# Emotional Intelligence and Implicit Interdisciplinary Skills: Key Components for Effective Digital And AI-Enhanced Learning

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## ABSTRACT

The theoretical problems of holistic, multidimensional modeling and prognostication of reality and society development are informed by the dialectics of deterministic and fuzzy interaction of objects, signs of their reception and interpretation (in the field of individual and collective consciousness), embodiment, consolidation and retransmission of the results of interaction of these systems of features in an event horizon that is qualified as a 'singularity' – the state-of-the-art of technology development that facilitates multiple unpredictable outcomes.

Transformative shifts in the knowledge economy of the XXI century, Industry 4.0 and Web 4.0 development and elaboration of networked society, emergency digitization of all social communicative spheres due to pandemic measures have imposed pressing revisions onto interdisciplinary and cross-sectorial job market demands of university level education, curriculum design and learning outcomes. Transgression of "real life" into a digital format necessitates the adaptation of the educational process to the new requirements of online being and the new labor market in particular. To meet their needs, higher education must keep pace with the times and predict the soft and hard skills required in the online dimension. The article dwells on criteria measuring students' academic success in the digital environment.

To distinguish implicit and explicit components of emotional intelligence requests in digital education, an additional empirical diagnostics of students' interaction with AI-enhanced technologies and tools was conducted. Incremental skills for productive online education, as a property that can be acquired during learning (incremental implicit theory), and stable skills, constant and unchanging (stable implicit theory) were distinguished. The impact of emotional intelligence and implicit/explicit abilities on academic success is discussed.

**Keywords**: Emotional Intelligence, Artificial Intelligence, Interdisciplinarity, Digital Education, Implicit Skills, Explicit Skills

## 1. INTRODUCTION

Transformative shifts in the knowledge economy of the XXI century, Industry 4.0 [7] (AI-powered technologies and production) and corresponding stages of Web technology development (from Web 2.0 – social media interaction, to Web 3.0 – Internet of things [6], to Web 4.0 – machine learning powered interaction, to Web 5.0 – intelligent personal agents [34]), development and elaboration of networked society and new media ecology [10], emergency digitization due to quarantine measures has imposed pressing revisions onto interdisciplinary and cross-sectorial job market demands of Liberal Arts university graduates' skillsets, upon entering the workforce. This, in turn, stipulates reevaluation of the interdisciplinary trends, permeating the development of digital education.

The theoretical problems of holistic, multidimensional modeling and prognostication of reality and its separate spheres development are informed by the dialectics of deterministic and fuzzy interaction of objects, signs of their reception and interpretation (in the field of individual and collective consciousness), embodiment, consolidation and retransmission of the results of interaction of these systems of features in an event horizon that is qualified as a 'singularity' [30] – the state-of-the-art of technology development that facilitates multiple unpredictable outcomes.

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The seminal overview of meta-trends, changing the world by D. Snyder [39] identified *universal connectivity* as a transcendent premise of technological trends development. Through the span of the following predictive Global Trends frameworks [19; 20; 21], provide the hindsight in the lens through which technological growth and advances features in the global development trendsetting (Fig. 1). The paradigm of these aspects evolving from *technological breakthroughs* (GT 2025) to *accessibility of technology* (GT 2030) to *transformative technology* (GT 2040), accordingly.

