Future Digital Society Transformational Transcendents & Gaps Extended Outlook

Zlatogor MINCHEV
Institute of ICT, Bulgarian Academy of Sciences
zlatogor@bas.bg

Abstract: The article sketches an exploration foresight framework towards the digital transformation future transcedents and the gaps in the socio-technological identification outlook. A combination of both experts/crowd sourcing data with plausible scenario matrix representation, system modelling and mixed cyber-physical reality training simulation for prognosticating future results assessment is employed. The approach gives a comprehensive view for the future digital society's resilience and offers a reasoned and measured understanding of accents, gaps and transformational potential. To wrap up, further research challenges are discussed.
Keywords: foresight analytical framework, digital transcedents, gaps analysis, digital transformation, social & technological challenges

INTRODUCTION

Understanding the future society's dynamics in a proper way is a rather challenging task. The exploration of valuable key assets scenario matrix for the digital transformation's tangible and intangible effects to both technological and human factor, combined with causality system-of-systems analytical modelling and interactive simulation results assessment, could be an extremely helpful approach *[Minchev et al, 2019]*. This should take place simultaneously with a sustainable organizational and agile governance framework approach (Shalamanov, 2017) towards a digitally transformed and resilient future civilization level of evolution *[Tagarev, 2019]*.

The present understanding of human superstition over the machines is giving a dominant role that the new technological transformation is trying either to modify or extend (Leonhard, 2016), *[Harari, 2017]*. As the ideas of intellectual singularity *[Borders, 2018]*and total digitalization are gathering vast popularity for the next 20-30 years, the world as we see it now is naturally going to be completely transformed *[Reese, 2018]*. This change is inevitably affecting our living standards, producing numerous digital transcedents related to new adversaries, challenges, opportunities and divides that together with the gaps need to be adequately handled. The transformational effect is additionally amplified by the technological disruptions and their deeper emersion both in the future society smart infrastructure, lifestyle and even beyond in our personalities, aiming towards comprehensive information coverage assisted via Internet of Things sensors and Artificial Intelligence mediating human-machine fusion *[Minchev et al, 2019]*.

The digital transformation is naturally caused by the necessities of future capabilities'

development for successfully coping with the constantly growing big data resources. They require the establishment of a new digital ecosystem with its own evolutionary rules and objectives, presently evolving in the Internet in social networks space *[Minchev, 2017]*.

Luckily, the complex living matter is giving a resilient hope for self-protection, as the emotions, intuition, creativity, attitude and innovation assets are still springing from the human factor and not the machines *[Leonhard, 2016]*. This naturally is producing new roles for the future people, giving them suitable moral, ethics and values requirements as future independent creators.

The transformational change is however also laying the groundwork for tremendous power for the future political and governance system, cooperating symbiotically with the technologies *[Wahlers, 2018]*. The effect is actually opening an unprecedented totalitarian outlook in comparison with the polyarchic democracy idea, exactly due to the technological superstition perspective. Luckily, as the social development is somewhat cyclic, the upcoming change is obviously going to get its peak after the new digital adaptation. The idea is inspired by the natural self-protection mechanisms of the human civilization vs machine self-awareness and singularity.

Though the transhumanization trends register dynamic progress, the level of discrete machine world interaction with our continuous biotope is still quite modest *[Sirius & Cornell, 2015]*. Moreover, the future perspectives are rather fascinating in this context and from another viewpoint – the human factor's desire and motivation for assisted technological transformation *[Schwab, 2017]*. This will be in fact the real problem for the digital society evolution, giving a huge responsibility to the new transformed generations for achieving a successful future development.

Further on, an integrated foresight framework with real implementation results for key assets of the work of identifying the tangible and intangible effects of digital transformation in the future is presented.

INTEGRATED FORESIGHT FRAMEWORK

The foresight framework is based on the integration of the ideas noted in Minchev et al (2019), and Minchev (2019) and could be aggregated in a threefold approach that encompasses the following stages: (i) Problem Space Matrix Definition; (ii) Prognostic System Modelling; (iii) Future Results Assessment.

Being complex enough, the framework is joining both technological and human factors that are targeting a comprehensive digital future exploration outlook, giving accents towards selected transcedents and gaps of the society transformation expectations for the not so far future in the present informational age and beyond towards the post-informational one.

