Teaching Digital Entrepreneurship

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# Teaching guidelines for digital entrepreneurship

# TEACHING GUIDELINES FOR DIGITAL ENTREPRENEURSHIP

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# Introduction

The development of digital infrastructure and digital entrepreneurship is a problem of harmonizing initiatives and programs of the evolution of three levels: telecommunication infrastructure, data management, services and digital skills and competencies. Focus and resources at one level or another are determined by the priorities of digital ecosystem. Thus, digital regulator is a tool for harmonization and development of digital ecosystem.

Digital entrepreneurship operates with entities similar to traditional entrepreneurship, such as capital, resources, people. The driving force of digital entrepreneurship is human capital – that is, knowledge, talents, skills, abilities, competencies, experience, intelligence of people. The rapid spread of digital technologies makes digital skills of citizens key among other skills.

Digitalization and cross-platform are currently the main trends in labor market. In other words, the ability to work with digital technologies produced by Industry 4.0 is gradually becoming permanent and necessary for most specializations, i.e. end-to-end or cross-platform. The uniqueness of digital competencies lies in the fact that thanks to them citizens can more effectively acquire competencies in many other areas (for example, learning languages, subjects, professions, etc.).

The goal pursued in the course of teaching digital entrepreneurship is revealed through the implementation of the following issues:

- What to teach? (answer – new digital competencies and skills);
- Why to teach? (answer – to modernise content);
- How to teach? (answer – effective use of digital technology);
- Where to teach? (answer – in a new space, a new augmented reality);
- Who should teach? (answer – teachers-coaches, mentors, teachers-practitioners in digital entrepreneurship);
- What is the result? (answer – high value of the graduate in the labor market, a specialist with high quality competencies and skills in digital entrepreneurship).

Using of methodological recommendations in the course of education of students on the peculiarities of the content of teaching digital entrepreneurship allows the teacher: to master new methods, techniques, technologies of digital learning in new virtual reality; to acquire digital business competencies in alignment with Industry 4.0 and highly specialized business level. This should be done in order to train professionals who have the required quality, the required business of the 21st century, the level of digital skills and abilities that effectively and safely use digital technology to solve business problems. For these reasons, it is important to use the latest methods in the field of education to increase the level of competence in digital entrepreneurship, namely teachers of economics and business, its compliance with approved European standards, which is what these guidelines for teaching digital entrepreneurship.

Fourth Industrial Revolution, which is becoming more comprehensive, determines the penetration of the latest 4.0 technologies and their impact on national economies and social sphere in general, namely: smart cities and houses, digital agriculture, digital entrepreneurship, e-finance, e-medicine, e-government, smart institute of digital education. However without the emergence of digital society (Society 5.0) it is impossible to implement global ideas at national level, therefore it becomes clear that teaching digital entrepreneurship, retraining and willingness of individuals to live in digital society, development of ecosystems of countries in general, sectoral and university ecosystems in particular are extremely relevant and popular plans for implementation in near future.

New social agreement between government, business and universities that takes into account European values is about digital skills for the next digital generation, changing business models and quality cooperation between universities, companies and governments, customers of highly skilled workforce in digital entrepreneurship and interesting innovative ideas.

The experience of implementing a number of start-up projects, in some places today, shows that the “weak spot” is not in financial, but in human capital. Staff professionalism determines whether innovative and digital tools will be effective. To apply technology,

employees must be involved in the process, trained and motivated. It is also important to build quality innovative digital business processes in the existing virtual reality. The description of business processes with the indication of risks and control is that basis which provides systematic work during project realization by digital enterprise.

The Organization for Economic Cooperation and Development estimates that more than one billion jobs, or nearly a third of all jobs in the world, are likely to be changed by technology in the next decade. The World Economic Forum estimates that by 2022, 133 million new jobs will be created in major countries to meet the needs of Fourth Industrial Revolution.

At the same time, economic and demographic shifts are putting additional pressure on the workforce today in terms of acquiring digital competencies and mastering digital skills. In addition, there is no clear understanding of values of personal characteristics and professional competencies of "digital people", i.e. people of the generation of buzzers and alpha people.

For these reasons, the purpose of guidelines for teaching digital entrepreneurship is to increase the level of digital competences and skills by academic and teaching staff of higher educational institutions, their ability to effectively use digital techniques, business technologies in practice-oriented economic education process.

Tasks of methodical recommendations of teaching digital entrepreneurship are among other:

- Creation of newest educational digital products, business practices, information resources on conducting digital entrepreneurship.
- Further development of digital literacy in entrepreneurship of the teaching staff of educational institutions.
- Development of a new quality of digital educational resources on digital entrepreneurship, taking into account the peculiarities of the styles of perception of the material and the level of economic development, transformation, modernization and adaptation of entrepreneurship in terms of increasing innovative glocalization.
- Use of digital tools for effective communication and cooperation in the course of teaching digital entrepreneurship in virtual reality.
- The spread of digital technologies in digital entrepreneurship in the educational process.
- Development of students' competencies, abilities and a sense of need for continuous self-development and self-improvement of digital business skills, the use of innovative pedagogical, digital technologies and online services in the course of teaching digital entrepreneurship.

The results of teaching digital entrepreneurship should results in possessing by research and teaching staff a digital literacy needed for pursuing the course of teaching digital entrepreneurship. They will have professional competencies of economic content of the highest level and new quality that meet European standards.

*Guidelines for Teaching Digital Entrepreneurship* reveal the content functionality and purpose of teaching, the characteristics of the use of educational digital technologies to acquire the latest key skills for practical implementation in digital entrepreneurship. These guidelines give the reader an idea of the mechanism for updating the curriculum among members of the partnership and existing digital teaching methods, a new quality combination of teaching digital entrepreneurship offline and online. Target audience of the publication is teachers of digital entrepreneurship, students, businesses in various sectors of the economy.

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# 1. THE ROLE OF THE HIGHER EDUCATION INSTITUTION IN THE FIELD OF DIGITAL ENTREPRENEURSHIP: AN EUROPEAN OVERVIEW

The formation of the institute teaching digital entrepreneurship in the education system runs through the formation of the latest landscape of innovators through the so-called "digitization" of individuals, namely their knowledge and the acquisition of a number of digital competencies. In the 21st century, it has become a typical and popular trend in the world institute of education, as a "platform" for teaching digital entrepreneurship and the formation of digital individuals, innovators-mentors, innovators, digital teachers with different industries affiliation/specializations.

However, the implementation of quality teaching digital entrepreneurship within the existing educational institutes in Europe and the world always encounters a number of obstacles, among which are:

- Low level of inter-country cooperation among mentors-innovators, digital researchers and teachers engaged in the implementation of teaching digital entrepreneurship at the institute of education, with the R&D units of large corporations in Industry 4.0 and Industry X.0 (Holoborodko et al., 2018).
- Limited access to financial and economic resources does not allow all business entities to carry out large-scale modernized digital entrepreneurship projects or initiate new ones (for example, some Eastern European countries (including Ukraine, Moldova), countries from African continent, some Asian countries, countries from Latin America).
- Inadequate general level of the development of the institute of digital education and business culture of digital entrepreneurship market, which causes a low priority of high-tech technologies among other areas of investment. This factor slows down the introduction of new technologies, which are produced by quite powerful progressive digital enterprises that are already operating in some parts of the world. The reason for this is the misunderstanding by all participants of the education bodies that digitalization of entrepreneurial activity has been long one of the key factors in the competitiveness of economic entities of all sectors of the economy.
- Low level of promotion and evidence base by innovators and providers of new products/services and digital solutions.

Mass and managed digitalization in entrepreneurship is a meaningful response to the challenges of growing competition, lagging behind the US and Asia, growing innovation, but also to the challenges of improving social and environmental aspects, and at the same time to possible job losses. Innovation and digitalization radically set new guidelines in terms of training in digital entrepreneurship and the new quality of the institute of education in virtual reality.

According to futurists, systemic complex thinking is completely supplanted by linear thinking. This fact will "pull" the need for changes in business, society, science and education and will cause changes in current approach to forecasting and development of digital skills. When it comes to European education, it is based on an interdisciplinary approach and creativity, and learning takes place throughout life.

When it comes to vocational education and teaching digital entrepreneurship, the continuing professional education of students and graduate students should be part of a systematic approach. Vocational business training and entrepreneurial digital skills must play a crucial role in providing all sectors of the economy with a highly skilled workforce. Successful career development and transition to new jobs in the near future will largely depend on the quality of education policy in a country and the conditions, tools, mechanisms for passing and preparing professional teaching in digital entrepreneurship, which gives practitioners (employees) access to advanced training and retraining opportunities throughout working age (Manzhura et al., 2018).

Main features of the institutionalization of the institute of education in the course of teaching digital entrepreneurship can be considered:

- Integration of the education system during the formation of Industry 4.0;
- Specificity and effectiveness in innovative laboratories of the university, working on the principles of entrepreneurship, digitalization and innovation;
- Realism and based on the interests and values of main stakeholders;
- Reforming the institute of education with the aim of more open and practical communication, communication between educational institutions and higher education. We are convinced that schools should systematically hold presentations of the professions of the future, in order to form in young people visual representation and vision of their future adult life. This is what will shape digital culture of the digital entrepreneur;
- Strategic focus and relevance;
- Based on the best European and world experience of the education system and the market of innovations, digital products/services;
- Consolidation of stakeholders during the implementation of innovative and digital projects;
- The integrity of the institute of education.

Regarding the use of “digital” technologies in the course of teaching (get an education) digital entrepreneurship, it is currently one of the most important and sustainable trends in global educational process. They allow the educational process to intensify its progress, increase the speed and quality of perception, understanding and assimilation of knowledge in digital entrepreneurship.

Given the inevitability of further “digitalization” of both global and national phenomena, secondary education reform must take into account the needs of the development of virtual-real innovation-digital space, digital society, digital entrepreneurship, research opportunities, new needs and challenges facing Europe as a result of COVID-19. The use of “digital” technologies in education should be cross-platform (cross-cutting) nature. That is, we are talking about the use of new technologies not only in the lesson in a separate class of computer science, but also in the study of other subjects, students interact with each other and with teachers, with real experts, research, individual teaching digital entrepreneurship.

Educational digital technologies allow to make the process of teaching digital entrepreneurship mobile, differentiated, individual, interesting and rich. At the same time, the latest educational technologies do not replace the teacher, but complement him. Such classes are characterized by adaptability, manageability, interactivity, a combination of individual and group work, indefinite teaching in digital entrepreneurship.

Educational digital technologies open new opportunities for the teacher of digital entrepreneurship, allowing together with students to enjoy communication and cognition in the course of teaching and mastering digital competencies and skills. Educational technologies allow teachers to automate most of their work, freeing up human resources for search, communication, individual work with students, provide instant feedback, improve the efficiency of educational management and research processes and self-education of future specialist in digital entrepreneurship.

We are deeply convinced that there is an urgent need to make people more aware of digital values of the content and methods of teaching digital entrepreneurship in the world and in Europe. It is the above factors that determined the content of our research.

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# 2. THE CREATION, FUNCTIONING AND DEVELOPMENT OF DIGITAL ENTREPRENEURSHIP CONTENT: SUGGESTIONS FOR TRAINING COURSE DESIGN

New characteristics of digital entrepreneurship require moving from the cult of efficiency and rationality to shifting the emphasis to openness, democratization, sociologization, innovation, creativity of organizational processes, non-equilibrium and nonlinearity of management hierarchical chains, unpredictability and diversity of development trajectories of economic entities of different levels of aggregation. The training course on digital entrepreneurship is designed to meet new expectations for business and economies in general (Marchenko et al., 2020).

Creating quality content for teaching digital entrepreneurship requires an educational policy that would enable the formation and development of the institution of creativity. It is worth "cultivating" digital skills, which are needed to solve the problems of digital entrepreneurship and integrated thinking. The interdisciplinary approach, which involves research and application in practice (STEM) and key high-performance technologies, have every opportunity to positively influence changes in solving national societal problems of rapidly acquiring new competencies in digital entrepreneurship.

Modern young generation easily learns to form digital skills that are transmitted through new technologies. On this basis, the simultaneous teaching of science and art is built, as well as technological platforms are created, on which scientists, educators, researchers and technologists work with designers, marketers, economists, auditors, bankers, civil servants.

Without the use of the latest methods in education for the purpose of quality teaching digital entrepreneurship and the ability of workers to use digital tools in production, means the deterioration of economies. The use of innovation (managerial, financial, resource, technological, "digital") is becoming almost the only possible source of competitiveness of industrial sectors, and human capital – the basis of economic recovery and growth.

Working professionals in modern digital entrepreneurship in virtual reality must be competent in matters like:

- Creation and processing of complex information;
- Systematic and critical thinking;
- Decision-making on a multicriteria basis;
- Understanding the content of the multidisciplinary processes that take place;
- Adaptability and flexibility to new information, to be characterized as a creative specialist in their field;
- Ability to identify, solve real problems of "digital world of entrepreneurship".

Figure 2.1 could be used as a framework in the system of economic education.

The comprehensive application of machine, computer training during teaching digital entrepreneurship, the use of big data or AI, will allow in the practice of digital entrepreneurship, increase productivity through more accurate intellectual predictions, build effective operation, as a result of knowledge of digital analytics processes. It will also allow for innovation based on a deeper understanding of the content of business digitization.

At the same time, the company's products will become innovative, and the company itself will create more customer-oriented digital processes and new scenarios in the market of digital products/services. Digital changes in enterprises are possible as a result of the practical implementation of technological and technical solutions. However, it is worth recognizing that

the drivers of such changes are innovators, leaders, individuals with quality education who are ready for change and able to quickly adapt to the changing conditions of labor markets and innovation and the industry in which they work.

Successful implementation the course of teaching digital entrepreneurship can be achieved by this method, by ensuring compliance with the following conditions:

- Development own methods and tools that allow to find, test and employ hundreds of specialists in digital entrepreneurship in a short time;
- Formation of powerful business cases, which are the basis of innovative competitions of any type or scale of teaching digital entrepreneurship;
- Improving the quality of the institute of education and conducting education in the market of digital products/services, ie launching and constant monitoring of systemic types of digital activities for quality economic and technical education and education of European and global customers;
- Development of a set of dual training programs for research, engineering work for master's students and graduates of economic and technical universities in educational programs of digital entrepreneurship;
- The availability of an optimal workplace that motivates both beginners and experienced engineers, conservatives, innovators in digital entrepreneurship;
- Development of a program of adaptation and additional training of new employees, new teaching programs by issuing advanced courses in digital entrepreneurship and teaching programs on technologies 4.0 and X.0 (Kraus et al., 2018);
- Introduction of complementarity of team core skills in combination with a high level of professionalism and reputation of researchers-innovators in the innovation entrepreneurship university: cultural affinity of foreign team members with a potential customer base abroad allows you to quickly achieve the required level of trust, and originality and high quality developments in the technical sense allows you to quickly build long-term relationships. Founders of smart companies within the walls of the innovation entrepreneurship university should have a correspondingly solid reputation in academia and the global business community, which in itself immediately becomes a contributing factor;
- Formation of a system of continuous professional development of teaching staff, support staff, undergraduate students through new R&D based on 4.0 technologies (Leonenko et al., 2018).

Teaching digital entrepreneurship is practice-oriented and can be implemented on the online platforms of educational institutions with the participation of business and government support. This type of teaching can be qualitatively implemented within the potential innovative ecosystem of digital entrepreneurship as hub, which is presented in Figure 2.2.

