

Green Digitalization - introduction of the digitization's multi-field impacts - the case of the Corvinus University

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Abstract – The article describes the stepwise process of the introduction of digitization and its multi-field impacts through diverse subjects taught in the Budapest Corvinus University. The various aspects of digitalization play ever growing role in most, increasingly in every fields of economy - therefore it has great significance also in handling the climate change related challenges. Due to this broader context the proper introduction of digitalization for students, who has to be prepared for entering soon to the labor market, has truly strategic significance for the higher education as a whole – this article argues. It offers to analyze as a quasi-case study the feed backing processes that in the Corvinus University have led to the emergence of a “Green Digitalization” concept, to its infiltration in multiple subjects, and to the recent idea of transforming it into a separate / independent course. Moreover, as the analysis indicates it is worth to consider this concept also as a useful component for the transformational strategy of the university. Since the digitalization in context of the emerging Anthropocene creates and has to handle multifaceted challenges affecting simultaneously technological, social, business, institutional and ethical aspects its interpretation requires inter- and transdisciplinary approach as well as changes in the framing and in the deployed toolsets.

Keywords: digital technologies, Green Digitalization, technology enactment, innovative business models, social innovation,

I. INTRODUCTION

This article explores both the emergence process and the significance of the Green Digitalization's concept and teaching in the context of (primarily higher) education where the combination of the courses and research activities can facilitate to discuss and treat digitalization and environmental challenges as connected phenomena. As the current global trends indicate the digital technologies should be enacted by following patterns that facilitate to

reduce the environmental footprint of all human /socio-economic activities [1] [2]. These trend urges the actors of higher education to elaborate and teach curricula that contribute to the practical implementation of the SDGs [3], i.e. going beyond their formal indication in every Syllabus. It has growing urgency to consider how the various courses and the entire system of education could provide essential and practical knowledge enabling the students to understand how the enactment of (increasingly “permeated” with digitization) technologies can contribute to effectively handle the climate crisis. It has growing importance, especially in the context of business economics, to indicate how the combination of forward looking business approaches and strategies into various innovative business models could contribute to a genuine transformation, the “greening of the economy” (European Commission, n. d.). The current paper elaborates on lessons provided by the exploration of the outcome of various initiatives unfolding in the Corvinus University that probably can serve as a quasi-case study also in the broader context of the Hungarian higher education.

II. THE GROWING IMPORTANCE OF DIGITALIZATION IN CONTEXT OF ANTHROPOCENE

The digitalization becomes increasingly omnipresent [4]. It exhibits robust impact also on the entire socio-economic development since it becomes one of the most important driver of innovation in the economy. “Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business” [5]. The interplay among artificial intelligence, machine learning, and the Big Data rapidly turns them into a new technological “holy trinity” [6]. These feed

backing phenomena make even more robust and visible the outstanding role of digitization, digitalization and digital transformation [7]. The digital technologies "...have the potential to boost more inclusive and sustainable growth by spurring innovation, generating efficiencies and improving service" [8]. However, the technologies can and often do bring about unexpected and rather negative impacts on both the environment and the society [9], [10]. "The human species has been recognized as a new force that has pushed the Earth's system into a new geological epoch referred to as the Anthropocene. This human influence was not conscious, however, but an unintended effect of the consumption of fossil-fuels over the last 150 years" [11]. Consequently, the human economic activities, which currently become increasingly "digital technology permeated" and driven, now operate also as drivers of the emergence of a new epoch, coined as the Anthropocene.

"Phenomena associated with the Anthropocene include: an order-of-magnitude increase in erosion and sediment transport associated with urbanization and agriculture; marked and abrupt anthropogenic perturbations of the cycles of elements such as carbon, nitrogen, phosphorus and various metals together with new chemical compounds; environmental changes generated by these perturbations, including global warming, sea-level rise, ocean acidification and spreading oceanic 'dead zones'; rapid changes in the biosphere both on land and in the sea, as a result of habitat loss, predation, explosion of domestic animal populations and species invasions; and the proliferation and global dispersion of many new 'minerals' and 'rocks' including concrete, fly ash and plastics, and the myriad 'technofossils' produced from these and other materials. Many of these changes will persist for millennia or longer, and are altering the trajectory of the Earth System, some with permanent effect. They are being reflected in a distinctive body of geological strata now accumulating, with potential to be preserved into the far future" [12]. In the emerging Anthropocene "...the main goal of the economy cannot be unlimited economic growth or maximizing economic welfare for the current generation without considering the need of future generations. What is at stake is the flourishing of life on Earth (including human, nonhuman, and future life)" [13].

The "growth obsession" of the current socio-economic settings [14] that drives the emergence of Anthropocene is the outcome of the globally dominant neoconservative approach operating as a

neoliberal ideology [15]. Initiatives that promote sustainable value creation and empowering associational dynamics have growing significance in order to handle the wicked problems constitutive of the Anthropocene [16] [17]. The responsible and ethical technology usage aims to contribute to the reduction of the global material and energy flows that belong to the largest drivers of the climate crises [18]. Moreover, by facilitating to consciously re-embed the economy into both the social- and the biosphere can contribute to create negentropic cycles facilitating exit Anthropocene [19] [20] [21].

To overcome the currently dominant power patterns and structures supporting and simultaneously being (re-) generated by the "growthism" [14] requires robust and radical transformations affecting the socio-economic system as a whole [1]. The paradigmatic changes mostly happen only under the threat of systemic collapse many diverse signal indicate that we approach to, rather generate such constellation [22] [1]. Somewhat unexpectedly also the managing director of the International Monetary Fund [23] argues for fundamental changes by emphasizing: "In the pursuit of further progress, we must all adhere to a simple guiding principle: policies are for people. Instead of globalizing profits, we should act to localize the benefits of a connected world. Start with the communities in every country that lost out in the "old globalization," and were set back further by the pandemic: Invest in their health and education...".