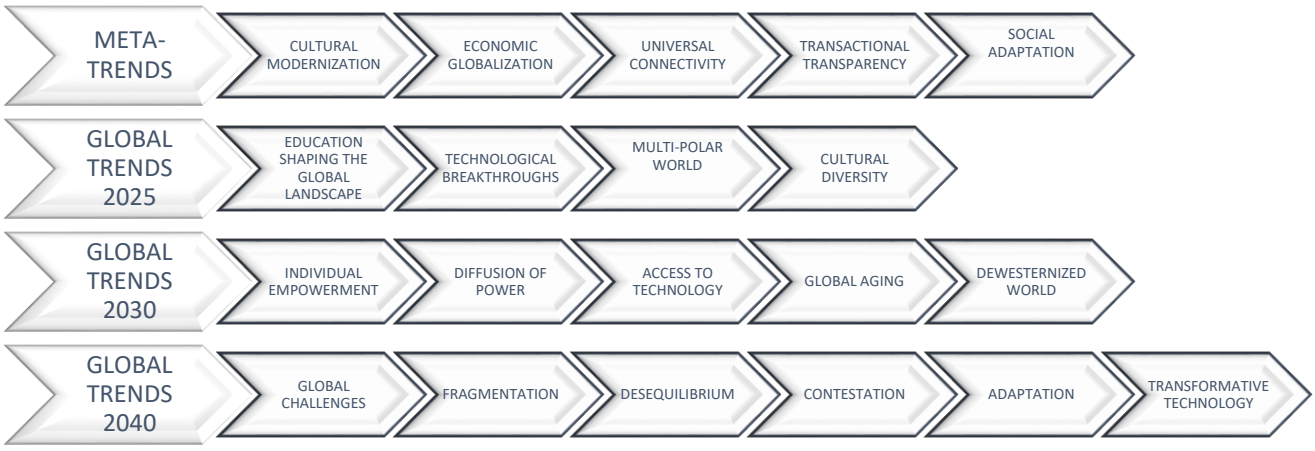


Figure 1: Global Trends For Societal And Technological Transformation

Through the span of these predictive Global Trends frameworks, provided is the lens through which technological growth and advances features in the global development trendsetting. The sub-trend of the technological society development is manifested through the elaboration of an interdisciplinary paradigm of Digital Humanities - a diverse, open-for-augmentation, transdisciplinary range of areas of knowledge, applied activities, and education in Arts a nd Humanities, centered on digital adaptation, production, processing, manipulation and dissemination of relevant thematic content: Digital history; Digital philology; Digital art; Digital education; Digital sociology; Digital music, etc.

Interdisciplinarity and ubiquity (universality) of digital education in the 21st century, therefore, is informed, in crucial ways, by intellectualization and amplified information capacity of human social activities in general. Thus, the intellectualization of modern global culture determines a qualitatively new approach to understanding the processes of parallel development of human activities and cognitive (intellectual) experiences. That is the origin and methodological premise of the concept of "noosphere". Noosphere is the unity of "nature" and culture, especially from the moment when the intellectual culture reaches (by force of influence on the biosphere and geosphere) the power of a peculiar "geological force" [45].

The noosphere is defined as the current stage of development of the biosphere, associated with the emergence of humanity in it [18; 45], and is interpreted as part of the planet and planet ambient with traces of human activity.

The integral real component of the Noosphere is identified as the Technosphere - a set of artificial objects (technologies) created by the humankind, and natural objects changed as a result of technological activity of humankind [28]. In turn, Computer Being (computer reality, cyberspace) is a complex, multidimensional sphere of synthesis of reality, human experience and activity mediated by the latest digital and information technologies; technogenic reality, a component of the technosphere of existence [22; 30].

Therefore, it is stipulated in **the study design**, that the cognitive (Noosphere) premise of digital education is informed by the following **dimensions**: 1) the *interdisciplinary dimension*, disclosed through the mutual transformative potential of information and modern technology, as "knowledge in a scientific sense can lag only slightly behind this world transformation because knowledge becomes transformed in the process" [22]; 2) *the universal dimension*, disclosed through the pervasive, ubiquitous nature of humanitarian and linguistic (especially multi-cultural) knowledge applicability, as "science and technology revolutionize our lives, but memory, tradition and myth frame our response" [18]; 3) *the interoperable dimension*, informed by the underlying anthropocentrism of linguistic knowledge and skills, providing the interface for development and application of skills and activities across different domains, as "a human is a nexus of existential horizons" [27].

Transgression of "real life" into a digital format necessitates the adaptation of the educational process to the new requirements of online being and the new labor market in particular. To meet their needs, higher education must keep pace with the times and predict the soft and hard skills required in the online dimension. The article dwells on criteria measuring students' academic success in online being.

The focus is shifting from a balance of technical skills (hard skills) to soft skills in education and learning, particularly emotional intelligence (EQ) as a cross-sectorial operator to bridge Human Intelligence (HI) and Artificial Intelligence (AI) through interdisciplinary communication. EQ is crucial for effective communication, motivation, and overall success in the digital age. The study examines the role of EI in online education and how implicit and explicit intellectual abilities (as identified by Sternberg, Furnham, and Dweck) influence learning.