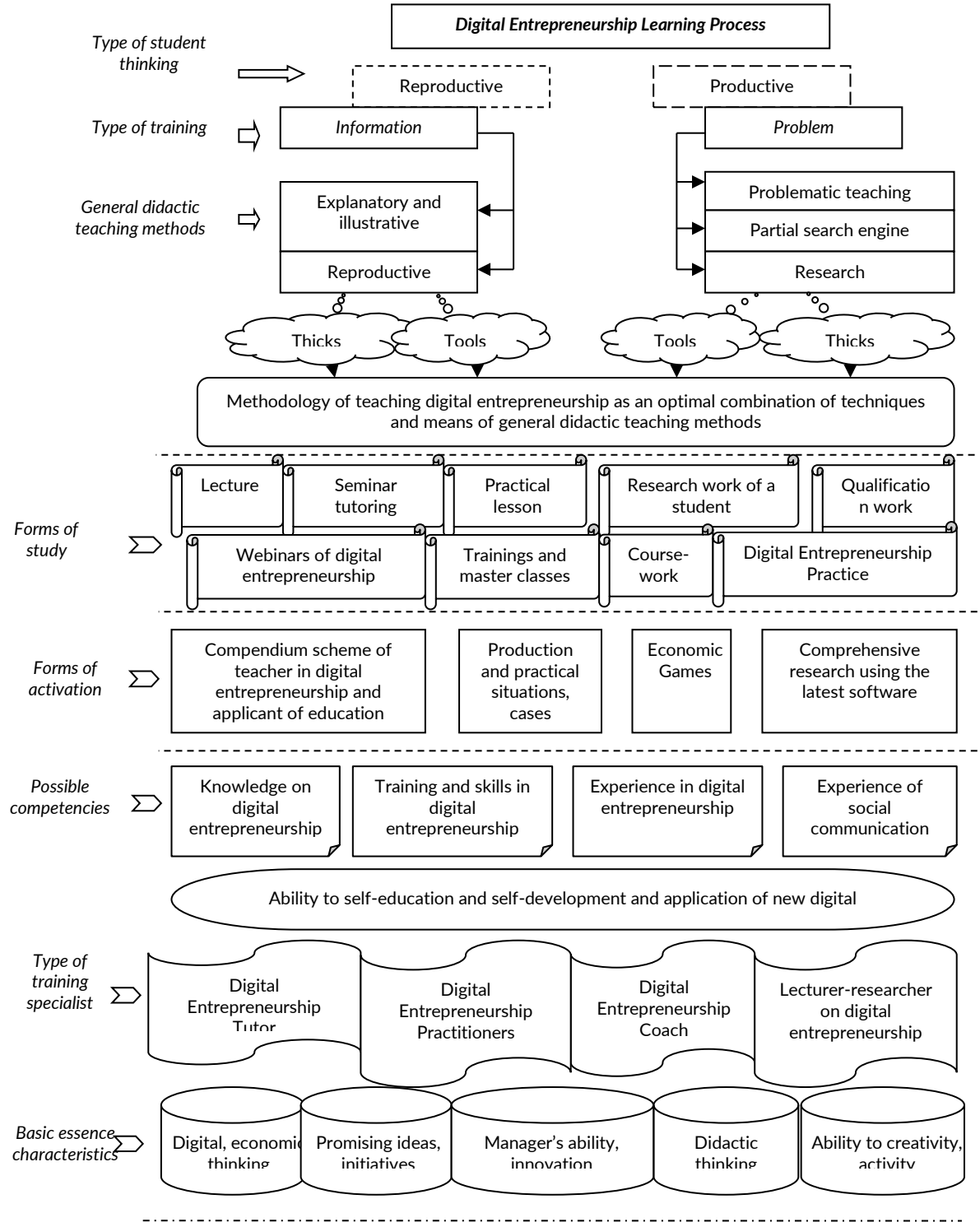


**Figure 2.1. Methodology of teaching digital entrepreneurial in the system of economic learning**

*Source: authors' development.*

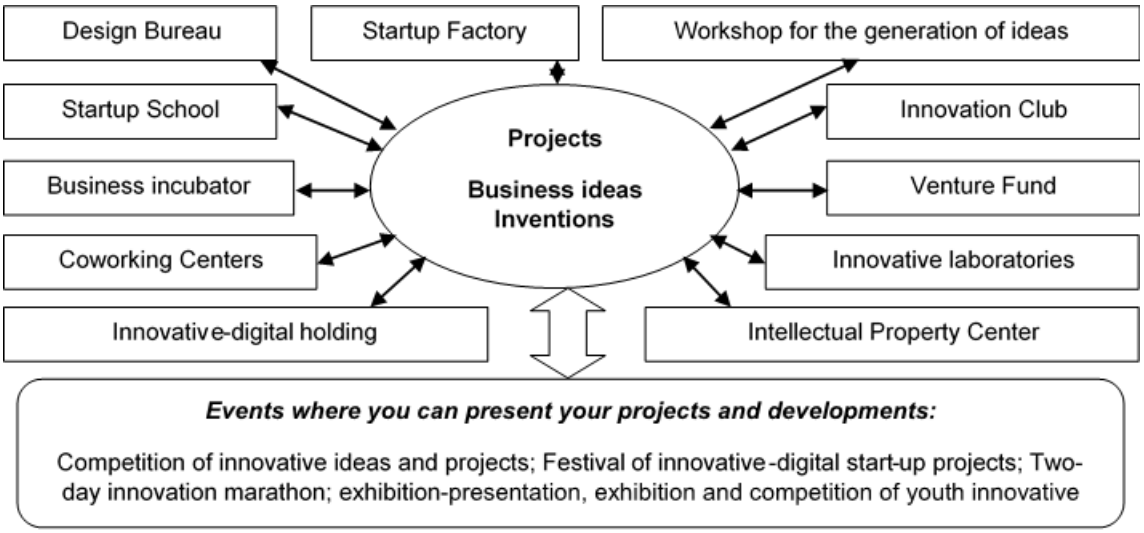


**Figure 2.2. Potential innovative ecosystem of digital entrepreneurship hub of the university**

*Source: authors' development*

Good outcome of teaching digital entrepreneurship is successful functioning of the economy within "digital triangle" shown in Figure 2.3.

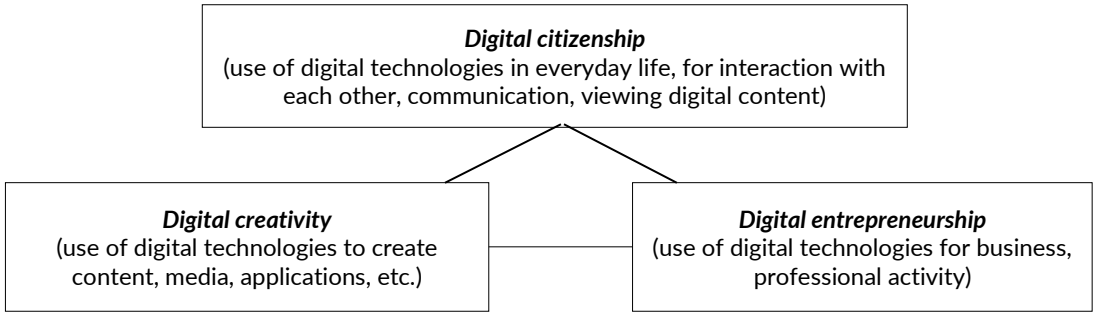


**Figure 2.3. Basic model of "digital triangle"**

*Source: authors' development*

The goal of quality teaching digital entrepreneurship, guided by the philosophy of student-centeredness, should be to "arm" students with the necessary set of digital skills and competencies and the formation of digital economies and transfer them to virtual reality at all levels of economic aggregation (Kraus et al., 2018). Convinced that cooperation between academia and business should be deepened today; increase digital skills in employees of functioning enterprises for effective change management in these entities; to pursue the goal of reasonable and motivated "retention" in their countries of domestic researchers, world-class teachers, who today in the course of teaching digital entrepreneurship, guided by their research, development and teaching of future workforce 2025-2035.

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# 3. THE NEWLY ACQUIRED KEY SKILLS IN DIGITAL ENTREPRENEURSHIP TRAINING COURSE

Key skills created by teaching digital entrepreneurship course are acquired within education system, namely the focus on the formation of new digital competencies, attitudes, culture, abilities, thinking and visions (Figure 3.1). By analogy with the construction of the well-known Rubik's cube ("Magic Cube" by Hungarian sculptor Erno Rubik), we believe that the accelerated formation of the applicant, namely knowledge of digital entrepreneurship, is possible by achieving simultaneous harmonious relationships "digital science – digital education", "digital rules – digital traditions", "digital skills – digital maturity", "digital mentality – digital society", "digital intelligence – digital quality", "digital culture – digital competencies" (obtaining a square of facets of a cube of the same color and size) (Andrusiak et al., 2020). Digital competence should also be seen as the ability to communicate and interact through the use of digital technologies within an effectively functioning ecosystem. Digital literacy as the ability to search, filter various kinds of information and digital content; evaluate digital data, the ability to use and manage it.

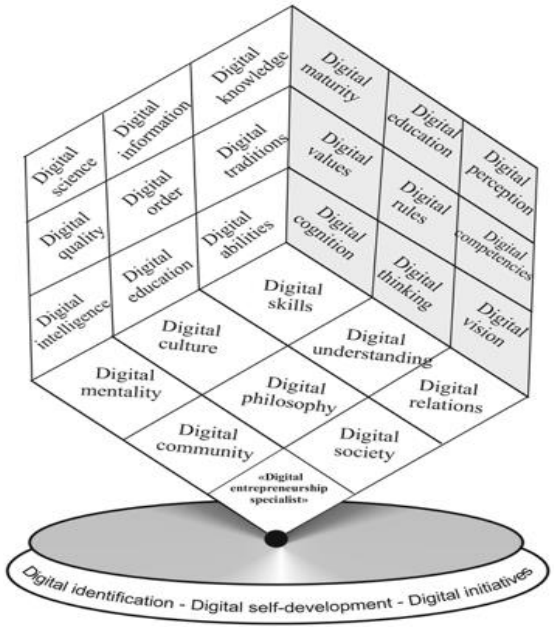


**Figure 3.1. Virtual-real slice of digital cubic space of the institute of creative specialist in digital entrepreneurship**

*Source: authors' development*

Convinced that this can be achieved quickly through high-quality officially functioning educational institutions, to which we include digital rules, digital order, digital information and digital science, presented in a virtual-real context, as constituent structural elements of the digital cubic space of the institute of creative specialist in digital entrepreneurship (Figure 4). In

addition, we need to develop technology platforms and research innovation hubs, pursuing the goal of pooling resources for technical, communication and digital skills. The study place and work environment of a student, researcher, graduate student also makes a significant contribution to the creation of digital values of the entrepreneur.

In addition, it would not be a mistake to assume that “main violin” in the formation of a specialist in digital entrepreneurship and the creative individual is played by informal institutions of educational system. We propose to include the digital mentality, digital perception, digital thinking, digital vision, digital traditions, digital values (Figure 3.1).

We, educators, scientists, with the support of the government and various public organizations and public educational institutions, non-governmental educational institutions, need to develop the ability (adaptability) and interest in lifelong learning, which will determine the accelerated development of digital entrepreneurship in Society 5.0 (Figure 3.1), which will be characterized by a digital relationship with digital quality. We are convinced that participation in the ongoing professional training of creative young people teaching digital entrepreneurship should be made more attractive and interesting. The state, represented by the government, should act as a facilitator between different economic actors, such as involving companies, higher education institutions and training providers, to ensure the development of the required digital skills.

We consider it necessary to note that the formation of digital entrepreneurship in the economy and the high-quality functioning of digital economic entities is possible within the chain of ”digital identification–digital self-development–digital initiatives” (Figure 3.1). Among the competencies that are basic for all, without exception, students of digital entrepreneurship are: literacy; language competence; mathematical competence and competence in scientific technologies, engineering; digital competence; personal, social and educational competence; civic competence; competence of cultural awareness and self-expression.

Digital competence has a number of structural components that must be possessed and able to operate a future specialist in digital entrepreneurship, as a result of successful implementation in practice of the course of teaching digital entrepreneurship. Their content is given in Table 3.1 and Table 3.2.

**Table 3.1. Digital competencies that produce the course of teaching digital entrepreneurship**

| Digital competence | Contents and general characteristics of digital competencies |
|---|---|
| Digital content | Ability to change, improve, use digital content to create new content; awareness of copyright and data licensing policies; ability to write program code. |
| Problem solving | Ability to solve technical problems that arise with computers, software, networks; ability to solve needs and find appropriate technical solutions, or customize digital technologies to their own needs; creative use; ability to independently determine the need for additional new digital skills. |
| Communication and interaction | Ability to communicate using digital technologies; ability to share information using digital technologies; ability to communicate with society, use public and private services through the use of digital technologies. |
| Information literacy and data literacy | Ability to search, filter data; ability to evaluate information; ability to use and manage data and digital content. |
| Security | Ability to protect devices and content, knowledge of security measures, understanding of risks and threats; protection of personal data and privacy; understanding the impact of digital technologies on the environment; knowledge and skills to maintain your health. |

*Source: authors’ development*

Individuals with digital competencies in entrepreneurship must understand the general principles, mechanisms and logic underlying digital technologies that are evolving, as well as know the features of the operation and use of various devices, programs and networks.

**Table 3.2. Professional flexible/soft skills of a digital practitioner who acquires knowledge in the course of digital entrepreneurship**

| Flexible / soft skills | What to do to achieve / acquire required skills? |
|---|---|
| Ability to communicate effectively with those around you | Learn to admit your mistakes, if you really made them; do not allow emotions to prevail, in particular, in business correspondence; learn to give constructive feedback: feedback should be based on facts and working moments, personal assessments should be avoided; avoid hints in communication, passive aggression, stop manipulation, avoid devaluation. |
| Emotional intelligence (expression of emotions, interpersonal relationships, emotion management, assertiveness, social awareness, adaptability, self-motivation, happiness, optimism, self-esteem, control over emotions, control of impulses, stress resistance, empathy, perception of emotions) | According to Claude Steiner's interpretation, "emotional intelligence is the ability of a person to be aware of an emotion, to generate it so as to engage thinking, to find understanding of emotions and what they mean, to manage them so as to promote their emotional and intellectual development". Emotional intelligence helps a person to adapt to the environment and find common ground with other people. It manifests itself both in relation to himself and in communication with others. Anger, sadness, fear and joy are the basic emotions that help solve the problem here and now, others, such as anxiety or guilt – are helpful. Therefore, it is important to learn to recognize the basic emotion and determine the cause. Remember that: fear is caused by a lack of information; anger – due to violation of personal boundaries; sadness – through loss; joy – as a result of meeting needs. An emotion diary will help you find the cause of your emotions. You need to try for a month to record and track your feelings and emotions according to the scheme: date and time; event; sense; the reason for which the feeling arose; actions that can be taken; how strong was the feeling on a scale of 1 to 10; bodily sensations that are experienced along with feeling. In order to learn to recognize what emotions are behind the bodily reactions, you can do the following: in moments when a person knows what emotion is experienced, you should write in a diary the physical sensations that accompany it. In future, feeling something similar, the individual will be able to compare their bodily reaction and recognize the feelings that are hidden behind it. To "pump" the interaction with others, develop empathy – the ability to empathize, to understand the feelings of another person. Everyone wants to be heard and accepted by others, to learn to see the interlocutor, to read his condition. |
| Time management | Clear planning allows you to maintain a balance in all areas of life: you should not rely on memory. You need to write down plans for the day, year and several years in advance. When planning, it is appropriate to first allocate time for rest, and then paint all the other things. |
| Flexibility and creativity | Search for new approaches in solving routine tasks. |
| Resistance to stress | Mastering new techniques that help in the fight against stress. Acquiring self-regulation skills that will help reduce the negative effects of stress on the body as a whole. |

*Source: authors' development*

Digital competence includes confident, critical and responsible use and interaction with digital technologies for learning, work and participation in society. Individuals need to understand how digital technologies can support communication, creativity and innovation, and be aware of their opportunities, limitations, consequences and risks.

It is expected that the competencies that an individual acquires in the course of teaching digital entrepreneurship, having fundamental knowledge, are the following: the ability to learn; critical thinking; creativity; savvy; cooperation; purposefulness; empathy; system thinking; communication; choice of priorities; flexibility; team work; business skills; information filtering; ability to set goals.

## 3.1. Teaching in the direction of practical implementation of the triad "digital literacy–digital mobility–digital commercial competence"

In today's virtual reality, pursuing the goal of quality training in digital entrepreneurship is the need to focus on achieving fair, comprehensive progress in equipping and providing the latest opportunities for each teacher of digital entrepreneurship and acquiring competencies in this business, digital jobs of the future (Kryvoruchko et al., 2018). For example, using the Office 365 enterprise portal provides the following benefits:

- A single place to store all types of documents;

- Single contact book;
- A single information (news, blogs, calendars) space for all professionals;
- Joint photo and video gallery;
- Work with independent accounting of vacations;
- Online reconciliation of memos;
- A single digital learning center;
- Social activities (competitions, bank of ideas, voting, etc.).
- Practically achieve the implementation of the triad: “digital literacy – digital mobility – digital commercial competence” can be done with analytics based on PowerBI:
- Reports on sales/purchases online anywhere (including integration into Microsoft Teams);
- Clear and user-friendly interface;
- Inability to “break” anything by the user;
- Unlimited scaling and design of reports “from any angle” (in terms of contractors/regions/products/managers/amounts, etc.);
- No need to involve developers in the design of new reports.

The implementation of the plan for a new quality of teaching digital entrepreneurship and the expansion of the list of existing competencies lies in the solution of a number of tasks, including:

- Introduction of an approach based on competence, cross-platform digital competence, ie when the study of subjects is through the use of “digital” technologies, during which, digital skills are developed;
- Increasing the share and improving the quality of training of specialists in the field of information and communication technologies (ICT) and innovative entrepreneurship: increasing the state order for the training of ICT specialists, involvement of girls and women in the ICT sphere and entrepreneurship (Boldyreva et al., 2019);
- Development of a system of “social and innovative elevators” in the ICT sphere and digital entrepreneurship, including informing schoolchildren and students about possible internships and internships in ICT companies, corporations, stimulating the development of youth ICT entrepreneurship and youth digital entrepreneurship (Holoborodko et al., 2019);
- Measurement and certification of digital skills. Adaptation of the methodology of measuring and implementation of independent certification of the level of digital skills in accordance with the needs of the labor market and digital entrepreneurship;
- Harmonization of the legal framework governing the certification of digital skills of entrepreneurs, teachers, civil servants, other segments, with international requirements, as well as the regulatory framework for additional accruals to wages in terms of confirmation of digital competencies;
- Updating the state classifier of professions, ie development and approval of the list of digital professions (based on labor market requirements, modern digital trends), their introduction in higher education institutions.

Teaching in practical implementation of the triad: “digital literacy – digital mobility – digital commercial competence” should take place through the use of a combination of different modern forms and types of work, which we present in Table 3.3 and through the use of new techniques, technologies and types of teaching digital entrepreneurship in terms of virtual reality (Table 3.4).

