anticipate that such assistance will encourage more people in need to start solving their mental distress, since it will be easier to come up with appropriate professional personalized treatment. Finally, this approach will hopefully decrease the stigma of mental health care in society.

General Terms

Algorithms, Documentation, Performance, Design, Security, Human Factors.

Keywords

Virtual assistant, psychosocial help, cognitive behavioral therapy, artificial intelligence.

1. INTRODUCTION

Most humans experience some amount of stress during our lives, whether at work, relationship issues, fears and phobias, etc. While some of stress is not harmful, prolonged or intensive stress can cause harmful consequences. According to Krivec and Suklan [13], 94,8% of Slovenians have experienced a state where a psychosocial professional help would be needed. If distress is not treated properly and in time, it can cause serious psychological conditions and mental health disorders that can affect daily lives. However, many of those in need do not receive the deserved treatment. One of the main reasons for this is stigma. Researches [13, 28] revealed that nearly two-thirds of people who need mental health care never get it mainly because they are too embarrassed to make in-person contact with a psychotherapist incorporated into the medical system. According to Krivec and Suklan [13], 60,5% of the interviewees think that psychotherapeutic practice should be widely accessible in societal facilities and not incorporated into the medical system. Stigma also affects therapeutic process. Even if people find professional help, there is a big discrepancy between the initial state and the number of people who successfully finish therapy. Moreover, people may not seek help due to the inaccessibility, especially if they live in a remote, rural area, far from a therapist's office. Next, scheduling, money, physical challenge, conflicting relationships, or misconceptions may also keep people from seeking help [17]. Last but not least, searching for therapy outside the medical sector can be tricky due to a vast number of unprofessional counselors. Addis and Mahalik [1] showed that strategies based on problems as a normal part of one's life enable an easier approach in seeking help to resolve them. Online psychosocial help is one of such strategies.

1.1 Online psychosocial help

For decades, people live part of their lives virtually with increase in recent years since virtual worlds have reached the mainstream. In particular, younger people using their smartphones and tablets for all of their social interactions live a substantial part of their life effectively online. In relation to stress, for many people the Internet feels more private and helps them get past the barrier of stigma to seek help through e-therapy. In 2001, eighty percent of Internet users or about 93 million Americans, have searched for a health-related topic online [3]. There are several different online facilities regarding psychological help. They can be classified in the following categories:

1. *Virtual communities*: self-help groups on the internet, where the psychosocial topics are widely spread, e.g. AYAs or 7 Cups of Tea online support encourages members of the community to exchange emotional and informational support, coping with difficult emotions through expression [14], [31]. Tinyurl [27] is one of successful self-help platforms, encouraging people to seek for help at depression.
2. *E-therapy and adjunct services:* counselling platforms, where a large net of counsellors perform different kind of therapies using virtual tools. Services are typically offered via email, real-time chat, and video conferencing with professional psychologists in place of or in addition to face-to-face meetings [16]. Examples of a good practice are [4], [24], [5] [21]. The formation of the International Society for Mental Health Online (ISMHO) was a milestone in the development of e-therapy [11].
3. *Computerized therapy virtual assistant*: In this case the computer is playing an active role in delivering the clinical content. There are several ways of computer activities:
    a. *Self-Help*: The rules encapsulate clinical knowledge and are used to deliver targeted interventions. Adding more

and more decision points and pieces of personalized content, the computerized "self-help book" is getting thicker and more accurate. Eventually, each reader takes a unique path through the book based on their own idiosyncratic mental profile. This, in a nutshell, is one of the key ideas behind computerized therapy [19]. There are several such applications already developed, such as Mood Tracker – a mobile application that allows users to self-monitor, track and reference their emotional experiences; PTSD Coach – provides opportunities to find support and tools that can help users manage the stresses of daily life with PTSD; LearnPanicCBT – self-treatment for panic disorder that is based on Cognitive Behavioral Therapy (CBT) principles; Stress Check - provides users with an overall stress score that illuminates their current level of stress; Cognitive Diary CBT Self-Help - helps to recognize thinking that interferes with achieving your goals in life and how to change that thinking.

b. *Virtual reality therapies*: use computer demonstration of reality most often to perform virtual exposure therapy for different kinds of anxieties and phobias, e.g. fear of flying. Examples of such applications are: Virtually Better, Psious, VirtualRet, Mimerse [25].

c. *Robots*: they are used as a human computer interaction such as Paro - a therapeutic robot in the form of a baby harp seal developed by The National Institute of Advanced Industrial Science and Technology in Japan to comfort dementia sufferers to increase their motivation, reduce stress of the patients and their caregivers and stimulates interaction between patients and caregivers [18].

d. *Avatars*: they are based on communication between human and computer in natural language. ELIZA is one of the earliest and most well-known programs that attempted to act as a therapist and provide Rogerian psychotherapy. Because Rogerian psychotherapy primarily encourages clients to talk more rather than engaging in a discussion, ELIZA takes the users text and rephrases it, putting the focus back on the user and encouraging him/her to talk more rather than conversing. This approach works for some clients but quickly becomes frustrating and useless. It might be worth mentioning that the version of ELIZA, developed in our department, was among the most often visited in the world. The reason was found years later – it mixed replies from users online at the same time. Unfortunately, it was treated as non-privacy-preserving and eliminated as a consequence. Unlike ELIZA, a newer chat bot Ellie was able to talk about herself and generate a conversation rather than only rephrasing the responses it received. Ellie's aim was to treat people with depression and veterans with post-traumatic stress disorder (PTSD). The program recognizes facial expressions and analyzes audio and posture to formulate its response and adjust its tone. Nonetheless, Ellie was far from being able to provide the kind of understanding a human therapist could [15]. More recent applications are MoodKit [26] that helps the user identify and change unhealthy thoughts and chart the user's state of mind and Woebot [30] which uses CBT to reduce depression. A virtual coach "Shelley" incorporates patient education materials and uses conversations to help the user make decisions and change behavior.

1.2 Efficacy and benefits of online psychosocial help

A growing body of research on online counseling has established the efficacy of online therapy with treatment outcomes being similar to traditional in-office settings [16]. Researches [2, 7, 9, 23, 29] showed that in the medium term, online psychotherapy yields same or even better results than conventional therapy. Cristina Botell and her colleagues [20] confirmed the efficacy of using virtual reality in psychotherapy. Client satisfaction surveys also tend to demonstrate a high level of client satisfaction with online counseling [8]. In a recent survey of over 400 clients of online therapists, more than 90% responded that working with a therapist on the Internet helped them [17].

Benefits of online psychosocial help:

- allows the patient to attend sessions at a higher rate than traditional sessions and reduces the number of missed appointments [10]
- good for clients located in areas under-served by traditional counselors (such as rural area) or for disabled that traditionally under-utilize clinical services [16], for clients who may have difficulty reaching appointments during normal business hours [6]
- therapy in person is more likely after using e-therapy Change [6] showed that 64% of the persons moved on from e-therapy to consult a therapist in person
- beneficial for young people, who are keen using computers or intelligent phones.
- cheaper and thus more affordability
- reduces social stigma
- anonymity encourages people to disclose their problems, emotions, thoughts or sensitive information. Patients admit that they feel less judged by the virtual therapist and more open to him/her, especially if they were told that (s)he was operated automatically rather than by a remote person [15]
- enhanced content: computerized therapy can incorporate more than text on a screen. The programs can be rich in multimedia content, with images, videos, animations, audio voiceovers, and interactive exercises. A well-designed treatment program can be a very compelling user experience.
- virtual reality is a protected environment for the patient, where one can deal with the feared situation in secrecy.

2. Virtual stress assistant OSVET

2.1 Scope

The scope of our solution, called "OSVET", is to help people in distress. It combines virtual community, e-therapies and avatars. It includes screening of the distress severity level, following by personalized self-help and psychoeducation. The human-computer interaction (HCI) is performed with communication in natural language, which gives the user a feeling as if she/he is interacting with a real human. In case of severe mental health issues, users are encouraged to proceed to e-therapy or seek in person therapy and appropriate contacts are provided to the user. With such an approach we believe stigma will be reduced and people in need will get a pleasant experience searching for help, which will further encourage them to increase care of their mental health.

2.2 Basic assumptions

- *Combination of several therapeutic techniques*: OSVET uses screening of the user state, psychoeducation, self-help, communication with virtual assistant using natural language and implements e-therapy if necessary.
- *Personalization*: based on the information provided by the user, OSVET provides personalized answers, instructions and assignments.
- *User friendly HCI*: besides conversation in natural language, user experience is enriched with information about the stress overload issues, cognitive distortions, exercises, etc.
- *Safety*: OSVET is based on the personalized psychoeducation, which is safe and positive in nature. When cognitive error is classified by OSVET, user is asked to confirm the assumption. If there is no confirmation, OSVET asks for the clarification before moving to further steps. If higher level of stress or more serious mental issue is detected, users are redirected to in person therapists. Last but not least, the content of the OSVET is designed by experts in the field of psychosocial counselling.
- *Cognitive behavioral therapy (CBT) approach:* OSVET is based on CBT approach. This approach was chosen because it is one of the leading therapeutic approaches to dealing with distress overload and anxiety disorders. Previous researches show that it is most suitable approach for algorithmic delivery style and for counselling with virtual assistant [19]. Kessler et al. [12] showed that online CBT is as effective as traditional "in-person" therapy for the treatment of depression.

2.3 OSVET architecture

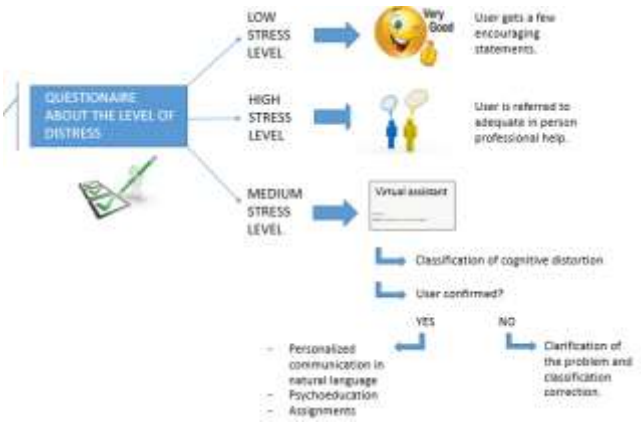

Figure 1. OSVET architecture.

- *Assessment*: OSVET first makes a screening of distress level based on the simple questionnaire. If the level is low, it provides some encouraging statements, directs the user towards simple relaxation techniques and reassures the user that the mental state is normal. If the level of distress is extremely high, the user is directed to get help with in person therapist and suggests an adequate counsellor according to the detected problem. If there is medium distress level, virtual assistant continues with personalized conversation. There is also an option for the user to pass initial screening and continue directly to conversation with virtual assistant.
- *Cognitive distortion identification*: CBT typically focuses on a specific problem, helping the patient to identify, recognize and change disturbing thought patterns and feelings that are leading to negative or destructive beliefs and behaviors [22]. In OSVET we identify the following 12 common cognitive distortions from the users' problem description:
    - Mental Filter: dwelling on the negatives and ignoring the positives.
    - Disqualifying the Positive: insisting that the user's accomplishments or positive qualities don't count.
    - Overgeneralization: viewing a negative event as never ending pattern of defeat.
    - Catastrophizing: blowing things way out of proportion or shrinking their importance inappropriately.
    - Personalization: blaming oneself for something one was not responsible for, or blaming other people and overlooking ways that the user's own attitudes and behavior might contribute to a problem.
    - Fortune telling: arbitrarily predicting things will turn out badly.
    - Mind reading: the user assumes that people are reacting negatively to the user when there is no evidence for it.
    - Shoulds and Oughts: criticizing oneself or other people with "Shoulds" or "Shouldn'ts", "musts", "oughts", "have tos" and similar offenders.
    - Emotional Reasoning: reasoning from how one feels: "I feel like an idiot, so I really must be one." Or "I don't feel like doing this, so I will put it off."
    - Global labelling: identification with one's shortcomings. For example, instead of saying "I made a mistake", the user says "I am a jerk".
    - Low frustration tolerance: think one cannot (and shouldn't have to) tolerate situations and conditions that are found frustrating.

  When a particular mental distortion is detected with the use of artificial intelligence algorithms, the user is asked to confirm the avatar's classification. If the user confirms it, (s)he is further guided to the appropriate personalized dialogue for the detected distortion. If the user does not confirm the way of thinking that avatar proposes, avatar asks the user to describe in detail the mental problem and the loop repeats.
- *Personalized dialogue with adequate assignments*: When the user's problem description is classified into one of the above cognitive distortion and confirmed by the user, one of the prepared scenarios, i.e. flexible sequences of dialogs is executed. It includes:
    - Psychoeducation: to educate users about the distorted way of thinking and representing the world is obviously of value.
    - Emotional support is given, i.e. inceptions which encourage the users to deal with his/her problem and gives him/her hope to find a solution.

- Guided self-help: OSVET guides users to think and analyze their way of thinking and mental representation. Several different therapeutic techniques are used such as paraphrasing, active listening, etc.
- Assignments: at the end of the conversation, assignments with instructions are presented to the user.
- Redirecting to adequate in person counsellor if necessary.

Data gathered throughout conversation are anonymously saved in databases and regularly checked by the experts. If there are signs of misdiagnosis or inappropriate further dialogue, experts correct it and thus OSVET is improving constantly.

3. OSVETS BENEFITS AND DISADVANTAGES

Main benefits of the OSVET online counselor are constant accessibility to all people in need, discreetness and safe, professional, personalized treatment, based on natural language communication. As such, OSVET reduces stigma and encourages people in distress to search for help, leading to better mental health in global society.

There are also some disadvantages of the OSVET solution: The rapport is limited since the therapist cannot see the user, and thus cannot interpret facial cues, voice tone and body language. It is questionable if emotional depth achieved through written words can be as deep as in person therapy. There is a particular risk of misdiagnosis. Even if safety is one of OSVETs main assumptions, there can still potentially be negative consequences when a system fails to understand emotions and incorrectly filter information during sensitive, high-stakes conversations. As such one should be aware of the fact that online counselling does not entirely substitute in person therapy.

4. CONCLUSION

OSVET is developed as an online psychosocial help solution for people in distress. The basic idea is derived from the fact that many people experience stress in their everyday life, but because of stigma they don't seek professional help. Besides, people are becoming more attuned to, and more dependent on technology in everyday living. It seems inevitable that counseling will be affected by the technology. Therefore, our goal was to develop a first stage of psychosocial help, which is accessible, professional and personalized, and user friendly. This innovation in psychosocial counselling is based on combination of artificial intelligence and distance technology with elements of traditional psychotherapeutic techniques, e.g. expert knowledge stored in the form of scenarios. The approach could be beneficial in several fields, for students and pupils under distress, career counselling, etc. If this kind of solution will gain on popularity, counselor education is likely to be affected significantly. Many challenges still lie ahead, including clinical, legal, technological, assessment and ethical issues, but we believe counselling solutions such as OSVET can be accepted as a useful clinical tool, if only appropriate monitoring and connection is established with real therapists. In time, such solutions will encourage more people to start to resolve their mental health issues and consequently decreasing stigma and promoting mental health hygiene in global society.

5. ACKNOWLEDGMENTS

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Cognitive Computing Within the Evaluation Process

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ABSTRACT

The evaluation process is one of the key components of education and business in general, and therefore it is of utmost importance to determine the optimal evaluations system as well as its methods. The main research objectives of this paper are to determine how performance evaluation rating systems increase employee productivity and the quality of student knowledge (e.g., ECTS grading system in higher education). The research will also determine how process evaluations affect interpersonal relationships and whether or not they motivate or dehumanize employees and students. Finally we question the possible effects of using a machine, grading algorithm for the purpose of evaluation. As a conclusion we aim to determine how important emotional intelligence is, immanent to the human being.

General Terms

Measurement, Performance, Algorithm Security, Human Factors, Standardization, Legal Aspects, Verification.

Keywords

Evaluation, Emotional intelligence, Assessment, Measurement

1. INTRODUCTION

The term evaluation has many definitions and synonyms which provide a different point of view. In its simplest, general sense it refers to making a judgment about the amount, number, or value of something. The focus of the subject is the starting point at which the evaluation process is being created. If this starting point refers to some program, policy or project, the purpose of the evaluation is to explore the concept and direction, measure the effect and estimate the success and the efficiency of the program, policy or project in the question. In that sense, the question arises as to - what is leading the human civilization to the achievement of a certain goal. There are many answers but the final goal should be the advancement of humanity.

2. THE IMPORTANCE OF EVALUATION

Increasing the degree of globalization in the marketplace leads to increased competition and increased dynamics in companies and educational institutions. If these companies and institutions wish to remain competitive, investment that increases the quality of business processes, products, services and employee's efficiency as well as the one that increases the quality of knowledge acquisition in educational institutions, becomes crucial for further development. In this context, the prevailing way of observing and analyzing the progress and system features is evaluation.

Evaluation is a process that critically examines a program. It involves collecting and analyzing information about a program's activities, characteristics, and outcomes. Its purpose is to make judgments about a program, to improve its effectiveness, and/or to inform programming decisions [1].

Regardless of the application of the evaluation - from the evaluation of the pupils in the earliest school days up to the evaluation of the employees in a company - it gains its importance as an essential tool for recognizing the subject's current state, but also improving it.

3. VALORIZATION OF KNOWLEDGE

Valuing knowledge and skills has a significant impact on the individual. Apart from the fact that ratings often have a direct impact on the realization of some student rights like the right to student accommodation or scholarship, they also have a psychological impact. This is an inevitable element that is essential to education in general. The psychological impact of evaluation on students depends on its motivational profile, which consists of:

3.1 Three components of motivation

3.1.1 Perception of one's own ability

Student's assessment of their own abilities for successful learning and performing tasks.