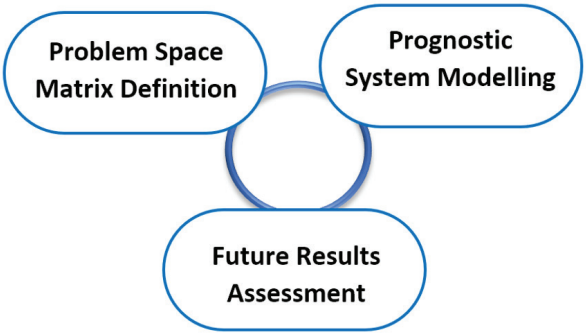


Fig. 1: *Integrated Foresight Framework Idea [source: Minchev, 2019]*

The latter is expected to give rise to a new level of speed for the technological world due to nano-solutions and quantum technologies achieving successful assisted handling of the future informational scale for the human factor's cognitive and physical capabilities. Hopefully, this is also going to explain the transhumanization phenomenon's appearance from both natural and machine evolution perspectives.

IMPLEMENTATION DETAILS

The practical implementation idea of the proposed framework is provided further with the already outlined three stages, giving additional methodological details and illustrated results for each of them.

PROBLEM SPACE MATRIX DEFINITION

Successfully foreseeing the future is a difficult task because it usually relies on expert opinion data, crowdsourcing or other literature studies, that normally are quite vague and uncertain, concerning a horizon of 10-30 years. Going further towards these sources, an effective fusion is obviously becoming more of an art form than a science as catching the trends for the future could be quite tricky and somewhat subjective. Apart from this, some successful methodological approaches could be useful in accomplishing this task (see Minchev, 2019, and Ritchie, 2011), giving a suitable initial structuring for further deeper analysis. Being anticipative by nature, this stage implements some of the views of digital challenges, divides, threats and opportunities, adding some data relativities on the digital ecosystems and future digital society beliefs. Additionally, some future gaps analysis, concerning overlays and identification of uncertainties is also added here, using the results from the book "Future Digital Society Resilience in the Informational Age" *[Minchev et al, 2019]*, during the working discussions at Driver+ (2019), FDR (2020).

The basic pool of results aggregation is obtained, using morphological (structural) analysis in I-SCIP-MA environment, following Minchev (2019). The solution gives a suitable concept for successful handling with uncertain, unstructured and noisy input data, using fuzzy sets extension. The approach is producing a cross-consistency multidimensional matrix of mutually exclusive alternative combinations towards a "plausible future" of scenarios for achieving a genuine futuristic outlook for the digital transformation transcedents and the gaps with present beliefs.

The aggregated scenario combinations are classified as "tangible" and "intangible" ones, adding also a"neutral" class for analytical completeness.

Morphological Analysis

Driving Factors	Digital Challenges	Digital Adversaries	Digital Divides	Digital Opportunities	Essential Gaps
Tech Innovations	Global Regulations	Total Digitalisation	Transhumanisation	Technological Progress	H-M Interawaring
Reality Mixing	Digital Economy	Hybrid Securing	Technological Superiority	Transformed Society	Neutropia
Social Dynamics	Societal Resileience	Biohacking	Digital Services	Transcending People	VMEA Digitalisation
Climate Changes	Transformed Privacy	Parallelism	Quality of Life		Digital Syncretism
Global Connectivity	Information Overload		Polyarchy		ECII Digitalisation
	Huge Data				

Index	Length	Weig..	Name
1	6	70	Scenario1
2	6	60	Scenario2
3	6	95	Scenario3
4	6	120	Scenario4
5	6	95	Scenario5
6	6	35	Scenario6
7	6	105	Scenario7

Active scenarios +

Passive scenarios -

Fig. 2: *A screen-shot of the cross-consistency scenario matrix for digital transformation exploration extended with "Essential Gaps" dimension in I-SCIP-MA environment [source: Minchev et al, 2013]*

The quantitative assessment is performed, using the Relative-Common-Weight – RCW extended fuzzy approach, following the ideas of Minchev et al (2013) on a quadrilateral relation assessment base ("driving factor" -> "assessed alternative" -> "future opportunity" -> "essential gap") that is expected to provide a reasonable outlook from both entropy and logical perspectives.

As the "Essential Gaps" dimension is a new supplementary extension to the matrix, some more details will be given next.