**Table 3.3. Forms and types of work that form digital competencies and skills in the course of obtaining education in digital entrepreneurship at innovative-entrepreneurship university**

| Forms of teaching, that used in the acquisition of knowledge in digital entrepreneurship | Types, content and characteristics, acquired competencies and knowledge |
|---|---|
| Trainings, dedicated to the acquisition of digital entrepreneurship skills | In the course of participation in trainings new digital educational products on a technique of development of critical thinking are introduced into practice, public and legal digital education, debates, digital education for sustainable innovative-digital development, interactive technologies of digital learning, educational management are put into practice. Active learning.<br>Research and structuring of information-digital space through training of high-level thinking operations in the process of working with digital information and big data, texts. System of work with information/texts of different content and volume with the help of graphic organizers (designers). |
| Webinars on digital entrepreneurship | In the course of acquaintance with the best European practices in the field of digital education and digital science in new virtual reality, "growing" on this basis its own institute of digital education, institute of digital entrepreneurship, institute of digital science, institute of digital entrepreneur. |
| Independent work on digital business | Development of critical thinking as an opportunity to express one's position in digital entrepreneurship. Creative search in terms of digital entrepreneurship development. The pyramid of memorization. |
| Round tables on online round tables on entrepreneurship digitization | Discussion on digital entrepreneurship at such events. Questions as a tool for a teacher of digital entrepreneurship. |
| Offline and online teaching | Critical thinking and argumentation in the formation and defense of scientific and educational position: the ability to identify arguments in different texts, formulate arguments in support of the position, create a system of arguments in their own educational and scientific text (article, report, speech, abstract, startup project, thesis, analytical note). Definition and refutation of incorrect argumentation, protection against information manipulation. |

*Source: authors' development*

The application of the "workshop" method during teaching digital entrepreneurship allows future specialists in digital entrepreneurship:

- To acquire theoretical knowledge about digital activities in various sectors of the economy, as well as to develop such competencies in future professionals in digital entrepreneurship as responsibility, objectivity, integrity (Kraus et al., 2018);
- To motivate participants to discuss the issues raised at the seminar, in the process of which the impact of digitization of entrepreneurship on the development of world economies becomes clearer;
- To acquire skills to create mindmapping-questions, which allows to substantiate the causes and consequences of digital business processes for the society of different countries and sustainable development of mankind as a whole;
- To study and discuss the experience of digital entrepreneurship in the world and the feasibility of its use, to identify main tools for the formation of a new quality of digital entrepreneurship on the basis of virtual reality;
- To acquire skills of teamwork, communication, coordination, consolidation in response to digital challenges that await companies in the future and to form a personal interest in the topic under study;
- Through their own active work to gain dynamic knowledge about measures to accelerate the digitalization of entrepreneurship in practice, which is satisfying and creates a desire to transfer this knowledge to others, and thus creates the conditions for a responsible attitude to their activities and counteract inaction at the mental level.

**Table 3.4. Innovative techniques, technologies and types of teaching in digital entrepreneurship in virtual reality**

| Innovative techniques and technologies and types of training used in the development of digital entrepreneurship | General characteristics of innovative techniques, technologies and types of training used in the development of digital entrepreneurship |
|---|---|
| Research teaching digital entrepreneurship | this is the organization of training sessions on digital entrepreneurship, which involves the creation under the guidance of a teacher of problematic business situations and active independent students of digital entrepreneurship to solve them, resulting in creative and innovative mastery of professional economic knowledge of entrepreneurship, digital skills, skills, competencies. |
| Cognitive-research or exploratory teaching in digital entrepreneurship | it is a type of activity that is the most effective link in the transition from educational activities to research, because it contains almost all the components of scientific and creative research and leads to the creation of a new product in digital entrepreneurship. Main forms of research and development of digital entrepreneurship education are participation in innovative laboratories, business associations, digital entrepreneurs' clubs, innovation factories, business incubators, individual and group work on research startup projects in digital entrepreneurship. It is also scientific-practical conferences, seminars, hackathons, startup fights, rallies, competitions – exhibitions of research works, study tours, expeditions, participation in virtual-real competitions as well as in training and in production-practical and vacation time. In the course of systematic search and research work, digital skills are formed in students of digital entrepreneurship:<br>- Intellectual – analysis, synthesis, comparison, generalization and systematization, abstraction, establishing cause-and-effect relationships in the course of luck or success in business, problem statement in the formation of digital entrepreneurship and hypothesis, search and use of analogy, deductive inference and proof successful for the implementation of investment projects;<br>- Practical – the use of educational, reference and additional literature on the implementation of digital entrepreneurship, both successful and failed, the selection of material for the experiment, the design of research results; self-organization and self-control – planning of search and research work, rational use of time and means and digital tools for innovative entrepreneurship in the conditions of virtual reality, verification of the obtained results, self-assessment. |
| Blended teaching digital entrepreneurship | it is a kind of hybrid method, when there is a combination of online learning, traditional and independent teaching digital entrepreneurship. This means not just the use of modern interactive educational digital technologies in addition to traditional ones, but a qualitatively new approach to learning that transforms, and sometimes "turns over" classroom. There are six key components of the implementation of blended teaching digital entrepreneurship, namely:<br>- Leadership in knowledge of digital entrepreneurship, as a necessary condition for the introduction of blended learning;<br>- Professional economic development of digital entrepreneurship is a key component of ensuring the implementation of the tasks set out in the roadmap for the implementation of training programs and courses in digital entrepreneurship. A coordinated, detailed and systematic plan of professional economic development on the basis of the stated goals should be brought to the notice of all participants in the process of implementing teaching digital entrepreneurship;<br>- Learning activities (the use of blended teaching requires the use of digital interactive systems, which are a means of delivering educational economic content of digital entrepreneurship, namely: digital interactive systems include learning management systems (LMS), content management systems (CMS), means of informing students of economic education on digital entrepreneurship.<br>- Reorganization of the educational process in the direction of full digitization and acquisition of digital competencies in entrepreneurship in terms of virtual reality;<br>- Electronic educational resources for teaching digital entrepreneurship. The decision to acquire and/or develop your own digital content is important for the implementation of online and blended learning technologies;<br>- Technological infrastructure to provide teaching digital entrepreneurship (reliable telecommunications network, software and hardware for training in new virtual reality). |

| | |
|---|---|
| Traditional teaching digital entrepreneurship or explanatory-illustrative | this teaching in which a teacher of digital entrepreneurship reports, communicates to students a certain amount of economic knowledge, explains the essence of phenomena, business processes, economic laws, formal and informal rules of digital entrepreneurship using illustrative material. Applicants must consciously master the proposed amount of knowledge in the implementation of digital entrepreneurship and reproduce this knowledge at the level of deep understanding and practice in various forms. |
| "Inverted" teaching digital entrepreneurship | a form of active teaching digital entrepreneurship, which allows you to "reverse" usual learning process as follows: homework for students of digital entrepreneurship is to view relevant videos about successful and failed digital entrepreneurship projects with training material for the next lesson (applicants independently pass theoretical material), and in the audience time is used to perform practical business cases. The value of inverted teaching digital entrepreneurship is the ability to use learning time for group sessions, where students can discuss the content of the business case, test their knowledge and interact with each other in practical entrepreneurship. During training sessions, the role of a teacher of digital entrepreneurship is to act as a trainer or consultant, encouraging students in digital entrepreneurship to study independently and work together. |
| Problem-Based Learning or problem-oriented teaching digital entrepreneurship | Teaching that focuses on problem and process of its solution, during the application of which the real complex problems of digital entrepreneurship are used as an educational tool. Business-based learning stimulates the application of critical thinking and problem-solving skills in a limited time and provides real-world experience that facilitates an active learning process, helps to systematize knowledge, and naturally integrates teaching digital entrepreneurship into real life. This training focuses on the ability of students to learn about the subject through the experience of solving open problem of digital entrepreneurship, found in trigger material. PBL process doesn't focus on solving problems with a specific solution, but allows you to develop other desired skills and traits. |
| Using ecosystems of educational innovation hubs in teaching digital entrepreneurship | Such structures are a set of organizational, structural and functional components (institutions) with their relationships involved in the creation and application of scientific knowledge and technologies in digital entrepreneurship, which determine the economic, legal, organizational and social conditions of innovation process and ensure the development of innovation. Key task of the ecosystem of educational innovation hub for teaching digital entrepreneurship is to create an innovative and active environment for the development of knowledge-intensive business by commercializing the results of research and development to digitize business activities. |
| The use of storytelling as an effective tool for creating digital stories for training on the formation and implementation of digital entrepreneurship | One of the most interesting and productive modern methods of teaching digital entrepreneurship. It is the art of telling the stories of beginning and development of digital entrepreneurship in order to, on the basis of such knowledge, be trained, managed by conveying the content of the message using a special technique. Among the most popular techniques are: word cloud, videos, texts, comics, movies, cartoons, photos. Using this technique, elements of dramatization, exaggeration, improvisation are used. |
| Project-Based Learning for digital entrepreneurship | Main goal is to get final digital product to facilitate doing business in new virtual reality. By studying project-based learning, those who acquire knowledge of digital entrepreneurship, for some time researching and responding to real, interesting and complex questions, gain the necessary knowledge and skills in conducting digital business. |

*Source: authors' development*

Main results of teaching digital entrepreneurship, which define and form a new structure and quality of competencies of both a teacher of digital entrepreneurship and a student of economic education in terms of digitization of innovative business activities are:

1. The latest digital tools used in the training of digital entrepreneurship in order to create a new quality of cooperation:
   1.1. Development of new ways and resources for digitization of business activities for joint e-interaction within the chain such as "E-government – E-university – E-business";

1.2. Using of digital tools to solve business problems in terms of cooperation between teacher and acquirer of knowledge in digital entrepreneurship in all possible types of teaching in virtual reality;
1.3. Placement and dissemination of created digital educational resources for the formation of digital entrepreneurship in innovative laboratories and on educational platforms of educational institutions;
1.4. Modification and editing of existing digital educational resources for doing business, subject to compliance with the requirements of academic integrity;
1.5. Creating and editing e-documents for communication, cooperation and informing participants of the educational process on digital entrepreneurship;
1.6. Joint creation on the basis of virtual platforms of digital educational resources for the formation and development of digital entrepreneurship by universities, business and government.

2. Digital tools used in digital entrepreneurship training to create a new quality communication:
2.1. Using digital tools to solve practical cases with business problems in order to form a new quality of communication in the course of teaching digital entrepreneurship in virtual reality;
2.2. Organization of online communication between all participants in the educational process through social networks, corporate services, e-learning system during teaching digital entrepreneurship;
2.3. Prompt counseling of all participants in educational process with the tools of digital environment of educational institutions in the course of teaching digital entrepreneurship.

3. *Innovative digital molding tools assessment of the level of acquired knowledge and competencies as a result of teaching digital entrepreneurship:*
3.1. Development and working out of criteria of an estimation of quality of the created educational e-courses, e-resources of a different format on digital entrepreneurship in the conditions of new virtual reality;
3.2. Using digital tools to solve problems in terms of objective and transparent assessment of acquired competencies, skills and abilities as a result of teaching digital entrepreneurship in virtual reality.

4. *New technologies e-teaching digital entrepreneurship in virtual reality:*
4.1. Description and forecasting of educational trends in teaching digital entrepreneurship, taking into account the development of digital technologies;
4.2. Systematic integration of digital technologies into the educational process of digital entrepreneurship;
4.3. Combination in the creation of e-learning resources of modern learning management systems (LMS), taking into account the learning styles of digital entrepreneurship in virtual reality;
4.4. Evaluation of innovative pedagogical and digital technologies for the introduction of formal, non-formal and informal teaching digital entrepreneurship in the conditions of virtual reality;
4.5. Use of online services and digital technologies for the formation of digital skills of a successful entrepreneur;
4.6. Implementation of continuous self-education and self-development in digital entrepreneurship through available digital resources;
4.7. Creation of educational e-resources for digital entrepreneurship (text, multimedia, audio, video, business cases) and the ability to argue the ways and methods of their use depending on the educational goals.

## 3.2. The future of digital generation and the change of business models through the lens of a chain type: "digital thinking–digital identification–digital self-development–digital initiatives–digital maturity–digital society"

The institute of education lags behind the modern needs and pace of development of society in the direction of the formation of Society 5.0 and Industry 4.0. Many of the world's leading companies do not require higher education for job seekers when hiring. A diploma is not as important as the practical digital skills that an individual possesses (Osetskyi et al., 2020). This is, above all, effective communication and the ability to work in a team. Although artificial intelligence will soon become a full member of the team, it will be necessary to delegate some of the responsibilities to the machines and, accordingly, to control them. Knowledge of foreign languages is also a necessary component of success. Big successful companies gather talent from all over the world, so you need to be able to work effectively in different cultures and international teams.

Hybrid thinking, the ability to solve problems, focus on results – the qualities that will be most in demand in the labor market in any field. The modern generation of creative, digital people lives under the slogan – "New contacts, new ideas, new opportunities ...". As jobs change with the technologies of the Fourth Industrial Revolution, there is an urgent need to retrain more than 1 billion people by 2030.

It is expected that by 2022, 42 % of the basic skills needed to perform existing work will change. In addition to high-tech skills, specialized interpersonal skills will be required, including skills related to sales, HR, and digital entrepreneurship education. In this regard, we consider it necessary to consider the characteristics of the generations of people of the twentieth and twenty-first centuries, through the prism of economic, institutional and professional content. Each generation has its own unique features due to the era, social norms, institutions, technologies (Table 3.5). As the Pew Research Center explains, the distinction between different generations over the years is only approximate, and experts' opinions on clear dates for the transition from one generation to another usually differ slightly (Manzhura et al., 2020).

**Table 3.5. General characteristics of the types of generations of people in the 20th and 21st centuries, through the prism of economic, institutional and professional content features**

| | Evolution of human generations of the 20th and 21st centuries | | | | |
|---|---|---|---|---|---|
| **Name of the generation** | **Baby Boomers** | **Generation X or "Generation 13", "Sandwich Generation"** | **Generation Y, or Millennials, "Peter Pen Generation"** | **Generation Z or Buzers, Postmillenaries, Centenaries** | **Generation-alpha (A)** |
| **Years of birth** | 1946-1954 (63) | 1966 (61)-1976 | 1977 (81)-1996 | 1995 (2003)-2012 | 2013 to the present |
| **Institutional features of states and time period** | institutes are strong, and individualism is weak | institutions are sacrificed for the sake of individualism | institutions are weak and individualism is growing | institutions are destroyed and people unite to create new institutions | alpha people form "transparent world" and "transparent" values. Reputation plays an important role in this world |
| **Economic life cycle** | lift | awakening | decline | crisis | a new rise is expected |
| **Personal traits of the individual** | optimists; industry; conservatism; cult of youth and team spirit | early become independent; distrust of the authorities; "Are witnesses of the pre-Internet era"; technically literate; individualists; pragmatists; are | shy, picky about their diet; dependent on fashion trends; love to travel, care about the environment, not frugal; tolerant; active | tolerant; sensitive; apolitical; advocate for same-sex marriage and equality; lead a healthy lifestyle; tolerant; prefer online communication; | are formed as individuals in the time of artificial intelligence; use gadgets from birth; have high moral standards; value freedom of choice; informal; 90% of children |

| | | | | | |
|---|---|---|---|---|---|
| | | the bearers of democratic views; forced to take care of children and parents at the same time | in defending their rights; lived with their parents for a long time and did not hurry to grow up | minimalists; well versed in technology; have an account on social networks; are interested in modern music, culture, memes; average life expectancy – 80 years | under the age of 2 use a tablet, and every 5th has its own gadget in 3-4 years; life expectancy is 100 years; erudite; non-aggressive; balancing; are the bearers of the humanitarian mission and the "engines" of progress; free from all sorts of conventions |
| **Teaching, education** | distrusts on technology in education and in general in all spheres of life; a small number of people received higher education | growth in the number of inconsistencies in the education system; reduction of funding for the education system and the difficulty of obtaining student loans | self-aware, prefer social networks to television, able to learn, share self-education | study in an interdisciplinary approach (at the intersection of different disciplines); concentration of attention – 8 seconds; most of them have higher education | value personalization and individual approach; concentration – 1 second, which allows you to develop critical thinking; have good relationships with parents who consult with them and listen to their knowledge in digital matters; special courses on how to distinguish facts from fakes are taught in schools; in their world the information picture displaces the text; according to forecasts –40% of children of this generation will not have higher education |
| **Professional qualities** | careerists who feel comfortable in teamwork; young people came to power and held leadership positions | strive to remain capable and professionally needed for a long time; changes in career prospects, which increased academic requirements and requirements for intellectual abilities | adhere to the balance between work and rest, work for them is a matter of a lifetime; easily cooperate in a team | do not understand life and work without the Internet, quickly switch attention – they find it difficult to concentrate, 72% dream of their own business | will not share the real and virtual world; will blog; creating a completely new type of content (streams, raffles, challenges) earn money at an early age; high moral standards; sensitive to lies |

*Source: authors' development*

Millennials are a digital generation that prefers online communication, distance learning, and remote work. They take advantage of modern technology, care about privacy, and misperceive systems that are not human-centered/human-oriented. If you look at generations A and Z, according to experts, they will have so-called "soft skills", which they also have to constantly "pump" (Manzhura et al., 2019).

Generations of alpha people, through further deeper development of the Internet, will try to build a flexible and socially responsible global space in which more attention will be paid to the environment, terrorism, resource exhaustion. Among the many skills, there are a number of basic: ability to show empathy for others; skills of building healthy communication; ability to plan and bring the business to a logical conclusion; be attentive to their emotions; critical thinking skills; ability to effectively manage their time; to develop emotional intelligence, which is only way to compete with robots, artificial intelligence, which develops quite intensively.

It is worth noting that emotional intelligence is a set of skills that allow you to recognize and understand other people's emotions and intentions, as well as control their own to solve practical problems. Many employers say that for a successful career, the alpha generation needs to master three things – adaptability, the ability to work with information and the ability to find "points of contact" with any person. And this is the practical realization of emotional intelligence.