An empirical analysis was conducted to identify the implicit and explicit components of EQ required for successful online learning. The concept of "incremental" (developable) and "stable" (fixed) implicit theories is used to differentiate between skills that can be learned and those considered innate.

The unstable e-environment and recent changes in the predominant online roles from person to artificial intelligence (AI) affect soft and hard skills balance and focus shift to students'

emotional intelligence (EI). EI is becoming one of the priority areas in higher education, as it contributes to the formation of professionally important qualities, motivation, and personal development and becomes a mediator to effective functioning in a digital world. In this study, emotional intelligence is regarded as the key to effective communication needed in a multidimensional world and is immanently provided as a prerequisite for the effectiveness of digital education and, consequently as a key factor in evolutionary development in the modern world. The role of AI in digital education and its various applications, including assessment and forecasting, are discussed.

The result of a fundamental Technosphere shift in the sphere of Foreign Languages Education, induced by the global pandemic development and enhanced by continuous iterative digitalization measures, was the need to take quick comprehensive action [31; 40] in order to achieve such desirable results: a) to adapt the existent educational scenarios to digital, remote and hybrid formats; b) to upgrade e-competence and digital literacy of all stakeholders of the educational process and industry; c) to activate complex interdisciplinary skillsets, otherwise latent or underutilized in the professional interaction**;** d) to introduce functional technical solutions for facilitation of formal and informal educational workflow and communication.

Taking into account the context of the erupted military intervention in Ukraine in February 2022 and the ensuing information warfare in various digital ambients (social media, news coverage, digital communications), the specific value is allocated to the enhanced role of digital humanism as a tool of the internationally broadcast strife for freedom and sovereignty. For the first time in modern history, the full inventory of interconnected areas of digital humanities (from fact-checking via digital archives to AI-powered content distribution algorithms and fake-news detection to viral blogging and SMM to big data processing and sociological analysis to corpus analysis and computer-assisted translation, digitally enhanced logistics coordination, etc.) are implemented to achieve a maximum advantage in the information warfare waged both on the cyber front and in actuality. This development clearly heralds the branching out of digital humanities into new, undercharted areas of military digital humanities and digital peacekeeping, digital diplomacy.

The study **objective** is therefore to disclose a wide scope of generalized theoretical and applied issues and models, permeating the digital communication and digital education context through the lens of interoperable EQ skills.

The inquiry allows to diagnose in-depth the dimensions of interdisciplinarity, universality and transdiciplinarity, informed by the interoperability of global sustainable development goals [33; 29] soft skills [2; 10; 11; 14; 38; 47; 48] and digital communication skills [3; 12; 15; 16; 32; 44] for efficient and successful digital education across contrasting timeframes and stages of quarantine measures.

The study of groundwork principles of universality and interdisciplinary of digital education in Liberal Arts and linguistic education in particular is a parcel of the framework project *TRANSITION: Transformation, Network, Society and Education* [31; 32]. The inquiry main findings disclose: global event horizon and paradigm shifts in the interdisciplinary trends of digital education in the Covid-19 timeframe and beyond; transformative changes and avenues of development of the network society and education as an interdisciplinary socio-cultural institution and industry in the digital age; global experiences, universal/generic challenges, technical advances and specific national gains in quality assurance of online and hybrid learning in the digital humanities paradigm.

## 2. FINDINGS

### A Conceptual Grid for Effective Digital and AI-Enhanced Learning

The following grid of groundwork concepts is applied to profile digital education in such dimensions:

- INTERDISCIPLINARITY
- TREND
- UNIVERSALITY
- DIGITAL EDUCATION
- INTEROPERABILITY
- EMOTIONAL INTELLIGENCE
- AI-LITERACY

The meaning of INTERDISCIPLINARITY is synthesized for the purpose of this study as an agglomeration of two or more fields of knowledge into one scope/goal of study, inquiry or activity [8; 17; 23; 26].

UNIVERSALITY is generally understood as a property of object or state **to "exist** everywhere **(ubiquity), or involve everyone"** [9]. In the context of this study we suggest to attribute the property of universality/ubiquity to social activity, vocational activity and professional performance.

The concept of INTEROPERABILITY is disclosed across different approaches [25; 37] as a characteristic of an object, product or system, that allows its interface to be comprehensible, to work with other objects, products or systems.