The "H-M Interawaring" is in fact addressing the self-awareness of both future humans and machines; the "Neutropia" asset is concerning the idea of general equilibria for a vague future, that is neither utopian, nor dystopian; "VMEA" & "ECII" Digitalisation" are hinting at the values, moral, ethics, attitude, emotions, creativity, intuition & imagination of the future digitalisation objective; finally, the "Digital Syncretism" is covering the ideas of philosophical fusion of different cultures, religions and political models in the digital age.

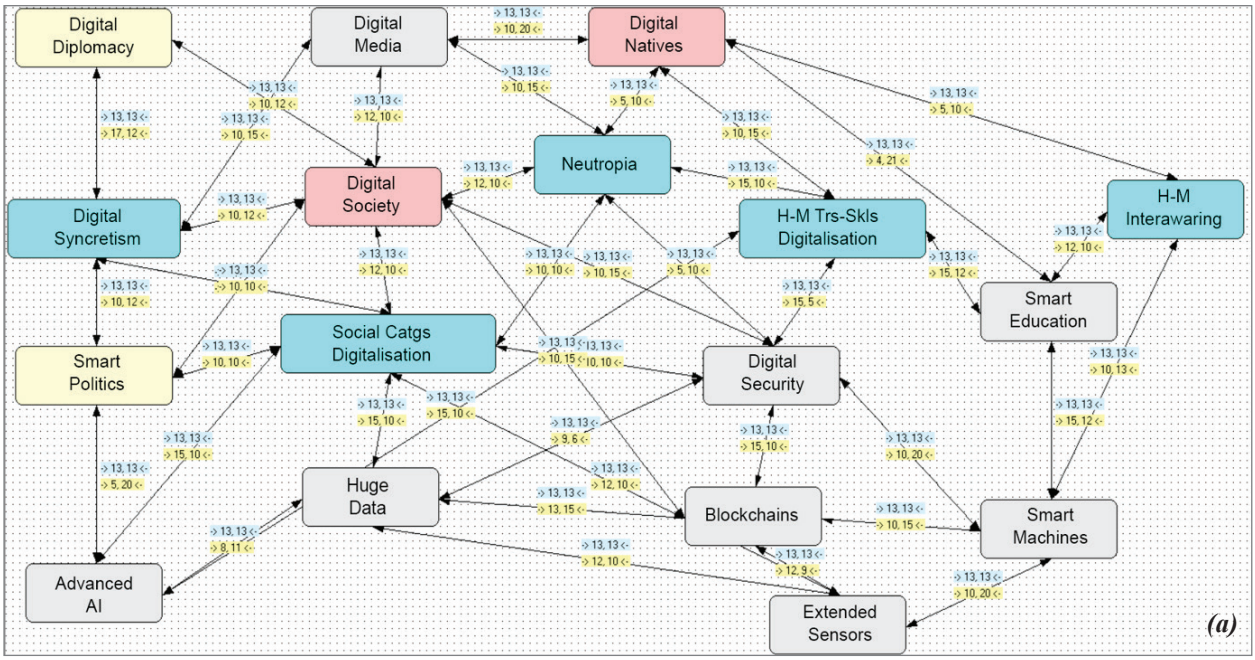
The present problem space scenario matrix M (see ***Figure 2***), has six dimensions ("Driving Factors", "Digital Challenges", "Digital Adversaries", "Digital Divides", "Digital Opportunities", "Essential Gaps") ranging from three to six alternatives each. The total number of the scenario combinations is N = 45000, obtained by multiplying the dimensions and number of alternatives, i.e., N = 5x5x6x4x5x3x5. Using expert support, 3868 scenario combinations were next selected and studied, producing three groups of scenarios, according to their RCW assessment: positive – 2608 (RCW > 0), negative – 1073 (RCW < 0) and neutral – 187 (RCW =0).

As the resulting scenario pool is generally focusing on some details but missing others being somewhat negligible, the produced problem space is further explored in more details, adding some additional data, implementing a system causality modelling perspective.

PROGNOSTIC SYSTEM MODELLING

Achieving a holistic outlook to the future digital transformation is possible by implementing system-of-systems analytical modelling (Vester, 2007). A practical solution of this idea is the application of a weighted graph, assuring multidimensional causality representation of the studied discrete complex system model in the I-SCIP-SA environment (Minchev, 2019). Both "Entities" (marked as tagged round rectangles) and "Relationships" (marked as bi-directional weighted arrows) are used to graphically illustrate the model, using an abstraction for representing the system-of-systems interconnectivity of multiple objects.