As part of the research, we attempted to present a comparison of economic and organizational benefits for modern companies employing people of different generations, namely baby boomers and generations of digital people (Table 3.6).

**Table 3.6. Comparison of generation A, Z and baby boomer skills and economic and organizational benefits as a result of their work for companies**

| **Skills typical of classic employees – the generation of baby boomers** | **New progressive acquired skills inherent in the digital generation** |
|---|---|
| Everyone in the team is on their own | Trust in the middle of the team |
| The team is in conflict | Mutual assistance |
| Lack of trust leads to concealment of information by the leader from the team | Knowledge and experience, communication with each other |
| The indifference of the team to the company's business | Ability to engage in constructive conflict and resolve it quickly |
| Distrust of employees by the manager and among themselves | Understanding of responsibility for your result and the team as a whole |
| Inability to make current decisions independently by employees; employees do not listen to the head | Demanding employees to colleagues |
| The team does not systematically achieve its goals | Everyone's desire to achieve common goals for the team and the company |
| **Economic and organizational benefits for the company from the work of traditional specialists or baby boomers** | **Economic and organizational benefits for the company from the work of digital specialists** |
| Problems are silenced and mistakes are hidden | Increase profits |
| Employees do not understand the ultimate goals and objectives | Time to grow the company instead of resolving conflicts |
| The manager controls everything himself | Ability to scale the business |
| Impossibility to scale business with such a team | Ability to predict team results |
| Not understanding how much profit the company will receive in each current month | Get out of the routine without having to check every action of employees |
| | Mutual trust between the leader and team members |

*Source: authors' development.*

According to experts, up to 70 classical professions are expected to disappear in the world by 2030. Of course, there will be a number of new and so far, which are the professions that

few can give a clear answer. This is due to the fact that the world is changing rapidly and it is not entirely clear why you need to learn to be in trend. The alpha generation will have to intuitively guess what skills they will need to be successful in the future.

The generation of buzzers and alpha humans will have to constantly acquire new skills and change activities. This is due to the fact that their income will depend on the understanding of the situation and the rapid, sometimes even instantaneous, "inclusion" in the process. It is expected that during his career, the alpha generation will change more than 5 activities and up to 20 employers. Analysts believe that new generation of digital people will be more self-aware through self-learning and self-education. In addition, remote work, ie freelancing, is becoming increasingly popular. For these reasons, Table 3.7 presents the author's vision of the matrix structure of the benefits that appear to the generation of millennials, buzzers and alpha people as a result of the formation of the digital workplace of the entrepreneur.

**Table 3.7. Matrix structure of benefits of the digital workplace of the businessman for generation of millennials, buzzers and alpha people**

| Prerequisites for moving to Office 365 | Benefits of Office 365 |
|---|---|
| 1. Weak infrastructure<br>2. Constantly non-working mail<br>3. Slow "Public folder" for storing shared documents<br>4. The need for a gradual transition to "cloud"<br>5. The presence of a single "login window" for all users of group companies<br>6. The need for universal software licensing<br>7. The need to keep all documents within the company<br>8. Establish a common security and privacy policy within the group | 1. Licensed, always relevant software for all employees of all companies in the group<br>2. Microsoft Exchange for mail and calendars<br>3. Instant deployment of Office 365 for new employees<br>4. Ability to work from anywhere<br>5. Preservation of company documents of employees<br>6. Instant exchange of information (including documents) within the company<br>7. Significantly increased mobility<br>8. Corporate portal based on SharePoint<br>9. Analytics reports are built on PowerBI<br>10. Teams for corporate communication and modern work |
| 1. User-friendly set of tools<br>2. Easy to master and launch the product<br>3. Profitable (compared to the classic licensing option)<br>4. Modern – there are all the necessary mobile applications, well-thought-out ergonomics of services, socialized tools<br>5. Flexible – you can choose different packages for different roles and tasks<br>6. There are no corporate alternatives on the market | 1. Staff training<br>2. Internal resistance to change<br>3. Not always stable operation of Microsoft services<br>4. SharePoint speeds are not always sufficient |
| **Why Office 365?** | **Office 365 application issues** |

*Source: authors' development*

The key changes that should be followed at all times when teaching a course of digital entrepreneurship are the following:

- Universities should not only provide the educational process, but also become platforms for the creation of innovations and digital products/services, which can be achieved by merging with science and practice;
- Pooling resources for the implementation of joint projects, the creation of scientific and educational on-line platforms for digital entrepreneurship courses;
- New opportunities for building personalized educational trajectories of digital entrepreneurship development;
- Development of a level system of thematic modules for teaching the course of digital entrepreneurship (Figure 3.2);
- Along with traditional education, society should make greater use of non-traditional, which would allow the growth of their competencies in terms of the new quality of digital entrepreneurship.

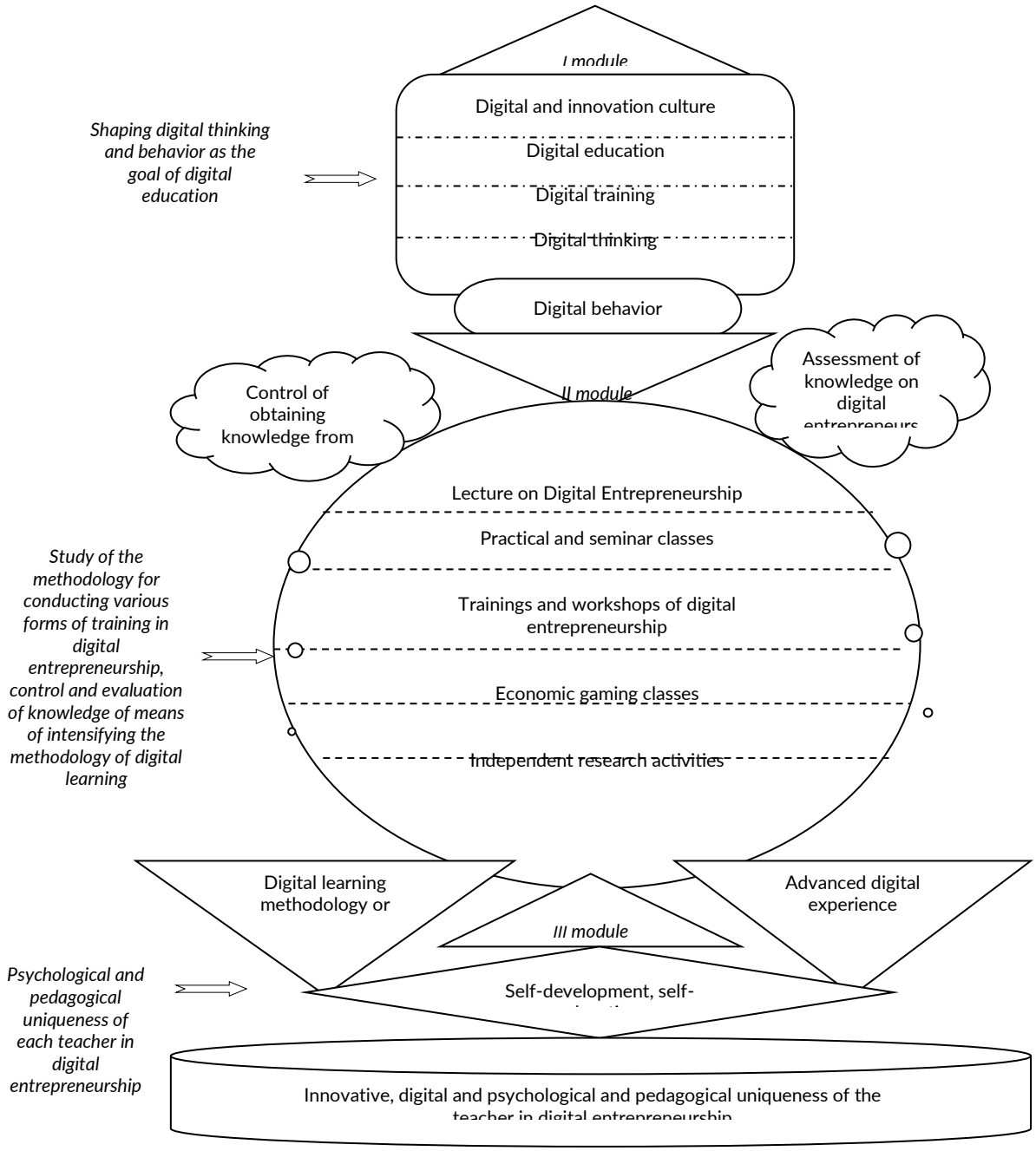


**Figure 3.2. The content of the modules of teaching the course of digital entrepreneurship**

*Source: authors' development.*

As a result, we note that digital entrepreneurship is an accelerator of socio-economic life of Society 5.0 in the conditions of virtual reality and is able to rapidly increase the GDP of any country. However, in this case there should be no pauses, let alone paradoxes. Pragmatism of organizational and institutional action, together with social responsibility, should be the basis of institutional support of digital competencies in the field of entrepreneurship.

Institutionalization of modern economic order in the direction of formation and development of teaching digital entrepreneurship should take into account the evolution of social values that dominate the economic order today, and be based on a quality institute of education and creative innovators and their digital competencies and skills. Convinced that there is an urgent need today to develop tools and mechanisms for virtual digital coworking centers, cross-platforms with digital industry, digital studio hubs, association hubs and hackathons, in order to form an economic digital virtual reality based on this knowledge. After all, virtualization allows you to reduce the initial capital costs for the deployment of the necessary digital infrastructure, through the use of “cloud” technologies and software-defined architecture.

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# 4. INTERACTIVE DIGITAL TEACHING METHODS

## 4.1. What is a digital learning method from the pedagogical point of view?

The digitalization process has become pervasive in everyday life. Indoubtly, connectivity removed space and time barriers making knowledge more affordable. However, having such knowledge at hand could not necessarily mean being more educated: in fact, knowledge conveyed via digital methods does not overlap with digital learning that emerges as a complex concept rooted into pedagogical literature.

The scope of this chapter is to review the main theoretical underpinnings of digital learning and its most effective methods by discussing the principal tools currently employed in teaching activities. That is, the chapter aims to answer the following research questions: 1) what is a digital learning method from the pedagogical point of view? 2) which are the most useful methods?

The first question appears timely and relevant since it is crucial to discriminate between an informal/occasional/unplanned digital learning experience and formal/planned/intentional one. In the first category fall, for example, YouTube® videos or digital conferences. The second category comprises, for example, E-lecturers or surgery operations shared via streaming by medical schools. The difference among the two reviewed digital learning occasions rests in the pedagogical usability that denotes whether the tools, content, interface and tasks of digital method environments support participants to learn in various learning contexts according to selected pedagogical objectives.

The second research question lies at the crossroad between diffusion of learning methods and effectiveness of such methods in the pedagogical sense. Answering such question helps to understand how digital learning supports learners and facilitates in constructing knowledge by using technologies.

Moreover, an in-depth analysis of the role of Massive Open Online Courses, Web platform and Webinars, Business Games and Simulations in shaping entrepreneurial learning is offered.

In the context of entrepreneurial education, Sousa and colleagues (2019) defined digital learning methodologies as “new methods of teaching using technology with the purpose to improve the quality of education and involve students in the educational process” (p. 227). However, a recurring problem with digital learning deals with its definition. To orient between different perspectives, it is useful to consider the impact of technologies on social changes. To this end, two approaches are instructive: determinist and instrumental (Feenberg, 1991). Determinist suggests that technology brings out changes regardless of circumstances. Instrumental rests in the assumption that technology serves the purpose of their users independently from what they might be. However, both approaches neglect the interactions between social systems, agents and media that, in turn, carve the impact of technology on real life (Warschauer, 2007).

According to the determinist view, technology in the learning process could give rise to positive changes without considering learners’ social and individual characteristics. According to instrumental view, such technology would increase learning experience just if correctly implemented without taking into account learners' needs and their learning objectives. The above overview leads to the impossibility to define digital learning as a learning process shaped

or enriched by technologies giving rise to the necessity of in-depth theoretical clarifications. On this point, Sangrà and colleagues (2012) cautioned scholars from using “technology-driven” definitions, i.e. those that define digital learning simply as the use of technology for learning, posing academic attention on "educational-paradigm-oriented" definitions, i.e. those that consider digital learning as a new way of learning or as an improvement of an existing educational paradigm.

Enlightening in this sense is the meaning that Naidu (2002) gave to this concept: "[the] educational processes that utilize information and communications technology (ICT) to mediate asynchronous as well as synchronous learning and teaching activities" (p. 137). Salmon (2005) echoed this view by advising that digital learning is not about computer or software but deals with time, knowledge, motivation and appropriate teaching methods. Technologies are instruments that are flexible and interactive by nature that can complement the learning process but never substitute teachers' ability and pedagogical intentions. As stated by Stain et al. (2011), the scope of digital learning is the same of any other educational activity: that is to enhance learning. To this end, technologies employed in digital learning should possess several characteristics (Jansen et al., 2002): 1) active participation of the learners; 2) active control of the process by learners; 3) flexibility and adaptability to learners’ needs.

Digital learning can practically assume the form of courses, modules or smaller learning objects (the smallest unit of learning material) and can be synchronous (learners and instructor enjoy simultaneously the same learning environment) or asynchronous with no geographical barriers.

Although digital learning is considered as an evolution of distance education, those concepts remain diverse and such diversity is threefold (Guri-Rosenblit, 2005). First, the difference stands in relation to remoteness and proximity between learner and instructor in the learning process. That is, distance learning implies, in its conception, the physical separation between those figures but also the absence of a learning group since students approach the learning process individually (Keegan, 1986).

Digital learning can be interchangeably used in distance teaching settings, in this sense technology is a tool to facilitate the process, and in traditional teaching one, in this case technology is a way to enhance the learning experience. Second, the difference relies on target learners. In fact, distance education is normally tailored for those who have difficulties in attending to face-to-face lessons such as: physical/health constraints; geographical barriers; working; family obligations; being held in closed institutions (e.g. prisons or hospitals) (Guri-Rosenblit, 2005).

Distance education has been considered, for this motive, a barriers remover form of learning process. On the contrary, digital learning does not refer to any particular target as it is used by young learners as well as by adults both in and out-campus or classrooms. Third, another distinctive characteristic is the economic cost of digital vs. distance learning. The latter, compared to face-to-face lessons, is normally cheaper due to decreased fixed costs and the possibility to leverage on economies of scale. The former, has higher costs linked to its dependency from technologies that rapidly become obsolete and less useful to teaching. Despite their great suitability to distance education, cost motivations explain why higher teaching institutions do not fully incorporate, or have done it to a little extent, information technologies in their learning paradigms.

Once defined digital learning, it becomes crucial to distinguish among digital learning experiences, those informal activities not planned or structured with a pedagogical aim, and digital learning education, those formal activities that respond to pedagogical needs. The difference among the two rest in the pedagogical usability that denotes whether the tools, content, interface and tasks of digital method environments support participants to learn in various learning contexts according to selected pedagogical objectives. To gain a pedagogical usability, digital learning methods should include (not equally weighted by the way) ten dimensions (Nokelainen, 2006), namely: 1. Learner control, 2. Learner activity, 3.

Cooperative/Collaborative learning, 4. Goal orientation, 5. Applicability, 6. Added value, 7. Motivation, 8. Valuation of previous knowledge, 9. Flexibility and 10. Feedback.

Learner control refers to the possibility to pace, sequence and select information aids learning (Scheiter, 2014). This would increase and sustain motivation to learn but also allows learners to adapt the method to their specific needs and preferences. Learners' activity depends, on a large amount, from the characteristics of the learners themselves but methods can foster or inhibit such activity by assigning the "didactic role" of the instructor: when it is regarded as a simple facilitator, learners' independent activity increases (Reeves, 1994).

Cooperative and collaborative learning takes place when learners collaborate to reach a common learning goal and do not acquire knowledge but participate to create knowledge as members of the learning community (Barab and Duffy, 2000). Goal orientation considers the need of a learning method to have a clear objective that should be aligned with instructors' and learners' goals: however, learners should have the chance to pursue their own goals in coherence with the ones ex-ante offered. Applicability tends to reflect the importance of the acquired skills in everyday life; in this sense, the learned knowledge should be transferred into working situations that learners will face later on. Value-added recalls the need for digital learning methods to offer a better experience to learners that can be achieved through an easier accessibility to materials (access is more effective and economic), greater level of communication between instructor and learners, better fit between necessities (of students) and goals (of learning method). Motivation serves as a powerful tool to reach learning goals (Reeves, 1994).

In digital learning, combining autonomy support (i.e. providing options and recognizing students' goals) and structure (i.e. providing a rationale for a task) positively impact on both intrinsic motivation and learning outcomes in learners and such combination is enhanced by the use of computer-based methods (van Loon et al., 2012). Methods should carefully consider learners' existing knowledge and encourage them to use it. Flexibility considers the ability to shape methods on individuals' differences and to meet individuals' learning objectives. Feedbacks are considered crucial to increase learning motivations: give feedbacks to learners helps to understand, eventual, lacks in her/his learning approach.

## 4.2. Which are the most useful methods?

The use of technology and more in general the use of computer-based tools significantly contributed to the shift from a learning environment where information is presented electronically to a learning one where learners are supported and facilitated in constructing knowledge. Using technology as cognitive support in the learning process offers learners the opportunity to develop high-order abilities but also serves as a stimulus for ameliorating their problem-solving capacities (Oliver, 2008).