As applied to digital education in Liberal Arts, the concept of interoperability represents the property of functional, dynamic interconnectivity between the source and target domains of professional content, professional theory content, related areas of scientific and universal knowledge, and domains of professional and social application and communication, informed and facilitated by the *digital transformation framework* [4]. Degrees of interoperability help define the measure of interdisciplinarity and universality of activities, skills and competence applications of Liberal Arts stakeholders.

The generic concept of multiple disciplinarity [1; 42] comprises, in its turn, of a framework of interconnected concepts:

- Multi-disciplinarity;
- Interdisciplinarity;
- Transdiciplinarity.

Multi-disciplinarity, thus, is understood as a multitude of fields of knowledge, that comprise the scope of understanding a certain object, problem or area of inquiry.

Interdisciplinarity in this respect is interpreted as the interconnectivity of multiple spheres of knowledge that comprised the content of a problem or area of inquiry.

Trans-disciplinarity, subsequently, is perceived as a transcendent product of merging multiple interconnected knowledge domains. *Interdisciplinarity in digital education in general* is, therefore, postulated in this study as a computational framework of interconnected types of disciplinary dimensions (Fig. 2) within the digital transformation framework:

1) Silo 1 – different types of disicplinarities (MULTIDISCIPLINARITY, INTERDICIPLINARITY, TRANSDISCIPLINARITY);
2) Silo 2 – digital education components (DIGITAL EDUCATION FORMAT, DIGITAL COMMUNICATION, DIGITAL LITERACY; AI LITERACY);

3) Silo 3 – digital education tools and practices (DIGITAL CONTENT, INTEROPERABLE DIGITAL MEDIA, DIGITAL LEARNING OUTCOMES; EQ; SOFT SKILLS).

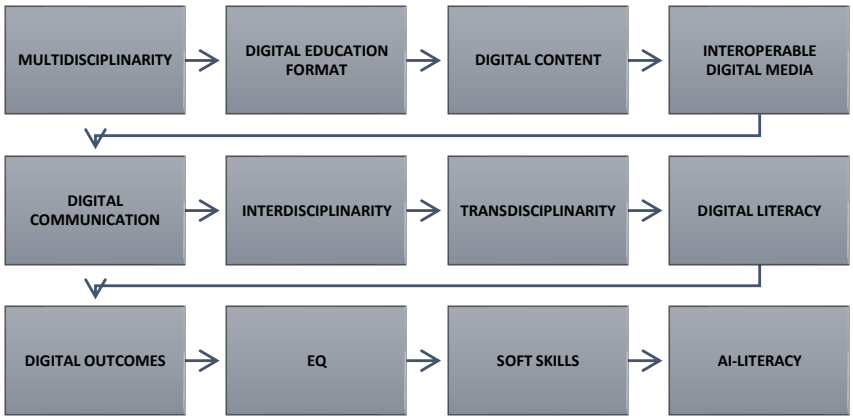


Figure 2: Computational framework of multiple disciplinarities in digital education

Multidisciplinary **input** into the education design and content in the form of data, information and facts across different source domains of human knowledge in order 1) to constitute the thematic content of education; 2) to constitute the semantic referents of key terms and concepts; 3) to constitute the vast framework of reference and contexts for professional communicative application.

Interdisciplinary connections of the educational **content** for digital education – internal interconnectivity of theoretical and applied disciplines, external interconnectivity of Liberal Arts content with non-related areas of human knowledge (computer science, physiology, anthropology, philosophy etc.).

Transdisciplinary **output** in the transcendent nature target knowledge domains and universal applicability of skills, training and outlook of the professionals upon graduation.

Interdisciplinary and transdisciplinary skills ensure *universal* applicability of Liberal Arts majors on the digital job market across various spheres of social activity.

Digital job market demands for Liberal Arts and FLE graduates in the years 2020-2021 (benchmarking conducted across national and international hiring platforms – LinkedIn, Indeed.com, Work.ua, Jooble.org, include the positions in the following professional areas, mediated by digital technologies:

- Teacher of language / literature, corporate coach / MOOC tutor / curriculum developer / teacher (negotiation) – EDUCATION
- Translator, proofreader, CAT editor – TRANSLATION, COPYEDITING;
- Researcher (scholar) - writing grants and grant applications, linguist-expert – RESEARCH AND DEVELOPMENT, NGO SECTOR; SOCIAL SERVICES; LEGAL SERVICES;
- PR manager, Copywriter, Content manager, SMM – MEDIA COMMUNICATIONS; ADVERTISING, CONTENT-CREATION;
- Computational linguist (NLP), lexicographer, applied terminologist, digital humanities – IT SECTOR, GAMING INDUSTRY.