3.1.2 Learning objectives

Goals that a student wants to achieve within educational activities, usually they can be divided into three categories:

3.1.2.1 Mastery / Skills development

The desire to understand and master the content and adopting new knowledge and skills.

3.1.2.2 Performance

Concern about getting the best ratings / results, the desire to be the best or one of the best in the group.

3.1.2.3 Avoidance

Attempting to meet the minimum requirements for passing a course with the least effort.

3.1.3 Other values

A combination of student interest in the courses, the perceived importance of the course and their perceived usefulness [2].

Depending on the motivational profile, the evaluation will have a different impact on the student. Generally speaking, it can be assumed that most students who believe that they are judged inferior to what they deserve or that their efforts, knowledge and skills are unfairly evaluated will lose the motivation for making an effort in their work and in acquiring new knowledge.

Besides the motivational factor, a very important psychological factor of student success is also self-confidence. Self-confidence is not a motivational perspective by itself. It is a judgment about capabilities for accomplishment of some goal, and, therefore, must be considered within a broader conceptualization of motivation that provides the goal context [3].

In order to reduce the differences in perception and misunderstanding, and raise the level of students' self-confidence for achieving success in learning, new "student-centered" educational trends are becoming prominent. Thus, Bloom's taxonomy, presented to help students strive to achieve sophisticated levels of understanding and abstraction, should be integrated into their overall educational experience.

4. COGNITIVE DOMAIN OF MEASURING KNOWLEDGE - FROM STUDENT PERSPECTIVES

Recently there seems to be an international change in education from a "teacher-oriented" to a "student-oriented" approach. One of such alternative models is recognizable in the Bologna system.

That model is focused on what the students are expected to be able to do at the end of the module. Such an approach, based on Bloom's taxonomy in the area of cognitive domains of learning, tries to define the necessary knowledge, which allows the professor to write the learning outcomes. Learning outcomes are statements of what a learner is expected to know, understand and/or be able to demonstrate after completion of a process of learning. The outcome-based approach has been increasingly adopted within credit frameworks and by national quality and qualifications authorities such as the QAA (Quality Assurance Agency for Higher Education) in the UK, the Australian, New Zealand and South African Qualification Authorities. The overall aim is to improve the efficiency and effectiveness of higher education in Europe [4].

Higher educational institutions provide online specification of the learning outcomes. In addition to describing what the students can show in terms of knowledge, skills and attitudes upon completion of a programme, the specification also gives examiners and students insight into the criteria that is applied to specific assessments. In that sense, students can know how much knowledge is needed for a certain number of ECTS credits, which in turn gives them an idea if they belong to the *Avoidance or Performance* type of motivational student profile. However, if they belong to a group of *Mastery / Skills Development* motivation profiles, learning outcomes could open up some new issues related to the content of knowledge. The question remains whether the traditional form of teaching can respond to such challenges, especially in the field of Informatics, where one can observe incredibly fast changes.

Based on the level of knowledge of Bloom's taxonomy, regarding the cognitive domain of the educational process, it is obvious that the processes of acquiring knowledge and skills as well as their evaluation are very complex and challenging. The task of the education system is to create an environment and structure of learning mode that will enable its participants to acquire constant and useful knowledge and skills that can be equated to a numerical value. However , the question is whether or not the professor will be able to take into account all the required standards, which the assessment itself requires, at any point in the decision making process. Or rather, can a professor conduct the evaluation process ethically while at the same time being mentally and emotionally independent of socially-conditioned standards? Following the above-mentioned issues, research was conducted through questionnaires at the Polytechnic of Rijeka and the University of Juraj Dobrila in Pula, Croatia.

5. RESULTS OF THE RESEARCH

The purpose of this research was to find out what students think about professors' objectivity and whether they believe that computer technology can achieve a higher level of objectivity? And finally, what percentage of students is willing to replace human beings with computer technology in some form of artificial intelligence, in order to achieve a greater degree of objectivity.

The survey was conducted by a questionnaire method that consisted of 10 statements related to the topic plus 2 questions related to gender and age of respondents. The study included 154 students from the fields of Information Science and Technology, Telematics, Entrepreneurship, Road Transport, and Occupational Safety. With concern to the gender of respondents, 56% students are male, 44% female. Regarding age, 77% of respondents belong to the age group of 18-25 years while the other 33% belong to the group older than 25 years.

For the first pronouncement in the survey, as the fundamental statement of this research, "When assessing, professors are always objective." 34% of students responded with the affirmative. In addition to that, 72% of respondents, believe that the professor's ability to successfully manage his/her own emotions in different circumstances, i.e. emotional intelligence of a professor, is a key factor that makes student assessment objective.

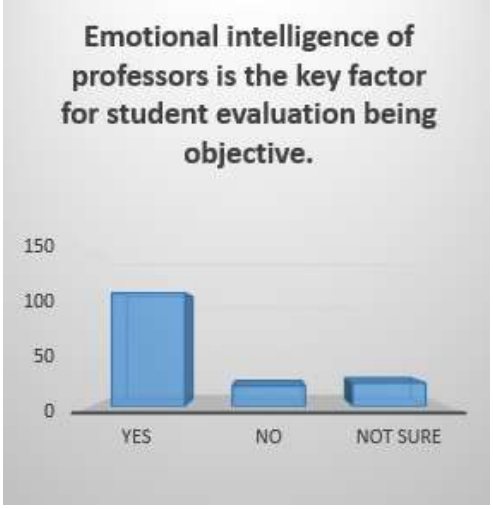

Figure 1. Emotional intelligence factor

Besides the emotional intelligence of a professor, 66% students also believe that objectivity can be influenced by some form of interaction between students and professors, in informal, out-of-class activities.

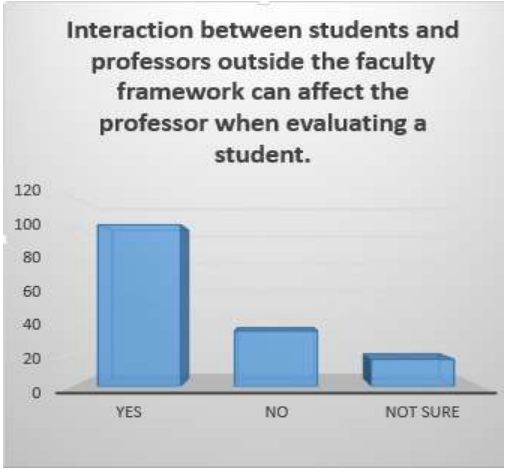

Figure 2. Non-institutional factor

According to the survey results, it is evident that most students believe that professors are not objective when evaluating. Such an attitude is one of the factors of reduced motivation in students.

As an alternative to the human beings' assessment, there are the opportunities offered by the development of digital technology.

"A computer program or some form of artificial intelligence (AI) would be judged more accurately than a professor." - This is a statement on which the 36% of respondents show indecision. 26% of students agree and 38% of students disagree.

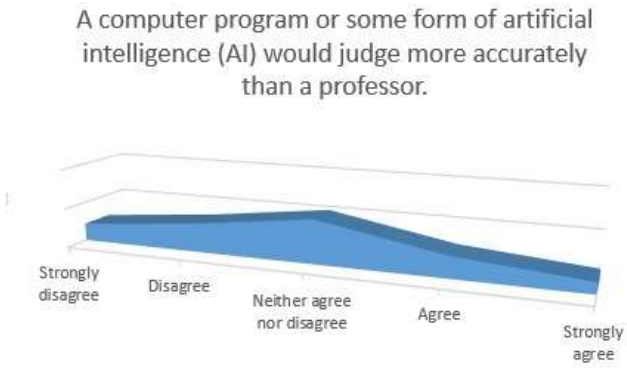

Figure 3. Knowledge measurement-challenges of digital technologies

Furthermore, 38% of respondents believe that computer-based assessment is acceptable, what is not a negligible number if we find that 22% of respondents are indecisive in this regard. Thus, 40% of respondents pleaded against such a choice.

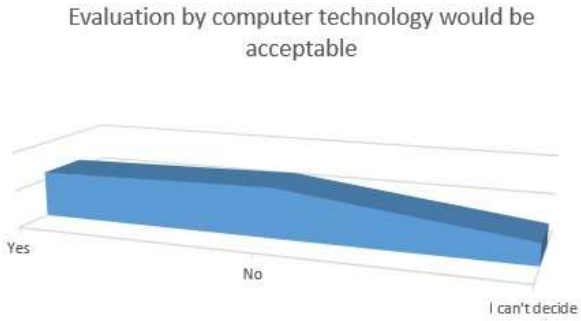

Figure 4. Knowledge measurement-acceptability of digital technologies

In order to determine if the students are ready for a different type of assessment and what it would look like if they are, the study introduced the following conditional statement: "To be able to change the grading system, the evaluation criteria would have to be determined:" –"According to a free/intuitive assessment" - what 3% of students choose. –"According to knowledge levels (knowledge, understanding, application, analysis, synthesis, evaluation)." - 37% of students choose the standard educational framework, which uses Bloom's taxonomy to evaluate the cognitive levels. –"According to a precisely defined structure, which defines exactly which point refers to the information/result, without exception." – is the choice of 55% of students. And the other 5% of students that belong to the category of "Other proposals", mostly offer solutions that include human factors based of education system, for example: "I believe that the student's progress must be more appreciated than the ultimate amount of knowledge." Judging by the results of the last statement, standardization in the assessment is a fundamental factor that provides an insight into the results of educational success. However, regardless of the fact that the students participating in the research are participants of the Bologna system, and as such have a pretty measurable scoring system like the ECTS system, more than half of them (55%) believe it is necessary to try to achieve a higher degree of precision in the assessment in comparison to the existing one that uses Bloom's taxonomy to evaluate the cognitive levels. In that sense, it is

obvious that social consciousness goes hand in hand with the development of technology, which ensures its accomplishments with its performance.

6. DATA VALUES - DIGITAL PERFORMANCE OF MEASUREMENT

Thanks to the development of digital technologies, it is possible to update student evaluation data within the database of educational institutions. Online learning is one of such examples where measurement takes place in a digital online environment. Expanding rapidly, with increasing numbers of providers offering services and more students choosing to participate, online learning becomes an excellent environment to enable tracking performance of digital measurement in both learning processes as well as in knowledge assessment. With that in consideration, standardization for evaluations in a digital online environment includes a wide range of data collection and analysis activities from formative evaluations that rely primarily on survey, interview, and observation data, to scientific experiments that compare outcomes between online and traditional settings. Institutions and professional bodies in many countries are addressing the challenge of how to make online learning a quality experience for students. An example of such an approach is development of Massive Open Online Courses (MOOCs) projects. Various EU-funded MOOC projects together with OpenupEd are working with the following definition: MOOCs are "online courses designed for large numbers of participants, that can be accessed by anyone anywhere as long as they have an internet connection, are open to everyone without entry qualifications, and offer a full/complete course experience online for free".[5] Thus, most top universities have started to offer some sort of MOOC platform, which applies new kinds of educational approaches that enable assessment of knowledge through written assignments, participation in online discussions essays, online quizzes, multiple choice questions to test understanding (formative) or as a test (summative), collaborative assignment work or debates, experiential activities such as role play simulation etc. The aforementioned approaches in online learning open a variety of new opportunities. MOOC generate massive amounts of data about learner behavior. This data can be used to understand cognitive growth and to improve instruction.[6] Furthermore, the creation of educational platforms for online learning opens up a wide range of possibilities in the field of cognitive computing. By generating data about learner behavior the system obtains data values that can be used for the development of an algorithm for artificial intelligence that can be used for educational purposes. Student engagement and effectiveness of incentives can be improved through software solutions that are implemented on such platforms. In addition, most technical universities collect data on MOOCs, while so far only few of the comprehensive universities, or the specialised or applied sciences institutions do so.[7] Though, only at the very beginnings of its existence, collecting data in digital form, within educational frameworks, provides new opportunities which bring adaptive learning to the next level.

7. CONCLUSION

Digital performance of measurement will certainly affect the change in the structure of education, methodology, evaluation, verification, intellectual property issues, security as well as all other legal aspects that are encompassed. The rapid development of digital technologies contributes to the perception of evaluation and the goals of education. Given that we still live in the time of traditional education, but we are largely consummating technological achievements that open up new opportunities, it seems important to put a fundamental question in the context of evaluation: What is real value? Regardless of cognitive computing and everything that comes with it, we need to create values by which we could achieve a social change. Both the professors in educational institutions and business leaders could increase the results by taking measures to enhance their standards of sustainability.

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Learning Processes for a Cognitive Democracy In Information Society

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ABSTRACT

In this paper we deal with *how* the processes of the Learning interact with the variable aspects of the democracies within the globalized world. Environmental catastrophes, cultural disasters, economic exasperations and social traumas became continuous and pervasive menaces, further emphasized by the political behaviors of the local /national governments. Such menaces distort even the very concept of Democracy, influencing in particular the behaviors of the young generations.

Vice versa, another idea of Democracy based on Relational Communitarian Learning Processes can be developed and differently practiced by various human societies as a *Cognitive Democracy.*

Such a *Cognitive Democracy* Idea is today urgent and extremely necessary, just to cope with the contradictions between techno-informational sciences and human societies, that strongly influence-without distinction-the weakest societies and all the young generations of the globalized world.

To realize such ideas we need a wide range of Learning Processes, modeled on different contexts and necessities and practiced through environmental friendly learning experiences.

On this premise it is possible to evolve the original concept of Democracy going beyond its binary (Individual/Society) socio-political field throughout ternary relationships (Individual/Society/Life Environment) experientially produced as a complex system at the same time aesthetic/ethic and concrete /informational, versus the trivialization and fragmentation of the Globalized World.

Some concrete practices of Learning Processes related to various socio-environmental political contexts can be taken into consideration and presented to discuss the proposals of this paper.

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Key words

Globalization, Democracy, binary /ternary systems, learning experience, informational/real world

1. INTRODUCTION

.The idea of *Cognitive Democracy* was promoted by the French philosopher Edgard Morin at the end of the XX Century, as an adequate way to propagate the appropriate forms of effective participation by different contemporary societies in the scientific and political processes. This idea involves another challenging idea, which has been suggested by the French Philosopher Felix Guattary as a *Molecular Revolution*. Both these ideas, even if they have not been officially celebrated, inspired a lot of social manifestations, behaviors and projects, continuously in progress. All of these manifestations are strongly linked to very learning processes that are spontaneously practiced by different contexts and social groups, dedicated to political discussions, protests or very action-researches referred to their local or general problems. Yet the democratic governments, completely ignoring or underestimating these challenges, overpower them by authoritarian decisions, macro financial programs or trivial public projects and works. It seems true that between the spontaneous manifestations and official powers do not exist effective relationships and that, consequently, the processes of the Learning cannot interact with the variable aspects of the democracies within the globalized world. In particular, the contemporary environmental catastrophes, cultural destructions, economic exasperations and social traumas are further stressed by the political behaviors of local/national governments to distort even the very concept of Democracy and influence the social behaviors and young generations towards the self-defense of their identity.

1.

2. A QUESTION REMAINS

If and how appropriate interactions can be realized despite this generalizable trend? The idea of democracy currently acknowledged is still referred to the traditional logic reasoning (the third excluded) the Game's theory (winner or losers) and the numeric representativeness of the voters during a pre-decided time when the Governmental projects have to be realized, often in spite of unpredictable events or changes of social mind. Within a so rigid framework (conceptual and practical) the cognitive processes cannot be harbored, the participative spontaneous processes in particular, and this is why :

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  he classic idea of democracy continues to be related to classic logical reasoning, (the third excluded), the Game's theory (winners or losers) and to the numeric contraposition (majority/minority) of the voters during a pre-decided time when the Governmental projects are *mechanically realized*, often despite unpredictable events or change of social ideas.
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  ithin a so rigid framework (conceptual and practical) the cognitive processes cannot be harbored, while the participative spontaneous phenomena remain defenseless, often interrupted and constantly attacked by the dominant powers.

In this situation, it is reasonable to wonder *whether* and *how* appropriate interactions between institutions, strong powers and legitimate social expectations can be achieved. This

question cannot be answered but remains open to stimulate the evolution of the *very* concept of democracy. The current well-established idea of democracy corresponds to a rigid framework of relations where there is no place for unforeseeable events or for the change of voters' willing, for participatory processes, initiatives, new ideas, and even less for the spontaneous learning processes emerging from different social contexts. On the contrary the simplifications, the exasperate contrasts and the most trivial political and social behaviors. are welcome.

3. THE COGNITIVE DEMOCRACY

Another idea of Democracy based on Relational Communitarian Learning Processes can be developed and differently practiced by various human societies as *Cognitive Democracy*.Originally the idea of Cognitive Democracy was suggested by Edgard Morin [8] at the end of the XX century: *"Cognitive democracy presupposes itself a reform of thought as science, since the sciences are extremely esoteric for the citizens. They give up understanding, they are sure they cannot understand, while the scientists say* - you *cannot understand-. So a profound ditch has been created even more serious why the most important political issues have a scientific and technical component that is reserved to experts"*. Morin's proposal was then addressed to educators and considered as a link between expert elites and people, whose participation in scientific advances *could* and *should* become more effective and democratic. This idea though hierarchically structured (from scientists to people) turned out useful for the dissemination and propagation of scientific knowledge.. But it harbored many other potentialities not only as a *democratization of the knowledge* but as a *different democracy*, constructible only throughout participative Learning processes. In those same years within the traditional democratic systems the contradictions and tensions among the political and governmental systems and their populations were growing. For these reasons, what we propose today is another evolutionary development of democracy, intended in a broader sense, as a *Democracy of Learning and Creativity*, practicable through spontaneous initiatives, autonomously encouraged by participants and supported by experts, but not hierarchically controllable. Starting from E. Morin's idea, we could approach the concept of democracy by using shared principles and diversified criteria, not standardized but tailored for many contexts and contemporary conditions.