Digital learning methods pushed the transition from heteronomous to autonomous learning (Peter, 2000). The former refers to the fit of expository teaching and receptive learning: instructors have the entire control over the learning process and its goals, they "expose" knowledge that is received by learners that are regarded as inactive, or passive, with a learning process that is cognitive. The latter refers to the active role of learners who guide and shape the learning process as well as teaching path.

One of the most used methods, and perhaps less innovative right now, is the interactive whiteboard (IWB) technology that turns classrooms into digital learning ones (López, 2010). At its core, this technology rests on an electronic board, wall-anchored, connected to a projector and laptop connected to internet: thanks to the projector, images of the laptop appear on the board. Despite its low level of technological advancement, IWB has contributed to reduce academic gaps among learners: combining the spoken word (the oral lesson) with the presented word (the combinations of images, sounds, graphs and so on) enhances the learning experience and helps maintaining high the level of attention (López, 2010).

Although IWB allows multimodal learning, that is a learning that uses verbal and non-verbal – such as static (photos or graph) and dynamic (video or animation) – modes to present

knowledge, it lacks interactivity. Interactivity takes place when the path of reaching learning goals depends on the actions of learners that are protagonist of the process (Moreno and Mayer, 2007). In doing this, the way knowledge is presented is not pre-determined or ex-ante established but varies upon learners' actions moving from "information acquisition" to "knowledge construction" (Mayer, 2001). Interactivity enables an action that is bidirectional, between instructor and learners, and not unidirectional, from instructor to learners. Literature individuates five types of interactivity (Moreno and Mayer, 2007): dialoguing (questions and answer of feedbacks); controlling (determining the order of knowledge construction); manipulating (setting the parameters of the action); searching (possibility to find new materials and contents); navigating (possibility to move from of learning block to another or shift the among different information).

Having these considerations in mind, scholars have often individuated digital game-based learning (DGBL) as a valid digital learning method permeated by interactivity. DGBL "is a competitive activity in which students are set educational goals intended to promote knowledge acquisition" (Erhel and Jamet, 2013 p.156). DGBL gives to learners the possibility to interactively explore a learning objective by using an entertainment perspective (i.e. players/learners compete while reaching educational goals) with the aim of developing cognitive skills or practice existing skill in real world-situation. Dealing with practical situations is crucial to meaningful experience and learn. This method has also the merit of stimulating the use of high-order thinking and Hwang et al. (2015) found that it significantly improves students' learning achievements, learning motivations, satisfaction degree and flow state.

Right now, another digital learning method is gaining scholars' attention: augmented reality (AR). It deals with computer-generated virtual information superimposed on the real-object image (Sungkur et al., 2016). AR must not be confused with virtual reality since the former supplements the real world with a virtual learning environment, while the latter totally immerges learners into a virtual environment. Among the merits of AR, Kerawalla et al. (2006) indicated the ability to make learners more dedicated and motivated to explore resources and apply them to real-world environment from multiple perspectives. AR is useful in reaching learning goals because it allows learners to carry out their personal tasks through the help of information complemented by virtual objects (Sungkur et al., 2016).

### 4.3. Focus on "Web platform and Webinars (online or virtual seminars)", "MOOCs" and "Business Games and Simulations"

The main goal of this section is to focus on main digital education methodologies and tools to develop knowledge and entrepreneurial capacity. Nowadays, even more with the Covid-19 pandemic, digital education is increasingly influencing both classroom/campus-based teaching: new models or designs for teaching and learning are becoming increasingly important (Sousa et al., 2019).

The stakeholders of training and teaching – namely schools, training and higher education institutions – are enriching and completing their study programs with specific courses about starting a business, by combining different and independent modules or embedding them into curricula.

In line with the above, supporting teachers while developing new and competitive entrepreneurial skills is worth mentioning in the attempt to face new and emerging environmental challenges.

A very common approach in teaching entrepreneurship education is problem-based learning and learning by doing and its success depends on the overall teaching and learning environment (San Tan and Ng, 2006). The most recent educational priorities highlight the importance and need to break traditional stereotypes in teaching and learning and, therefore, seek a tradeoff between tradition and innovation in the educational practice of teaching the subject "Technology and Entrepreneurship" (Mitova and Zoneva, 2017).

Depending on above, Digital Learning Environment (DLE) is useful to learn and work with digital tools, particularly referring to entrepreneurship Malach and Kylis (2019) define

Entrepreneurial Digital Learning Environment (EDLE) as a useful instrument supporting entrepreneurship education.

According to Malach and Kylis (2019), Business Games and Simulations, Social Networks, Podcats, Webinars, Video Sequences, E-book, Web Platforms, MOOC, and E-testing all belong to the EDLE. Despite this, it is a matter of fact that among all the components mentioned, only a few are more effectively suited to the learning purposes of higher education programs. This is the reason why Mooc, Business Games and Simulation, as well as web platforms and webinars were considered for a further deepening, in this chapter (Figure 4.1).

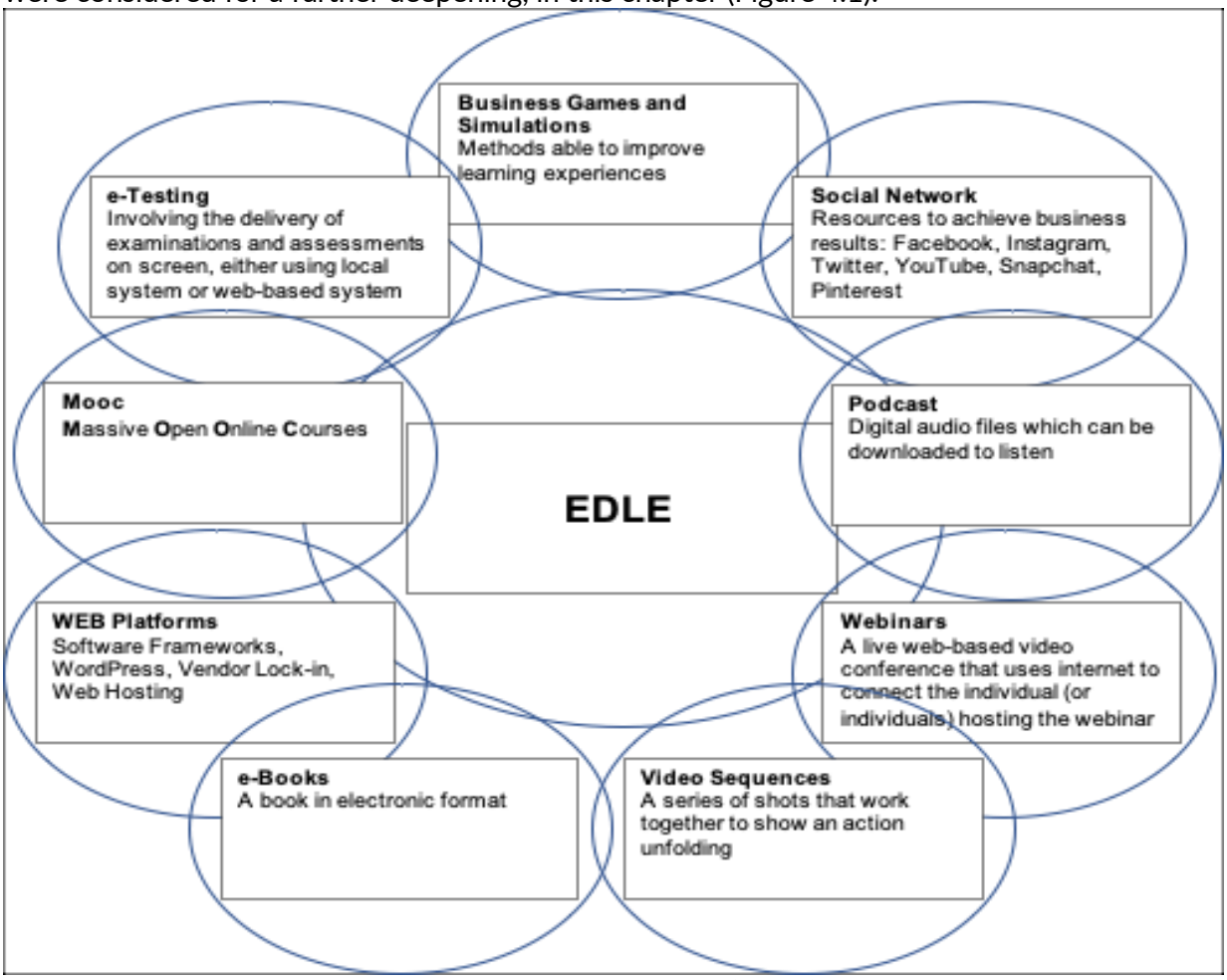


**Figure 4.1. Entrepreneurial digital learning environment (EDLE)**

*Source: adaptation by Malach & Kylis, 2019*

### 4.3.1. Web platforms and webinars (online or virtual seminars)

Web platforms are used to communicate, co-manage information and grow knowledge: they are an important and basic tool for technology-enhanced learning (Jones and Iredale, 2009). The number of the web platforms currently available is growing to a great extent, mainly because of the Covid-19 pandemic. Among them, Blackboard Collaborate, Adobe Connect, Webinar Jam, Zoom, Cisco Webex, Microsoft Teams, Google Meet, are the most used and well-known ones.

The use of web platforms to disseminate and further entrepreneurship education can foster wealth creation, promote freedom and create opportunities for individuals, businesses and civil society at large (Jones and Iredale, 2009).

If web platforms are the tools, the webinars – a live web-based video conference that uses internet to connect the individual (or individuals) hosting the webinar – are the content.

Webinar is “a seminar conducted over the internet” (Oxford Learner’s Dictionaries), is “an occasion when a group of people go on the internet at the same time to study and discuss something” (Cambridge Dictionary), is “a talk on a subject which is given over the internet, allowing a group of people in different places to watch, listen and sometimes respond on the same occasion” (Macmillan Dictionary).

Given the frequent use of webinars, many scholars tried to detail their characteristics and rules (Marić, 2017; Beckingham and Nerantzi, 2015; Darbey, 2011).

Particularly referring to the webinar characteristics, the continuing flow of language, information, knowledge, skills development opportunities may be easily detected. Each webinar needs a video conferencing software and can be synchronous (in real-time) or asynchronous (replay). It is open access (even if registration is usually required) and it is recorded and available for a limited or unlimited period of time on websites or social media channels. One of the main advantages of webinar is that it enables synchronous interaction with the lecturer/presenter, audience and content presented enabling a high number of participants (depending on the organizer’s choices) to access the contents. Accordingly, seminars and conferences are a great opportunity for discussing and sharing new insights and networking with peers and can be considered as scientific meetings. Moreover, they can hold more participants than a physical conference room setting which could be limited by different problems such as space and accessibility.

Referring to its duration, each webinar usually lasts 60-120 minutes, but it may be also managed as a series of sessions (e.g. “webinar day”); can be short term appointment, in terms of one session duration, but continual in terms of monthly or yearly planning; and last social media pages and groups can attract a wide range of teachers or scholars interested in topics being presented. By organizing regular online seminars, it is also possible to share knowledge, so, as consequence, webinars present a great virtual opportunity to stimulate and engage interactions between presenters and participants and content analyzed. But we have to remember that a successful webinar session is highly dependent on previous planning activities.

Fadlelmola et al. (2019) define ten simple rules for organizing a webinar series:

- Assemble an effective webinar coordination team,
- Align a webinar theme to the expectations of the audience,
- Consider a webinar planning checklist,
- Share webinar organizational documents,
- Plan early and devise a calendar of regular activities,
- Settle on a convenient and user-friendly webinar platform,
- Select theme expert presenters,
- Announce webinars through mailing lists and social media platform,
- Allocate time for the platform orientation,
- Iteratively assess and evaluate what works and what doesn’t.

### 4.3.2. Mooc

There is no unambiguous, simple and broad accepted definition of Massive Open Online Courses (MOOC). Investigators of the EU project called "E-learning, Communication and Opendata: Massive Mobile, Ubiquitous and Open Learning (ECO)" have chosen the following clear operational definition for MOOC as *“online course designed and built for numerous participants which can be accessed freely everywhere, as long as you have an internet connection, it is open to all with no entry requirements and offers a free and comprehensive course experience”* (Brouns et al., 2014).

MOOCs represent one of the strongest trends (Cirulli et al., 2016) within the field of digital entrepreneurship education tools. greatly influencing both the contents and the flow of teaching and learning. They may be also considered a disruptive innovation able to foster the involvement of many people in an open online course available via the Internet (Pizarro Miliam and Gurrisi, 2017). MOOCs have developed from the growing experience of universities in the use of distance learning and open educational resources (Clarke, 2013).

The many benefits that can be obtained with MOOCs include the ability to bring together the best academics from leading international universities, to prepare excellent learning materials and to offer courses for free (Clarke, 2013). Major universities such as Harvard, MIT and Stanford have developed MOOC platforms such as Udacity, Coursera, edX, MIT Open Courseware and Stanford eCorner and the courses have been created with the aid of technological supports for self-learning (papers, short videos on well-focused content, flash animations) and, at the same time, for synchronous and asynchronous interaction.

MOOCs represent a privileged tool for the development of knowledge and certain skills among adult learners with sufficient motivation, self-regulation (Onah & Sinclair, 2017) and cognitive quality time to engage and succeed in these online courses. In light of the foregoing, MOOCs could be considered an excellent opportunity for many participants in informal settings to achieve educational goals such as developing an entrepreneurship culture (Pizarro Miliam and Gurrisi, 2017).

MOOCs have four main characteristics (Schulmeister, 2013):

- they are open to everyone, so there are no entry requirements,
- there is no numerical limit of participants,
- are free,
- are made completely online.

MOOCs also have critical issues such as, for example, the reduced quality of resources and materials that support online learning, the interaction of students and academics, the high fees required by leading online courses, and difficulties with assessment and accreditation (Clarke, 2013).

MOOCs also have high dropout rates: fewer than 10 percent of those enrolled take the final exam (Clark, 2013).

Developing, implementing, and supporting a MOOC requires considerable effort. This aspect concerns the universities or academics who are developing the courses. However, this also applies to platform providers who make courses available to participants (Treeck et al. 2013).

The spread of MOOCs on entrepreneurship has made possible to provide digital content both inside and outside the classroom to students involved in entrepreneurship initiatives (Roehl et al., 2013): there have also been great benefits for educators and students, far from the pulsating ecosystems companies, to access a wider range of support, skills and content (Al-Atabi and Deboer, 2014).

A lot of studies have thoroughly analyzed the phenomenon to understand the positive impacts and assessment of students' learning outcomes in entrepreneurship courses offered as MOOCs. The results showed that the MOOC is an excellent platform for teaching entrepreneurship, as it provides numerous tools that facilitate collaborative learning and enhance the most important affective entrepreneurial aspects of individuals, such as recognition of opportunities and acquisition of resources (Al-Atabi and Deboer, 2014).

Given the relevance of the MOOC, a project was developed to understand its spread in Europe: the BizMOOC project.

The BizMOOC project represents one of the most important analysis and study efforts of MOOC phenomena in the European area. In 2016, the BizMOOC project was aimed at understanding the compliance of MOOCs for the business world.

Based on these findings, BizMOOC focused on lifelong learning and business key competences "Learning to Learn (via MOOC)", "Entrepreneurship and Intra-entrepreneurship" and "Innovation, Creativity and Problem Solving" were developed to test different approaches to career-oriented learning. BizMOOC allows a private company or a public institution to teach their employees and/or students in an innovative, easy to manage, scalable and flexible way, while at the same time acquiring knowledge and developing skills (Malach and Kylis, 2019).

### 4.3.3. Business Games and Simulations

Currently, there is a growing trend towards the use of business simulations at all levels of education. Business simulations and games are used as a tool for improving the traditional learning environment. In doing so, business simulations particularly provide a so-called "secure environment" (Barišić and Prović, 2014).

Business games are role-playing experiences that involve economic and financial issues and, at the same time, aim to develop monetary and financial management skills. Students, trainers and workers address managerial issues and define market strategies. The main educational and training purpose consists in the development of decision-making skills and confidence in business strategies (Knotts Jr and Keys, 1997; Ceschi et al., 2014). The simulations replicate particular social or physical realities in which participants make decisions with well-defined responsibilities and constraints (De Freitas and Oliver, 2006).

Simulation-based learning is developed on the basis of constructivist learning theory, as users learn or construct new knowledge from their conceptual knowledge (Dewey, 1938; Vygotsky, 1978; Zulfiqar et al., 2019). Some scholars (Mawhirter and Garofalo, 2016) have argued that simulation is a creative and innovative way to increase students' interest in learning (Zulfiqar et al., 2019).

The simulation is a stimulating and effective virtual system that offers students a varied and risk-free "protected" environment in which they can work together, discuss and make decisions.

In line with the above, business simulation games define a series of rules and roles that students must follow and, therefore, the essence of work in a reality-based scenario (Leemkuil et al., 2000).

Business simulation games are mainly adopted within the field of management, marketing, finance or accounting, economics, product development, and entrepreneurship. These games provide students with innovative and creative ways to improve their learning skills, in a virtual environment, within real business scenarios (Mawhirter & Garofalo, 2016). Thus, technical and critical thinking of students is enhanced by making an association between their theoretical and practical knowledge (Bell and Loon, 2015).

Over the years, "*the use of games and simulations in economics has become well established, with a well-developed body of literature to support their use in the teaching environment*" (Sutcliffe, 2002, p. 2). In this sense, business simulations can be considered effective for improving business skills (Greco & Murgia, 2007; Rachman-Moore & Kennett, 2006). Some authors argue that assessment methodologies lack scientific rigor and that it is difficult to demonstrate that learning takes place through simulation (Gosen & Washbush, 2004; Anderson & Lawton, 2009).