The systematic reduction of our environmental footprint presupposes the sharing of the global knowledge, the overcome of perceiving negative externalities as drivers of gaining competitive advantage, and the strengthening of the local autonomies. These feed backing changes require innovative business models capable to bring about genuine alternatives in the economic activities [2]. Currently the consequences of the interwoven environmental, climate and biodiversity crises affect the economic activities in a growing scale. Such backlashes are especially well-detectable in the insurance industry where the payment obligations are rapidly increasing in connection with the growth of the number and sums of insurance damage events connected to the climate crisis [24]. In fact, the firms are exposed to growingly complex climate change related challenges independently in which sector(s) they are operating. Therefore, while dealing with financial transactions and investments of their clients the credit and financial institutions, banks, hedge and investment funds, etc. have to routinely consider also this context. Similarly, the rating agencies should carry out among others also the credits' and investments' environmental, social, and governance

(ESG) screening. Since the market players' strategies have to reflect the climate related complex requirements these recall with growing frequency (at least some of the) 17 SDG tasks and the connected indicators [3].

The technology – significantly due to its growing pervasion with digitization - currently becomes the driving force of the economy's digitalization and generates its robust and rapidly growing transformational potential. That turns the digital technology into major driver of the emergence of Anthropocene through accelerating aggregation of the multiple feed backing disruptive effects unfolding in many, in fact in most fields of the current socio-economic setting [18]. In order to effectively handle the climate crisis, its rapidly growing challenges must be thoroughly considered ways and mechanisms of the digitization, the digital technologies' targeted enactment. This context makes of paramount importance to focus on responsible usage, enactment [25] [26] of the (growingly digital) technologies by following regenerative approaches enabling the reduction of the global material and energy flows [27].

Such regenerative approach in fact can facilitate to overcome also certain shortcomings of a limited or weak (perception of) sustainability that "...focuses on minimising damage to the environment and human health, and using resources more efficiently to limit the degradation of earth's natural systems. Regenerative approaches, however, seek to go beyond simply minimising damage, instead reversing the degradation of the planet's living systems and seeking to restore a healthy relationship between humans and other life. Regenerative development encourages us to design human systems that co-evolve with ecological systems to generate mutual benefits and greater expression of life and resilience" (Re-alliance, n. d.). The "...regenerative design seem quite compatible with the procedural basis of regenerative sustainability, at least at the level of existing practice. Perhaps most importantly, both suggest a reorientation of focus from reducing harm and damage to creating net-positive outcomes..." [28]. There are numerous initiatives aiming to facilitate the implementation of the regenerative approach in practice. One of them has launched the Institute of Electrical and Electronics Engineers (IEEE), which "... is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity" (<https://www.ieee.org/>). Their Planet Positive 2030 initiative [2] aims to prepare patterns and (quasi-) standards that facilitate "strong sustainability" or achieving net-positive outcome [29] while designing new technologies.

Due to these trends also the employees have to become increasingly capable handling the various climate, environment, and biodiversity related challenges in their daily work and to obtain a rapidly extending set of adequate skills and capacities. Therefore, the organizations of (higher) education should consider these developments and define these growing requirements in order to effectively prepare their students for entering to the labor market. The curricula should provide them practical knowledge, skills, and attitudes that are relevant to handle the challenges constitutive of the emerging Anthropocene. To be capable to tackle the frequently exponentially growing requirements the students have to learn to act responsibly and at an autonomous manner by mastering among other such soft skills as the capacity of problem solving, critical thinking, cooperation, etc. They have to be familiar also with critical approaches similar to ecological and community economics, degrowth studies, business ethics, etc., what requires to follow inter- and cross-disciplinary approaches [30] while obtaining, rather co-creating adequate knowledge [31] [32]. Therefore, their education should consciously overcome the current academic hegemony, quasi-exclusivity of the neoconservative approach operating as a neo-liberal ideology [15]. This article considers this broader context and argues that considering the Green Digitalization concept in both their research and teaching activities can enhance higher education organizations capacity to contribute to effectively tackle the challenges characteristic for the Anthropocene. The developments unfolding in the Budapest Corvinus University can serve as a quasi-case study; their description and analyzes probably can provide lessons in the above context also for other organizations of the higher education.

III. THE EMERGENCE OF THE GREEN DIGITALIZATION CONCEPT

In multiple fields of research, education and social services already for a longer period were present various trends in the Corvinus University, which at a hindsight could be seen as related to the emergence of the concept of Green Digitalization. The 12. annual conference of the European Society for Ecological Economics (ESEE) that took place in the Corvinus University in July 2017 [33] probably was one of the most visible events. In the same year, in 2017 was established the formal requirement of identifying in the Syllabus of every subject its connection with the UN 17 SDGs [34]. These and similar other events and tendencies could play significant role also in the increased interest toward sustainability related issues among the students. A well visible recent example of such a trend was the

two days long GreenSpire Festival in November 2021, initiated and organized through the active cooperation of the Student Self-organization, with the (newly established) Ethics, Responsibility and Sustainability (ERS) HUB and the Institute of International, Political and Regional Studies [35].

Similar developments facilitated to thread sustainability into more and more aspects of the daily life in the university. A good example for such tendencies provided the recurring appearance of the idea of establishing a “green canteen” in the university. In frame of the June 2021 Research Week a panel discussion and brainstorming was organized to elaborate on the (pre-)conditions, expected impacts and the best practices available in various foreign, mostly German universities [36]. This line of thoughts reemerged also during the 2023 Agora organized to facilitate the elaboration of a sustainability strategy for the university in frame of the January Research Week [37]. A lively discussion among practitioners, community organizers, students and researchers aroused about whether and how “green food” and a broader range of bio-products could be provided for members of the university community by cooperating with their producers.

In line with these strengthening tendencies the Corvinus University has joined to the Sustainability Platform of the Hungarian Universities (MEFP) that 14 organizations of higher education established in September 2022 [38]. The participants aim was to pay due attention to handling the environmental challenges in their educational, research and community activities and to systematically reduce their footprint. The participants emphasized that they intend to share the related best practices and also cooperate with foreign universities, primarily with those ranked on the global list of “Green Colleges” [39]. In this vein a baseline study was prepared with the coordination of the Chancellor that aimed to quantify and to start to systematically reduce the environmental footprint of the Corvinus University. The “Corvinus Green” website was rolled out in September 2022 aiming to catalyze the university citizens’ growing awareness [40]. The Corvinus ERS HUB in 2022 was an important next step in establishing a systematic coordination among the various progressive efforts unfolding simultaneously in multiple fields [41]. In order to launch a

University-wide discussion on key components of a long term sustainability strategy by considering also the available best practices¹ the ERS HUB organized an Agora during the 2023 January [37].