3.1 Steps to a Cognitive Democracy

As we have just described, the E. Morin's. proposal did not change the management of scientific and technical knowledge but made them simply more propagable and easily understandable by the users. Today, we do not think that, given the exasperated separation between dominant powers and people, it is still possible to maintain the traditional style of current political practices, mainly based on binary relations .On the contrary, we believe that the Democracy can change only by reconstructing suitable ternary relationships among people, their contexts, and the Institutions who govern them. In other words these changes become possible only through different approaches based on the circularity of ternary relationships. For the contemporary conditions such kind of a Cognitive Democracy is today urgent and extremely necessary, just to cope with the political contradictions and the strong contrasts between human societies and driving forces (political, techno-informational, financial). These Forces strongly influence - without distinction- the weakest societies and all the young generations of the globalized world, by attacking the ternary relationships among individuals/society/life environment that are the most threatened. Today it is true that some aspects of Morin's proposal have been successfully implemented. In fact we have conquered informational social communication and instant access to news e ideas, we have developed forms of political struggle and creative proposals, self-sustained by people, but once again all these forms of propagation and communication use linear dynamics with very limited results regarding the real advances in socio-cultural activities of contemporary society. In this way the democracy , though widened, is practiced only at a mechanical-reduction level, without any chance of circular-experiential verification by the subjects involved and therefore without the emergence of learning processes. Furthermore the influence of the digital world on such contemporary conditions produces new exasperations on individuals and social behaviors, by worsening the spontaneous communications and exchanges (ideas, experiences, projects), which are all forced to follow linear dynamics far from any ecological circularity.

At the same time, the need to maintain the intrinsic prerogatives of creativity, common to all living systems, continuously stimulate the human societies to start new learning processes, often temporary, consequently fragile and easily controllable by the dominant powers. For all these reasons we think that considering democracy as a standard phenomenon that can be imposed indifferently on every society in the world is an epochal error with irreversible consequences on the social mentality where the existing tensions are often exasperate or increased.

Actually, to realize the multiple forms of Cognitive Democracy we need a wide range of Learning processes, tailored to different contexts and needs, and practiced through friendly learning experiences, which must remain constantly referable to well-identified and recognizable ecological ternary systems.

On these premises it is possible to evolve the current Democracy to go beyond its binary habits and refer it to ternary systems of relationships (i.e. Individual/Society/Life Environment) and experiential action-researches, socially produced as complex systems, aesthetic/ethic and concrete /informational at the same time, against the trivialization and fragmentation of the Globalized World.

4. THE MOLECULAR REVOLUTION

Felix Guattari , the French psychotherapist and philosopher who coined the word Molecular Revolution, inspired us a new approach to the complexity of nature and the idea of Learning, free from constraints and hierarchical systematizations of the thinking. The Molecular Revolution is a very impressive idea which suggests and involves many topics, problems and human realities since the bio-molecular nature , micro, autonomous, creative and interactive within the living world leads us to a variety of realities and contexts. In our opinion the Molecular Revolution can combine the dynamics of the living world with the dynamics of the evolutionary cognitive processes in a non-hierarchic way, homologous to the one used by individuals and groups to evolve their ideas, mature their desires and practice their creativity, according to the virtual-actual dynamics, quintessence of the all living world. The circular combination of molecular dynamics and learning experiential processes can produce and develop that necessary adequate knowledge (autonomous and self-produced) to practice differentiated forms of democracy, all cognitive and equal, beyond the current democratic methods.. This combination can lead us towards new and various types of democratic participation, each adapted to the

characteristics of the context in which it is formed. These eco-epistemological research and action- strategies welcome the philosophical thoughts of Gilles Deleuze and Felix Guattari, realizing the concrete translation of micro virtual and real dynamics, into a tangible social dynamic so often highlighted in their philosophical elaborations.[1]This translation -from the micro level of the organisms to the political level of societies- constitutes a very evolutionary shift for the contemporary realities since it can mark, for the first time, the direct, capillary pervasion of the philosophy into the social contexts in a spontaneous and non-authoritarian-deterministic way. In such a way it becomes possible to escape from the mechanical (cause /effect/ action/reaction) political, social, informational habits and reintroduce on the scenery of the world multiple and propagable versions of molecular revolution As a lot of study cases testify, our contemporary age already shows many micro- dynamics that, as new cyanobacteria in a global primordial soup, actually practice contemporary molecular revolutions, in counter tendency to the massive global attacks of the dominant forces on the planet. Hence we could say that the new dynamic processes which continuously rise from the exasperated human/ environmental contexts actually constitute a translation of the philosophical concepts virtual-actual into political dynamics tension-fact, and a base of further molecular revolutions.

5. MULTIPLICITY AND VARIETIES OF COGNITIVE DEMOCRACY

The theoretical and contextual reference points outlined above allow us to define the key elements to activate new forms of democracy based on ternary relationships Individual/ Society/Life environment (understood as a wider ecological context, as a very *landscape* where culture, economy, human solidarity, meet and interact throughout processes of participative learning). Therefore, to achieve appropriate levels of participatory democracy and adequate systems of Governance the following procedures become necessary and basic for every context :

- Re-discovering potential or latent ternary systems capable of harboring and supporting new learning dynamics
- Encouraging people involved in learning processes
- Inspiring new functional, aesthetic and attractive configurations that life environments can take
- Implementing and promoting true relational structures at any level, rooted in the contexts

A lot of potential Cognitive Democracies can come to light from different contexts andstimulate different forms of Governance where the participants become at the same time guarantors, promoters and administrators of the environment, guardians of its values and trustees of its Governance.

[1]Virtual-actual have to be translated into tension-fact.

What does it mean for us today practically, i.e. politically, to translate the relation virtual-actual in the one tension-fact? It means to disclose the productive nature of the relation virtual-actual, or, as Deleuze affirmed, to potentiate the nature of the virtual, which is the invention of the new. …I would say – that the "dynamics of becoming as differentiation and creation" comes to be (Anne Sauvagnargues in *Le vocabulaire de Gilles Deleuze*, p. 22)

6. FIRST STEPS TO COGNITIVE DEMOCRACIES

Many action-research experiences are already in course in different places, from the post-industrial metropolitan realities (Cleveland, USA) to the contradictory megalopolis of post colonialist realities (Kibera/Nairobi, Kenia). In Europe many social experiences have taken shape just to answer the economical, urban and social crises in course and promote new levels of experiential processes. Some significant experiences in Italy can validate the strategic importance of this approach to urban, rural and territorial contexts. They are very interesting examples of potential Cognitive Democracies practicable at the urban, rural and territorial scale that can take roots in different contexts developing throughout the reconstitution of inter/eco-systemic relationships, stimulated or encouraged by appropriated ecological inputs.

7. EXPERIENCES IN ITALY

The daily struggles to contrast the degradation and environmental transformations provoked by natural catastrophes or authoritarian political decisions are usually impeded or ignored by the Public Authorities. For these reasons they could develop in terms of action- researches beyond the mere opposition or the alternative Projects or Planning. Most of these experiences brought to light new levels of adequate knowledge and concrete socio-environmental perspectives. This phenomenon has been continuously testified by numerous *spontaneous micro activities* and *territorial experiences.* Such experiences, autonomously promoted by participants or encouraged by scientific-technical promoters, could further develop through unexpected ecological configurations of the ternary systems involved. Some significant examples in Italy can validate the strategic importance of the experience practiced on different life environments urban, rural and territorial.

7.1 The La Pica Garden and Kitchen gardens -Mirandola (Emilia Romagna Region, North Italy)

In this small town of Mirandola a No- Profit Association founded and realized the *La Pica Garden* and developed a *kitchen garden area* organized around the ancient town, destroyed by the 2012 strong earthquake.

These two experiences achieved interesting and integrated outcomes towards people, life environment and political government, playing a fundamental role towards the citizens in search of new reference points (aesthetic, cultural, social, economic) especially after the 2012 earthquake. Today the Garden is appreciated as a very stimulus to cultivate culture, agriculture and social consciousness, while the Kitchen Gardens became a fundamental encouragement for the renaissance of the devasted town. All of these initiatives, successfully carried out by their promoters and citizens, got a

more intense and involving relationship towards the local public managers, just to transform these voluntary proposals into effective continuous popular participation in the public management. A very micro revolution, towards a concrete management of the Public Common Goods is in course at any level (solidarity income taxes and services, mutual interaction of social works and cultural initiatives). A very autonomous Governance is developing!

7.2 The "Asilo Filangieri", a new Urban Common-

The Asilo (Napoli, Campania Region, South Italy) is an ancient building originally dedicated to poor people. In coherence with the name of its founder Gaetano Filangieri (Naples 1752-1788) a noble enlightened jurist who dedicated his entire life to the political and social justice, the Asilo became property of the Naples Municipality, who recently acknowledged it as Urban Common Good. Thanks to the constitution of such an Urban Common Good the Building – located in the centre of the ancient City within an impoverished but alive animated area – has been transformed into a complex socio-cultural structure, jointly promoted by spontaneous Groups and local Municipality. This structure is now self-managed by artists, artisans, actors, students and producers who develop a very interesting cultural policy towards the entire City of Naples. This Asilo (a former institute to welcome poor people) became a creative harbour able to revitalize the urban area and implement the civic participation in the cultural activities. The Asilo became also a key factor for a wider ranging action-research towards a micro urban ecology and self-governance.

7.3 The Landscape Cities in Tuscany

We would consider the Landscape City as a nucleus and a mover of the in-becoming Life Environments, the place where the multiple networks (natural, technological and informational) of the town are closely entwined around the environmental texture to form a very holistic configuration.
Such configuration equally involves the territory, the living spaces, the single persons and the social communities reciprocally linked and ecologically balanced. In this sense the Landscape City can emerge as an aesthetic catalyser of new projecting processes.
This phenomenon develops at the *real/local environmental dimension* but it is strongly connected to the unbounded informational *web environment* in a continuous reciprocal entanglement.
In other words, the Landscape/ City is nothing but a *very relationship* between a consolidated social trim –the traditional town- and a new organization of its environmental context to which the ancient town had been referred.
The very nursery of such relationship are the both territory and its natural aesthetic Configuration. We are speaking of a complex and multiple system of relationships where the Action-Research of Persons and Community play a fundamental role, just as reference point to their whole environmental contexts that include and harbour both the City and the Landscape. If in such condition they could be related each other and involved in reciprocal dynamics we could really think of a new entity able to harbour and foster an in becoming human /environmental context.
In Tuscany and in Italy in general, such realities (ranging from small villages or towns , to little parts of urban or metropolitan areas) are still alive and manifest throughout the habits, experiences and life styles of their citizens even if they often are overwhelmed by the impelling globalization.
Within such realities more and more communities improve their knowledge, experiences and projects that could open the ways to different configurations of Landscape City.
On this base we consider that multiple versions of Landscape City are possible and can be realized within such socio-environmental conditions, according to various procedures, that can continuously take shape on each territorial reality throughout evolutionary participative processes.

7.4 The Landscape Contracts in Italy

Specific new agreements between social groups, environmental, economic managers, policy makers can be promoted and practiced on different life environmental contexts through shared landscape projects. The Landscape Contracts can be concretized through the choral construction of specific proposals, statutes, project activities which tailor specific modalities of Governance suitable for each environmental context (territorial, social, informational, cultural and so on). The very key actors of the Contracts are the groups of citizens who participate in the action-research as creative promoters and responsible partners of the Contract's Governance, who are organized as Landscape Contract's Presidia.

The Panaro (Emilia Romagna Region) and Simeto (Sicilia Region) River/Landscape Contracts have been developed by interdisciplinary staffs along with local groups, associations, Public Bodies (politicians and technicians), Schools, local Museums, and local entrepreneurs (tourism, culture , agriculture) through the following steps:

- Social perception of the Life Environment – *friendly learning approach among local groups, experts and staff -Informal meetings, survey promenades, some thematic synthesis;*
- Self-reflection on the local River landscape – *shared evaluations, constitution of a common stock of information and aesthetic landscape evaluations*;
- Social potentialities and actions- *ecological, cultural, scientific, educational, economic- have been recognized in their mutual relationship with specific territorial river areas and connected as a dynamic interactive network (creative hive);*
- Location of the network on the river territory-landscape valley;
- Constitution of River Landscape Presidium of citizens *who become promoters and guarantors of the participative Governance of their territories and mover of the ecological ternary process of the Contracts*

The proposal of the Contract is a new Pact between society and river sites, an agreement between official Bodies (Region, Province, Municipalities, local Groups, Technicians,

public Managers) for a new way to manage the natural-social common heritage in evolutionary terms..

8. CONCLUSIONS

The examples described above show that every context can achieve its own Cognitive Democracy while specific modes of governance can actually be realized at different scales and levels.

All these dynamics constitute a multiplicity of articulated sets of initiatives, experiences, changes in the lifestyle of people and their reference societies, all involved in environmental changes of great strategic importance even if of small size.

As it happens in the case of all evolutionary processes, the turning point of cognitive democracy does not proceed linearly, but in a complex, circular and reticulated manner, with many different episodes, with different initiatives and cultural achievements, with successes and failures, with times and rhythms each time different and, above all, with the alternation of virtual-actual/ tension-fact dynamics that remains common to all experiences.

However, these processes are irreversible and can continue. The Cognitive Democracy is already alive and in becoming!

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Suicide attacks, mass media and data mining

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ABSTRACT

The aim of this study is to evaluate, examine and critically analyze two contradictory approaches and perspectives concerning terrorist suicide attacks. The first approach reflects the majority of theories, research and literature that are based on sociological explanations that portrait the suicide attacker as driven by his/her ideology. The second approach is based on a new field of research that studies the possibility of suicide attackers being mentally unstable, driven by their suicidal tendencies. In addition, this research examines the role of the media and how terrorist organizations exploit the fact that terrorist suicide attackers are presented by the media as rational individuals committing an altruistic suicide that is driven by their ideology. The conclusion of this study is that the factors that prompt an individual to commit suicide are not necessarily limited to one on each individual. Many factors often co-exist. Moreover, the role of the media plays a role on the rates of suicide attacks. The study suggests that a more systematic cross-disciplinary research and cross-national collaboration is needed in order to facilitate the design of a prevention program.

1. INTRODUCTION

There is a variety of reasons that explain the rationale behind a terrorist organization and its actions, but different factors and reasons might play a role for an individual to join in a such organization and proceed to act through suicide attack. This study's aim is to explore and examine different theories and explanations regarding an individual's decision to commit a suicide attack. As it is a phenomenon that rose the past years and left thousands of people dead and the public in fear, it is worth examining in detail in order to try and explain such behavior. Are the perpetrators acting on an ideological cause, or are they mentally unstable individuals with suicidal traits?

2. THE SOCIOLOGICAL EXPLANATIONS OF SUICIDE ATTACKS

2.1 Social explanations of suicide attacks

There are two main factors that influence an individual's decision on suicide attacking; the impact terrorist organizations and groups have on the individual, and the individual's social context. Most of the Islamic terrorist organizations and groups aim for a social change by firstly developing alternative principles of living, and secondly by introducing these alternative principles through practice, massages and codes that come in various forms and flow through networks and media. These terrorist organizations and groups are structuring their war on religion and perceived oppression, stating that the fight is for the threatened and oppressed Muslims but also God's will. Furthermore, Islamic terrorist organizations are spreading and exploiting the dissatisfaction and alienation of Muslims in order to get more recruits. This ideology and principles serve well these terrorist organizations, as the individuals involved, fight for God's (Allah's) will and Islam. Thus, they are not afraid of death and they are willing to die in their attacks for the greater purpose, making them an impossible enemy to intimidate or destroy [1].

There is a variety of motivations and factors linked to an individual's decision to participate in a terrorist suicide attack. One of them, is an individual with an authoritarian personality, associated with religious fundamentalism who is not able to express his/her authoritarian character in his/her social context. Joining a terrorist organization and proceeding with a suicide attack is perceived as the only way to prove his/her power [2]. Moreover, emotional distress and moral outrage associated with experiences of humiliation, not only of its own but as well as in the context of the individual's close circle, that can be either religious or ethnic circle are often factors that prompt the individual to act out of revenge for his/her people or for his/her own dignity [3]. An example of this case would be a TV interview in January 2005 of Saleh Jamil Kassar who was a captured Saudi Fighter that stated that seeing pictures of Muslim violations as well as Muslim women getting violated in TV and internet was what motivated him to join the terrorist group and try to carry out a suicide attack.

Nevertheless, in some cases there are possible motivations in terms of instrumental rationality. An individual that might be suffering by a status crisis, either a real loss of status or the fear of losing it, can chose to join a terrorist organization. Such individuals might believe that dying in a suicide attack is a better choice than losing their social status and staying marginalised. It might be based on an egoistic interest, trying to find solidarity as well as becoming a glorified martyr who will act and die in a heroic manner [4]. Thus, the individual leaves the social norms in the context of which he/she fears of losing his status and becomes a member in a group where he will gain prestige and glory, even if it comes to the price of his/her own life. The idea of having the image of loyalty, sacrifice and autonomy overcomes the price of death [5].