A lot of studies have analyzed the advantages of simulation games for educational purposes (Aldrich, 2004; Kafai, 2006; Lainema and Nurmi, 2006). According to the mentioned multiple benefits of business games were identified by Barišić and Prović, (2014), such as:

- motivation for learning (Garris et al., 2002),
- complex approaches to learning processes and outcomes (Sterman, 2001),
- student involvement (Kiili and Lainema, 2008),
- active learning techniques (Oblinger, 2004).

In view of their advantages, business simulation games can be useful as an innovative pedagogical approach to teaching business concepts (Aldrich, 2004; Prensky, 2001).

Taking into account the mentioned considerations, both business games and simulations may be adopted as an effective, easy and enjoyable tool for knowledge transfer and learning, supporting the students in the development of a "critical mind" (Zulfiqar et al., 2019).

Simulation-based training is believed to be an additional tool in classroom learning that enhances cooperation between students with greater involvement in the overall learning process (Otting et al., 2009; Zulfiqar et al., 2019).

Empirical evidences (direct observations of business simulation games engaged in business training courses) enables us to highlight both the advantages and opportunities arising in a learning environment (Barišić and Prović, 2014), as in the following:

- increasing efficiency;

- encouragement for the development of enjoyable, funny, and transparent learning environments;
- teamwork supporting, with reference to both collaborative attitudes and reskilling processes;
- establishment of a "protected environment" at both individual and organizational level, useful to encourage the experimentation of new strategies in the absence of risk;
- speed up of evaluation processes, since the enabling of immediate and clear feedback about the consequences of individual decisions;
- improvement of experiential learning and hands-on approach;
- enhancement of students' attention, motivation and problem-solving skills;
- expansion of the available set of learning tools that add to case studies or lectures.

The present chapter analyzed the role of digital learning in fostering entrepreneurship education. First, it distinguished between learning occasions available thanks to technology tools and learning methods by levering on the concept of pedagogical usability that discriminates whether or not a method supports participants to learn in various learning contexts according to selected pedagogical objectives.

The analysis remarks the importance for digital learning to possess the following characteristics: 1) active participation of the learners; 2) active control of the process by learners; 3) flexibility and adaptability to learners' needs (Jansen et al., 2002).

This chapter also focused on the most effective methods among various forms of digital learning. It scrutinized the interactive whiteboard, digital game-based learning and augmented reality. After reviewing them from the pedagogical perspective, it offered a structured overview of the current trends in teaching entrepreneurship via digital methods. In this light, web platforms and webinars, massive open online courses, business games are posed under the entrepreneurship educational lens.

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# 5. CURRICULUM UPDATE MECHANISM

Each learning system performs a cognitive and educational function, gathers and transmits knowledge, and creates incentives for development. It allows students to acquire knowledge and develop their competences (Annala et al., 2016). The curriculum is a key element of the education system: it has a guiding and informative function, but also consolidates and stabilizes the whole teaching system. In this way, the entire educational path is a fairly stable transition from the entry level (lack of knowledge) to the graduate level in terms of knowledge and skills.

As a result, the curriculum becomes information for both the student and the future employer about the method of teaching, the scope of knowledge, acquired skills (Meij & Merx, 2018). For this reason, the curriculum should not be subject to revolutionary changes, but should be built as a stable foundation (core), and all changes should result from the need to introduce technical, technological, substantive and procedural supplements only in terms of adapting the curriculum to changes in the real word (Levander & Mikkola, 2009). With the assumption of keeping the main foundation of the curriculum unchanged, it becomes possible to implement similar curricula in many places simultaneously (Annala et al., 2016). The differences in these programs result mainly from the specificity of the place (country) and the students – their level of knowledge and the scope of the need for specific detailed knowledge.

## 5.1. Purpose and main principles of the curriculum

The primary goal of the curriculum update mechanism is to ensure that the content presented during the course is up-to-date. It is mainly created for partnership of organizations creating the proposed content. Updating the curriculum is a necessary element of the educational process, the main reason is the need to adapt the program to the current offer available on the educational market, to modernize the content and tools in the context of technical and technological changes, and to refer to practical utility for everyday life (Young, 2014). An important aspect of keeping curriculum update is also the changing expectations of students and teachers (Kulm & li, 2009).

For this purpose, general principles for updating the curriculum have been developed. These principles will build the foundation for the updating process, making it repeatable and sustainable. As a result, it will be possible to flexibly adjust curriculum to the needs and challenges of today's world (Mccombs, 2008; Murray et al., 2004; Yang et al., 2019). The main guidelines are:

- Monitoring and studying society and market problems and needs, weaknesses reported by market and educational experts, students, and teachers.
- Building a curriculum must follow the experience of students subjected to the educational program, how they are doing in the marketplace.
- Teachers and their experience are a key element of updating: Insights, exam results, project results should supply the mechanism with data.
- Teachers' assessment of consultations with students: results in a teacher survey.
- The identification of key problems in educational process and the simultaneous identification of general changes in trends in educational processes must be based on monitoring of changes.

- The group overseeing the process and developing the curriculum must collect data on the strengths and weaknesses of the curriculum, as well as consider the needs and preferences of students and teachers.
- It is necessary to analyze the quality and adequacy of textbooks and other materials, as well as in the area of the goals and specific topics of classes reflected in practice.

## 5.2. Construction of the curriculum update system

The designed curriculum update system allows to update the curricula and adapt them to the needs of students and teachers. This system consists of two consultation and monitoring groups as well as participants and stakeholders of the educational process.

These groups will be established on two levels, they will be the International Group and the National Groups.

International group (IG) composed of representatives of project partners whose task would be to implement top-down updates – based on scientific knowledge and information from the market obtained in the form of partial reports carried out by national groups (Top-Down Update Protocol (TUP)). The IG acts as a Digital Entrepreneurship Education Program Council.

National groups (NG) composed of people implementing the project at the national level (the level of each partner), whose task would be to implement the bottom-up update. This update is based on national summary reports based on student and course teacher opinions (Bottom-Up Update Protocol (BUP)). The NGs act as the university's teaching and curriculum teams. The NG operates in every country of partnership.

The second group of participants in the updating process are participants in the educational process, that is, teachers and students.

Teachers are an important link between the information flow and generating conclusions at the level of students' own experiences. The information flow from a report summarizing the didactic process and from a curriculum evaluation analysis. Teacher-led assessments improve the quality of the curriculum in its most important aspects, especially when it comes to adaptation to the needs and abilities of pupils / students (Kulm & li, 2009). On the other hand, students are beneficiaries of educational activities and at the same time the source of information provided directly to teachers and by means of satisfaction surveys and curriculum analysis. Thus, student assessment is important as it increases the quality of curricula, especially in terms of the way classes are delivered and the tools used in the process (Kulm & li, 2009).

The NGs and the IG will constantly cooperate with the stakeholders of the educational process. Stakeholders include representatives of the business community and representatives of academia and training. Stakeholders are responsible for changes in the educational goals and the form of the educational process. In the case of stakeholders, the most important feature is goal orientation (Bilén et al., 2002). Stakeholders suggesting changes to improve the curriculum, their propositions are considered at meetings of NGs and recommended to IG. Stakeholders' opinions are also taken into account at the highest level, i.e., in the case of an IG, during the preparation of the report “Tracking the world”.

An important element in creating the system is the identification of sources and methods of obtaining data and opinions that will allow updating curricula. The following will be used for the main methods of obtaining data:

(1) Analysis of the teaching process at the university implementing the curriculum (content and technical research). In this case, the responsible body is the NG, based on the opinions of the teachers and their own.

(2) Analysis of student needs / expectations and satisfaction surveys. In this case, the responsible body is the NG, based on the opinions of the teachers.

(3) New experiences of the lecturers. In this case, the responsible body is the NG, based on the opinions of the teachers.

(4) Analysis of new educational techniques etc. In this case, the responsible body is the IG.

(5) Analysis of changes in market needs as expressed by employers or in scientific research / analysis. In this case, the responsible body is the IG.

(6) Analysis of the teaching process in other countries/universities/courses. The entity responsible for this action is the IG. An important element of the update system will be reports with recommendations for changes in the education process and curricula. As a result of implementing the designed update mechanism, a report consisting of two parts will be created, which will contain the guidelines for updating. This will be part of the main report developed by an IG, this part will be called: "Tracking the World". This part will present the conclusions of the monitoring of teaching methods and methods used in the world. The second part of the main report will be the BUP summary, it will consist of 3 parts: (1) recommendations of the IG, consisting in the diffusion of national solutions throughout the partnership; (2) recommendations of the NG derived from internal reports that are part of the quality assurance process of the education process as a summary of the BUP protocol; (3) individual, ad hoc, non-formal assessment recommendations curriculum assessments by group members, teachers or stakeholders.

## 5.3. How the curriculum update mechanism works

The cycle begins with a thorough evaluation of the implemented program; as a result, it will be possible to propose a program improvement in order to improve the quality and effectiveness of the implemented activities. The repeatability of this process will guarantee flexible adaptation of the curriculum to the changing educational, technological and economic reality (Figure 5.1).

The curriculum development and improvement cycle will mirror the Deming Cycle (PDCA). In this way, it will be possible to use a proven solution that allows for a critical analysis and, as a result, to identify weaknesses and improve badly functioning elements, and to implement improvements that increase the efficiency of the entire system.

The cycle consists of two main protocols (update paths) presented below:

1) a bottom-up update protocol (BUP). This update is based on (1) observation (monitoring) of the teaching process (2) analysis of student needs/expectations (3) individual experiences of the teachers

2) a top-down update protocol (TUP). This update is based on gathering information regarding: (1) learning processes in other countries/universities/courses etc. (2) implementing new educational techniques etc. (3) changes in market needs as expressed by employers or in scientific research/analysis.

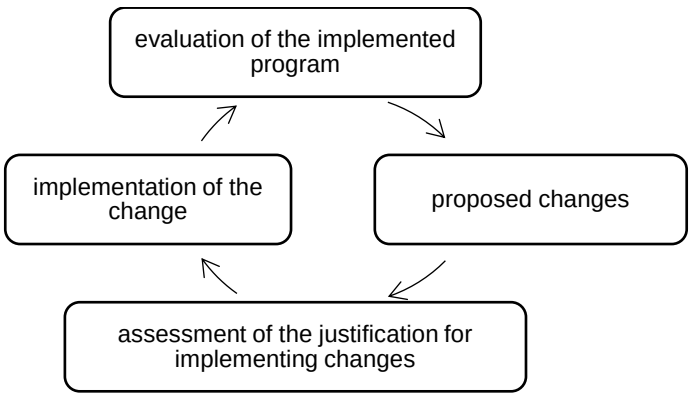


**Figure 5.1. General scheme for updating the digital entrepreneurship curriculum**

*Source: authors' development*

Overall, the full update will consist of two independent ways of updating the curricula which, at the level of conclusions and recommendations, will be combined into one report (Figure 5.1).

### 5.3.1. The bottom-up update protocol (BUP)

This protocol is a formalized flow of information from teachers and students to the NG (see Figures 5.2 and 5.3). The information will include opinions of students and teachers, summaries of the teaching process created by teachers (As a result, a report summarizing the teaching process is prepared).

The bottom-up flow of information stops at the level of the NGs. The NG decides which information reflects only country specificities and which is relevant to the entire education process. In the first case, when the need to change the curriculum results only from the national specificity, the country groups make their own decisions on the implementation of changes based on the information received. The changes implemented at this level will concern the adjustment of the curriculum to the specificity of students, the specificity of the country's culture and economy, and the national education system. Changes that take account of these specificities will be undertaken autonomously by national groups. The change process is reported to the international group.

In the latter case, the NGs consider, on the basis of the information (opinions) received, that the procedure and the way of teaching the entire curriculum require changes, then the NGs decide on sending the relevant information to the IG, i.e., they decide what information is crucial for the entire teaching process. Information on the overall curriculum design, effectiveness, quality, etc. that may imply changes to the entire curriculum is sent to the IG – changes to the entire curriculum remain the responsibility of the IG. The IG, based on information from partners (Summary Report of the Teaching Process supplemented with information from the I-BUP), makes decisions about introducing changes to the general and specific assumptions of the curriculum. These changes cover all areas of the curriculum vertically and horizontally.

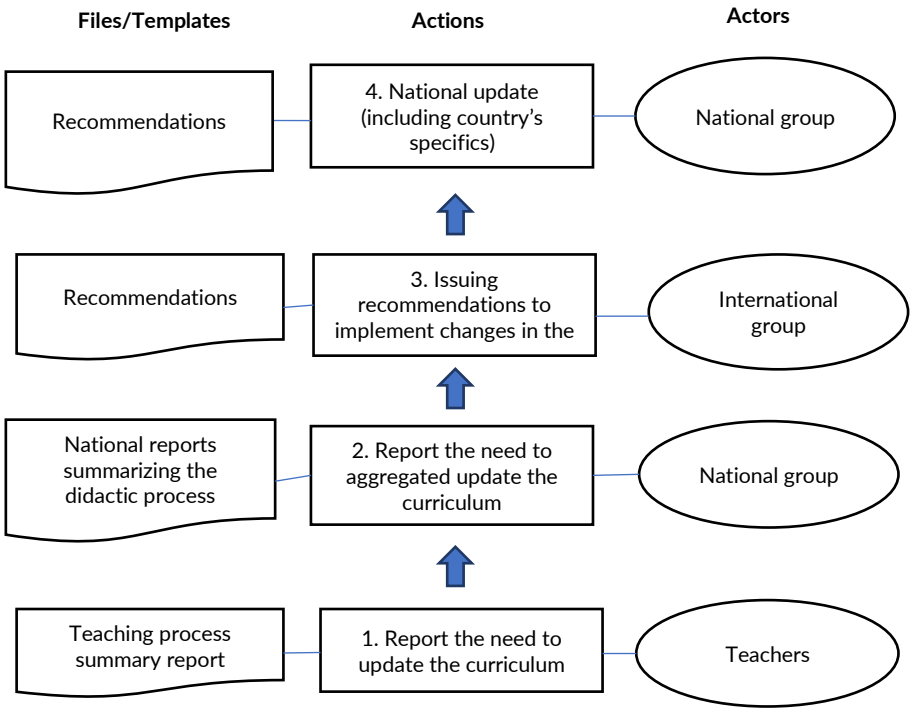


**Figure 5.2. The generic scheme of bottom-up update**

*Source: authors' development*

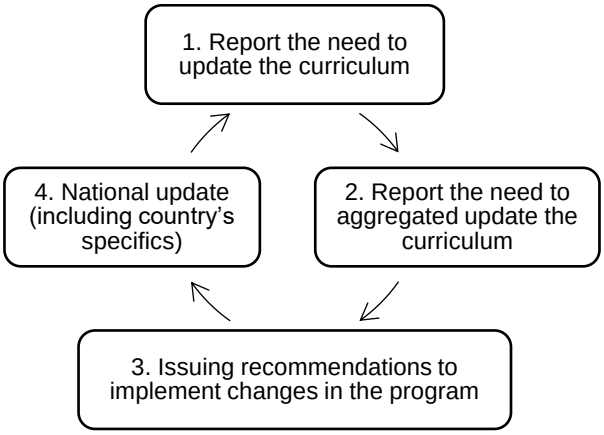


**Figure 5.3. The cycle of bottom-up update**

*Source: authors' development*

## 5.4. Top-Down Update Protocol (TUP)

Top-Down Update Protocol (TUP) covers activities initiated by the IG. This group commissions cyclical analyzes about: changes in curricula, changes in technologies and tools used in the educational process, as well as takes into account changes in the economy, science, etc. As a result, it creates the report called "*Tracking the World*". Based on this Report, the IG introduces changes to the entire educational program and develops *Recommendations*.

Creation of "*Tracking the World*" report will take place during the implementation of the educational program and will be carried out by teams at the national level. The results of the teams' work will be available two weeks before the end of the educational process. Thanks to this chronology, after the end of the educational process, the IG will have information from the work carried out under the bottom-up and top-down protocol (*Tracking the World* + BUP).

The BUP can be completed by protocol for spontaneous and Individual Bottom-Up Updating (I-BUP). This protocol covers activities initiated by individual employees, students, stakeholders. The application is made electronically to the NG via standardized application. The NG analysis such reports as part of the BUP and follow this protocol. The reason for implementation is the result of studying social and market problems and needs reported by market and educational experts, students, and teachers. The result is a report from BUP supplemented with information from I-BUP.