The environment and climate change related developments and challenges gained growing visibility and significance in the Corvinus University as the above, far from complete overview of the events and tendencies indicates. Indeed, in both the research and teaching activities of the previous years, around a decade or so, a broadening set of critical approaches emerged, including degrowth studies, ecological and community economics, various business ethics related subjects. Some of these initiatives unfolded in frame of separate projects as happened in case of the community storytelling those outcome was published during the Researchers’ Night in 2021. This project context created access also to grants by enabling to involve external experts, for example in case of the community storytelling an actor and a screenwriter. Their intense participation allowed to co-create a much stronger awareness effect for the resulting paper entitled as “My beautiful, new past” [42] which had described a non-standard vision embracing the potential developments in the next 50 years².

In the Corvinus University besides the Researchers’ Nights - organized in every institute of higher education – in the subsequent semesters regularly was organized also a Research week. It proved to serve as effective enabling frame and facilitator for the self-organizing knowledge co-creation and sharing. The various project works and research activities enabled and provided growing visibility to the various inter- and trans-disciplinary efforts. These research focused events interplayed also with the Intensive or Project weeks, which were organized in every semester. These in turn facilitated to thread primarily into the teaching the findings provided by the various non-traditional research initiatives. The discussion of a number of topics at a concentrated manner during a week allowed for more freedom for experimenting also in teaching with innovative solutions. The acquired experience helped to elaborate detailed curricula and to start to teach these issues also as “regular courses” during the semesters.

¹ In this vein during the Agora was continued the conversation and the sharing of the best practices with representatives of the universities participating in the Sustainability Platform of Hungarian Universities.

² The project had also an important longer term outcome, namely contributed to the formal establishment of the Decision Theory Education Workshop.

The diverse initiatives catalyzed strengthening networking and the emergence of a broader group of faculty members. Their participants lately have formed among others the Decision Theory Education Workshop and the Science Shop. These initiatives in turn facilitated more active cooperation with researchers from the Business Ethics Centre and the Institute of Data Analytics and Information Systems. Such self-organizing cooperation continued to flourish also after the 2022 reorganization of the university that has led among others to the establishment of the Sustainable Development Institute that seems to focus primarily on environmental economics.

These feed backing developments facilitated also to establish a broader program approach with the primary coordination of the Centre of Business Ethics. It catalyzed the stepwise elaboration of a set of overlapping subjects that were connected with and building on each other. The proposed set of diverse level courses allowed discussing the various aspects of sustainable value creation. In frame of the “Digitalization - value creation - knowledge society” (2IR32NAV05B) course a loose set of introductory lectures unfolded mainly for junior students. It enabled to discuss during a project week various interconnected subjects. The “mosaic” these issues draw facilitated to identify the dynamics characteristic also for broader socio-economic tendencies. As a next step the program proposed for the interested students various modules on sustainable value creation (2ET27NAV04B) or /and on happiness economy (PSGK004NMBB). These courses are available in both ways - in frame of the intense or project week and also as a “regular course” during a semester. Finally, a semester-long course (PSGK003NMBB) provided jointly with leading experts from European and US partner universities offered a more in depth analysis of the sustainable value creation’s patterns and specificities.

For the best performing participants of these interconnected courses also a summer school was planned to be organized in the premises of the UNESCO sustainability chair of the Nancy Business School. The underlying aim was to enable personal acquaintance and collaboration among students and professors from various European and US universities participating in the joint program. Partly due to the COVID related restrictions such summer school was not organized yet. Since the UNESCO chair recently has been relocated from Nancy to the Budapest Corvinus University this setup provides a new chance to organize such summer school for the

students and faculty of the multiple partner universities.

These interconnected, partly interlocking course modules provided a theoretical background facilitating to elaborate on the causes of the climate change and the emergence of the Anthropocene. Moreover, these modules provided access also to multiple aspects of the non-mainstream Economics. The combination of the project approach, the intense team work, and the focus on the solution co-creation allowed creating capacities and capabilities for the participating students to contribute to effectively tackle also global challenges through local actions. These trends probably played a role in the “infiltration” of the enlisted approaches and topics also into the MBA courses as a separate subject (Future ready business models, VGDE021NAMB) and as part of the MBA students’ project work. By learning from the lessons derived from the above presented program (components) and the MBA courses two new subjects were elaborated also in the Institute of Data Analytics and Information Systems. These optional / facultative courses were available also for students from other institutes of the Corvinus University, as well as for participants of the Study Abroad and the Erasmus programs.

The re-hauled syllabus of the restructured Digital Disruption course (293NBUSVI444BB) focuses on investigating how the digit(al)ization can become a major driver of the environmental footprint’s conscious reduction. It emphasizes that since the digital technologies possess dual potential their selective enactment [25] [26] can serve as major contributor to tackle the growing challenges that the (interconnected) climate crisis and the shrinking biodiversity generate. Since those disruptive phenomena threaten ultimately with the collapse of the Earth’s entire ecosystem, a Green Digitalization focusing on non-disruptive patterns of technology enactment can serve as a robust driver facilitating to exit Anthropocene [21]. Actually, the Green Digitalization that aims preventing further disruptions in social and environmental context is in line also with the perception that Christensen (2015) originally argued for in the frame of disruptive innovation [43] [44]. It feeds back with the key role of the extended cooperation unfolding also as inter-team collaboration overcoming the more “traditional intra-team work”.

To handle the new challenges constitutive of Anthropocene requires altered institutional structuration [45] enabling to identify and enact new narratives [46]. It demands to identify the emerging

differences compared to the “rhythms” of the industrial revolutions and the long waves [47]. Following this approach, a second course entitled as “Business opportunities – How we got here and where should we go? (Narrative changes in business, technology, and politics)” (INIR083NABB) was elaborated. This course focuses on non-traditional, mostly digital technology enabled regenerative business opportunities and related models /strategies. It aims to clarify the necessity to combine alterations simultaneously in three fields: the usage/enactment of technologies, the (enabling) social innovations, and the business model innovations [2].