Moreover, in Durkheim's theory there are two explanations that could apply on this matter. One is the anomic suicide; anomie is the condition where social and also moral

norms are confused, unclear or simply not present. Individuals in this concept, lack the sense of social regulation and have a feeling of marginalization from the societal norms, resulting in a self-crisis and choosing suicide. In this case, individuals that feel like they have no place in their own society, turn up to a terrorist organization where the social norms no longer exist and this results in a suicide attack. Furthermore, the second explanation of Durkheim's theory that could apply, is altruistic suicide. In this case, individuals that give primary consideration to the interests and welfare of others but are not able to express it in their social context, choose to join a terrorist organization and "sacrifice" themselves through a suicide attack [6]. An example of a case would be the story of Teoria Hamori, a Palestinian woman who was captured right before she tried to commit a suicide attack. As she stated, she was very disappointed for her unsuccessful attack, her only purpose was to sacrifice herself for Palestine, her land and her people; her life would be the price for the Palestinian freedom.

As mentioned above, the main resource for all organizations that use suicide attacks as their main form of action is the availability of attackers. Their recruitment method involves socialization with all the important circles of society, such as, family, educational institutions, religious community, peer groups as well as mass media. Individuals might get involved in such an organization as a result of the strong bond they form in this circle. In this case, these individuals, in their search for companionship and solidarity, are joining terrorist organizations with no intention of committing a suicide attack. However, as the social bond becomes more intense they adopt the values, ideologies and goals of the group [7]. In the modern age, radicalization and the creation of these social bonds have become increasingly constructed through the internet instead of face-to-face communication. Thus, individuals that already have a strong fundamentalist view are able to find groups that share the same ideologies with them easily, through private networks. In addition, there are individuals that grew up in a social context where radical fundamentalism, extremism and suicides attacks are their social norms. These individuals are trained and recruited in an already Islamist radical environment and their life goal is to proceed with a suicide attack.

Another factor is the political beliefs an individual has and his/her oppositions to certain countries or Governments that can prompt the decision to suicide attack in order to protect his/her political positions [8]. Nevertheless, the factors that prompt an individual to commit suicide are not necessarily limited to one; many of the above factors often co-exist in the act of one suicide attacker. An example of that case would be the attack of Mohammad Sadique Khan who was the ringleader of the 2005 London attacks. As he stated, his motivation comes from his religion, Islam, the duty to serve Allah, the need to destroy the democratically elected governments of which Muslim people, or "brothers" as he calls them, suffer, and the need to sacrifice himself for the people he loves. As it can be seen in the above statement, there is a variety of factors that prompt the specific suicide attacker to act, radical religion beliefs, political oppositions, solidarity as well as the need to express heroism. Thus, for a better understanding of suicide attacks, all the above factors should be taken into consideration and every attack should be studied individually, rather than being generalized in a theory of one-fits-all.

3. THE MYTH OF MARTYRDOM AND THE PSYCHOLOGICAL EXPLANATIONS OF SUICIDE ATTACKS

3.1 Religion and suicide attackers

Many scholars come in contrast with the belief that suicide attackers cannot have suicidal tendencies, as a result of suicide being strictly forbidden in Islam. It is believed that Muslims have lower suicide rates as they are not willing to get humiliated and stigmatized in their community by disobeying Allah's "orders" [9]. The assumption that religion prevents suicide is not a solid argument. It might be true that religious affiliation is correlated with lower rates of suicide attempts in some clinical populations. However, in Islam where suicide is strictly forbidden by the Qu'ran, few Muslims will admit to have suicidal tendencies if questioned directly, whereas more Muslims would admit it if the questions are open-ended [10]. Findings show that taboos against suicide can result in suicides being underreported, and growing evidence show that suicides are largely underreported in Muslim countries [11]. An analysis that was conducted in 17 predominantly Islamic countries, reported that suicide rates including "hidden" suicides that are otherwise classified as "other violent death" (OVD) were as high as those in the United Kingdom and eight times higher than otherwise officially reported [12]. In addition, the idea of suicide attackers not being able to be suicidal based on religion is problematic, on the grounds that there is no evidence of all suicide attackers being Muslims or religious [13]. On the other hand, a result of suicide being strictly prohibited and a crime against God, Islamic individuals find suicide attacks as the only honourable form of suicide that will lead them to heaven. Thus, the belief is that for that very reason the majority of suicide attackers come from an Islamic background [14].

3.2 Psychopathology and terrorism

There is a remarkable consensus in the research literature field that there is no such thing as a terrorist's personality or psychopathology and that mental illness is not an important consideration when trying to understand terrorist attackers. Many research findings suggest that terrorists are "normal" people but who commit acts of terrorism. In addition, Ruby commented that terrorists are rational individuals that have unrealistic goals based on their extremist ideologies [15]. There is a large number of individuals that have common extremist ideologies regarding religion and nationalism. Terrorist groups might use this in their advantage by recruiting individuals that share these extremist ideologies, but that fails to explain why not all of them join.

3.3 Mental Illness and suicide attacking

A research conducted by using qualitative method and interviewing the family members and close associates of 26 female Chechen suicide bombers found that nearly all had lost close family members in bombings, landmines or air raids carried out by Russian forces in battle. Many of them had witnessed themselves the death or torture of their family. As their family members and friends stated, none of them had any significant

personality disorder or symptoms of depression before the trauma, but all changed afterwards. More specifically, they all had dissociative symptoms which is a characteristic of posttraumatic stress disorder (PTSD). In addition, before they commit a suicide attack, 92% became socially isolated, 73% of them showed signs of depression and 23% became aggressive [16].

Furthermore, Ariel Merari conducted a controlled study of three groups. The first group that was interviewed was 15 "would-be" suicide terrorists, as they were arrested moments before their attack. The second interviewed group was 12 non-suicide terrorists and the last group was 14 terrorist organizers. None of the interviewed individuals had a diagnosis of psychosis or a history of hospitalization for mental health disorders. However, 53% of the "would-be" suicide terrorists showed symptoms of depression, such as, low energy, emotional constriction, distracted attention, melancholy, sadness, hopelessness and tearfulness. In addition, three of the "would-be" suicide terrorists displayed evidence of PTSD. On the other hand, only 8% of the organizers showed depressive tendencies and none of them showed evidence of PTSD. Findings also showed that 25% of the control group and 7% of the organizers group exhibited psychopathic tendencies, whereas none of the "would-be" suicide terrorists had exhibited these traits [28].

3.4 Recruitment

There is an assumption in research literature that recruiters successfully reject individuals who are mentally ill. However, Berko who interviewed Israeli terrorist prisoners argues, that recruiters are often told to "look for sad guys" [17]. The question arising is how do these recruiters spot out the mentally ill candidates? There is good evidence that soldiers are the ones that can spot and predict signs such as withdrawal, poverty of thought and lack of help-seeking the best in combat situations, thus terrorist recruitments might also have the same "ability" [18].

3.5 Impulsivity and suicide attacks

The notion arguing that suicide terrorists could not be suicidal as a result of the belief that suicide attack is a well-planned action, whereas suicide is impulsive is simply wrong [19]. While on some populations impulsive traits have been shown to increase the risk of suicide, especially in those who suffer from bipolar disorder and alcohol abuse, decades of research have shown that the majority of individuals who commit suicide do not act so impulsively and that in fact, have had suicidal thoughts and ideation for some time and made prior plans for these acts [20].

3.6 Murderous intend argument

The proposition that suicide terrorists could not be suicidal based on the belief that they have murderous intent represents a false dichotomy. Even if suicide terrorists have murderous intent, it does not mean that suicide intent can't be also part of the decision. They might be both homicidal and suicidal. Furthermore, depending on the culture in which the act occurs, the degree of homicidal intent might be lower or higher. At least in the initial phases, suicide attacks were less effective and took fewer victims in Afghanistan than in Iraq. This might be as a result of cultural taboos on killing innocents in Pashtun culture [21].

3.7 Familiar network and genetic factors

As researches show, suicide bombers in particular are known to act in familial pairs, such as, mother with son, father with daughter, as well as siblings. This raised the idea of suicide bombings being a result of socio-environmental factors and upbringing. However, the growing evidence of genetic factors in suicide, come to challenge the idea that suicide terrorists could not be suicidal, because suicide bombers most often act in familial pairs [22]. According to one study, in 15% of cases, identical twins share suicidal tendencies [23]. In addition, many other adoption studies evidently showed that individuals that were adopted were six times as likely to commit suicide as their biological relatives who committed suicide [24]. Thus, the fact that suicide bombers and attackers often act in familial pairs might be as a result of transmitted genetic suicidal traits [25].

4. TERRORISM AND THE MEDIA: A DANGEROUS SYMBIOSIS

4.1 The media-related goals and means of terrorists

Terrorism has as "target" the wider audience at which the violence is actually aimed. However, without the media's coverage, the terrorist acts would be arguably wasted, narrowing the impact to the direct victim(s) of the attacks [26]. In addition, the terrorist organisations are mainly interested in the wider audience, rather the direct victims and it could be argued that the reaction from the audience has the same importance as the acts themselves [27]. Moreover, terrorist organizations are carefully selecting the places that they will attack, in order to get the best media coverage and win the attention of national and foreign publics as well as the decision-makers in a government. An example would be the 9/11 attacks in the US, where not only a large number of media covered the story immediately but also it was documented by hundreds of people through videos and pictures [28]. However, the goals of terrorist organisations are not limited into gaining the attention of the masses. However, it is through the media that they aim to inform both foes and friends, regarding the motives behind terrorist deeds, explain their rationale behind their acts of violence and publicize their political causes as well as to motivate future recruiters [29].

4.2 Media's coverage of terrorism

Terrorism and terrorist incidents involve blood, tragedy, heroes, shocking footages, drama and the feeling of danger. For that very reason, media's coverage of terrorist-related stories provides a high pick of view ratings and profit which is very beneficial, as Media rely on views and the audience [30]. Another factor that makes terrorism such an attractive topic is that, in the modern television culture, violence has been a major and defining quality that public audience enjoy [31]. Moreover, what is problematic

regarding media's coverage of terrorism is not the actual act of covering terrorism, but rather the way the media cover terrorism. There is no doubt that terrorism should be reported, but the way the incidents are framed and the extent to which it is covered is also important. Media's coverage of terrorism is most often framed by enlarging stories, sensation-seeking, exaggerating the matter of who is to blame, repeating the same footage and images over and over again, separating physical and mental health consequences of disasters as well as creating new syndromes [32].

4.3 What is problematic about this symbiosis

The media may directly or indirectly serve the interests of terrorists by over-simplifying stories for the audience to the point that it has little to do with the actual events. By repeating the traumatising horrific scenes and stories it also serves the goals of the terrorists, which are to appear in the media as long and often as possible. Moreover, the media's obsession and bias of sensationalising certain aspects of terrorism related stories might contribute to the fact that terrorist organisations are using media as a tool for their own success. Creating an atmosphere and politics of fear and creating the necessary conditions for propaganda and recruitment following a terrorist attack is the ultimate contribution of media to terrorism.

In addition, the way media frame suicide attackers, is by portraying them as rational individuals that committed an altruistic suicide on their beliefs and ideologies. This idea and view has been adopted and shared by the broad audience that mass media have. One could argue that the way suicide attackers are framed and covered by the mass media contributes to the recruitment of future suicide attackers by creating copy-cats. In other words, individuals that will choose to mimic this kind of action and behaviour. As mentioned above, terrorist organizations arguably plan out their attacks in a rational and strategically way with having full awareness of the influence that media coverage has on society as well as government officials in almost all levels. Thus, recruiters and leaders have knowledge on the impact the media have on an individual's decision to participate in such an act and use it on their own benefit.

This can be seen and explained through the different approach media gives to mass-shootings, school-shootings and suicide attacks. All of the above-mentioned acts involve a perpetrator that kills a number of people and then proceeds to take his/her own life. However, the media will portray the gun-shooter as a mentally unstable individual that suffered depression and suicidal thought, whereas the terrorist suicide attacker as a rational individual that acted on ideologies and beliefs. Thus, mentally unstable individuals with suicidal tendencies and intrigued by the media's portrayal of suicide attackers, might choose to act in the context of terrorism in order to get the expected response by the media and be portrait in the same manner. Media's representation of terrorism and suicide attacks influence the public in such a degree that it is a major contributing factor in the recruitment of future suicide attackers.

5. CONCLUSION

The researches and literature in the field of suicide terrorism has been dominated by political and social theories. This might be a result of the political and social aspects of suicide terror being thought as more important, or at least more pertinent to counterterrorism than individual aspects. In addition, it might be also a result of information on what motivates an individual to engage in this behaviour being so difficult to obtain. Suicide attackers, after all, operate in secret, they are protected by clandestine groups, and many do not live to tell their stories. However, for scholars there might be an additional concern, which is that any inquire into the psychological or psychiatric aspects of suicide attacks will somehow marginalize or delegitimize the real political and social grievances that are thought to lie at the heart of the phenomenon.

Even though every case of an individual committing a suicide attack can differ as well as the rationale behind it, previous attacks, attackers' statements and evidence, suggest that the influence and impact terrorist organizations and groups have, as well as the individual's social context, can be the key to certain suicide attackers' decision on attacking. However, this new growing field of research comes to challenge the popular and traditional opinion, regarding the reasons behind suicide attacks, stating that the psychology of an individual and genetic traits are also important factors for one's actions. Thus, psychological explanations of suicide attacks should also be considered.

6. FUTURE DIRECTIONS

This emerging evidence and research that argues regarding suicidal ideation and behaviour, playing a role in a number of cases of suicide terrorism, should not be dismissed, even if that number is found to be significantly low. Just because suicidal ideation operates at some level in some cases does not mean that political and social factors do not also operate at other levels or that these levels are not equally important. What is needed, is a more systematic, cross-disciplinary research and cross-national collaboration regarding this phenomenon. Well organized and systematic databases have been beneficial for this field of research, for example the Suicide attack database. These databases can be mined for factual information regarding suicide attacks and incidents, such as, tactics and weapons used, the motivations of the groups or organizations promoting the attacks and where and when they occurred. However, they are not designed to provide insight information on the very personal motivation or the psychopathology and potential suicide tendencies of individuals who turn to suicide attacking. Knowing whether suicide attackers are suicidal is not simply an academic issue. The growing evidence that recruitment occurs among the bereaved, those with disabilities and even mental illness has clinical implications. It also has implications for prevention. If suicidal ideation, intent or planning plays any role in the decision for an individual to become a suicide attacker, even if such individuals might be the minority of suicide attackers in general, that finding could be used in order to possibly design a more proper prevention programme for such vulnerable individuals and possibly future recruits.

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Architectural Cognition Sociology

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ABSTRACT
The aim of this paper is to promote Architectural Sociology keeping cognition in focus. Firstly architecture, cognition and society are considered in their relationships. Secondly associations promoting cognition, its study and extensions of architectural cognitonics are discussed. This all is made in order to form a clear basis to understand architectural action in socio-psychological reality.

General Terms
Design, Experimentation, Human Factors, Management, Performance, Theory

Keywords
Architecture, Certainty, Information Society, Cognition, Cognitonics, Sociology

1. INTRODUCTION
Architecture manifests human creative potentials in culture [Alvar Aalto, 1963 in discussion]. These potentials are evidently cognitive and achieved by talent and education [37, 28]. In this sense Architectural Sociology [33, 5, 26, 27] is the most natural forum to discuss architectural cognition and its role in society. We have the following key questions:

Architecture, cognition, society and cognition

Cognition society, study, cognition sociology extended

Architecture and thinking have the same roots in ordination, which according to Aristotle is central content of thinking [38, p. 25]. Later Vitruv [37, p. 37] adopted the concept of ordination into the constituents of architecture. Cognition is a broader concept than thinking. The common point mentioned gives, however, a good start to discuss the problem. In practical life designers do not think thinking but just think [31]. In theory the notification of this has been emphasized [36]. It is also a commonplace to say that architecture is one of the so many targets of thinking and cognition, but how this happens is a new question. [22]

2. INTRODUCTION TO ARCHITECTURAL COGNITION SOCIOLOGY

2.1 Architectural Cognition
Architecture consists in its relation to cognition of ideas represented in its basic theory [37], like:

Ordination, disposition, harmony (and cognition)

Symmetry, decor, distribution (and cognition)

Architecture is subordinated to the idea of order analogical with cosmic order [42]. We are directed toward world (Brentano) and its architecture. In ideal form this relation is harmonic, but fight for harmony and peace is one possible and important extreme in our attitudes.

Our relation toward world is dually “symmetric”, and a lot of similarities exist in supposed reality and mental representations due to the cosmic order [35, 14]. We are interpreting our environments and décor tells about the social content of targets. Finally architecture is distributed and this correspond the most accurate descriptions of it in mind.

Architecture has its cognitive modes discussed in literature [30, 40] Environmental Psychology is a study area discusssing cognitive problems also in architecture [10]. More surprising is that cognition has its architecture [23, 24, 25].

Spatial architecture refers both to performances and products and the same holds for cognitive architectures, which have also their mental perfomances and products.

2.2 Cognition
Cognition is studied not only in philosophy but in cognitive psychology as well [41]. How to define it is a problem, but we define it in a relative unproblematic way to consist in relation to architecture of ideas:

Perception, memory, thinking (and architecture)

Abstraction, knowledge, information (and architecture)

Architectural perception does not differ from general one in principle, but in orientations [10]. The role of memory in architecture has been noted, but also problematized [29]. The word “reminescences” has been used in design speech [Aalto, 1968 in discussion] and art history to mean the use of loans from other

buildings. Thinking is the key element of cognition in rationalistic architecture [31].

Abstraction [15] has its typical forms both in science but also in art [1, p. 71-]. Knowledge-based approach in architecture [9, 12] has brought architecture closer to KE (Knowledge-Engineering) and AI (Artificial Intelligence). Ideas like Information Society [18, 2] have catalyzed discussion in architecture and its communication [32, 40, 20].

Architects have discussed a lot how to guarantee multi-modal convenience in architecture and prohibit strong reflections or noise [1, p. 37-]. Information on the other hand is the same as the elimination of uncertainty, which has central task in all cognitive faculties above. - Rational skills are the first tools to discuss cognition, but rationality is only a sector in cognition. Covering discussion has to consider belief, knowledge, volition, desire, emotion and skills.