**Emotional Intelligence and Interdisciplinary Communicative dimensions of Digital Education**

Based on the theory of R. Sternberg, A. Furnham, and K. Dweck [24; 33] implicit and explicit intellectual skills affect human behavior and learning and are key components of the self-concept associated with academic success. Implicit theories of intelligence play a crucial role in determining whether a person is focused on acquiring new skills or demonstrating existing knowledge, and this determines the success of their learning activities.

Trans-disciplinary and cross-referential integration between the corresponding skillsets, henceforth, constitutes a meta-framework of digital educational communication. The transdisciplinary integration of communication in digital education could be referred to the following key interdisciplinary domains: DIGITAL EDUCATION, DIGITAL CONTENT, INTEROPERABLE DIGITAL MEDIA, DIGITAL COMMUNICATION, DIGITAL SKILLS, SOFT SKILLS; EMOTIONAL INTELLIGENCE; DIGITAL OUTCOMES.

Interoperability for professional skills, acquired through digital education, is ensured by the communicative nature of interdisciplinary skills. The core cross-sectorial domain that is referential for primary skills (social skills, emotional intellect, collaboration, communication, digital literacy), necessary for educational goals achievement, is COMMUNICATION.

The digital dimension of communicative interoperability of digital education stems from the structure of Noosphere [40] and content of its components:

- ANTHROPOSPHERE - a set of people as living organisms, their activities and achievements;
- SOCIOSPHERE - a set of social factors characteristic of this stage of society development and its interaction with nature;
- TECHNOSPHERE - a set of artificial objects created by man, and natural objects, altered as a result of human activity.

Given the nature of increasingly digitalized context of foreign languages education and communicative application ("the Technospheric shift" [32]), it is suggested to consider the different types of information source and information destination (human and machine/computer/program, accordingly) in the structure of the groundwork Communication model (Cf. Claude Shannon [36]), when communication is approached as the core factor of interoperability of source and target knowledge and application domains (Fig. 3). Subsequently, a model of interdisciplinary dimensions of digital education, informed by the nature and subjects of communicative interaction of the stakeholders, is elaborated (Fig. 4).