The value of the equipment and assets that due to the required changes in the hydrocarbon industry can become obsolete and useless continue to grow exponentially [48]. In order to (re-)enact the multi-trillion USD volume of technology / equipment that the climate crisis related changes can drive out of circulation turning them into stranded assets [13] requires innovative business models. These should be capable serving also as quasi- “Blue Ocean Strategy” [49], i.e. contribute to achieve improved firm competitiveness while healing previously caused environmental and social disruptions. The important take away of this course is that narrative shifts enabling to implement in practice a regenerative approach while generating profit is a “mission possible”. Moreover, the course aims to provide also practical tools confirming the viability of the proposed non-standard vision therefore it deploys multiple innovative methods such as the citizen jury (CJ) [50]. The CJ approach catalysis the deliberations’ enhanced effectiveness through expert testimonies and Q and A session in order to enable students to identify the (frequently macro-level) narratives’ interplay and the mechanisms that affect and shape the feed backing transformational trends. The direct aim of the citizen jury is to facilitate elaborating public policies that offer favorable and enabling context for the projects that the students prepare as the closing task of the course. The teams consisting of four or five members should elaborate for their project proposal also a (quasi-)business model that offers (mostly local) solution(s) that can contribute to handle also global problems [51].

Both courses systematically deploy methodological pluralism [52] by combining multiple approaches, methods, tools and technics. As more “traditional technologies” the students elaborate on various case studies, often with contacting the members of the involved communities and also watching related YouTube videos. The simulation tools, similar to the

MIT created EN-ROAD [53] and C-ROAD [54] enable to elaborate complex action plans that aim to keep the accumulated global warming below 1,5 C in line with the 2015 Paris climate agreement. Following the same vein, the students’ work teams by capitalizing on various role playing technics can act as delegations participating in the follow up events of the 2015 Paris Conference on climate change, often mentioned as COPs or conferences of parties. In this frame the teams consisting of 4-5 members represent various countries or country groups similar to India, China, the USA and Europe, as well as the group of developing countries or the Alliance of Small Island States (AOSIS).

The course participants enact also the Backcasting method [55] [56]. As a first step the teams co-create a normative vision. The subsequent reverse mapping by moving “back from the future” enables to draw the story line consisting of 10 years “long” time slots or intervals as aggregation of (frequently non-trivial) events. This story line allows connecting often unexpected, deviating from the characteristic trends developments that mostly would remain invisible by following the logic of the dominant tendencies’ linear extrapolation. The Backcasting method can facilitate enhancing the students’ agency by instigating their creativity and imagination.

These courses promote the students’ enhanced cooperation by supporting and encouraging them to work together also with members of other teams in order to co-create knowledge and cooperate instead of trying to over-compete one another. The aim is to facilitate learning how to generate through collaboration interwoven transformations that can affect simultaneously multiple fields by contributing to the systemic reduction of the environmental footprint. The enhanced cooperation empowers the students to carry out agency by co-creating their readiness and capacity to consciously affect in the long run also the socio-economic context as a whole. Therefore, the teams exercise the collaborative aggregation of multi-level changes through co-creating impacts in diverse fields simultaneously. The combined interactions can catalyze more effective knowledge co-creation and sharing [31] [32] what require enhancing the students’ personal engagement by strengthen their intrinsic motivation to actively participate. With the mass-entrance of Z generation the acceptance – and he effectiveness - of the frontal teaching radically decreases to be growingly replaced with experience-based / experiential learning In this context it is important, but largely insufficient to deploy such “traditional” apps as Mentimeter, Kahoot, Plickers, etc. The

ChatGPT of the Open AI rapidly becomes a daily tool for more and more students also in the Corvinus University triggering new challenges for the teachers. The teaching has to enact “unconventional”, mostly digital technologies, including state-of-the-art virtual and extended reality (VR, XR) related applications. The growing number of courses introducing also Green Digitalization related issues should “walk their talk” and enact truly innovative “digitally enabling” technologies.

IV. SHOULD GREEN DIGITALIZATION BE INTRODUCED AS A STAND-ALONE COURSE?

The Green Digitalization concept capitalized on an interplayed with a growing number of courses. These were partly the constituents of a broader program coordinated by the Business Ethics Center, on the one hand, and partly optional or facultative courses taught “under the umbrella” of the Institute of Data Analytics and Information Systems, on the other hand. The “Green Digitalization” concept was also described in a more formalized manner as a conference paper [57]). It could consider also the lessons learned during the multiple variants of the concept’s practical deployment. Further details were elaborated during the preparation for and in the course of two subsequent research workshops unfolding in 2022. One of them took place during the Assisi conference of the “Economy of Francesco” initiative [58]. The second workshop unfolded in The Hague, in frame of the European conference of the Planet Positive 2030 project where the Green Digitalization was presented in cooperation with the Metrics and Indicators Committee [2].

The received feedbacks supported the proposed axiom arguing that any technology is the instantiation of human interactions and relationships. Consequently, (the pattern of) effective technology implementation or enactment [25] [26] can be affected and shaped also by the characteristics of its co-creators’ interactions and relationships. Furthermore, the (volume and the character of the) value that the enacted technology generates can be and in most cases is influenced by these instantiated relations. These instantiated relations reflect also the intrinsic value that all, human and non-human, natural being possesses [59] [60]. Consequently, the concept of Green Digitalization is significantly imbued with a relational dimension what affects also its practical implementation. Namely, the effectiveness of the Green Digitalization’s implementation is strongly influenced by the

interplay among (patterns of) (i) technology enactment; (ii) related social innovations; and (iii) innovative business strategies. Indeed, the actual pattern of the enactment shapes profoundly the outcome that the technology generates [25] [26]. The success of the deployment of the regenerative approach [61] [62], perceived as a focal aim of Green Digitalization, its acceptance and remuneration depends at significant degree from a (proper pattern of) social innovation. The successful (mass) take up of the particular digital technologies depends at a large degree from the selected business model(s). It is especially visible in case of the rapidly growing volume of stranded assets [13]. Moreover, even to go beyond “simply” preventing further environmental and social disruptions requires implementing rather sophisticated business models that consciously avoid deploying “traditional” environmental and social externalities in order to achieve competitive advantage and generate (“high enough”) profit [63].

Growingly sophisticated requirements related to the necessity to handle various aspects of the climate change can be expected to emerge by affecting the firms daily activities. There is a growing number of related tendencies similar to the EU Green Deal efforts (European Commission, n. d.) or the USA Inflation Reduction Act (IRA) [64]. These are increasingly characteristic for the legislation and public policies also for the members of the G7 and G20 formations. That triggers growing interest toward attempts of elaborating and implementing coordinated policies. One can predict that these tendencies will bring about continuous regulatory changes combined with significant alterations affecting taxation (including carbon tax), grants, subsidies and various other public policy mechanisms. These try to incentivize and shape the market players’ strategies – including the characteristic patterns of the technology enactment. It is worth to introduce also phenomena similar to ESG, socially responsible investment (SRI), impulse investments and their rightly criticized (rather frequent) interplay with attempts of green washing which follow growingly sophisticated patterns. Recently one can observe comparable steps and approaches also in the activities and communication of the IMF [23] and the World Bank, not to mention the OECD or the World Economic Forum.