2.3 Societal Cognition

The form and content of human societies separates us from other animals. The secret behind this depends on cognitive potentials (Aristotle > rationem particeps). [28, p- 16-] Societal cognition has its forms, like:

Ecological, communal, technological (cognition)

Economic, cultural, civilization/ -civilized (cognition)

Ecological cognition renders it possible to survive in a world in a sustainable manner. Human world has evolved to be an Antropokosmos [7, p. 251-]. It consists of community societies [8] challenging the human mind to react to social needs and desires in renewing ways. This catalyzes technological evolution based on typical ways of cognition in the same way that architecture does as arche-technology [1].

Humans have developed fiscal ecology called economy, which has its characteristic ways of thinking in good and bad. In normal societal discussion the concept of thinking is most connected to cultural phenomena (above). In culture we may differentiate civilized forms or not of cognition. Crucial question in this evaluation is the dilemma between human or not human [1]. Today it is important to note recent transition toward Information Society [12, p. 20-], Electromediative [21] or "Smart Society"[3].

3. SOME SIGNIFICANT ASPECTS OF ARCHITECTURAL COGNITION SOCIOLOGY

3.1 Cognition Societies

The dispersions of our opinions concerning what is cognition force us to found cognition-associations or mini-societies to promote right ways of thinking [39]. Key ideas to note include:

(Cognition) ecology, community-networks, technology

(Cognition) economy, culture, civilization

Cognition is under constant processes of change. [38] Some ideas are born whereas other die or decade. The only way to fight for cognition promotion is to network locally and globally for professional assertion [39] (> CIAM, [4]). Cognition technology in the form of mnemonics has its long roots and can be connected today to ICT (Information and Communication Technology) [13].

Cognition has its own economy, which can be traced to the ideas of Occam and Mach [11, p. 18-]. In practical level we also know that cognitive tools are targets of exploding business (> Nokia, Microsoft, Apple). The ways how we manage cognition can be called cognition culture, which may reach its civilized forms or not. Today there are a lot of mal-uses of cognitive devices, like in cyber-war, cyber-crime, reckless confusions in digital education etc. Smart societies are from our point of view communo-technological ecosystems utilizing ICT [3].

3.2 Study

Cognition sociological problems can be studied first of all in Cognitonics [6]. From methodological point of view we may separate forms [26, 27], like:

Statistical, empirical, logical cognition-study

Comparative, qualitative, quantitative cognition-study

Statistics is a natural tool to run brain-study in the same way than behavioral approach in sociology. Brain and mind are, however, not identical research targets. Empirical study of mind is a problem and should be re-connected with the idea of internal experience or experiment (Hutcheson). In this sense we need reflective conception-logics and notification of modal and deontic logic. [16]

Cognition is naturally compared as related to variation of content (> Carnap, Hintikka > [17]). These problems can be studied in qualitative [19] or quantitative information theory [20] discussing the elimination of uncertainty in environmentally related action.

Logical study of cognition starts eg from the logic of perception. If some of the cognitive operations above (2.2) hold for target x, and hold for target y, then they hold for target x and y. If cognitive operations hold in the case of target x, then they hold for more general targets like x or y. They either hold or not for x. Then if I perceive a house and I perceive a sauna, (then) I perceive a house and a sauna. If I remember a red door, then I remember (a red or a green door) it is I remember a door. Cognitive operations are thus connected to Propositional (Boolean) Algebras to be represented in Set Theoretical tools in the so called Stone Space (created). [17] In the case of perception we have the situation of standard scientific experiment. It is however well known that in addition to perception experiments we may have remembering, thought, abstraction/ determination, knowledge acquisition and information gathering experiments as well. In fact for example perception experiment is also information gathering experiment per se in eliminating our uncertainty about the target. [20]

3.3 Cognition Sociology Extended

Architectural Cognition Sociology has its key target in society. The complex problem means that it is natural to enlarge the study to dimensions, like:

Sociality, society, state (and cognition)

Function, work, politics (and cognition)

The study of cognition starts from personality [24]. Personality is built, however, on collective achievements. [1, p. 92-93] Society is the primary growth environment for us. State however gives still mainly the rules for societies. In this sense it is natural to speak about Finnish or Scandinavian design and so on. The situation is however changing and we have lost Regional ideas [1] on the altar of not only International Style but also of Global often speculative forces.

Architecture refers only seldom to global problems of Mankind in war and peace. The normal level of thinking in architecture is functional. [39, 42, 4] In this sense we have to recognize sacral, public, work, free-time, private and profane tasks and challenges to be solved with our creative potentials (above). Work has its special

status. Design is work and design for work is decisive because success in it catalyzes success in general [34]. In this sense politics and work politics have decisive role in directing human potentials to right targets. According to Aristotle the best politics in Politeia picks people to realize their own talents and skills achieved by education.

4. CONCLUSIONS

We have shown what Architectural Cognition Sociology is in its big picture. Society is the basic unit to consider interaction of architecture and societal activities. This concern can be deepened to personal aspects of cognition and toward global problem formulations. The main field of application of the theory lies on the side of Information, Electromediative and Smart Societies.

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Goals of Cognitonics in Formal ICT Education

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ABSTRACT

Cognitonics is a scientific discipline of the newer date developed with the aim of studying the human being in the digital world. The aim of this study is to evaluate the realization of Cognitonics' goals within IT subjects in Croatian primary education. The work will serve as a starting point for further research of the implementation of Cognitonics' goals within IT subjects in elementary education.

Categories and Subject Descriptors

K. Computing Milieux: K.3 Computers and education: K.3.0 General, K.3.1 Computer Uses in Education, K.3.2 Computer and Information Science Education.

General Terms

Management, Measurement, Documentation, Performance, Design, Reliability, Experimentation, Human Factors, Standardization, Theory.

Keywords

Cognitonics, ICT, ICT education.

1. INTRODUCTION

Cognitonics is a scientific discipline of the newer date developed with the aim of studying the human being in the digital world. It is based on research results that point to the gap between intellectual and spiritual development of individuals in a modern information society under the influence of rapid technological progress, ICT (Information and Communications Technology) development and globalization.

One of the goals of Cognitonics is to determine which are the optimal age and the cognitive preconditions that a person must possess for getting acquainted with ICT in order to reduce the gap that affects the integrity of human nature, i.e. the harmonious development of a person. Furthermore, the goal of Cognitonics is to create theoretical basis that will enable development of different systems within ICT. These systems must have a positive impact on development of individual's creativity, its sense of harmony and beauty, awareness of belonging to a particular national culture, a positive impact on the development of individual language skills, ethical behaviour, self-regulation and other values that represent some of the principles of Cognitonics. The application of these principles should be encouraged for the purpose of harmonious and complete, correct development of individuals.

The aim of this research is to evaluate the realization of Cognitonics' goals within IT subjects in Croatian primary education and to point out the changes that should be made for quality and harmonious intellectual and spiritual development of an individual.

2. ICT in Education Systems

Today it is necessary to supply schools with multimedia equipment, connect them to the Internet, and train teachers to work with this technology. It can be done by encouraging schools to be more proactive, to accept new ideas and to adopt and implement the changing goals of society. By integrating ICT, the tools for work as well as educational contents are changed, i.e. the complete educational environment is changed. According to Bearden [1], the goal is to change traditional concept of classroom teaching, to integrate technology into education, and to create a space open to demands of society, with the aim of building a sense of belonging to society in order to achieve a smart, sustainable and inclusive growth of an individual. In the research conducted in Italy [1], the teacher's view is that the use of ICT within the education system affects the development of group work ability and represents a cognitive learning resource that enables development of more complex and richer thoughts among individuals.

Today, there are a number of educational contents in digital form. Teacher is the one to choose the form in accordance with educational needs of students and characteristics of educational content. Besides that, appropriately chosen technology and content can be a motivating factor for encouraging and maintaining interest in both teaching and learning.

The use of ICT in education has a number of advantages over the traditional way of education: accessibility, mobility, interactivity, lower price, distance learning, etc.

Additionally, digital learning materials can be easily updated and / or altered with new ones, which is essential in today's rapidly changing educational environment.

Many studies point to the benefit of using ICT as a teaching and learning tool within teaching. Using it, students are able to change the way they access information, collect them, analyze them, present them, etc. It also enables them to develop the skills of socialization, creativity and cooperation skills. In this way students show interest and satisfaction, and learning is transformed from static to dynamic situation.

3. Cognitonics and Emotional-Imaginative Teaching System

The traditional education system in Croatia was focused on content, not on an individual; on results, not on the process of acquiring knowledge and skills; on shaping an individual

according to existing social patterns, not on creating conditions for development of his/her creative potential. The main goal of the education system should not be to absorb large amounts of different information, but to develop the logical and creative abilities of individuals as well as to develop their ability to change existing situations.

According to Fomichova and Fomichov [3], the main social function of education is reproduction of culture. Their approach to solving educational problems is in line with the constructivist theory which states that knowledge is not only transmitted by a teacher to a student but it is built into the mind of students during the process of active learning. That is why the educational process should be based, among other things, on the principles of Cognitonics. The goals of cultural enrichment, the development of cognitive mechanisms and intellectual and spiritual development of child must be jointly incorporated into contemporary educational processes in order to enhance the child's ability to properly process all information.

In the 1990s, Olga Fomichova created the Emotional-Imaginative Teaching System (EIT - system), which became one of the principal preconditions of developing in the 2000s (together with Vladimir Fomichov) the foundations of Cognitonics.

According to Fomichov and Fomichova [4], the aforementioned system aims at developing in individual: ability to process symbolic information; ability to observe and appreciate beauty in all its appearances, particularly in human activity; ability to understand others; understanding of so-called social agreement and social relationships; ability to have one's own point of view; sense of belonging to the generation as well as the understanding of those generations that were before and those that will develop later; and awareness of belonging to a particular national culture. In other words, this system aims to introduce a social, human component into education and can be perfectly integrated into goals of Cognitonics for the use of ICT.

Related to this, Micarelli and Pizziolo [5] mention the fact that today's younger generation under the influence of modern ICT is increasingly deprived of perceptual experiences arising from the social environment in which they live. They remain deprived of direct and spontaneous social relationships, and these are replaced by superficial, virtual interaction. Authors believe that traditional education systems are not able to close this trend, which suggests that certain changes are certainly needed to create new ways of teaching and learning. They argue that it is necessary to teach the children of a modern information communication age to discover and interact with their living environment and recognize themselves as the integral and active part of that environment. In other words, it is necessary to encourage a sense of belonging and social awareness and sensitivity. In addition, it is necessary to harmonize the impact of virtual and real-world environment, as well as to enable their merging to achieve an extended life environment. Micarelli, Pizziolo et al. [6] claim that the virtual environment seeks to replace the real world by imitating it, endangering the social component of individual life. One of the ways that authors [5] emphasize, as being successful in creating an individual's connection to their environment, is the pursuit of activities that allow friendly engagement, spontaneous conversations, social awareness, and real connectivity with their surroundings, all accompanied by a pleasant atmosphere. In this way, an individual can once again discover the possibility of respecting and associating with his/her own living environment.

The main driving force of each society of knowledge is a creative class that encourages development of: creativity, the desire to be useful to society, the ability of social co-operation and a deep sense of social responsibility.

Additionally, in order to develop intellectual and emotional spheres of students harmoniously, emotions need to be taken into account. In order to equally develop student's intellectual and emotional sphere in the classroom, it is necessary to take into account what incentives are needed for their development. There is, for example, thought about music or any other type of art that promotes the development of emotions. For art it can be said that it is representation of emotional experience which is achieved by experiencing a particular work of art. Besides emotions, there is a need to develop the ability of empathy, sympathy, and emotionality in students.

4. Cognitive Psychology and Informatics

Cognitive psychology was developed in Great Britain in the fifties and sixties of the 20th century under the influence of various disciplines (neuroscience, linguistics, anthropology, philosophy, etc.) including computer science. Technological development has influenced the way that human psyche began to be perceived, so the development of ICT has led to the use of IT terms in the sphere of psychology (for example, a sentence: the human brain has limited *capacity* for processing information). Besides that, cognitive psychology studies how human mind works using computer tools and methods. Cognitive psychology, as well as Cognitonics, studies how computers can be best used to help an individual in his/her work, with the aim of harmonious development of his/her emotional and rational sphere. On the other hand, psychological knowledge can be a very useful tool in developing ICT, which enables communication of the individual (user) with the mentioned technology. Psychological optimization will probably become one of the important factors in the development of user interfaces for computer systems that will stimulate the achievement of goals of Cognitonics as a newer scientific discipline.

5. Cognitonics and eLearning

Today's use of the online education environment is increasingly frequent.. In order to make the use of eLearning successful, it is necessary to offer to individual high quality of educational experience. In order to achieve this, it is necessary to have a well-made training course adjustable to student needs and capabilities. This can be achieved with a well-developed system for evaluation of student achievement. With this system, a student can be provided with a more personalized learning experience.

Since it is, in today's information communication era, more and more common the use of eLearning, which is carried out within the various educational programs, it is necessary to, at all times, respect the goals of Cognitonics in order to achieve desired results in the development of individual (student). One of the items that must be taken into account when organizing and conducting eLearning is the culture and cultural heritage of the society within which such a form of learning is implemented [7]. In addition, there are many items in each individual participant of such programs that must be taken into account in order to meet the goals that are being set up by eLearning. Some of them are: the language in which the program is being conducted (level of knowledge of the language, the competence of its use), the necessary foreknowledge of the participant, his/her material status, religious orientation, cultural and social background, sense of beauty, etc. All these are important parts that need to be carefully considered during design of an eLearning program, so they could be indeed adapted to an individual enabling the

harmonious development of his/her intellectual and emotional sphere.

In accordance with this, Burdescu et al. [2] note that classification is one of the main algorithms that must be used when implementing eLearning. It provides the possibility of detecting potential groups of participants of similar characteristics and similar responses to the offered learning strategy. Furthermore, the authors believe that the use of classification: increases the learning ability of students; allows the grouping of students who are faced with a failure to help them improve their skills; identifies participants with low motivation, and similar. The aim of the use of classification is to increase the effectiveness of the online education process, which is one of the biggest challenges of the information society. For this purpose, the authors created a structure for the classification of the participants, based on their final grades. That has been achieved by using certain algorithms and procedures for classifying every student.

In order to improve the communication between professors and participants of eLearning program, new tools are developed, which contain intelligent data analysis techniques (for analysing the text itself and the feedback that students send). In addition, it is necessary to develop tools that will be able to analyze the cognitive development areas of students with the aim of enabling teachers to develop precise mental models of each student's abilities. Within regular education systems, teachers achieve that by a constant face-to-face interaction with students, which enables them to recognize both learning abilities and individual developmental abilities. It is much more difficult to achieve that online. The aim is to develop tools to monitor the activity of each individual student so that teachers can understand and analyze their behaviours and actions to improve their skills and experience while attending online education programs [8].

6. Research about implementation of goals of Cognitonics when introducing students into the spheres of ICT

The aim of the research is to determine the extent to which informatics teaching in elementary schools in the Republic of Croatia is conducted in accordance with the goals of Cognitonics. In other words, the aim is to analyze the existing situation by investigating how far the Cognitonic goals are being pursued during the introduction of an individual into the sphere of ICT. Research will also help to understand when the children are first encountered with formal IT education.

The research was conducted by an anonymous survey that was distributed online to the student (academic) population. It should be emphasized that this was a non-probabilistic sample of volunteers. A sample of this age group was selected because it is considered that respondents can reasonably, accountable and comprehensively approach reflection during filling in the questionnaire. In addition, the respondents were able to see, with a certain time lag, the situation in which they were in the first formal meetings with ICT.

For the purpose of the research, it was used a survey questionnaire with closed questions and with the obligation to answer each question. Survey respondents were voluntary and anonymous. The survey was distributed through the web site www.inovacije.eu, which aims to conduct online research. When analyzing the results of the survey, descriptive statistical data analysis was used.

With this survey and analysis of its results we want to gather data and explore whether and to what extent are the goals of Cognitonics represented in formal elementary informatics education in the Republic of Croatia. This will give a clear picture of the current situation regarding Cognitonics. This research has not yet been carried out in Croatia, and can be included under primary research with regard to the type of data being collected. Given the type of data being studied and considering the goals, this will be a theoretical descriptive statistical study.

6.1 Survey questions

1. Gender?
2. Year of birth?
3. Do you have daily access to the computer and the Internet?
4. For what purpose do you use the computer and the Internet most frequently?
5. How often do you use the computer and the Internet?
6. How old were you when you started using the computer?
7. How old were you when you started using the Internet?
8. Do you feel like a computer literate person?
9. When did you start with formal (organized) education in the field of information technology?
10. Have you been encouraged to use ICT for educational purposes during elementary school education?
11. Do you think that at the beginning of the organized (formal) attendance of IT education you have been introduced into its spheres so that ICT: has become a tool that has expanded / enriched your creative way of thinking; has became a tool that guided you / determined your way of thinking?
12. During the use of ICT that was available to you in your classes, professors supported / encouraged the development of your: personality; creativity; cognitive sphere; emotional sphere; awareness of national affiliation and national culture; language skills; communication skills; ability to cooperate; ability of independent thinking; ability to prepare for real situations; ability to make your own decisions; analytical abilities; learning abilities; ability to learn from mistakes; Did not encourage any development; I do not know.
13. At the beginning of your formal (organized) IT education was it accentuated to you what kind of behaviour is expected of you in the information environment, and what kind of behaviour is strictly forbidden?
14. Do you believe that the Internet, at the beginning of your formal education, has influenced your cultural identity (an identity that speaks to which culture you belong)?
15. Do you feel that during formal (organized) IT education you have been encouraged to appreciate traditional values (family, religion, awareness of national affiliation ...) regardless of the fact that Internet allows globalization?
16. Do you believe that the use of ICT generally encourages in you the acceptance of traditional or commercial values?
17. During your beginning of formal IT education, by using ICT you were encouraged to: develop awareness of the values of the national culture to which you belong; develop the need for globalization instead of belonging to a single national culture; I do not know.
18. When using ICT during the beginnings of your formal IT education it was stimulated your: spiritual development; intellectual development; equally intellectual and spiritual development; I do not know.
19. When using information technology for communication, do you pay attention to the grammatical accuracy of your language expression?
20. Each of us has its own value system in life. The use of ICT in formal education encouraged you to follow which value system subjects?