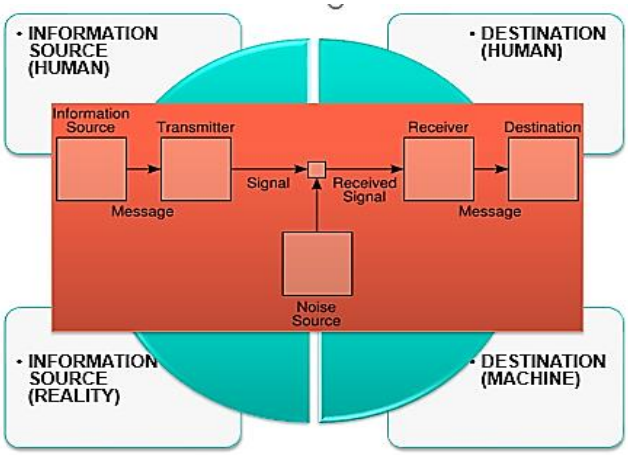


Figure 3: Adaptation of communication model to digitized context of education

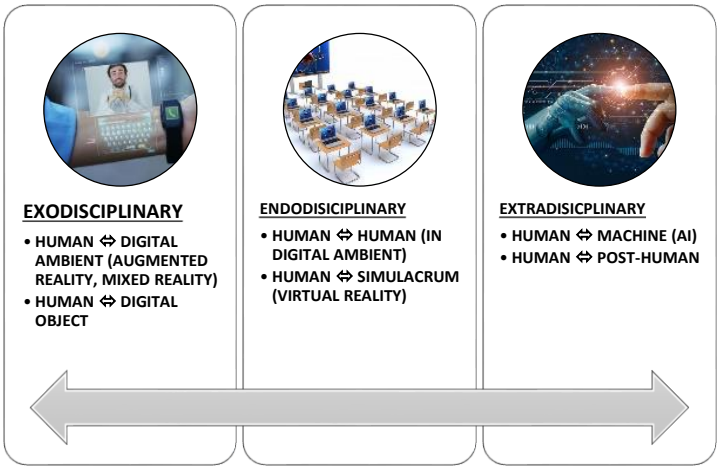


Figure 4: Interdisciplinary dimensions of digital education

Communication is considered a factor of interoperability of source and target knowledge as well as transdisciplinary domains of application of language and technologies. The proposed model reveals the nature of communicative interaction in the digital environment in the following main dimensions: 1) EXODISCIPLINARY DIMENSION - the compatibility of a) a person and the digital environment (augmented reality, mixed reality); b) people and digital objects; 2) ENDODISCIPLINARY DIMENSION - the compatibility of a) a person as a subject and another subject in the digital environment; b) human and digital simulacra (virtual reality); 3) EXTRADISCIPLINARY DIMENSION - the compatibility of a) a person as a subject of communication and generative AI (e.g. ChatGPT or other large language models) as a subject of communication or a source of cross-domain data; b) human and post-human subjects of communication (Web 5.0 technologies).

Thus, the fundamental interdisciplinarity, that COVID-19 digital procedural transformations imposed on the educational process in the area of Liberal Arts, is verified by a unified framework of correspondence between the components of a crucial communicative competence [24], comprising of a diverse skillset, and various aspects of ICT competence in Liberal Arts [3; 15; 16; 44], utilized in the educational process, elaborated for the purposes of this study.

Based on the interdisciplinary communicative and digital interoperability grid the following freeways of digital transformations in education are identified: DIGITAL HUMANITIES; NLP, DATA SCIENCE, MACHINE LEARNING; E-LEARNING.

The framework of these developments is informed by the range of consecutive transformations in digital humanism, social media ecology and communicative patterns. Namely: NETWORKED SOCIETY transformations [lead to] ⇔ RHIZOMATIC education [open ended educational practices and lifelong credentials accumulation] that [leads to] ⇔ the configuration of an INTERDISCIPLINARY NETWORK of knowledge (Fig. 5).

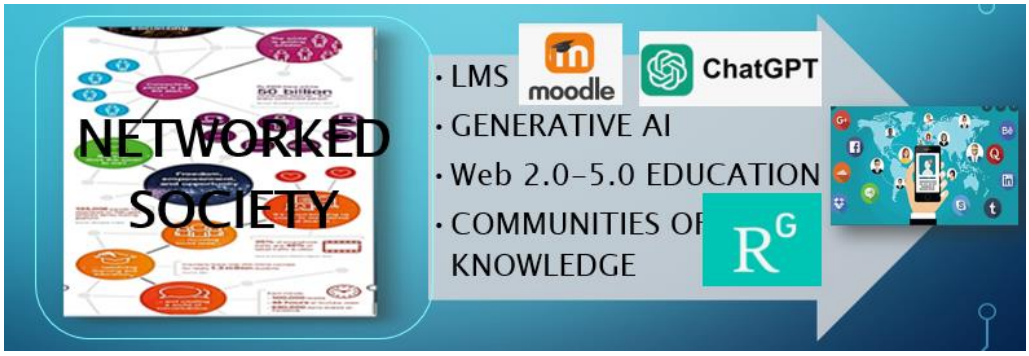


Figure 5: Networked Society Transformations for Digital Education

The open-ended interdisciplinary network in digital education is elaborated with the help of such digital tools as and educational technologies as: learning management systems; Web 2.0 education through social media; formal, informal and semi-formal digital communities of knowledge (academic social media).

Subsequently, the network communication patterns in digital education follow the general typology of Web communication (Web X.0 scheme), distributed across two axes – X-content orientation and axes Y – types of skills involved (Fig. 6):