Not by chance similar signals can be detected also on behalf of such “iconic” global higher education players as Oxford, the London School of Economics, various faculties of Harvard, Stanford and the MIT [65] [66]. Diverse players in growing unison

emphasize the necessity of critically rethinking mainstream ideas, introducing alternative approaches to Economics including environmental and community economics, degrowth, as well as business ethics. The “bold position” requesting the Ethics’ (urgent) re-introduction into the Economics has growing significance [67] [68] [69]. The ethical context – not without vast controversies - gains rapidly increasing significance in context of the most cutting edge technologies those growingly intensive spread into the companies’ daily activities triggers intense robust environmental, social, financial, social and ethical disruptions. In the context of Anthropocene, a growing significance has to consciously catalyze strong sustainability by design while elaborating new technologies that are mostly intertwined with digitization [2]. The accelerating temps of digitalization triggers robust challenges and often overarching transformations in many and growing number of fields. It brings about the enhanced importance and timeliness of presenting the characteristics, intertwined dynamics, potential effects and (partly unexpected) challenges of Green Digitalization for the students. They as future employees and experts have to deal with various aspects of information technologies, data science, nano- and bio-technology, while ensuring to handle consumer data at a GDPR conform manner.

The current Green Digitalization concept and topics emerged in context of teaching of the overlapping courses that focused on alternative patterns of value creation and was selected mostly by students learning other majors than business informatics in the current stage a stand-alone Green Digitalization course is to be offered primarily for students of the Institute of Data Analytics and Information Systems. They study Information Systems, Infocommunication, or Computer Sciences as well as Mathematics and Statistics but rarely pay attention to phenomena related to the climate change or the ecosystem crisis despite the focal role of digitalization in these contexts. The envisioned Green Digitalization course should pay special attention to the ethical aspects becoming growingly complex and urgent. Also the rapidly increasing, including techno-cultural-socio-economic broader impacts of the “AI-ML-Big Data Triarchy” should be thoroughly discussed. To consider the ethical frames and context has growing importance, especially in the light of the multiplying scandals when companies and their leaders openly challenge the relevance of Ethics while treating AI related product developments [70] [71]. The context where Ethics has growing significance covers the necessity to scrutinize multiple topics as nano- and bio-

technology. The exponential growth of the daily services that the chat bots have to provide in a multiplicity of various firms, probably soon including also the SMEs.

The proposed topics with high probability should introduce also both the theoretical works and the practical activities of such researchers as Kate Raworth, Stephanie Kelton, Mariana Mazzucato. Raworth through the Doughnut Economics Action Lab cooperates with cities including Amsterdam, Sydney or Toronto. The diversity in the perception of the Modern Monetary Theory makes worth to be at least aware about the work of Stephanie Kelton. The coordination of the preparation of the current 7 yearlong EU budget and the outlines of the Green Deal strategy, as well as the recent efforts of implementing the mission driven innovation concept in order to generate the capacity of producing chips in the European macro-region are arguments in favor to present the activity of Mariana Mazzucato. The acquaintance with so diverse approaches probably can facilitate to better understand the interplay among the focal components of the Green Digitalization. These constituents include the conscious combination of the non-traditional patterns of technology enactment with social innovation and innovative business models. It also emphasizes the necessity to follow inter- and trans-disciplinary approaches.

The Green Digitalization concept is highly practical in nature [57] and has a strong tendency to become increasingly data driven [2]. Actually, the Green Digitalization as independent course could include for the longer run also the proposal of combining the theoretical components with lessons learned from practical activities while acting as consultants, moreover as co-creators. Such practice focus approach requires and catalyzes systematic cooperation with companies looking for changes in their business strategy and model. The leaders of the Corvinus University in 2021 offered their support to a formal proposal that offered to use the Green Digitalization concept. It suggested to combine research, teaching and social services also with practical consultancy / coaching provided in frame of an envisioned science park. Nevertheless, practical steps into this direction until today remained absent. Partly due to its deeply inter- and transdisciplinary character the Green Digitalization could become a significant component, even the linchpin for a new university strategy. That could serve simultaneously as a true Blue Ocean Strategy [49] in regional context, and currently even in international comparison.

V. CONCLUSIONS

The emergence of the “Green Digitalization” as component of multiple courses introduced in the Budapest Corvinus University can serve as a case study reflecting numerous controversies characteristic for the exponentially broadening role of digitalization in the period of Anthropocene. The digitalization potentially has to handle the climate crisis and the related challenges. However, currently it frequently causes/creates multifaceted challenges arising simultaneously in numerous, including technological, social, business, and ethical aspects. This article aimed to discuss how and why could and should the research and the teaching of the characteristics, trends and impacts of digitization and digital technologies indicate the broader transformational tendencies that the technology - due to its growing pervasion with digitalization - creates in most fields of our current socio-economic setting.

The article describes and explores the changing framing and toolset that aimed and facilitated to introduce the multi-field impacts of digitization through a growing number of subjects taught in the Budapest Corvinus University. The article recalls that the digitalization creates and has to handle multifaceted challenges affecting simultaneously technological, social, business, institutional and ethical aspects that should be interpreted in the context of emerging Anthropocene. It describes the interplaying processes that lead to the emergence of the concept of Green Digitalization and the proposal to introduce it also as an independent course. Since the various aspects of digitalization play ever growing role in most, probably in every fields of economy its proper introduction for the students soon entering to the labor market has rapidly growing, truly strategic significance for the higher education as a whole.

The article therefore offers to analyze as a quasi-case study the lessons offered by feed backing processes of the emergence of the “Green Digitalization” concept, its infiltration in multiple subjects, the idea its transformation into a separate / independent course, and the initiative proposing its consideration as a transformative component for the university strategy as a whole. Upon the currently available experience a Green Digitalization course can provide value being taught especially for the students of the Institute of Data Analytics and Information Systems of the Corvinus University, the article argues. Moreover, due to its practical nature the concept of Green Digitalization in the longer run could be considered primarily in the context of a foreseen

science park. Therefore, it could become a significant component for a new university strategy that aims to improve the quality of both teaching and research in regional, and potentially also in international comparison.