21. How do you react to any negative situation you face on the Internet?
22. How much are you affected by the information you are encountering on the Internet?
23. With other people you usually associate: virtual; live; equally virtual and live; I do not know.
24. Where do you feel better: in virtual reality, in real life, or equally?
25. Do you think there is a difference between "face to face" communication and communication by using ICT?
26. Do you feel that you belong to the social community within which you live?
27. Have you ever used ICT for any wrong purpose?
28. Do you think that using ICT encourages tolerance, dialogue, and respect for others?
29. Does the use of ICT affect you positively or negatively?
30. Were you, during the formal education, warned on the negative consequences of using ICT for the wrong purpose?

7. EXPLANATION OF RESULTS INSTEAD OF CONCLUSION

The results of the survey analysis show that there was an equal number of female (50.94%) and male (49.06%) respondents. The sample with which the analysis was made consisted of 53 examinees. The oldest respondent was born in 1969, the youngest in 1998, and it was a student (academic) population. All respondents (100.00%) have daily access to the computer and the Internet. As far as *information literacy* is concerned, most respondents (92.45%) are considered themselves *literate*. Two respondents (3.77%) *did not know* and two of them (3.77%) responded *nor yes nor no*. When stating what is the most common purpose of using computer and Internet, the majority of respondents placed *communication* (28.30%) and *entertainment / gaming* (20.75%) in the first place, which shows that it is a younger population. In the second place, most of the respondents put *informing* (30.19%) and *fulfilment of faculty obligations* (20.75%). In the third place, it was again the *fulfilment of the faculty obligations* (24.53%). On fourth place, the majority of respondents put equally *learning* and *informing* (20.75%). In the fifth place, most of the respondents put again *learning* (24.53%). Considering the population of the respondents, it would be expected that *learning* would be at a higher priority ranking place. At the second last place most of the respondents put the *purchase* (35.85%) and the *work / fulfilment of the business obligations* (24.53%). The same is the last place: *purchase* (41.51%) and *work / fulfilment of the business obligations* (30.19%). The last two places are again an obvious indicator that respondents who have completed the survey belong to the student population.

When answering how frequently are using the computer and the Internet most respondents (98.11%) responded *several times a day*, and only one respondent (1.89%) responded *several times a week*. More than half of the respondents started using computers *between 6 and 10 years of life* (50.94%), and the Internet *between 11 and 14* (56.60%), which points to the need and importance of implementing Cognitonics' goals into ICT education already in elementary school. According to the answers to the previous question, most respondents (43.40%) started with formal IT education in *higher grades of elementary school*. Nonetheless, more than half of the respondents (54.72%) answered that during primary education *they were not encouraged to use ICT for educational purposes*. Positive side points out that almost half of the respondents (49.06%) said that at the beginning of their formal IT education, ICT became a tool that *expanded / enriched their creative way of thinking*. More than half of the respondents stated that the professors used to support / encourage the development of their: *communication skills* (52.83%), *co-operation skills* (50.94%), *self-reflection skills* (52.83%) and *learning abilities* (50.94%) during the use of ICT in teaching. A little less than half of the respondents stated that the professors used to support / encourage the development of their *creativity* (49.06%), *analytical skills* (41.51%), and *the ability to learn from mistakes* (45.28%). What indicates insufficient presence of goals of Cognitonics in teaching is the statement of less than one third of respondents that during the use of ICT in teaching professors supported development of their *cognitive sphere* (24.53%), *language skills* (22.64%), *ability to prepare for real situations* (28.30 %) and *the ability to make their own decisions* (26.42%). It is worrying that 20.75% of respondents stated that there was not encouragement of any development in them. Likewise, only 16.98% of the respondents state that during the use of ICT in teaching, it was stimulated the development of their *personality*. The development of the *emotional sphere* (1.89%) and *awareness of national affiliation and national culture* (7.55%) are completely neglected.

It is interesting to note that the same number of respondents (43.40%) stated that they were *accentuated*, and were *not accentuated at the beginning of their formal (organized) IT education what kind of behaviour is expected of them in the information environment*, and *what behaviour is strictly forbidden*, while 13.21% of them *do not know* the answer to this question. As far as *cultural identity* is concerned, more than half of respondents (64.15%) stated that the Internet, at the beginning of their formal education, *had no impact on their identity which tells them to which culture they belong to*. Among the respondents, 43.40% stated that during formal ICT education they *were not encouraged to value traditional values* such as family, religion, previously mentioned nationality and similar, while 39.62% stated that they *were encouraged*. On the other hand, when they had to choose whether ICT use generally encouraged them to respect traditional or commercial values, 35.85% said it was *commercial* and only 1.89% said it was *traditional values*, while 30.19% of respondents considered that the *representation of values is the same*. Almost half of the respondents (49.06%) stated that during formal IT education they were encouraged *to develop the need for globalization instead of belonging to a single national culture*, 39.62% *did not know*, and only 11.32% stated that they *were encouraged to develop awareness about the values of the national culture they belong to*. More than half of the respondents (67.92%) stated that at the beginning of their formal IT education, it was stimulated their *intellectual development*, only one respondent (1.89%) stated *spiritual development*, and 22.64% stated *the same amount of intellectual and spiritual development*. In any case, it is too little to argue about how successful goals of Cognitonics are pursued during elementary school education. Interestingly, more than half of respondents (52.83%) stated that when using ICT for communication they *pay attention to the grammatical accuracy of their language expression only when they consider it necessary*, less than half of the respondents (45.28%) stated that they *pay attention always*, and only one of the respondents (1.89%) stated that he *does not pay attention*. Respondents stated that, during the use of ICT in formal education, they were stimulated to grow the feeling for the following elements of their value system in the following percentages: *career* 49.06%, *friendship* 41.51%, *social responsibility* 39.62%, *decency* 35.85%, *tolerance to differences* 35.85%, *sincerity* 30.19%, *honesty* 30.19%, *family* 20.75%, *trust* 18.87%, *love* 15.09%, *religion* 5.66%, and *patriotism* 3.77%. As

for the negative situations encountered over the Internet, most respondents (45.28%) *stop and think before allowing the negative situation to affect them*, 24.53% *do not respond to negative situations*, 20.75% *respond to the first impression*, 7.55% *do not encounter situations that negatively affect them*, and one respondent (1.89%) *does not know*. When respondents were asked to what extent they are affected with the information they encounter over the Internet, most of them (75.47%) stated that *they are affected to the extent to which they feel that this information is accurate*. 20.75% responded that *they are not affected*, one respondent (1.89%) answered that he is *fully affected*, and one respondent (1.89%) *did not know*. Less than half of the respondents (41.51%) believe that ICT use *encourages them to tolerance, dialogue and respect for the other*, 30.19% argued that *this is not the case*, and even 28.30% *do not know*.

Half of the respondents (50.94%) stated that they usually associate with other people *in person*, 45.28% of them communicate *equally virtual and live*, and only 3.77% communicate only *virtually*. Accordingly, 62.26% of respondents stated that they *feel better in real life*, 26.42% stated that they *feel equally good in virtual reality and in real life*, and 9.43% respondents responded that they *feel better in virtual reality*. Regardless, all respondents (100.00%) are aware that *there is a difference between "face to face" communication and communication using ICT*. More than half of the respondents (62.26%) stated that they feel *they belong to the social community they live in*, 24.53% feel *they do not belong* and 13.21% *do not know*.

It is worrying that almost half of the respondents (49.06%) stated that they *used ICT for some wrong purposes.* 39.62% responded that they *were not*, and 11.32% *did not know*. Probably this is the reason why 41.51% of the respondents believe that *ICT affects them both positively or negatively*, one third (32.08%) considers that it affects them *positive*ly, 20.75% stated *neither positive nor negative*, 3.77% stated it affects them *negatively*, while one respondent (1.89%) *does not know*. In the end, the respondents were asked if they were warned during formal education on the negative consequences of using ICT for the wrong purposes. 60.38% of the respondents stated *yes*, 2.53% stated *no*, and 15.09% *did not remember*.

In the next paper, we will deal with a more detailed analysis of the collected data and with making more conclusions related to them.

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Serendipity as a Design Principle for Social Media

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ABSTRACT

Personalization of content in social media fundamental to restrain information overload and satisfy Internet users. Yet, over-personalization creates filter bubbles and strengthens echo chambers. Thus, it also restrains exposure to diversity of information. This represents a fundamental issue for media law and ethics which attempts to maintain pluralism in democratic societies. As a result, individuals reduce their informational empowerment and societies become more politically polarized. This short paper discusses the potentials of serendipity as an alternative design principle. Serendipity is indeed a complex phenomenon that can be considered as a capability of seeking and processing unexpected and valuable information. As a precondition, it requires novel and diverse information. As outcome, it causes cognitive diversity. Therefore, serendipity is able to encompass relevant phases of production and consumption of information, representing a positive freedom valuable from an epistemological, educational and even political perspective. The research exposes an emerging theoretical trade-off in information filtering between relevance and serendipity (or unexpected relevance) that might be tackled with serendipity-driven recommender systems and specific design choices.

General Terms

Algorithms, Design, Theory, Experimentation

Keywords

Filter bubbles, Personalization, Ethics, Serendipity

1. INTRODUCTION

Internet is very serendipitous. Every day Internet users can discover plenty of unexpected and valuable informationthat can change their current task, their own beliefs, or even their life. Hyperlinked digital environments are a fertile ground for serendipity [1]. Even social media, where users increasingly spend most of their online time, isa powerful source of coming across information serendipitously [2]. Of course, serendipity is often an implicit design goal. Yet, the Internet can be ever more serendipitous.In the past, in fact, any procedure to select information recognized and sought to solve in a beneficial manner the ideal tension between *relevance* – what a reader wants – and *serendipity* – what a reader may want (or "unknown relevance"). In the digital environment, this balance inevitably shifted from serendipity to relevance [3]. Actually, already back in 1997 it was warned "the end of serendipity" [4]. Theoretical basis for the necessity to defend randomness from processes for search and discovery have also been proposed [5]. In fact, aside from natural human proclivities such as selective exposure, confirmation bias and homophily, information discovery is actually limited by over-personalization of online content, especially in social media. Information filtering and design choices can indeed fuel *filter bubbles* and *echo chambers*, two sides of the same token. Generally, the first refers to the situation in which a user continue to see, listen and read what reinforces their opinions and interests. The latter refers to a group situation where information, ideas, and beliefs are uncritically spread and amplified, whereas dissenting views are ignored. The risks of this phenomenon have been well discussed [6, 7, 8]. In theory, it raises serious concerns both on the individual and collective levels. Individual, because these filters might reduce opportunities for users to self-determine, by reducing the exposure to alternative points of view and serendipitous discovery. The consequences may be various: from the limitation of personal creativity to a reduction in the ability to build productive social capital. Collective, because by fuelling political polarization, media pluralism may be weakened and make people more vulnerable to censorship and propaganda, or, better, to self-censorship and self-propaganda. Furthermore, another prominent risk is growing inequality. Indeed, a certain privileged group of users that have enough (digital) literacy would be able to reach a good balance between relevance and serendipity, and a larger group of users would risk to be exposed only to a minimum, qualitatively inferior range of information. In practice, the risks of over-personalization are very hard to prove. In fact, most research is often inconsistent and inconclusive because they are generally survey-based, and thus dependent on self-reporting, or based on a small or unsatisfactory sample. Also, in the light of the rapidly changing media landscape, many studies become quickly out-dated [8]. The question, then, is not whether filter bubbles and echo chambers exist because there is plenty of evidence of their existence. Instead, four key issues persist: to what extent filter bubbles and echo chambers are actually detrimental, to what extent are social media complicit in their growth, whether they should be the target of a policy focus and, eventually, what kind of intervention might be pursued.

This short paper presents the idea that the phenomenon of serendipity is able to encompass fundamental phases of production and consumption of information, and to re-balance the emerging trade-off between relevance and unknown relevance. Indeed, serendipity needs information diversity as a precondition to occur, and it also sustains "cognitive diversity" [9]. These, in fact, are fundamental media policy goals.

Before advocating serendipity as an alternative design principle for social media, the information filtering landscape it will be firstly analyzed to argue that over-personalization can become very detrimental and that social media are complicit and responsible for its risks. Secondly, the concept of information diversity from a media law and ethics perspective it will be briefly introduced to present the current debate. Finally, what is intended with serendipity, and why it is so valuable, will be defined.

Besides, potential design choices for supporting serendipity in social media will be proposed.

2. INFORMATION FILTERING

By bridging the gap between demand and supply in an ocean of information, personalization performs a fundamental role of knowledge management by limiting information overload. Generally, it can be explicit and implicit; the first makes use of user requests, while the latter is mainly based on monitored user activity. Both forms of personalization have increased dramatically in the last years, though many websites have acted to make passive forms of personalization the fastest growing forms[3].Of course, its invisibility makes it dangerous because nobody decided consciously to enter into such an "informational bubble", whereas many others simply ignore that they are already living in it. In fact, users embrace and enjoy automatically generated personalized recommendations. For most of them, algorithms are not doing anything wrong cause they recommend impartially [10]. However, there is no objectivity in the realm of filtering and personalization. Indeed, algorithms are using supplied criteria to determine what is "relevant", though these biases are not generally recognized. Rather, users do not have much influence on the recommendation process, apart from providing implicit or explicit ratings for items, usually in the long-term use of the system. Many argue to design recommender systems from a user-centric perspective. A lack of transparency, interactivity and control, in fact, prevents users from comprehending why certain items are suggested and, as a result, creates a reduced trust in the system. Nevertheless, most of the users have no awareness, skills and motivations to opt-out – in particular due to the *network effect* – so they are "locked-in" in such over-personalized social media.

Even though social media becoming our being-in-the-world, interests of social media companies conflict with the opportunities that social networks entail. Their policies and profit-driven models negatively affect the externalities of personalization. Facebook, in particular, offers many ways for personalizing, whereas it does not provide any clear tools or afford ancestor "depersonalize". Newsfeed algorithm attempts to nudge users' comfort zone by satisfying their interests, homophilic attitudes and hedonism, without taking into serious consideration the importance of diversity, of the dynamicity of users' identities, and of personal discovery. Instead, information intermediaries might actually increase users' engagement, and thus the profit, by triggering unconscious addictive rituals. Techniques like gamification and "captology" (computers as persuasive technologies), a study at the intersection of computer science and psychology, are more and more widespread and exploited [11].

Furthermore, future advances in artificial intelligence, machine learning, and the semantic web have the potential to enable algorithms to make ever more sophisticated recommendations, while virtual reality, augmented reality and the Internet of things will definitely blur the distinction between online and offline. As Pedro Domingos [12] argues, tomorrow's cyberspace will be a vast parallel world that selects only the most promising information to try out in the real one and it will be like "a new, global subconscious, the collective id of the human race". These main trends are increasingly evident. Thus, it is becoming imperative to employ an ethical mediator in influencing media users and information intermediaries appropriately.

Is it possible, then, to find a good balance between human and computer agency, and between individuals' and corporate rights? Is it also possible to ground a methodological framework based on an encompassing principle that is able to provide users with the necessary agency to autonomously and effectively deal with the first trade-off by balancing the latter?

3. INFORMATION DIVERSITY

Media pluralism is considered a fundamental goal of national and European media policies. Media policy, especially in Europe, has aimed mainly at organizing the supply-side of pluralism through various sources that focus on content diversity [13]. Internet, however, constituted a significant challenge to established media policies and the role of public service media. With large media providers no longer serving a gate keeping function, the diversity of individual exposure turned on the choices of users and algorithms. As a reaction to such new media environment, the notion of *"diversity exposure "*increasingly received attention as both a media policy objective and a challenge to the legitimacy of public service media [14]. Mere exposure of consumers to various sources and content, however, is not sufficient to ensure actual experience of media diversity. Therefore, a thorough analysis of media diversity in the digital age must also consider the cognitive and affective factors that drive Internet users, and ultimately actual *"diversity experience"*. Of course, its normative evaluation is a lot more complex than the traditional policies. Yet, media law debates could employ a user-centric perspective and thereby extend beyond the assumption that supply diversity equals diversity experience[15]. From a theoretical perspective, in fact, all the models of democracy consider the consequences of filter bubbles problematic for particularly different reasons [16].

The main rationale of any policy proposal is that development of accurate beliefs requires diversity experience. It has been already argued, indeed, that in an age of user-driven pluralism, public service media could find new legitimacy in facilitating user experiences of diversity and creating encounters with challenging and, eventually, serendipitous content [13],so as to tackle filter bubbles [16].Arguments in support of serendipity as a design principle for media ethics will be now briefly introduced.