The model overall assessment is given in a 3D "Sensitivity Diagram" – 3D "SD", using "Influence/Dependence" ratio results, spread among four sectors: Buffering, Active, Passive & Critical. Additional subclassification is provided, granting either "Active" (marked in white) or "Passive" (marked in grey) behaviour role to each entity from a certain SD sector of interest.



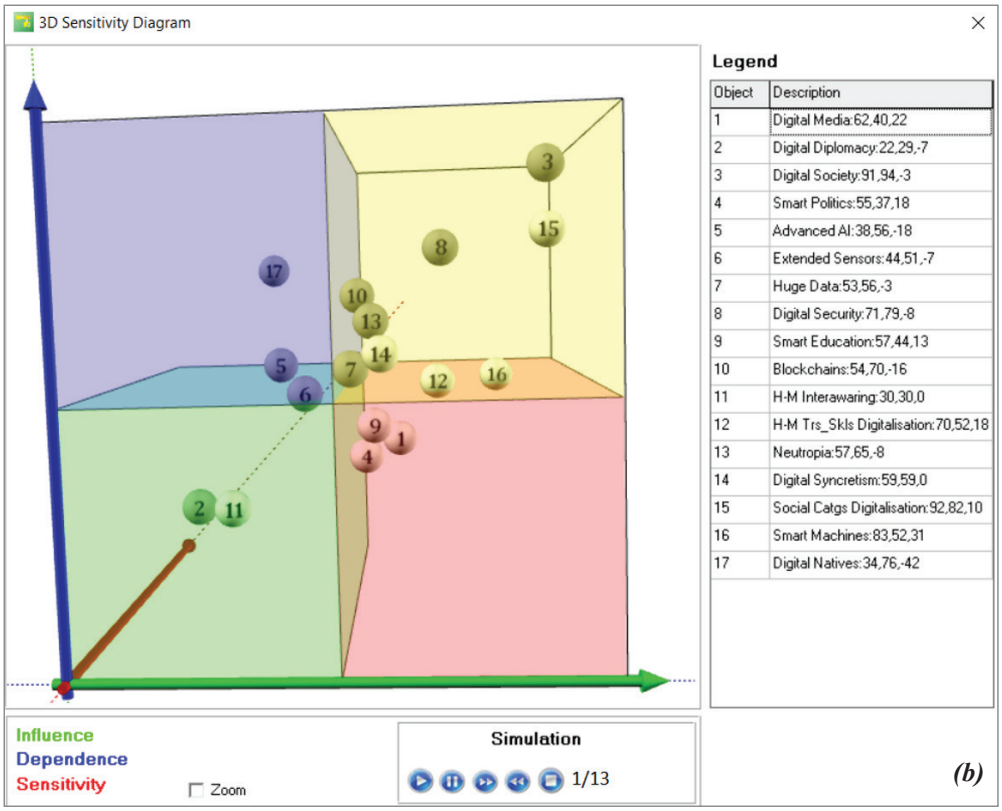


Fig. 3: *Digital transformation gaps analysis modelling (a) and sensitivity assessment results (b), concerning technological progressive scenarios towards the year 2033 [source: Minchev, 2019]*

The outlined system model produces a system effectiveness model (encompassing 17 entities and 42 bi-directional relations) with the future (year 2033, reached in 13 steps) aggregated assessments (see Figure 3) that could be spread in four main initial types: technologically oriented (marked in grey), socially oriented (marked in red), governance oriented (marked in yellow), gaps oriented (marked in blue).

The resulting expectations for the year 2033, are distributed among four SD sectors, regarding the entities location as follows:

• Buffering: "Digital Diplomacy" – 2 (passive), "H-M Interawaring" – 11 (active);

• Active: "Digital Media" – 1, "Smart Politics" – 4, "Smart Education" – 9, all assumed as "active" ones;

• Passive: "Advanced AI" – 5, "Extended Sensors" – 6, "Digital Natives" – 17, assumed as "passive".

Finally, the Critical entities are divided into two sub-classes:

• "Active": "H-M Trs_Skls Digitalisation" – 12, "Digital Syncretism" – 14, "Smart Machines" – 16

• "Passive": "Digital Society" – 3, "Huge Data" – 7, "Digital Security" – 8, "Blockchains" – 10, "Neutropia" – 13.