The further elaboration of the Green Digitalization concept offers multiple topics for further research. These include among others its interplay with our self-transformation into a Kardashev Type I civilization [72] (Gray, 2022). It also requests reinterpreting what such transformation means and how should it take place. This includes the focal role of enacting in full extent all the available sources of the renewable energies instead of continuing the extrapolation of the energy consumption. Actually, the later trend currently operates as a major driver of our civilizatory self-disruption. In this context it is worth to elaborate in details on the outcomes of the recent “stress test” carried out by an MIT researcher [73]. Unfortunately, it showed that we are on the disruptive tracks described in 1972 in frame of the famous study with the telling title “The limits to growth” [74].

Another topic for further research could be the growing urgency to reincorporate the Ethics into the Economics -triggering the robust criticism on behalf of the mainstream. A more ingrained vision of such well-known tools as the Maslow hierarchy of needs [75] is becoming growingly important. The findings of Koltko-Rivera (2006) [76] indicate the significance of previously omitted components about the significance of self-transcendence as the highest and in a sense the most important level and field of the human needs to be fulfilled. Any of the indicated issues would be worth to be more thoroughly discussed while the proposed concept of Green Digitalization provides a rather long list of elated topics worth to be further explored. This concept emphasizes the necessity to connect interdisciplinary research, with diverse forms and ways of teaching and with activities aiming the Green Digitalization’ practical implementation.

REFERENCES

- [1] IPCC, "Sixth Assessment Report," Intergovernmental Panel on Climate Change, 2021. [Online]. Available: <https://www.ipcc.ch/assessment-report/ar6/>
- [2] IEEE, "Planet Positive 2030," IEEE, n.d. [Online]. Available: <https://sagroups.ieee.org/planetpositive2030/>
- [3] UN (n.d.) The 17 Goals <https://sdgs.un.org/goals>
- [4] J.-P. Chamoux, "Digital Omnipresence: Its Causes and Consequences: Big Data Stakes," in *The Digital Era 1: Big Data Stakes*, Wiley Online Library, 2018, pp. 5-34. DOI: 10.1002/9781119102687.

- [5] Gartner Glossary, "Digitalization," n. d. [Online]. Available: <https://www.gartner.com/en/information-technology/glossary/digitalization>. [Accessed: Apr. 05, 2023].
- [6] J. Veress, "Digitalization and Social Innovation – The Case of ENVIENTA," in P. Shrivastava and L. Zsolnai (eds.) Value Creation for a Sustainable World, Routledge, in press.
- [7] J. Vrana and V. Singh, "Digitization, Digitalization, and Digital Transformation," in Handbook of nondestructive evaluation 4.0, Cham: Springer, 2021. https://www.researchgate.net/publication/354270373_Digitization_Digitalization_and_Digital_Transformation
- [8] OECD, "Digitalization and Innovation," n. d. [Online]. Available: <https://www.oecd.org/g20/topics/digitalisation-and-innovation/>.
- [9] C. Bai, P. Dallasega, G. Orzes, and J. Sarkis, "Industry 4.0 technologies assessment: A sustainability perspective," Int. J. Production Economics, vol. 229, p. 107776, 2020. DOI: 10.1016/j.ijpe.2020.107776.
- [10] Mahdiraj, H. A., Yaftiyani, F., Abbasi-Kamardi, A., and Garza-Reyes, J. A., "Investigating potential interventions on disruptive impacts of Industry 4.0 technologies in circular supply chains: Evidence from SMEs of an emerging economy," Computers and Industrial Engineering, vol. 174, pp. 108753, 2022, DOI: 10.1016/j.cie.2022.108753.
- [11] I. M. Otto, M. Wiedermann, R. Cremades, C. Auer, J. F. Donges, and W. Lucht, "Human agency in the Anthropocene," Ecological Economics, vol. 167, p. 106463, 2020. DOI: 10.1016/j.ecolecon.2019.106463.
- [12] Working Group on the 'Anthropocene', "Results of binding vote by AWG Released 21st May 2019," <http://quaternary.stratigraphy.org/working-groups/anthropocene/>, 2019.
- [13] P. Shrivastava, L. Zsolnai, D. Wasieleski, M. Stafford-Smith, T. Walker, and O. Weber, "Finance and Management for the Anthropocene," Organization and Environment, vol. 32, no. 1, pp. 26-40, 2019. DOI: 10.1177/1086026619831451.
- [14] H. Daly, "Growthism: its ecological, economic and ethical limits," 2019. [Online]. Available: <http://www.paecon.net/PAEReview/issue87/Daly87.pdf>. [Accessed: Apr. 05, 2023].
- [15] J. K. Galbraith, "A history of economics The past as the present," Hamish Hamilton, London, 1987.
- [16] H. W. J. Rittel and M. M. Webber, "Dilemmas in a general theory of planning," Policy Sciences, vol. 4, no. 2, pp. 155-169, 1973. <https://doi.org/10.1007/BF01405730>.
- [17] J. Conklin, "Wicked problems and social complexity," CogNexus Institute, Napa, USA, Tech. Rep., 2006. [Online]. Available: <https://cognexus.org/wpf/wickedproblems.pdf>.
- [18] J. Syvitski, C.N. Waters, J. Day, J. D. Milliman, C. Summerhayes, W. Steffen, J. Zalasiewicz, A. Cearreta, A. Gałuszka, I. Hajdas, M.J. Head, R. Leinfelder, J. R. McNeill, C. Poirier, N.L. Rose, W. Shotyk, M. Wagreich, and M. William, "Extraordinary human energy consumption and resultant geological impacts beginning around 1950 CE initiated the proposed Anthropocene Epoch," Commun Earth Environ, vol. 1, p. 32, 2020. <https://doi.org/10.1038/s43247-020-00029-y>.
- [19] C. Piques and X. Rizos, "Peer to Peer and the Commons: a path towards transition A matter, energy and thermodynamic perspective," [Online]. Available: https://commonstransition.org/wp-content/uploads/2017/10/Report-P2P-Thermodynamics-VOL_1-web_2.0.pdf
- [20] C. Sagan, "The Cosmic Connection: An Extraterrestrial Perspective," Doubleday, 1973.
- [21] P. Heikkurinen, T. Ruuska, M. Ulvila, and M. Wilén, "The Anthropocene Exit: Leaving the Epoch and Discourse Behind," presented at hopefulNESS: The 13th Nordic Environmental Social Science Conference, 6-8 June 2017, University of Tampere, Finland. https://helda.helsinki.fi/bitstream/handle/10138/332176/The_Anthropocene_Exit.pdf?sequence=1
- [22] IPCC, "Summary for policy makers - GLOBAL WARMING OF 1.5 °C," Intergovernmental Panel on Climate Change, 2018. [Online]. Available: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf
- [23] K. Georgieva, G. Gopinath, and C. Pazarbasioglu, "Why We Must Resist Geoeconomic Fragmentation - And How," 2022. [Online]. Available: <https://www.imf.org/en/Blogs/Articles/2022/05/22/blog-why-we-must-resist-geoeconomic-fragmentation>. [Accessed: Apr. 05, 2023].
- [24] R. Hailey, "Climate risks for insurers: Why the industry needs to act now to address climate risk on both sides of the balance sheet," S&P Global, 2021. [Online]. Available: <https://www.spglobal.com/esg/insights/climate-risks-for-insurers-why-the-industry-needs-to-act-now-to-address-climate-risk-on-both-sides-of-the-balance-sheet>. [Accessed: Apr. 05, 2023].
- [25] W. J. Orlikowski, "The duality of technology: rethinking the concept of technology in organizations," Organization Science, vol. 3, no. 3, pp. 398-427, 1992.
- [26] W. J. Orlikowski, "Using technology and constituting structures: a practice lens for studying technology in organizations," Organization Science, vol. 11, no. 4, pp. 404-428, 2000.
- [27] Kullmann, F., Markewitz, P., Stolten, D., and Robinus, M., "Combining the worlds of energy systems and material flow analysis: a review," Energy, Sustainability and Society, vol. 11, no. 1, p. 13, 2021, doi: 10.1186/s13705-021-00289-2.
- [28] J. B. Robinson and R. Cole, "Theoretical underpinnings of regenerative sustainability," Building Research and Information, vol. 43, no. 2, pp. 133-143, Mar. 2015. DOI: 10.1080/09613218.2014.979082.
- [29] P. Polman and A. Winston, "Net-positive. How Courageous Companies Thrive by Giving More than they Take," Harvard Business Review Press, 2021.
- [30] C. K. B. Choi and A. W. P. Pak, "Multidisciplinarity, interdisciplinarity and transdisciplinarity in health research, services, education and policy: 1. Definitions, objectives, and evidence of effectiveness," J. Clin. Nurs., vol. 15, no. 1, pp. 1-3, 2006. DOI: 10.1111/j.1365-2702.2005.01332.x.
- [31] M. Polányi, "Personal knowledge Towards Post-Critical Philosophy," Routledge, London, 1958.
- [32] I. Nonaka and H. Takeuchi, The Knowledge-Creating Firm: How Companies Create Dynamics of Innovation. Oxford University Press, 1995.