4. DESIGNING FOR SERENDIPITY

Serendipity plays a relevant and often undervalued role in our everyday life. Itis the art of discovering new things by observing, and learning from unexpected situations. It can be defined as "an unexpected experience prompted by an individual's valuable interaction with ideas, information, objects, or phenomena" [17]. The ability to extract knowledge from an unexpected event covers all areas of human activity, including business, law, politics and, particularly, science. According to Robert K. Merton [1] serendipity is the "happy accident" inherent in scientific research, one of the main forces that has steered the progress of science. Indeed, its role in epistemology of science is well established [19]. Such discoveries can be perceived as accidentals but not necessarily unplanned or the result of fortuity. Contrary to vulgar interpretations, more often serendipity is the result of groundwork, observation, and knowledge. As Louis Pasteur once famously said [1]: "in the field of observation, chance favours only the prepared mind." Thus, serendipity is a capability [18].

Serendipity helps us to innovate and to be creative, leading us to the emergence of a theory, a law or perhaps simply revise an

opinion. In fact, serendipity has been considered as a fundamental experience to maintain creativity in the computer era [20]. Also, it usually manifests among interdisciplinary scholars [19]. Being strictly related to abductive reasoning and the innovative learning theory of "connectivism" [21], it represents a powerful mode of tackling the challenges of the information era [22]. Hence, serendipity is a valuable experience also from an educational perspective [23]. Such pursuit can also be intended as a *positive freedom* against algorithmic power. In fact, designing for serendipity would imply a change in the asymmetric power to favour the agency of final users. Hence, it could also represent a fundamental political struggle. It has, indeed, the potential also to stimulate the *algorithmic imaginary* of users.

4.1 SERENDIPITY BY DESIGN

Programming for serendipity might sound like an oxymoron. It is, in fact, a subjective and unexpected phenomenon. Indeed, serendipity cannot be created on demand. Though, it can be cultivated by creating opportunities for it through the design of physical, digital, and learning environments [24]. Similarly to other analogous proposals to expose users to different media, such as "diversity by design" [14], "serendipity by design" is the idea that it is possible to mitigate the influence and improper bias of personalization by creating an architecture that gives people powerful incentives to seek and encounter alternative information and, ultimately, experience more serendipitous insights [25]. From a user-perspective, there are two main information behaviours for seeking, encounter and experience serendipity: non-purposive or passive and purposive or active [26]. These will be briefly analysed in the following sub-chapters.

4.2 SERENDIPITOUS FILTERING

The primary goal of recommender systems (RSs) is to provide personalized recommendations so as to improve the satisfaction of users. Many studies showed that RSs are moving beyond accuracy and embracing serendipity [27]. Indeed, when serendipitous encounters are successfully implemented by intersecting users' interests, it is possible to avoid predictable recommendations in collaborative filtering systems, and solve the over-specification problems in content-based systems while also helping users reveal their unexpected interests. Yet, most of the current recommender systems have been criticized for not sufficiently account for serendipity [28]. Studies also show that users are willing to sacrifice some amount of accuracy for improved serendipity in the algorithms filter performance [29]. Though, increasing serendipity might negatively impact accuracy. In some cases, RSs metrics such as novelty, diversity and serendipity can also be improved simultaneously, without any apparent trade-off. A question, therefore, arises: does accuracy as a major metric naturally leads to more profits for social media companies rather than serendipity-driven RSs? In other words, it seems that very accurate personalization increases the engagement of users in the short-run more than might occur with serendipity-driven RSs. Arguably, this is a theoretical trade-off that can emerge in knowledge management (see table 1).

Table 1. A Theoretical Trade-off in Recommender Systems.

PLATFORM	VALUES	EXPLICIT GOAL	LATENT GOAL	TENDENCY
Business Social Media	Relevance and Accuracy	Engagement (Short-term Gratification)	Profit	Determinism
Alternative Social Media	Diversity and Serendipity	Unexpected discoveries (Long-term Satisfaction)	Individual and Social fulfillment	Chance and Randomness

Currently, there is no consensus on the definition of serendipity in RSs [24]. The two core characteristics of serendipity embedded in RSs, however, are usually *unexpectedness* and *usefulness*[27]. Thus, serendipity also implicitly builds upon the concepts of *diversity* and *unfamiliarity.* This is certainly relevant in the context of media policy attempts to cultivate information diversity experience. Serendipity, in fact, can encompass all these metrics: a user is surprised by a novel, unexpected (thus mostly diverse) and useful information. Of course, optimizing current RSs for more serendipitous recommendations is not a trivial task.Programming for serendipity, however, is indeed possible. Notably, Campos and Figueiredo patented the "serendipity equations"[30] and codedan information retrieval software that reached the level of 52.7% of (pseudo)serendipitous suggestions [31]. Interestingly, they also offered a granular approach to the question of assessing serendipitous findings and encountering: by dividing user results into distinct categories, according to their possible outcomes. By opening space for similar granularity it is possible to expand and encompass a wide range of results that can be considered serendipitously valuable. In fact, under the general commitment to serendipity there are other concepts related to information seeking and encountering; for instance, opportunistic acquisition of information; pseudo-serendipity; micro-serendipity; accidental discovery of information, etc.. Designing for serendipity would indeed mean to aim to cultivate all of these indirectly, and directly serendipity par excellence.

4.3 SERENDIPITOUS ENVIRONMENT

Aside from non-purposive information behavior, it is possible to cultivate a serendipitous environment for active seeking [24, 32]. Firstly, it is possible to design several features that empower users, extract value meaningfully from their profiles, to illustrate connections, and to stimulate creative and serendipitous associations. For instance, the visualization design developed by Nagulendra and Vassileva [32] displays to users their filter bubbles, showing them which categories and friends are in their bubble and which ones are not, allowing them to control the algorithm by manipulating the visualization to escape the bubble, by adding or removing friends on a certain topic to the filters. The results are promising: 72 % of participants said that it was easy to find an interest which was not inside their filter bubble, so that they were able to "discover new interests that they didn't display otherwise in their behaviour."Also, other visualization tools have been developed to make users aware of their information diet, their potential narrowness of choice, in order to seek serendipity, including *Bobble*, *Balancer*, *Scoopinion* or *EscapeYourBubble*. Some of these plug-ins could be implemented by default in social media.

Secondly, another fundamental possibility to cultivate a serendipitous environment would occur with *multiple filtering*. In fact, in mainstream media there is no possibility to have more than one filtering per profile. As Facebook chief Mark Zuckerberg remarks: "having two identities for yourself is an example of a lack of integrity". However, identity is dynamic, and one may want (and need) to seek different information at a different time with multiple filtering. Indeed, many factors, such as weather, mood or location, can influence user preferences for recommended items. Changing such design choice could increase user resiliency in seeking more serendipitous information by subtracting from the determined path offered by personalization.

Certainly, there is plenty of potential design choices to improve serendipity [25]. Also, the assessment of perceived serendipity is one the most problematic issue to focus on. Foremost, it is needed an objective theoretical and methodological framework to assess serendipity. Some measures have already been experimented [24, 26], and alternative ones can be framed [25]. Yet, many technical challenges persist, considering how it is hard to prospect a one-size-fits-all framework for all mainstream social media. This, however, represents the ideal purpose that the paper advocates.

5. CONCLUSIONS

Serendipity is a fundamental and profoundly valuable experience for individuals and information societies. On the one hand, designing for serendipity increases the diversity of information. On the other hand, educating for serendipity increases "cognitive diversity".Of course, more often, serendipity is an implicit goal for designers, though it can be explicated for its inherently positive value. In the case of social media, design for serendipity would meanto find a right balance between personalization and "serendipitous generalization", between determinism and chance. It is their dynamic relation that can actually sustain a healthier infosphere. Such design approach can indeed increase user resiliency and restrain information redundancy.

The pursuit of serendipity can also be interpreted as a technical attempt to maintain a sense of freedom and mystery that is available in less networked information environments. It might indeed become fundamental in the future to maintain the pleasing feelings that elevate accidental discoveries to sensations of serendipity. When a user is educated and treatedas an active-seeker of information, indeed, he/she will perceive his/her findings as triumphs of personal agency, intuition, and inspiration, and as a self-reinforcing expectation, it will increase his/her (perception of) freedom from algorithms. Such empowerment could also prevent users from the actual risks of persuasion.

Overall, serendipity can represent a design principle able to reinforce the protection of media pluralism in the new emerging social media landscape. To some extent, filter bubbles would probably persist but, eventually, users could burst them and autonomously seek and experience information diversity through the access to more potentially-serendipitous encounters.

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Evaluating a Reading Companion Service

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ABSTRACT

This paper presents a pilot case study using an empathy-mimicking companion robotic platform to support reading–learning for children in Brevard County, Florida. Literacy skills are vital for all; they are critical to communicate with others and to understand the world. Furthermore, they represent the strongest predictors of students' success in primary school. Motivation is an important factor influencing acquisition of reading ability. To remediate children with reading difficulties, we engaged pupils to learn reading by teaching a robot in a face-to-face setting. Our innovative platform uses alphabet recognition and phonetic awareness skills, a method used by teachers in all elementary schools of the county. The children that were evaluated were in kindergarten grade, and came from economically disadvantaged families registered at elementary school.The research presented considers how such issues might be addressed by using robot-supported learning, and specifically empathy-mimicking robotic platforms.

General Terms

Design, Human Factors, Measurement, Experimentation

Keywords

Reading skills, Cognitonics approaches to learning, Robotic Companions.

1. INTRODUCTION

Research in the past two decades has greatly increased the knowledge concerning the beginnings of successful academic trajectories for children. Such work has established that young children's emerging understandings of numbers, letters, and sounds are important predictors of later academic achievement [1-4].

The ability to name the letters of the alphabet during preschool and kindergarten is a well-established predictor of children's later literacy skills [2], [5-6]. More specifically, reading abilities are predictors of long-term school attendance, and are required to break the cycle of intergenerational poverty [7-8].

Spoken words are made up of different individual sounds called phonemes which permit the distinguishing of one word from another. Literacy in elementary school is based on a phonemic awareness (PA) curriculum. From kindergarten to 2nd grade, children are trained to be phonemically aware, that is being able to isolate the sounds, manipulate the sounds, and blend and segmented the sounds into spoken and written words.

Having identified the importance of the children's future role in the nation's economy, schools in USA are exposing children at an early age to the fun of learning science, technology, engineering, and mathematics (STEM) [9].Before the arrival of computer technology into family homes, the most important pillars of education were reading, writing, and mathematics. The pervasiveness of computer systems has also modified learning activities in modern education. Students have witnessed the arrival of Intelligent Tutoring Systems (ITS), computer programs that are able to model learner's states in order to provide individual instruction. ITS consider the learner's knowledge level and progresses to personalize and adapt presentation of learning activities [10]. Several examples have proven the benefits of this kind of personalized education [11-13]. All these experiences are based on embodied conversational agents (ECA) trained with teachers' pedagogical practices.

Recently, more attention has been given to robots in education, for example to teach children a second language [14], to train them in storytelling [15], or to teach them about healthy food choices [16]. In such settings, the robot is used as an adult teacher, and the ensuing robot–child interactions are based on interactions between children and their teachers. However, in long-term interactions, children may treat the robot as a peer, not as a teacher. Moreover, peer interactions have been shown to have a positive effect on language development [17]. In addition, research conducted by [18] has found that "sociable robots, used as robot learning companions can provide the necessary social setting for language learning" [19-21].

STEM education programs are targeted for pre-K to 12th grade students; they are also oriented to make these fields more racially, socially, and gender diverse. From kindergarten to 2nd grade, children gain skills to learn to read; 3rd grade is expected to consolidate reading abilities; and the important shift of reading to learn occurs by 4th grade. Reading to learn is crucial in STEM careers as they require critical reading skills. In USA, of the total pupils in fourth grade hailing from low income families, 82% are not proficient in reading skills. Furthermore, 34% of children entering in kindergarten lack the basis language skills needed to learn how to read, 65% of children in 4th grade are reading below grade level, and 37% students graduate at or above reading

proficiency [22].Struggling children readerscome from African-American, Hispanic, and Native American populations[8].

1.1 Tutor Companion or Tutee Companion

The process of teaching is as follows: preparation, explanation, and feedback [23]. Teaching to learn is a well-known pedagogical mechanism which provides opportunity to learn by teaching. It involves a different beneficial cognitive process: the teacher-tutor needs to revise the information, establish material, and identify the basic structure. Moreover, research suggests that interaction with the tutee is key factor in tutor's learning [24]. Previous research suggests that children aim to interact with companions. In a learning game-based setting, 80% of children from ages 9 to 10 perceived Companions as friends [25]. This suggests that children are not looking for a hierarchical relationship with a Companion even in a learning setting. An empathetic relationship between children and companions is to be constructed [26]. We would like to propose and encourage an active role for children with respect to the robot to promote their spontaneous learning by teaching the robot as a peer.

The purpose of this study is to examine the interaction between children and robots to help improve reading abilities in children. The study, therefore, intends to use robots as a tutee in order to help improve children's reading skills. Empathy and social interaction are proposed as a support and mode of interaction, respectively, in improving learning amongst young children. Additionally, the study hypothesizes that interacting with a social robot would also motivate the child to learn.

2. RELATED WORK

Cognitonics aims to help people adapt to and use technology by improving cognitive mechanisms of human processing information and developing the emotional sphere of the personality [27-28]. This approach is particularly relevant in educational setting, see par example work of [29-30]. Robots have recently arrived in the camp of educational technology and they are quickly becoming the prominent agents in this field [31]. These are very promising technologies particularly for kids [32],[15]. They provide and maintain children's interests by allowing new modes of interaction and new opportunities of socialization. Empathetic robot tutors are transforming the classroom atmosphere and the ways that children are learning [33-34],[15].A good example is a robot that helps children with visuoconstructive deficits; kids that struggle with writing. The robot provides support even to children with poor handwriting and poor self-confidence [35]. Another example of social robots booming in educational setting is the Junior Robotics category in the World Robot Summit 2020 hosted by the Japan Ministry of Economy, Trade, and Industry andthe New Energy and Industrial Technology DevelopmentOrganization. The Junior Robotics category will be a student competition in 2018. It aims to promote STEM learning and computing, preparing the kids to understand the human–robot interaction and how these artifacts will assist humans in their everyday life [36].

3. OVERALL RESEARCH PLAN

The idea of a robot reading Companion is based in several assumptions explained previously, and we developed a research plan which included the following hypothesis:

H_{01}: Children's reading–learning experience is modified after the introduction a class with a robot

$H_{A1:}$ Children's reading–learning experience is not modified after the introduction a class with a robot

H_{02}: Certain reading skills are more influenced than others after children's exposure to the robot

H_{A2}: Certain reading skills are not more influenced than others after children's exposure to the robot

H_{03}: Children progress through a "learning by teaching" method using a companion robot

H_{A3}: Children do not progress through a "learning by teaching" method using a companion robot

4. METHODOLOGY

We involved a kindergarten teacher in participatory design of our case study [37]. The following parameters were used to test the children: letter recognition, beginning sounds, and blending words. The teacher was also in charge of the evaluations of the children.The experiment was conducted during the summer break of an elementary school. Of the children attending this school, 91% are economically disadvantaged with a diverse population: 48.2% white, 34.8% African-American and 10.1% of Hispanic/Latino descent. The experiment was conducted in three sessions over a period of two weeks. The first two sessions were conducted with a gap of 2 days. The third session was conducted one week after the second session.The participants for the experiment were 6 students (5 boys, 1 girl) in the age bracket of 4-5 years, who were all attending the same elementary school.

4.1 Experimental set up

The children were told that the robot was fully autonomous and that it would respond to their inputs as a peer would. However, the Wizardof Oz technique was employed [38], in which the robot was remotely controlled from a laptop in a neighboring (control) room outside the line of sight of the children. The robot, named Ellie, was voiced by a young girl, aged 9. We had a control room with the Wizard and a child assistant and an experiment room with participants, the teacher and the robot when it intervenes.The apparatus for the experiment included a JD Humanoid robot, which is manufactured by EZ-Robot[1], a laptop, two mobile phones, and a microphone.

Figure 1 shows a view of the robot control interface.

[1] http://www.ez-robot.com

Figure 1. Robot control interface view

The setup was such that the controller with the laptop and the young girl—located in a control room—could view the participants via the robot's camera and could hear the participants via an active mobile phone call from another phone in the participants' room. The young girl then responded to the participants' questions and inputs so as to simulate the robot autonomously responding to them.

Figure 2. The JD Humanoid robot used in the experiment

4.2 Experimental Procedure

The first session of the experiment was conducted in three phases. The two first phases took place between the teacher and the group of children the last phase was an individual meeting between each child and the robot. The teacher was present in the room with the participants when they interacted with Ellie to regulate the teaching process. The first phase consisted of the teacher testing the children's reading and speaking skills on the basis of three tests; letter recognition (LR), beginning sound (BG), and blending words (BW). The second phase consisted of the teacher teaching the children a predefined lesson that taught the abovementioned three skills. The children were then tested again on the same skills to evaluate the skill levels. The third phase consisted of the children interacting with the robot on a one-on-one basis. At the beginning, they have a minor social exchange: the robot engages the child in a personal conversation, asking them their name, etc. Once they had familiarized themselves with Ellie, the children then taught Ellie the same skills they had learnt in the class with the teacher in the second phase of the session. After the participants' interactive meetings with Ellie, they were tested once more on the same skills to evaluate any possible change in the skill levels. The second session of the experiment was conducted exactly in the same manner as the first, with only one difference being that the first phase of the test, which was the initial testing of the children's skills. The two other phases were conducted in the same manner with the same content in the testing, teaching, and robot interaction. The third session of the experiment was conducted a week from the first session and consisted solely of the teacher testing the participants with the same testing methodology as in the first and second sessions. This interaction was independent of the researchers or the robot.

5. RESULTS

Qualitative results in Figure 3 and Table 1 display the children's performance during the 2 days exposed to Ellie. We could observe a positive modification of their results after teaching Ellie (H1), (H3). It is also observed that some variables improved such as BS and particularly BW progress more than letter recognition (H2). This could be based on the fact that half of the children mastered LR with a maximum score before the test, and two of the children's scores regressed between the first and the second session.However,another child progressed, maintained his score and progressed further during the third session. The progression looks particularly significant in BW where all the children started with a low score.