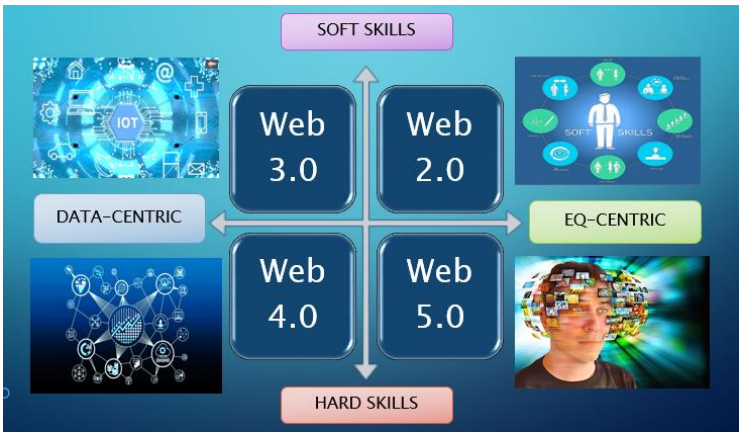


Figure 6: Network Communication Pattern for Digital Education

Overall, the network communication in digital education is actualized through such dimensions: 1) Data-centric, soft-skills oriented (Web 3.0 type); 2) Data-centric, hard skills oriented (Web 4.0 type); 3) Emotional Intelligence (EQ)-centric, soft-skills oriented (Web. 2.0 type); 4) Emotional Intelligence (EQ)-centric, hard skills oriented (Web. 5.0 type).

AI enhancement of the learning stakeholders and communicative components informs transformations in other components of educational communication, namely the elaboration of machine learning powered mixed reality [28] learning environments and content, such as: AUGMENTED REALITY; VIRTUAL REALITY; ANNOTATED REALITY; 3D PRINTING.

Taking into account the nature of the suggested modeling of educational communication across frameworks of complex skills, it is stipulated that META-disciplinarity has become the universal vehicle or framework of education in the digital realm, whereas TRANS-disciplinarity can be perceived as a universal output of educational communication in the digital realm. Consequently, the communicative dimension of education proper acquires meta-digital and trans-digital (transcendent digital) properties. The trans-digital characteristics of educational communication are ensured through the interoperability of such framework parameters as: Interaction, Disciplinarity, and Learning.

## 3. CONCLUSIONS

The comprehensive diagnostics of the interdisciplinary trends of digital humanities paradigm for education disclosed the interoperability of soft skills and digital communication skills across contrasting timeframes and stages of Liberal Arts education.

Digital environment, digital industry, digital communication, digital stakeholders and digital literacy are estimated as the interoperable parameters that inform interdiciplinarity of trends and models in digital educational design and practice in the timespan of the last 2 years (2020-2021).

GLOBAL CHALLENGES of digital education in the emergency digitization measures of 2020-2021 include the following types: SOCIAL AND PSYCHOLOGICAL: Emotional burnout; Stress; Fatigue; Health; Domestic difficulties / limitations; Time restrictions in connection with the introduction of quarantine restrictions; TECHNICAL CHALLENGES AND DIGITAL LITERACY: Technical difficulties (lack of stable Internet connection, lack of necessary equipment, capacity of household computer equipment); Lack of digital literacy skills; Lack of experience in transforming the curriculum and training materials into an online format; Lack of digital communication experience;

Lack of experience with electronic learning management systems (Moodle, Google Class, etc.); Lack of experience with auxiliary Digital tools for organizing the learning process (video conferencing, testing, surveys, online boards, etc.); SOFT SKILLS: Lack of skills of adaptation and self-organization; Lack of situational learning and training skills; Lack of communication and cooperation skills.

The inquiry results inform the derivation of the following recommendations for UNIVERSAL AND LOCALLY CUSTOMIZED SOLUTIONS *for interdisciplinary digital education going forward*: 1) To critically review of the curriculum content to accommodate the dynamics of digital society input; 2) To update the curriculum content interconnectivity and learning outcomes to accommodate the interoperable interface of skills, customized to facilitate professional activity and communicative application in the intensely digitized world; 3) To devise a flexible model of educational content upgrade to meet the dynamic transdisciplinary requirements of the job market in the digital economy of the post-pandemic timespan; 4) To enhance the universality of professional application for university graduates in the digital age.

The study overview results provide a springboard for the assessment of interdisciplinary and interoperable digital skills adaptability for separate groups digital education stakeholders, according to roles and tasks performed in the communication workflow, as well as according to age and entry digital literacy level (digital immigrants and digital natives). The perspective of the study is in scaling the inquiry into the digital education trends and models to estimate the parameters Liberal Arts education interdisciplinarity and universality for separate areas of knowledge, as well as to diagnose interdisciplinary trends of digital education in Arts and Humanities across different countries and regions of the world.

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