- [33] Greenfo, "Ökológiai közgazdászok nemzetközi konferenciája," 20-Jun-2017. [Online]. Available: <https://greenfo.hu/sajotajekoztatok/okologiai-kozgazdaszok-nemzetkozi-konferenciaja/>. [Accessed: Apr. 05, 2023].
- [34] Corvinus, "Hogyan töltem ki a tantárgyi adatlapot?" [Online]. Available: <https://moodle.uni-corvinus.hu/mod/lesson/view.php?id=671984&pageid=35205>. [Accessed: Apr. 05, 2023].
- [35] Tepfenhart, B. (2021) „A Corvinus egy olyan közeg, ahol érdemes a fenntarthatóságról beszélni” – A Greenspire főszervezői társadalmi felelősségvállalásról és motivációról. https://corvinusonline.blog.hu/2021/11/19/_a_corvinus_egy_olyan_kozeg_ahol_erdemes_a_fenntarthatosagrol_beszelni_a_green_spire_foszervezoi_tars
- [36] Corvinus, "Zöld menza a Corvinuson? Akció és kutatás – "konyhaszinten" (braintorming és műhelybeszélgetés," <https://www.uni-corvinus.hu/ona/kutatasi-het/kutatasi-het-2021-junius/#accordion-item-1016>, 2021.
- [37] Corvinus, "ERS Agora," <https://www.uni-corvinus.hu/ona/kutatasi-het/kutatasi-het-2023-januar/>, 2023.
- [38] Corvinus, "A fenntarthatóságért fog össze tizennégy magyarországi egyetem," <https://www.uni-corvinus.hu/post/hir/a-fenntarthato-sagert-fog-ossze-tizennegy-magyarorszagi-egyetem/>, 2022.
- [39] Princeton Review, "Green Colleges," n.d. [Online]. Available: <https://www.princetonreview.com/college-rankings?rankings=green-colleges>. [Accessed: Apr. 05, 2023].
- [40] Corvinus Green, <https://www.uni-corvinus.hu/post/landing-page/corvinus-green/?lang=en>, n. d.
- [41] Corvinus ERS Hub, <https://www.uni-corvinus.hu/ind/corvinus-ers-hub/?lang=en>, n.d.
- [42] Researchers' Night, "My beautiful new past – debate theatre," [Online]. Available: <https://app.kutatokejszakaja.hu/esemenyek/budapesti-corvinus-egyetem/szep-uj-multam-vitaszinhaz>.
- [43] C. M. Christensen, M. E. Raynor, and R. McDonald, "What Is Disruptive Innovation?" Harvard Business Review, Dec. 2015. [Online]. Available: <https://hbr.org/2015/12/what-is-disruptive-innovation>.
- [44] C. Cote, "What Is Disruptive Innovation?" [Online]. Available: <https://online.hbs.edu/blog/post/what-is-disruptive-innovation>. [Accessed: Apr. 05, 2023].
- [45] A. Giddens, "The Constitution of Society Outline of the Theory of Structuration," Polity Press, Cambridge, 1984.
- [46] Y.N. Harari, "Sapiens. A brief history of humankind," Harper Collins Publishers, 2015.
- [47] J. D. Sterman, "The Economic Long Wave: Theory and Evidence," [Online]. Available: <http://dspace.mit.edu/http://dspace.mit.edu/bitstream/handle/1721.1/47592/economiclongwave00ster.pdf>.
- [48] IEA, "World Energy Outlook 2021," International Energy Agency, 2021. [Online]. Available: <https://www.iea.org/reports/world-energy-outlook-2021>
- [49] C. Kim and R. Mauborgne, "Blue Ocean Strategy, Expanded Edition: How to Create Uncontested Market Space and Make the Competition Irrelevant," Harvard Business Press, Boston, Massachusetts, 2015.
- [50] L. Carson, C. Hendriks, J. Palmer, S. White, and J. Blackadder, "Consult your community. A handbook. A guide to using citizens' juries," [Online]. Available: http://www.activedemocracy.net/articles/cj_handbook.pdf, 2003.
- [51] G. Frazzetto, "Local solutions for global problems," 2003. [Online]. Available: https://www.researchgate.net/publication/10735076_Local_solutions_for_global_problems. [Accessed: Apr. 05, 2023].
- [52] A. Van de Ven and M.S. Poole, "Alternative Approaches for Studying Organizational Change," Organizational Studies, vol. 26, pp. 1377-1404, 2005.
- [53] EN-ROAD, "The En-ROADS Climate Solutions Simulator," n. d. [Online]. Available: <https://www.climateinteractive.org/en-roads/>. [Accessed: Apr. 05, 2023].
- [54] C-ROAD, "C-ROADS – The platform harmonised C-its deployment in Europe," n. d. [Online]. Available: <https://www.c-roads.eu/platform.html>. [Accessed: Apr. 05, 2023].
- [55] L. Börjeson, M. Höjer, K.-H. Dreborg, and T. Ekvall, "Scenario types and techniques: Towards a user's guide," Futures, vol. 38, no. 7, pp. 723-739, 2006. DOI: 10.1016/j.futures.2005.12.002.
- [56] Köves, A., "Back from the future: Defining sustainable employment through backcasting," 2015. [Online]. Available: http://phd.lib.uni-corvinus.hu/832/1/Koves_Alexandra.pdf.
- [57] J. Veress and L. Zsolnai, "A zöld digitális gazdaság," in Fókuszban a változás avagy nemzetközi trendek a pénzügyi és a számviteli oktatásban és kutatásban. V. Bosnyák János emlékkonferencia és más kutatási eredmények, Budapesti Corvinus Egyetem, 2021. http://unipub.lib.uni-corvinus.hu/7029/1/Foluszban_a_valtozas_2021_final.pdf.
- [58] EOF, "The Economy of Francesco," n. d. [Online]. Available: <https://francescoeconomy.org/>. [Accessed: Apr. 05, 2023].
- [59] L. Zsolnai, "Environmental Ethics for Business Sustainability," http://unipub.lib.uni-corvinus.hu/424/1/Zsolnai_2011a.pdf, 2011.
- [60] J. Veress, "Transformational Outcomes of Civil Society Organizations," <https://aaltodoc.aalto.fi/handle/123456789/23392>, 2016.
- [61] L. V. Gibbons, "Regenerative—The New Sustainable?," Sustainability, vol. 12, no. 13, p. 5483, 2020.
- [62] Re-alliance, "What is Regeneration? - Re-Alliance," [Online]. Available: <https://www.re-alliance.org/regenerative>.
- [63] T. Helbling, "Externalities: Prices do not capture all costs," [Online]. Available: <https://www.imf.org/en/Publications/fandd/issues/Series/Back-to-Basics/Externalities>. Accessed on: Apr. 7, 2023.
- [64] United States Congress, "The Inflation Reduction Act (IRA) Public Law. 117–169—AUG. 16, 2022," [Online]. Available: <https://www.govinfo.gov/content/pkg/PLAW-117publ169/pdf/PLAW-117publ169.pdf>.