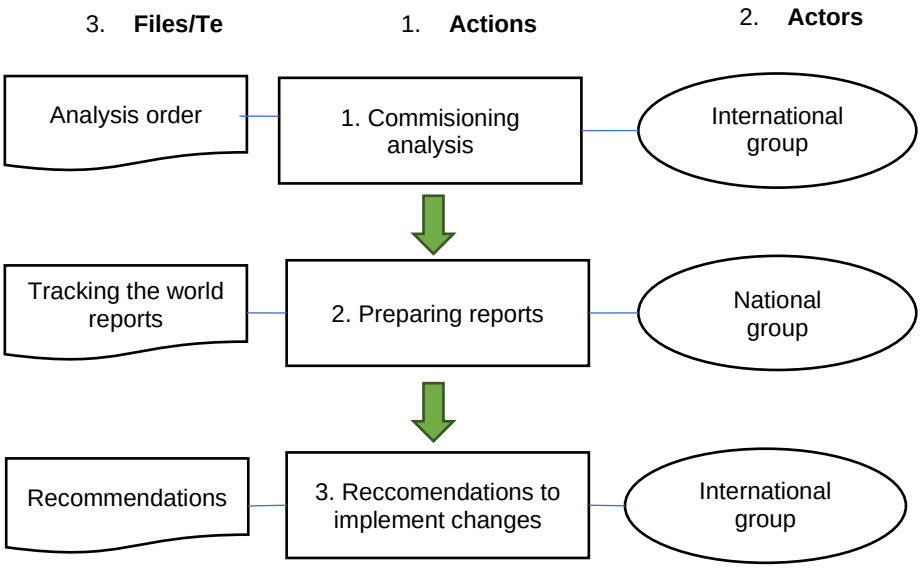


**Figure 5.4. The generic scheme of top down update protocol**

*Source: authors' development*

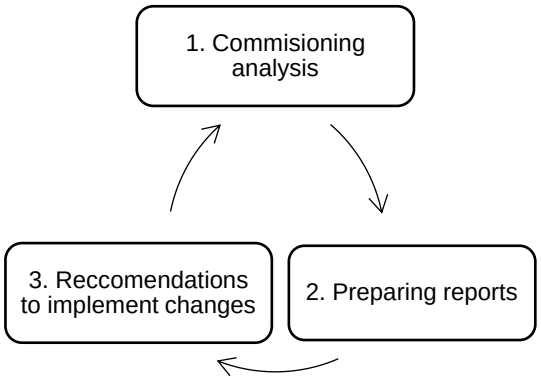


**Figure 5.5. The cycle of top-down update**

*Source: authors' development*

## 5.5. What products will be made and how

The key element of the whole process are the products that will be created as a result of the implementation of the procedure described as "*Curriculum Update Mechanism*". This procedure provides that every year, after the end of the course, a *Main Report* will be prepared containing conclusions from the monitoring and evaluation of the curriculum implementation process as well as conclusions from the analysis of curriculum implementation and changes in the educational, market and technological space observed in a given period. This report will contain recommendations for changes, if the conclusions of the report's analysis require such them. The report will consist of two parts corresponding to the two-update paths proposed in this chapter.

In the first part, the Report will contain conclusions from the so-called Report from BUP supplemented with information from I-BUP based on: 1. Grading table; 2. Student opinions; 3. Teacher opinions.

Detailed sources:

- Student Performance – Grades
- Students' opinions – An analysis by teachers of students' opinions on the curriculum, content-related evaluation of the curriculum, technical evaluation and student satisfaction.
- Teachers' opinions – The opinions presented by teachers on the implementation of the curriculum will supplement the opinions of students. These opinions will, as in the case of students, concern the curriculum, content-related evaluation of the curriculum, technical evaluation and teacher satisfaction.
- Individual opinions of stakeholders and / or participants of the didactic process

The second part of the main report "Tracking the World" consists of partial studies. These analyses will be conducted in order to find new solutions, challenges, weaknesses or problems that arise in the area of interest of curriculum developers and that may affect the way of learning or the content of the curriculum. Therefore, analyses will be carried out in the aspect of curricula of similar courses implemented by other educational entities and curricula of other courses and those involving digital education technologies. In addition, educational trends and how educational leaders in this field work will be analyzed. In the next step, the results of the analysis: changes in market expectations, economic preferences and potential changes in employers' expectations will be presented.

The implementation of the update process in its two paths (visible in the form of a report) will allow to improve the quality of the educational process and increase its effectiveness by making the process more flexible and permanently adapted to the needs of students and teachers and enriching it with new solutions used in curricula, in the economy, as well as

modernizing it through the use of new techniques and technologies. Figure 6 depicts nested cycles from TUP and BUP.

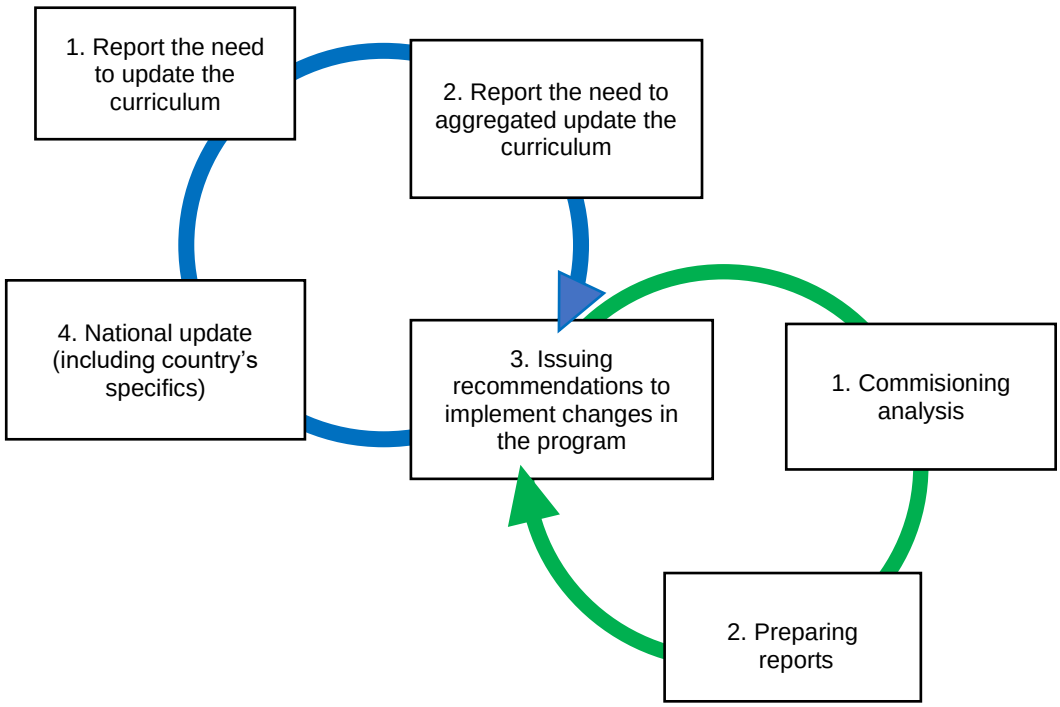


**Figure 5.6. Nested Top Down and Bottom-Up Updates Protocols**

*Source: authors' development*

**Francesco Schiavone, Pedro Víctor Nuñez-Cacho Utrilla**

*University of Naples Parthenope, Italy; University of Jaen, Spain*

# 6. BEST-PRACTICES OF TEACHING DIGITAL ENTREPRENEURSHIP IN THE FOURTH INDUSTRIAL REVOLUTION

After the global diffusion of some critical socio-economic and business phenomena, such as the industry 4.0 revolution, digital transformation, sharing economy, and others, digital entrepreneurship became a crucial domain for both entrepreneurship researchers, educators, investors and public administrations.

Depending on the above, it is necessary to adapt traditional teaching in entrepreneurship to the new technological and economic reality. In this way, it is necessary that both the methodologies and the teaching tools are transformed to make a new kind of entrepreneurship a reality, digital entrepreneurship.

An effective teaching of digital entrepreneurship is crucial for the economic development stimulating entrepreneurial spirit and the creation of new companies related to the digital economy, to better understand the habits and behavior of stakeholders. In particular, this subject, if properly taught and transferred, can be useful to train change agents that companies need to tackle the digital transformation process and a powerful support for students in disadvantaged contexts and/or personal conditions.

The goal of the present chapter is to illustrate some best practices in teaching digital entrepreneurship via the most common IT tools available, namely platforms for video-conferencing, MOOCs, and business simulations and games, already examined in the previous chapter, where the scientific literature about the subject was reviewed, focusing on articles on entrepreneurship, innovation and new university teaching methodologies.

To identify best practices, a review of the web pages of business schools, universities and other training centers was carried out.

The present chapter is organized as follows. After the present introduction, the next section reports some European best practices in the utilization of video-conferencing platforms and webinars for teaching digital entrepreneurship. Section 3 analyses MOOCs and describes the key characteristics of Coursera and other platforms providing such educational services. Section 4 is focused on the application of business games and simulations for improving the quality and impact in teaching digital entrepreneurship. Finally, the fifth and last section provides a short summary of the main findings and offers various suggestions and guidelines for instructors.

## 6.1. Best Practices via Video-Conferencing & Webinars

With the Covid-19 pandemic, educators all around the world were forced to adopt suddenly online platforms, such as Zoom, Google Meet, Microsoft Teams, and many others, in order to keep providing courses to their students. In the field of digital entrepreneurship, the adoption and implementation of these platforms generated radical changes to the teaching methods and syllabi used by teachers.

In the present subsection we stress the key aims of digital platforms for video-conferencing & webinars, the ideal format (ex. duration of programs, delivering process – synchronous vs asynchronous- in the selected best practices, etc..), benefits and limits of the different tools implemented by the selected sample.

In order to find and illustrate some remarkable examples and best-practices of such forced radical changes in teaching modalities and structure, we review how the adoption of online

platforms impacted the teaching of digital entrepreneurship in the top 5 European business schools ranked in the Financial Times Ranking 2019: HEC Paris (France), London Business School (UK), SDA Bocconi (Italy), University of St. Gallen (Switzerland), and Insead (France). The date and information about such best practices were gathered online from the Business Schools websites. The subsection ends by reporting a table summarising the key characteristics of these best-practices.

HEC Paris, from 2014, before the Covid-19 pandemic, has been the first business school in Europe to launch Massive Open Online Course (MOOC) in partnership with the Coursera platform. Since then, the university has provided online courses and on-campus courses. Online courses are provided in partnership with Coursera and concern degree programs, executive certifications and MOOCs. Degree programs and executive certifications include fees, while MOOSs are free and targeted at people who not usually have access to higher education.

On-campus courses have been re-organized because of Covid Pandemic. Despite HEC Paris considers community life one of the cornerstones of its education, lessons have taken place online on the Zoom platform. Particularly reffering to digital entrepreneurship, HEC Paris proposes a "Digital Entrepreneurship certificate" as a part of a master's program or MBA. The certificate is integrative courses that offer over 100 contact hours on real business projects and fieldwork. Lessons are conducted in a synchronous way by both Professors and experts. Although this kind of certificate requires group participation in project work and case studies analysis, activities have been carried out online. Participants who initially have claimed less effective group works results have considered positive networking actions on ZOOM like "Zoom apéros" that have improved the relationship among participants. Furthermore, the faculty has evidenced a clear advantage of online sessions. The facility organizes events with professionals and guest speakers worldwide: they are very open to participating because they better handle their work commitments.

London Business School (UK) has developed new and open learning ways, proposing three types of lessons: hybrid, live and online. These options were reserved for executive programs to provide a world-class education for its participants, but these challenging times have led LBS to adopt the same strategy for ordinary courses in the duration of the national lockdown. Degree and Executive Education programs will be delivered online, joining classmates via Zoom.

The LBS has not a specific course on digital entrepreneurship. Within the Global Master and the Master in Management, the university has an elective course in "Digital strategy"; while within Executive Education, there is a course titled "Exploiting disruption" in the "Strategy program" , an entire program dedicated to "Digital transformation and innovation" and an online program in "Innovating in digital world". Master degrees delivered exclusively on campus, are recently scheduled on Zoom. Executive Educations on related issues on digital entrepreneurship are conducted through Hybrid or Online Learning. The Hybrid form is a new learning model that enables the simultaneous delivery of programs to participants either on-campus or live virtually. The duration of the program is on average 5.5 days. The Online form is a self-paced, flexible online learning (5 weeks). The modality unlocks insights from the faculty, connects participants with a global network of peers and benefits from a dedicated Learning Manager who supports participants in engaging assignments and self-paced learning activities. Advantages of that approach are:

- increased participation of practitioner speakers, willed to stay more time to discuss with participants;
- recorded lessons. They permit students to listen to more time professors and speakers' interventions.

Weaknesses concern the social aspect and group work. However, students have organized virtual events such as virtual dinners to have fun with classmates and have collected feedback periodically to ensure the level of satisfaction of students.

SDA Bocconi, in compliance with government measures, delivers distance or hybrid courses. Depending on course type, the university offers live online programs or on-demand live programs. They are scheduled on an e-learning platform named Blackboard that from 2017

supports the university's educational activities. Particularly courses are provided in a synchronous way through the section BlackBoard Collaborate. Lessons could be followed in asynchronous way later, but for a given and short period. Concerning digital entrepreneurship courses, the university has not a specific course. Bocconi offers the "Digital Entrepreneurship week" or the "Digital transformation week" in its EMBA program; the "Digital Enabled Business Transformation" elective course during the "concentration" phase of the MBA; an open executive program in "Digital transformation and innovation" delivered in a hybrid way.

The first couple is a single modality course, while the last one plans distance learning as an independent activity. It refers to an asynchronous learning mode that provides access to training tools, business cases and materials on an e-learning platform, and face to face learning. However, if, on the one hand, participants consider the usability of the platform and the flexible organization of their time in attending lessons positively, other participants complain about the new sociality and the lack of company visits and learning lunch.

Since 2019 the St. Gallen University has discussed innovative teaching and learning, believing teachers' role change towards supervision or coaching, while students increase individual learning blocks. During the autumn semester 2020 it has experienced the so-called "social video learning", a practice that integrates mini-teaching blocks with video material, feedback and discussion. Nevertheless, the corona crisis has impelled all professors to adopt a hybrid, traditional teaching method, using the Zoom platform to connect themselves with their students. The St. Gallen University has not a specific course in "Digital entrepreneurship", too; however, it offers a generic course in "Entrepreneurship" and courses about digitalization of customers and digitalization of industrial organizations (13-14 credits). Courses are provided mainly in a synchronous way for bachelor students. Similarly, it has an Executive MBA in "Business engineering" on the business transformation in digital era conducted online in a synchronous way and other short programs, such as "Digital innovation and business transformation" and "Digital transformation implementation".

Complete online courses hamper the development of relationships, emphatic cooperation and not improve students' learning objective attainment. The advantage is the flexibility of students in organizing their lives.

Insead (France) hosts over 500 events per year. Many of these were already online. In addition, now that physical events have temporarily been suspended, the university moves many of them online. Like other business schools, it is using online learning, engaging virtually professors, students and participants. Courses related to digital entrepreneurship issues are provided in open programs or programs for executive education that could be proposed as live virtual or online programs. Live virtuals are in synchronous format with 6 days on average of duration. They are processed on the Zoom or Go-Live platform. Their value is similar to on-campus courses because it ensures a high level of interaction with INSEAD faculty, such as one-on-one discussion, coaching and real-time feedback. Online programs are in asynchronous format, are online pre-recorded lectures organized by participants for 5 weeks on average (4-6 hours per week). They are accessible on the INSEAD Online Learning Platform, a dedicated course platform with program materials, various content elements, discussion forums, and more (Table 6.1).

**Table 6.1. On-line course and program characteristics**

| Business School | Education Level | Course/Program | Language | Platform | Mode | Delivering Process | Duration | Strengths | Weaknesses |
|---|---|---|---|---|---|---|---|---|---|
| HEC Paris (France) | Master, Executive | Digital Entrepreneurship certificate | English, French | Zoom | Online | Synchronous | 100 h | · Zoom Apéros<br>· Facility in organizing event with professionals and guests speakers | · Workgroup and experience sharing |
| London Business School (UK) | Master | Digital strategy | English | Zoom | Online | Synchronous | - | · Increased participation of practitioner speakers | · Social aspect and group work |
| | Executive | Exploiting Disruption in a Digital World | | | Hybrid | Synchronous | 5,5 days | | |
| | Executive | Digital transformation and innovation | | | Hybrid | Synchronous | 5 days | | |
| | Executive | Innovating in digital world | | | Online | Asynchronous | 5 week | | |
| SDA Bocconi (Italy) | MBA | Digital Enabled Business Transformation | English | BlackBoard | Online | Synchronous | 2 months | · Usability of the platform<br>· Flexible organization of time | · Online sociality |
| | Executive MBA | Digital week | Italian, English | | Online | Synchronous | 1 week | | |
| | | Entrepreneurship week | | | | Synchronous | | | |
| | Executive | Digital transformation and innovation | English | | Hybrid | Syncronous/ Asynchronous | 4 days | | |
| University of St. Gallen (Switzerland) | Bachelor | Entrepreneurship | German | Zoom | Online | Synchronous | - | · Flexible organization of time | · Lack of relationships and emphatic cooperation<br>-Slow student's learning objects |
| | | Digitalization and customer journey | | | Online | Synchronous | - | | |
| | | Digitalization of industrial organization | | | Online | Synchronous | - | | |
| | Executive MBA | Business engineering | German | | Online | Synchronous | 83 days | | |
| | Executive | Digital innovation and business transformation certificate | German | | Online | Synchronous | 18 days | | |
| | Executive | Implementation of digital transformation | German | | Online | Synchronous | 20 days | | |
| Insead (France) | Executive | Leading Digital Transformation and Innovation | English | Go-Live or Zoom | Live virtual | Synchronous | 5 Days | · Interactive materials and an active participation<br>· Students' feedoms and additional technical capabilities | · Lacks the intimacy and interactivity of real-world classrooms |
| | Executive | Leading Change in an Age of Digital Transformation | English | | Live virtual | Synchronous | 5 Days | | |
| | Executive | Strategy in the Age of Digital Disruption | English | INSEAD Online Learning Platform | Online | Asynchronous | 5 weeks | | |
| | Executive | Building Digital Partnerships and Ecosystems | English | | Online | Asynchronous | 5 weeks | | |

*Source: authors' development*

Concerning digital entrepreneurship, the university offers two related live virtual courses “Leading Digital Transformation and Innovation” and “Leading Change in an Age of Digital Transformation” and two online courses “Strategy in the Age of Digital Disruption” and “Building Digital Partnerships and Ecosystems”. Despite the university offering multimedia and interactive materials and professors and professionals' active participation, students have reported that online learning lacks real-world classrooms' intimacy and interactivity. They appreciate freedoms or additional technical capabilities lacking in conventional classroom settings but wish to return early to the traditional form of courses.