The results are showing somewhat passive behaviour role by means of future digital natives, artificial intelligence and sensors advanced integration for the digital future of the year 2033, providing future people with augmented and assisted capabilities, embodying both sensors and machine intelligence for successful handling of the huge data dynamics. At the same time, the near future digital society transformation is going to establish a rather challenging security environment that both smart machines and digital natives have to adequately handle in order to successfully close gaps, challenges related to digital syncretism, neutropia, future humans/machines traits (e.g.: creativity, imagination, intuition, attitude, moral, ethics, values) and skills (e.g. ingenuity, learning, adaptation, cognition), social categories (e.g.: gender, religion, culture, social role, political beliefs) and interawaring (i.e. mutual human-machine self-awareness, towards singularity, as stated in Borders (2018)). This new level of society transformation is expected to be accomplished due to the active role of politics,

media and education, giving also a sustainable meaning to diplomacy (and further, within the international relations and future conflicts, according to Sandre (2015) and Nye and Welch (2017)) and blockchains (for interactive things, data & values exchange approach) as natural social and technological elements from the future digital society transformation *[Minchev et al, 2019].*

The outlined future findings were further experimentally studied for achieving comprehensiveness, using an interactive assessment in a mixed cyber-physical reality that is further presented.

FUTURE RESULTS ASSESSMENT

Properly understanding the future analytical beliefs from both morphological and system analysis, especially with a time horizon of 10-15 years, is a quite challenging task, that could be empirically supported by using an interactive mixed cyber-physical reality exploration, assessing both technologies and human feedback responses.

In this sense, the social experiment presented in Minchev et al (2019) gives rather fascinating results for the future but requires quite extensive time and resources investment to be regularly organized. A more budget suitable solution is the implementation of Computer Assisted eXercises *[Kick, 2014]* and interactive exploration of futuristic scenarios, that have been successfully organized in the last several years since 2015 *[SDF, 2020]*, together with recent virtual reality extensions. The approach provides a dynamic exploration capability for interactive training towards approaching future education and skills expectations *[OECD, 2018],* outlining the future digital transformation transcendings and gaps through a practical context assessment.

Generally, the architecture includes multiple complex security threats (like: social engineering, industrial and corporate espionage, malware, targeted and distributed attacks) spread among several main teams, organized in different roles (e.g. commercial companies, terrorist organizations, governmental and non-governmental organizations). As this type of architecture implementation has to be politically neutral, a fictitious country community context is normally selected in order to be able to further distribute the obtained results in public. The participants are usually organized on an agent-based team manner *[Minchev, 2019]*, using both popular commercial technologies (e.g. phablets, specialized goggles, interactive joysticks, desktop and mobile computers, cloud services for data storage and sharing, encryption, chats, social media, avataring, multimedia messaging, e-mailing) together with specific solutions (e.g.: cryptophones, data leakage protection multi asset configurable monitoring, biometric monitoring stickers, assessment and behavior stimulation).

A multicriteria results assessment is finally performed, combining both technical and participants responses for the environment, scenario, interfacing, software services, overall technological and human factor effects, following the accomplishment of the objectives of the training exercise. The mix is usually matching response-time and video behavior monitoring of the participants, according to the scenario simulation script and attacks, linked with participants questionnaires after-action assessment and biometric correlates test battery (brain activity, heart rate variability, galvanic skin response) and other successful quantitative measurements *[Minchev, 2019]*. Additional generalization of the balanced effectiveness evaluation could be performed, using the aggregated data results *[Minchev, 2017]*.

Several selected recent examples with some illustrative results are presented in ***Figure 4***.