- [65] Macfarlane, L., "33 Theses for an Economics Reformation," 2017. [Online]. Available: <https://neweconomics.opendemocracy.net/33-theses-economics-reformation/>.
- [66] D. Hope and J. Limberg, "The economic consequences of major tax cuts for the rich," Oxford University Press, 2022. [Online]. Available: <https://academic.oup.com/ser/advance-article/doi/10.1093/ser/mwab061/6500315?login=false>
- [67] F. J. de Graaf, "Reintroducing ethics to economics and development theories," 2011. [Online]. Available: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1742202. [Accessed: Apr. 05, 2023].
- [68] W. Keane, "How everyday ethics becomes a moral economy, and vice versa," *Economics*, vol. 13, pp. 2019-46, Nov. 14, 2019. <http://dx.doi.org/10.5018/economics-ejournal.ja.2019-46>
- [69] L. Zsolnai, "Green business or community economy?," *International Journal of Social Economics*, vol. 29, no. 8, pp. 652-662, 2002. DOI: 10.1108/03068290210434198
- [70] D. Wakabayashi and S. Shane, "Google Will Not Renew Pentagon Contract That Upset Employees," *The New York Times*, Jun. 1, 2018. <https://www.nytimes.com/2018/06/01/technology/google-pentagon-project-maven.html>
- [71] J. Weinberg, "Microsoft Jettisons AI Ethics Team," *Daily Nous*, Mar. 16, 2023. <https://dailynous.com/2023/03/16/microsoft-jettisons-ai-ethics-team/>
- [72] R. H. Gray, "The Extended Kardashev Scale," *The Astronomical Journal*, vol. 159, no. 5, p. 228, May 2020, DOI: 10.3847/1538-3881/ab792b.
- [73] G. Harrington, "Update to limits to growth Comparing the World3 model with empirical data," *Journal of industrial ecology*, vol. 25, no. 3, pp. 614-626, Jun. 2021. <https://doi.org/10.1111/jiec.13084>
- [74] D. H. Meadows, D. Meadows, J. Randers, and W. W. Behrens, "The Limits to Growth. A Report for THE CLUB OF ROME'S Project on the Predicament of the Mankind," A Potomac Associates Book, 1972. Available: https://collections.dartmouth.edu/content/deliver/inline/meadows/pdf/meadows_ltg-001.pdf
- [75] A. H. Maslow, "A Theory of Human Motivation," *The Psychological Review*, vol. 5, no. 4, pp. 370-396, 1943.
- [76] M. E. Koltko-Rivera, "Rediscovering the Later Version of Maslow's Hierarchy of Needs: Self-Transcendence and Opportunities for Theory, Research, and Unification," *Review of General Psychology*, vol. 10, no. 4, pp. 302-317, 2006.