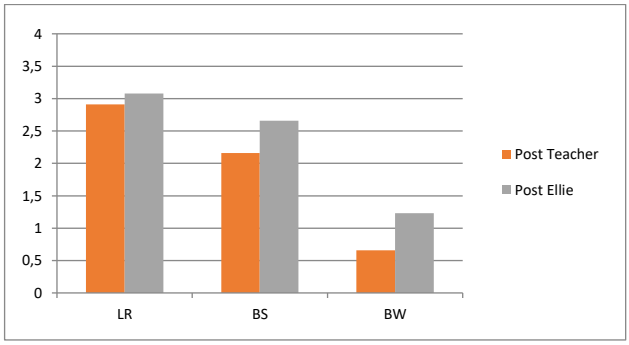

Figure 3. Children's combined performance (weighted average) on both days

Table 1. Combined results (weighted average) of children's performance

Testing	All Students: Both Days		
	LR	BS	BW
Post Teacher	2.91	2.16	0.66
Post Ellie	3.08	2.66	1.23

Concerning the global learning experience (H1), we observe a net progression in the results including over the time. This progression is not noteworthy for LR which is also the variable with higher score before the experiment. This progression is observable in Figure 4 and table 2

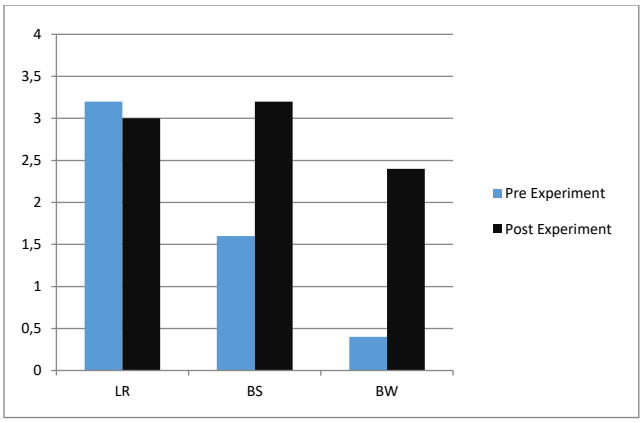

Figure 4. Children's performance on day 2

Table 2. Results test performance pre post experiment

Testing	All Students: Day 1 vs. 3		
	LR	BS	BW
Pre Experiment	3.2	1.6	0.4
Post Experiment	3	3.2	2.4

6. DISCUSSION

In this qualitative study, all participants had a very positive perception and reaction towards the empathetic robot named Ellie during and after our intervention. For example, the teacher informed us that in the classes following our visit, children requested to again meet and interact with Ellie. The children, too, provided a lot of inputs concerning the robot's appearance, such as the fact that they liked its small size. They also confirmed that it had the right look as a robot, and also mentioned that they probably preferred it to have human-like hands with fingers, rather than the pincers our robot had. They also suggested dressing it up in different clothing (see in Figure 2, Ellie's appearance without clothes).

Concerning the interaction with the robot, the children were amazed by Ellie calling them by their names and giving smart and empathetic responses, such as "yes, I would like you to teach me that", "hello! How are you? Did you enjoy your pizza?","Yes I would love it if you read me a story."

The teacher considered the robot to be a very good and effective tool for small children, and also did not expect such good results in such a short time. In addition, she confirmed that children were not distracted by the robot, and they were totally focusedon teach it. The children considered Ellie to be their peer, and look forward to seeing it again in their classes.

7. CONCLUSION

Our study was limited to only three variables of the skills considered in kindergarten teaching: letter recognition, blending words, and beginning sounds. The children displayed significant change in their progress in one of these variables. Results are influenced by the fact that our sample is small. The age of the children also limited the time they could spend in the sessions, as their concentration span does not last for a long duration of time. For the same reason, we did not conduct any surveys.

The children do not consider Ellie to be a teacher but as their peer.However, they perform better in all the evaluated skills LR, BS, and BW; particularly in the last one. Furthermore, results suggest all are skills retained over the time, however more research is needed to confirm this retention. As per the data collected, children learned better with Ellie than they did with the teacher, but more studies are required to confirm this result. Having said that, the global results suggest that the progress in performance of children was due to the use of the robot by the teacher, as a complementary learning tool.

8. FUTURE WORK

We expect to conduct the same experiment with a bigger sample of children composed with an equal number of boys and girls for further observation and to measure improvements.

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Recovery in Children in the Digital Age

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ABSTRACT

Stress-induced disorders have become more the norm than the exception in the last ten years, especially in children (ages 0 to 14) and young adults (ages 14 to 19). Lifestyle and economic factors have begun to provide a favourable environment for even the smallest genetic component to flower into a completely symptomatic disease. Even infants show higher rates of eczema which has a high mental health component. Are they absorbing stress from their care - givers, from their life in-utero or their own personality at its (current) state of development? Is it a combination of all of these? How does the digital way of thinking help these children and their families? How does one incorporate thorough examination and laboratory investigations, regular follow-ups and quality in-depth interviews into the quest for recover? How can we optimize health-interviews when working across continents through digital communication, as could be the case for specialized treatments? These questions are more powerful than their answers because in the digital age, answers change and evolve. The questions shift between "same-ness" and "new-ness" for improved results. The paper deals with these questions in case specific contexts. Archival data are taken from study of recovery in chronic diseases as part of a thesis in Medical Anthropology (University College London, 2011-12).

General Terms

Documentation, Human factors

Keywords

Recovery, Stages, Children, Digital Interviews, Health-care

1. INTRODUCTION

Children experience the world in mainly in terms of sensations, colours, feelings and sounds up to the age of 6. Following a time in transition, they begin to experience more analysis and morality from ages 7 up to 12 (or puberty). The post-puberty stage until the age of 18 (approx.) is the phase of communication, testing ones limits as a 'pre-adult' and shedding the now unnecessary dependence of child-dom. These stages are general guidelines based on the work of Freud, Carl Jung, Erik Erikson and Rudolf Steiner – these are subject to individual and clinical context.

When working with children in recovery from long-standing non-communicable disorders, one observes that child perceives illness and recovery within these contexts. To facilitate an individualized and effective turning point, one is needed to step into the psycho-social-developmental stage of the child, evaluate his/her self-dialogue and then apply the appropriate medical guidelines. One wants the flash of insight arrive from within the child – this makes it more real, more permanent for him or her. It gives the child the flexibility to utilize it in a context-specific way through his/her stages of development, rather than as a 'black-or-white'-like compulsion.

2. DIGITAL COMMUNICATION AND RECOVERY IN CHILDREN

In the case of pre-verbal stages in a child, one relies on video - conference facilities and history shared by the family or guardian. In post-verbal stages, one can utilize the understanding of psycho-social development via digital communication.

2.1. Ages 2.5 to 6 years or equivalent

This stage of growth can vary slightly or drastically, depending on the state of health of the child and medical history.

The best way to maximize therapeutic accuracy is to work with the imagination of the child through a series drawings regarding his/her illness, fears, perceived relationships, dreams and self-image. This gives one access to the child's world of physical sensations even when connected through a two-dimensional computer screen.

The child, as early as in this stage, has the agency and insight to form new conclusions with respect to his/her suffering. New conclusions set the stage for fewer fears, improved compliance and regular follow-ups. Other happy side-effects can include deeper bonding with parents, guardians, teachers, siblings and peers.

2.2. Ages 6 to 12 or equivalent

These are the years of naturally developing moral agency in the child. If the natural moral convictions are at odds with strong moral values in the surroundings, there forms the beginning of conflicts with authority. This is emotionally painful for the child, even if he/she is not fully aware of this pain. The child has a biological urge to be loyal to the parents and the proverbial 'village' or community, but the inner pangs of morality are not in sync with his/her established trust. Most children ask unending "Why?" based questions at this stage – they are only beginning to process the nuances of decision-making. They are beginning to grow past the pain versus pleasure pendulum and are willing to undergo pain for ethical benefits; for example, reporting a bully to the teacher or surrendering a favourite toy to another child.

At this stage, recovering children respond beautifully to letter writing combined with drawing. They may be more exposed to television and media now, and it is best to ask them to conjure their own scripted[2] cartoon series. The entire inner picture of

disease, conflict and resolution becomes evident – the child's mind reaches a peak of conflict in this storytelling process followed by stages of resolution as his/her consciousness resolves the various components of the plot. This can be sequential or un-sequential – the objective is to reach a point of peace through the digital screen. In this way, the 'missing' empathetic physical presence of the doctor is slowly replaced by the child's own self-empathy. At the same time, the relationship with the illness is re-framed.

2.3. Ages 12 to 19 or equivalent

Listen, listen, listen, listen, listen – this is the phase of Whatsapp, Messenger, Snap Chat, Instagram, Facebook, Skype, cell-phones and video-games. The child is already plugged into technology; he or she is living in the parallel world of the internet (often within parental content settings!). In this stage, the young adult (also referred to as teen or tween in some circles) wants to emote, communicate, shut off, withdraw, shine, compete and experiment all at the same time. It is the natural urge of growth. At the same time, he or she *demands* unconditional approval from perceived authority, often the parent or guardian. It's an adventurous time for the family – the family is growing up too.

The digital screen turns into an even more dependable tool during these years. This is the time when the parents, siblings and sometimes even grand-parents need specialized counseling with respect to the recovery of the child. Technology becomes a way of reaching out even when extended family, cousins, parents or the doctor are in different cities. The modern grand-parent is more aware than the modern parent. This grandparent is in his/her own quest to keep up with technology, and to keep pace with the times. Therefore, they are more open to learning new strategies in helping – their stakes are higher.

Ingraining confidence in more nuanced use of technology for the senior citizens involved has deep and long-term benefits. It improves communication, confidence, trust and ownership of each family member towards the problems at hand. Grandparents often recognize, though they may not always openly acknowledge their part in the harmful conclusions in the parent. They can see these mechanisms working against the synchronicity of the situation, but don't always know how to rectify the same. The main coping mechanism then turns up in the form of guilt and difficult though well-intentioned advice.

The magic of technology is to work with the family as a unit, in addition to one-on-one interviews with the primary patient.

3. CONCLUSION

Solutions are everywhere. It is important to turn to qualitative data and in-depth interviews to effect deeper recovery with the help of the virtual and not-so-virtual world of technology. While one part of digital efficacy does lie in the virtual realm, the effects can be very very tangible.

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Mobile Mental Health Support for Chinese University Students

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ABSTRACT
World Health Organization statistics shows that 29 percent of people worldwide suffer from mental health or psychological problems at some point in their life. The problem can be particularly acute for Chinese university students due to high expectations from family and the pressures of the academic environment. This paper analyses the need for different mental health support app functionality to facilitate self-help or encourage students to make use of traditional mental health support services. Results allow us to characterize student preferences in the design of our own prototype app and should support the design of more effective mental health support apps in the future.

General Terms
Human Factors

Keywords
Mental health support; university students; application prototype evaluation

1. INTRODUCTION
Around 29 percent of us will suffer from mental or psychological problems at some stage in our lives [1]. However, many victims of mental health problems are often unwilling or incapable of finding the support and guidance they need to most effectively overcome their difficulties. For many individuals, there is still a stigma attached to mental-health issues and private mental-health treatment can be expensive. This can be particularly problematic for university students who tend to have limited financial resources and pressure to obtain high levels of academic achievement [2]. While most universities have psychological consultation centers, resources tend to be limited and there is a need to make the best use of resources to support students and encourage them to utilize the services available.

The leverage of new technology is one way in which universities can make better use of available resources for psychological counseling and intervention. Research in this area is focused on online remote treatment, the use of virtual reality technology, intelligent hardware, wearable devices and different types of application to support traditional counselling services [3]. This paper looks at developing a methodology for designing mobile mental-health support apps for Chinese university students.

2. STATE OF THE ART
There have been a number of applications developed for mental health support in the past two decades. As early as 2001 Helen Christensen, at the Australian National University, developed mobile app called MoodGYM which was specifically designed to help adolescents cope with depression [4]. This development was initially a cause of considerable controversy among mental health specialists and attracted a great deal of criticism from detractors who felt that the automation of mental care support might be detrimental to users from a vulnerable group who could benefit from a more human-touch. These doubts were eventually overcome as initial results proved positive and the app has since been adopted by the Australian National Health Service. Now MoodGym has more than a hundred-thousand active users in Australia and is also used in over two-hundred other countries around the globe.

In another significant development, in 2007, the British National Health Service developed FearFighter, an online environment to support patients dealing with fear and anxiety. This included an APP called 'Beating The Blues for Depression' which dealt specifically with mental health support [5].

Other mental-health care apps of note include Biteback, Mycompass [6], Optimism and BellyBio [7]. The functionality of these apps can be roughly classified into categories such as; guidance, mental health tests, treatment follow-up, psychological consultation, and social assistance. And while a significant number of practitioners still express doubt over the overall effectiveness mental-health apps, it is increasingly more widely accepted that these apps will form an integral part of any larger mental health care solution that also includes more traditional methods such as one-on-one counselling and support groups. Indeed, a number of developed countries with progressive social care programs, such as Australia, Holland and the United Kingdom, have already incorporated online mental-health support into their national systems of health-care provision.

3. METHODOLOGY
In this paper, we present the results of a requirements analysis exercise aimed at determining what functionality is needing in an app for mental-health support. The app is designed for Chinese university students and our study focuses on the needs of this particular group of users as well as different types of user within this group as determined by gender, age, area of study, and type of degree. Results of a survey of our users allow us to develop a prototype mobile application that is further tested to gauge the users' overall impression of this type of app.

4. INITIAL SURVEY

The 60 subjects of our initial survey are Chinese university students from Xian Jiaotong-Liverpool University. 65 percent of the responders are male and 35 percent female. The subjects are aged between 18 to 26 and divided into two groups; age range 18-21 (70 percent) and age range 22-26 (30 percent). The art and business major students form 55 percent of our sample while science and technology major students form 45 percent. There are 47 undergraduate students (78.33 percent) and 13 postgraduate students (17.17 percent).

The main part of the questionnaire asks subjects to gauge the importance of the six mental-health care app functions we found to be the most common features of existing software. These are:

1) **Mental health self-evaluation tests.** Users can use this function to test aspects of their mental health. This can give users an indication of their mental health status and tell them which forms of additional support might be most appropriate.

2) **On-line consultation.** This allows users to talk to consultants online before having a face-to-face consultation or in lieu of an online consultation if another course of treatment is thought more appropriate. This form of consultation can be more convenient and cost-effective than a traditional one-to-one consultation performed in person.

3) **Communication and discussion.** This can include chat-rooms, forums and other media for facilitating communication between app users. Social interaction can help users benefit from shared knowledge, reduce feelings of isolation and help build a sense of community among users.

4) **Entertainment.** This aims to stimulate the user and elevate their mood with music, positive videos, humor and puzzles.

5) **Events and activity postings.** This highlights real-world events and activities such as workshops or lectures on mental health.

6) **Professional tips.** Links to mental-health advice and resources.

5. RESULTS

The results of our survey indicated that the three most important functions for mental-health support apps are on-line consultation, professional tips and self-evaluation tests. Communication and event posting are also thought to be important but these where thought of as secondary features that shouldn't detract from the principle functions of the app. User preferences didn't change in any significant way for different types of user which suggests that the same general design can be used for different groups in different universities.

Figure 1 shows the online consultation page of our prototype app. Figure 2 shows self-evaluation, figure 3 shows the mental health tips and figure 4 shows events and activities.

Evaluation of the prototype app gave us further insight into how the tool might be used. For example, while features like event postings and communication where not considered as core functions of the app, the students thought they might be useful in encouraging first time users who may otherwise be inhibited by using the app. This type of discovery encourages us to consider the complete user experience in our design and think more about the process of a user progressing through different functions of the app as their requirements evolve.

Figure 1. Mental-Health Support App, online consultation.

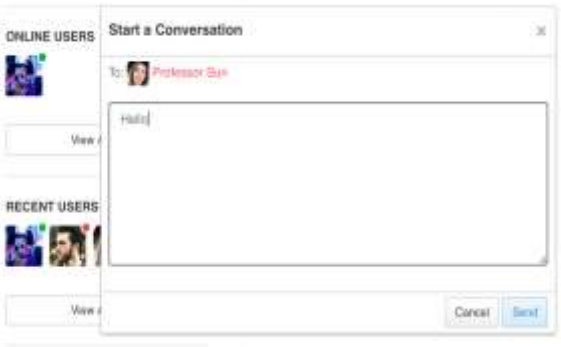

Figure 2. Mental-Health Support App, self-evaluation quizes.

Figure 3. Mental-Health Support App, mental-health tips.

Figure 4. Mental-Health Support App, events and activities.

6. RESULTS

Looking at student preferences for mental-health support apps has allowed us to make informed decisions in the design of our own app by prioritizing on-line consultation, professional tips, and self-evaluation tests. Reaction the prototype was largely positive.

Another more general conclusion from this project is that automated support should complement rather than replace human-interaction. Online consultation was a priority for our users and online consultation would, in many cases, lead to an actual meeting with a counselor or psychologist. The main benefit of our app would be to support the user up until this point.

Another important conclusion from our investigation is that mental health support apps require people to continue using the apps in order to record enough data for them to help with any diagnosis or help prescribe any sort of treatment. A study showed that 60 percent users stopped using the MoodGYM after they finished the first module [8]. If mental-health support apps are to be effective they need to encourage people keep using them. So apps need not only to include core functionality, but they also need to be usable, entertaining and reward progress in order to keep users interested.

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