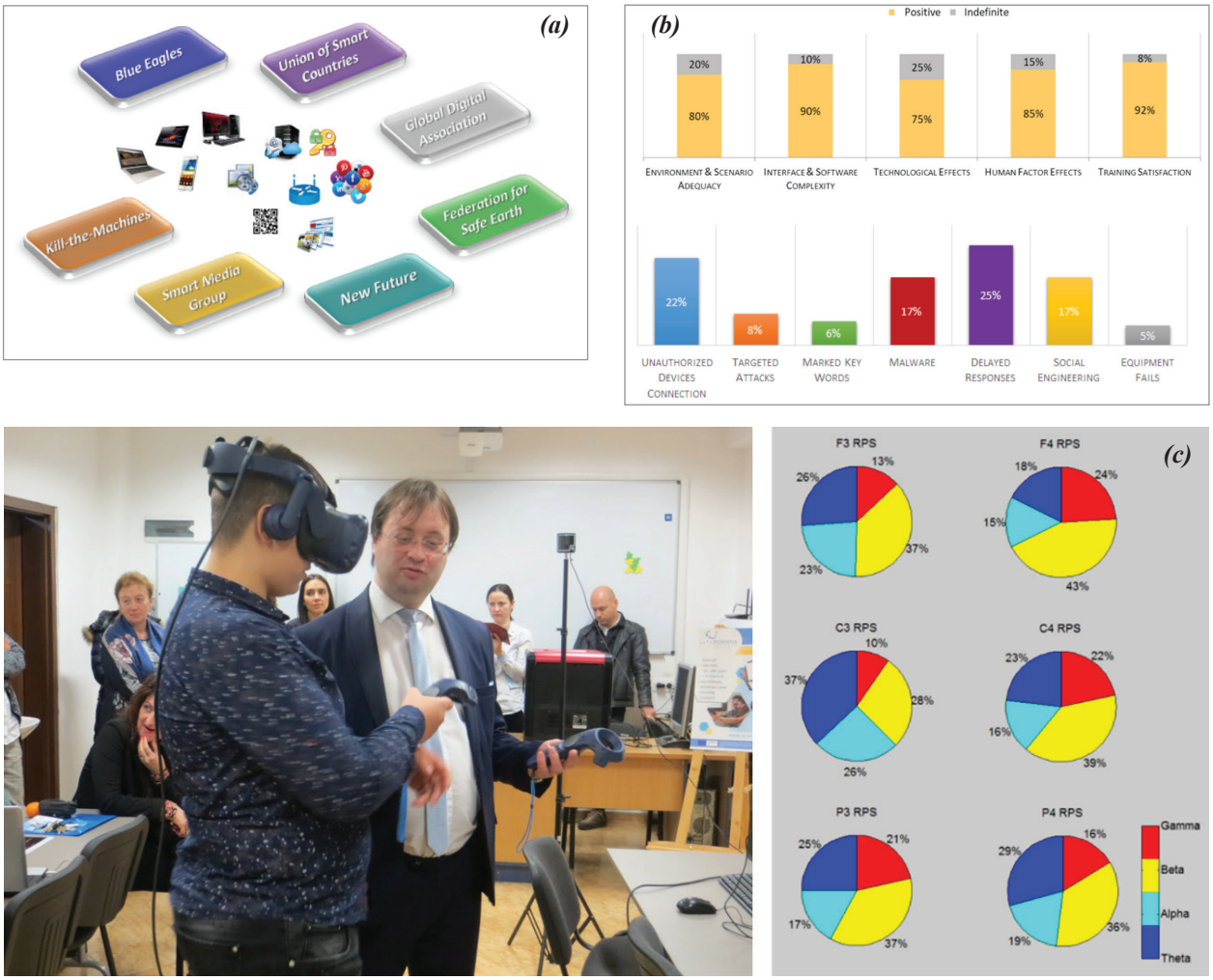


Fig. 4: *Selected moments from future digital transformation experimental assessments, during CYREX 2019 (a), aggregated multicriteria assessments with attacks and trainees' feedbacks (b) and virtual reality lab recent futuristic experiments with brain activity monitoring, showing clear participants engagement with the training process (c) [source: Minchev, 2019b]*

DISCUSSION

The presented ideas are intended for a comprehensive exploration towards the future, though whether they will be successful enough will only be completely certain when the very moment of the foresight is reached.

The future digital world is obviously going to transform our lifestyle and landscape of working and existing towards an uncertain neutropian world with fused human and machines traits, skills and categories.

At the same time, the establishment of a new digital society is also going to require both human and technological efforts that are probably going beyond the post-informational age towards future technological singularity.

This is naturally giving some priorities to the advanced smart machines role mainly related to data processing and fast response support, that are expected to go above the normal human capabilities.

Apart from these ideas, a suitable organization for the new political, economic, religious and other governing digital society transcedents is naturally expected to be cultivated, giving new capabilities and knowledge also to the future humans for successful handling of the new society's transformational gaps.

Hopefully these expectations of human-machines interawareness are going to produce a new peaceful digital world that is going to foster an advanced level of joint evolutionary development, keeping the natural social balance with the technological progressive trends (from the current perspective).

ACKNOWLEDGEMENTS

The results obtained in this study are due to the technological and expert support obtained in the framework of the initiative "Securing Digital Future 21", http://securedfuture21.org. Additional gratitude is expressed towards the author's colleagues: Todor Tagarev, Velizar Shalamanov & Evgeni Krastev for the fruitful discussions related to the models' developments and analysis, including the unique capability of joining the EU FP7 Driver+ project final conference in February, 2020.

REFERENCE LIST

Borders, M. (2018), The Social Singularity: How Decentralization will Allow Us to Transcend Politics, Create Global Prosperity, and Avoid the Robot Apocalypse. ISBN 1732039402, Social Evolution

Driver+ Final Conference Wrap-ups (2020), Brussels, Belgium, February 18-21, 2020, as Driver+ (2020), https://www.driver-project.eu/driver-project-celebrates-major-achievements-and-successes/

Future Digital Society Resilience in the Informational & Post-informational Ages International Discussion, Sofia, Bulgaria, December 12, 2019, as FDR (2019). https://www.facebook.com/zlatogor/media_set?set=a.10216002667764327&type=3

Harari, Y. (2017) Homo Deus: A Brief History of Tomorrow, HarperCollins Publishers, Introduction to Theory and History. 10th Edition, Pearson Education, ISBN-13: 978-0134403168

Kick, J. (2014) Cyber Exercise Playbook, The MITRE Corporation, https://goo.gl/SOkkw6

Leonhard, G. (2016) Technology vs. Humanity: The Coming Clash between Man and Machine, Fast Future Publishing

Minchev Z. (2019) Human Factor Role for Cyber Threats Resilience. In Multigenerational Online Behavior and Media Use, pp. 215-241, IGI Global

Minchev, Z. (2017) Security Challenges to Digital Ecosystems Dynamic Transformation, In Proc. of BISEC 2017, Belgrade, Serbia, October 20, 2017, http://dx.doi.org/10.13140/RG.2.2.32354.84160

Minchev, Z. (2019b) Extended Reality Training Analytical Transcends in the Future Digital Society, In Proc. of ERIS 2019, Plovdiv, Bulgaria, May 31, 2019, pp. 151-164

Minchev, Z. et al (2019) Future Digital Society Resilience in the Informational Age. SoftTrade, 2019

Minchev, Z., Boyanov, L., Georgiev, S. (2013) Security of Future Smart Homes. Cyber-Physical Threats Identification Perspectives. In Proc. of National Conference with International Participation in Realization of EU HOME/2010/CIPS/AG/019 project, Sofia, Bulgaria, June 4, 2013, pp. 165–169

Nye, J., Welch, D. (2017) Understanding Global Conflict and Cooperation. An Introduction to Theory and History, Pearson, 10th edition (January 18, 2016), ISBN-13: 978-0134403168

OECD (2018) The Future of Education and Skills. Education 2030, OECD, 2018, http://bit.do/eZnZZ

Reese, B. (2018) The Fourth Age: Smart Robots, Conscious Computers, and the Future of Humanity. Atria Books, ISBN-13: 978-1501158568

Ritchey, T. (2011) Wicked Problems – Social Messes. Decision Support Modelling with Morphological Analysis, Springer-Verlag Berlin Heidelberg, http://dx.doi.org/10.1007/978-3-642-19653-9

Sandre, A. (2015) Digital Diplomacy. Conversations on Innovation in Foreign Policy, Rowman & Littlefield, ISBN-13: 978-1442239128

Schwab, K. (2017) The Fourth Industrial Revolution: What It Means, How to Respond. World Economic Forum, May 9, 2017, https://goo.gl/e1Kc3F

Securing Digital Future 21 Web Forum, as SDF (2020), http://securedfuture21.org

Shalamanov, V. (2017) Institution Building for IT Governance and Management. Information & Security: An International Journal, 38, Procon. Ltd., ISSN:0861-5160, 13-34

Sirius, R., Cornell, J. (2015) Transcendence: The Disinformation Encyclopedia of Transhumanism and the Singularity, Disinformation Books, ISBN-13: 978-1938875090, Stiftung, No. 1

Tagarev, T. (Ed) (2019) Digital Transformation, Cyber Security and Resilience, Information & Security: An International Journal, 43, 1, Procon. Ltd., ISSN:0861-5160

Vester, F. (2007) The Art of Interconnected Thinking – Ideas and Tools for Dealing with Complexity, Munchen, MCB–Verlag, ISBN-13: 978-3939314059

Wahlers, G. (Ed) (2018) "The Digital Future, International Reports", Konrad Adenauer