Even if analyzed universities and students’ associations collectively are making efforts in maintaining high the level of education, they are trying to restore on-campus courses. Especially for MBA courses that are highly interpersonal programs filled with robust in-class discussions, where the difference between an online learning model and an in-person model is stark compared to other programs. However, during the Covid-19 pandemic, students and participants are as ever at the center of their model: one-to-one assistance is offered and informal events are organized to maintain the spirit of collaboration among students and the faculty. Concerning the lesson mode, case studies evidence a greater use of Zoom platform and a propensity towards the synchronous way to deliver services; about the duration, it changes compared to the education level.

## 6.2. Best Practices via MOOCs

The acronym MOOC refers to Massive Open Online Course and today it could be considered the future of education. These are massive training courses whose access is usually free and within the reach of anyone with internet. Its origin takes place in the Harvard Business School, by Dave Cormier and Brian Hypertuano and from that day until today, more than eight hundred universities around the world have implemented thousands of MOOCs on various topics. MOOCs are defined as: "online courses open to any individual without any restrictions, structured in learning goals in a study area, in a specific time, supported by a platform in which participants can interact" (Beltrán and Ramírez, 2019). The term MOOC was used for the first time in 2008. The first courses were designed by Downs and Siemens, under the theoretical principles of connectivism (Carrillo-Rosas and Ramírez-Montoya, 2016).

The success of MOOCs is due to their main characteristics that fit very well in today's society. Thus, access to the training platform is free and easy, designed so that anyone interested in learning can access it without any type of test. Although they are mostly free, there is the possibility that fees are paid for tutorials, evaluations or completion certifications. In any case, access will always be free. Another characteristic that makes it ideal for the modern world is its conception as autonomous learning, that is, there is no need for a third party to explain the agenda, since the audiovisual files together with links, and documentation are responsible for this work. Finally, being totally in anyone with a computer and internet access can participate in them.

A MOOC differs from an online course, since firstly, while in an online course the number of participants is limited, in a MOOC it is unlimited. Second, the course requires a tuition payment, while the MOOC does not. Third, both modalities differ in the approach given, while in an online course the objective is aimed at achieving minimum qualifications and an accreditation, in MOOCs the main objective is the learning of the students, prioritizing this above of the evaluation.

Thus, we find that as time has advanced different types of MOOC have emerged, we can therefore take the following MOOC models.

- Transfer MOOC. They are those that arise from existing courses and have been adapted to the format through pedagogical bases. In this type of MOOC we find those developed by platforms such as Coursera, which we will see later.
- Made MOOC. This type tend to be more formal and demanding, with complex software development. They offer an interactive and sophisticated experience and include audiovisual resources instead of monotonous and uninviting talk.

- Synch MOOC / Asynch MOOC. These variants are clearly related to the calendar, the first one has a defined start and end date from the beginning, making its development clearer. And the second does not have this planning.
- Adaptative MOOC. They are those whose software is programmed using adaptive algorithms, to adapt teaching to each person in a unique way. These algorithms are based on personalized learning experiences.
- Group MOOC. The main characteristic of these MOOCs is that small groups with limited access are created, arguing that, in this way, the participants will be more involved and advocating a more group-centered work.
- Connectivist MOOC. They are based on connections across a network rather than opting for pre-defined subject content. In this way the information and content flows freely between the different users.
- Mimi MOOC. These focus on dealing with content of less development and duration, its main objective being learning about a specific subject, generally specialized in a shorter period of time than usual.

According to the European Union, the best MOOC platforms today are the following: Coursera, eDX, Future Learn, Udemy, Saylor, and Khan Academy. They cover all kinds of subjects, such as science, computer science, economics, language, math, and history.

### 6.2.1. Best practices: the case of Coursera

Coursera is a leading online learning platform for higher education, where millions of students from around the world learn the skills of the future. More than 200 universities and educators collaborate in it. Many companies rely on the Coursera for Business to transform their talent. Also, Coursera for Government equips government employees and citizens with the skills necessary to create a competitive workforce. Finally, Coursera for Campus enables any university to offer high-quality, job-relevant online education to students, alumni, faculty, and staff.

We analyze below one of their MOOCs entitled "Effective Negotiation: Essential Strategies and Skills". This MOOC addresses the issue of negotiation, explaining that since all of us constantly negotiate on a personal level. Many times, not even aware of it. Therefore, acquiring certain negotiation strategies will make our day to day more productive. In the professional field, a company needs to be nurtured by personnel trained in these matters, therefore, negotiation can boost the personal career of any of its members. As he explains, successful planning consists of four necessary steps: Prepare, Negotiate, Close, and finally Perform and Evaluate.

This MOOC has a degree to certify it and is available in Spanish and Portuguese, in addition to its original language, English. It has been created by the University of Michigan and is taught by George Siedel, professor of business administration at the University of Michigan and business law at Thurnau University.

The MOOC program has four main parts. The first introduces us to the world of negotiation by applying the four keys mentioned above both in the professional and personal fields. It has two videos (24 minutes total) also has seven readings (70 minutes total). The second part focuses on the negotiation process focused on planning, key to obtaining a successful negotiation. It consists of ten videos (142 minutes total) and four readings (40 minutes total), it also includes a practice exercise (30 minutes total). In the third part we see that there are two main points (how to use power during negotiations and psychological tools that you can use during negotiations) the nine videos they contain (96 minutes total) are accompanied by four readings (40 minutes total) and another practice exercise (30 min). The fourth and last part deals with the contract. How to seal all the profit obtained during the negotiation and make it material and closed, that is, to be able to use the results during the negotiation in a practical way. It consists of six videos (76 minutes) and three readings (30 minutes total), it also ends with a practical exercise to consolidate what has been learned (30 minutes total).

The next MOOC analyzed by COURSERA is: Innovation Management. The objective of this course is to transmit to the student the innovation capacities to face the needs of the modern world by offering renewed products or services that distance themselves from their peers and stand out from the rest. It is taught by the Erasmus University of Management, Rotterdam, one of the world's leading schools for innovation and management. The teachers who teach it are Serge Rijsdijk, Sandra Langeveld, Stefano Tasselli, Dirk Deichmann, Murat Tarakci and Daan Stam. Jan van en Ende, professor at the Guido Carli University, Rome, is the main professor.

The program has four main parts. The first, or introduction, tries to establish the terminology of innovation and the development of this, as well as teach how to differentiate between one type of innovation and another. It consists of five videos (22 minutes total). The second part, Embrace Innovation, teaches how to use and distinguish innovation in today's society, and how long it takes people to accept innovation. It consists of two videos (26 minutes total). In the third part, Fuzzy Start (Creation), it is about implementing innovation as an essential capacity for the organization and how to obtain a substantial competitive advantage through it. It consists of five videos (48 minutes total). And in the fourth and last part, Fuzzy Start (Idea Management), it focuses on using the basic principles of innovation management to clearly identify what it requires from its application and how to do it efficiently. It consists of three videos (32 minutes total) and a practice exercise (30 minutes total).

The last MOOC is about entrepreneurship specialization taught by University of Pennsilvania. This course covers the conception, design, organization and management of new enterprises. This program has five parts and is designed to take you from opportunity identification through launch, growth, financing and profitability. This program combines as teachers' top professors from Wharton School with start-up founders and financiers. The aims are to develop an entrepreneurial mindset and hone the skills need to develop a new enterprise with potential for growth and funding, or to identify and pursue opportunities for growth within an existing organization.

### 6.2.2. Best practices: the case of edX

edX is a platform for education and learning, founded by Harvard and MIT, a global non-profit organization, that is transforming traditional education by removing cost, location and price barriers. The platform offers support to students at each stage, either before entering the job market, or when changing fields, seeking promotion or exploring new interests. Offers topics ranging from informatics and data to leadership and communications. edX is your ideal destination to learn

We also analyzed a MOOC course on this platform, titled: CS50's Introduction to Artificial Intelligence with Python. Its duration is 7 weeks, with a dedication of 10 to 30 hours per week. If you want to receive a verified certificate, you have to pay € 164. The level is introductory and the course is taught in English. The instructors are David J. Malan Gordon McKay and Brian Yu of Harvard University. Regarding the contents of the program, an Introduction to Artificial Intelligence with Python from CS50 is first addressed. The concepts and algorithms in the foundations of modern artificial intelligence are then explored, delving into the ideas that give rise to technologies such as game engines, handwriting recognition, and machine translation. Then, through hands-on projects, students gain exposure to the theory behind chart search algorithms, classification, optimization, reinforced learning, and other artificial intelligence and machine learning topics as they incorporate them into their own Python programs. The course allows students to gain experience in libraries for machine learning, as well as knowledge of the principles of artificial intelligence that allow them to design their own intelligent systems.

Another MOOC course in this platform is becoming an entrepreneur designed in partnership with Massachusetts Institute of Technology. Its duration is 6 weeks with a dedication of 1 to 3 hours per week. This course aims to guide people through the process of founding a company providing inspiration to explore and entrepreneurial path and tools to overcome the initial challenges of building a business. This course uses a combination of short

videos and activities to identify business opportunities, performing market research and choosing the target consumer, designing and testing your offering and planning the business logistics, plus pitching and selling to customers.

### 6.2.3. Best Practices via Business Simulations & Games

Simulation it could be defined as a contextual device that tries to delve into one or several hypotheses by accepting a series of rules or characteristics that are taken for certain and after that, acting accordingly, trying to apply the best parameters. Due to this, simulations are a great tool for teaching, mixing theory and practice in a single exercise, they are perfect models for teaching and learning (Shannon and Johannes, 1976)

Any simulation must consist of at least the following parts:

- A definition of the system, that is, to establish what the objective of the simulation is and what it is intended to obtain or solve with it.
- Model formulation, establish a context where to introduce the objective or problem that the simulation will try to face.
- Data collection, what are the data that the simulation context needs, so that it is well defined and the results produced are optimal.
- Verification or verification, make sure that both the established data and the context are correct to obtain the desired result, this step is the test before launch.
- Experimentation, once the model is validated, it is put to the test to verify and put into practice that it advances as desired.
- Interpretation, the data obtained are put on paper and agreed with the desired objectives.
- Documentation, since based on the previous phase the obtained is verified. Once this step has been prepared, it is possible to define what changes are necessary, if they were, and how to facilitate their use through a user manual so that the model developed can be put into practice.

Simulation is widely used for educational purposes. Traditionally, simulations were used in education where it was very expensive or where it was risky for students. Today, thanks to the development of software, computing capabilities, and the use of artificial intelligence, simulations are extended to numerous training activities and are an important element for career development. Using simulation for project management training improves retention of learning and enhances the learning process.

Simulations create a scenario-based environment, where students interact to apply prior knowledge and practical skills to real-world problems, which also enables teachers to achieve their own goals (Vlachopoulos & Makri, 2017; Angelini, 2015). During scenario-based training, the player gains important skills such as interpersonal communication, teamwork, leadership, decision-making, task prioritization, and stress management.

For example, we have in the case of the HEC Paris Business School, with its courses in which it offers the main course, in which business simulators are treated as a prominent aspect. Its program lasts eight months and classes are divided into four or five students, each from different countries and sectors. The course is divided into two parts, the first, in which business concepts, applied mathematics and business simulators are dealt with in a basic way. Its objective is to prepare the student to delve deeply into various aspects that will be deepened later. The second part is Corporate Finance or Economic Management and the course is designed to take advantage of the knowledge learned during the first part. All this is carried out through business simulations in which the students face real cases that they must handle and solve.

Another case is the Coventry University that has the Business Simulation Suite in which students can develop practical cases, simulating a business or commercial environment.

Its objective is to provide students with experience based on decision-making, as well as observation of their peers in a similar environment to which they have been exposed, alternating between theory and practice. It is widely equipped with the necessary material to carry out the simulations, both in a material and computerized aspect (hardware and software).

### 6.2.4. Best practices in simulation. The Harvard Publishing case and the Everest simulation

Everest is a Harvard Business School team leadership simulation, with each team consisting of a group of five people. Each person on the team has a different role as leader, doctor, marathoner, environmentalist or photographer. The simulation uses the context of a mountaineering expedition to Mount Everest and seeks to reinforce group dynamics and leadership in the students.

The simulation lasts 6 rounds that take approximately 1.5 hours. In each phase the team members analyze information about the weather, health, supplies, objectives or the speed of the march and discuss the steps they must take to reach the next campsite or summit.

Decisions are made regarding the distribution of supplies and oxygen cylinders required for the ascent, which will influence the speed of the ascent of the mountaineers and ultimately the team's success at the top of the mountain. Lack of communication and analysis of information accurately as a team has negative consequences on team performance. The simulation is designed to be used with student teams. The material includes a Facilitator's Guide containing an overview of the simulation screens, elements, and a full tutorial.

### 6.2.5. Best practices in simulation. PhET simulations

Founded in 2002 by Nobel Laureate Carl Wieman, the PhET Interactive Simulations project at the University of Colorado Boulder creates free interactive math and science simulations. PhET simulators are based on extensive educational research and engage students through an intuitive game-like environment where students learn through exploration and discovery. PhET offers fun, free and interactive science and math simulations based on research.

The simulations work with Java, Flash, or HTML5 and can be run online or downloaded to a computer. All simulations are open source. Currently, 158 interactive simulations have been developed, with 94 translations into different languages and more than 2711 sent to teachers.

### 6.2.6. Gaming

In recent years, interest in examining the use of games in higher education has grown. Games place students in interactive virtual environments that can be inmmersive and the consequential serious play that follows allows students to test out decisions and build entrepreneurial preparedness in a safe and risk-free environment. Games have strong problem-solving aspects and this encourage forms of reflective learning. Games engage students in narratives providing insights into specified entrepreneurial context and so in a dynamic way, allowing students to navigate through virtual situations, decisions and choices (Fox, Pittaway and Uzuegbunam, 2018).

This includes educational games, digital game-based learning, and applied games. Within gaming we can find the following genres (Gros, 2007):

- Action games: video games based on answers.
- Adventure games: the player solves problems to advance through levels within a virtual world.
- Fighting games: involve fighting with characters controlled by computer or controlled by other players.
- Role-playing games: players assume the roles of fictional characters.
- Sports games: they are based on different types of sports.
- Strategy games: these recreate historical scenes or fictional scenarios, in which players must devise a suitable strategy to achieve the objective.
- Serious games: computer-based learning simulations that engage players in realistic activities designed to increase knowledge, improve skills, and enable positive learning outcomes. Serious games differ from enterntainement games as they focus on problem-solving takes and incorporate the imperfect nature of interactions with the real works and

especially useful concept in approaching entrepreneurial opportuninities (Fox, Pittaway & Uzuegbunam, 2018).

### 6.2.7. Case study through comics

It is an innovation in classical technique of case studies using a format that aims to attract the attention and interest of the students, such as comics. This type of format introduces playful aspects and connotations such as gamification (Arias, Bustinza and Djundubaev, 2016) and it could increase the student interest for the proposal case and for the resolution of the questions raised. Indeed, according to the students, this method offers the opportunity to learn while having fun and to actively participate in classes related to technology (Inel and Balim, 2013). The application of this new method in the field of operations management has shown a high level of satisfaction on the part of students and teachers, observing, in addition, that comics use is more useful to promote in studens creativity, visual thinking, assimilation concepts or interest, among others (Maqueira et al., 2020).

In this chapter we tried to analyse the main developments of digital technologies and methodologies applied to teaching in the field of digital entrepreneurship. We provided various and interesting evidences about the teaching methodologies currently used in education can be adopted and implemented by instructors and teachers of digital entrepreneurship. These best practices in teaching suggest an instructor needs to extend greatly skills and competencies. The ability of recording videos prior the course start is crucial.

Such richness of tools and materials (that can easily be found on Internet and used freely) increases the need of selecting and preparing in advance the materials to share with students and to discuss in classroom. In other words, the spread of digital technologies and methodologies and tools could decrease the value and utilization of improvisation, a key ability of experienced “offline” teachers for adapting their lectures to some not forecasted topics and/or debated. It is important to stress the IT solutions reported in this chapter are not the only ones that a teacher of digital entrepreneurship can use. For instance, over the last few years a large number of Apps for smartphones were developed for educational purposes. Many of them can be important tools for improving the quality and impact of a digital entrepreneurship course.

In order to conclude the present chapter, we can highlight a number of final remarks and recommendations for digital entrepreneurship’ educators. First, we do believe the continuous development of the technological competencies of teachers is crucial in order of being aware of the different IT solutions available in this fast-changing market. Second, the richness of information and data offered by these technologies allows an effective customisation of the syllabus and the contents of the course for the students. Third, the integration of more technologies is strongly advised in order to increase the educational impact of the course.

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# 7. THE IMPLICATIONS OF DIGITAL ENTREPRENEURSHIP ON ORGANIZATIONS, COMPANIES AND INDUSTRIES

In order to develop and present meaningful guidelines to teach digital entrepreneurship in higher education, the implications of digital innovations and technology on organizations, companies and industries need to be understood. This chapter aims to provide an overview about these implications, thereby not only highlighting key concepts and constructs behind digital entrepreneurship, but also showcasing practical and real-world examples how companies and industries, as well as their associated business models, are impacted by the rise of digitalization and companies and start-ups using these digital opportunities.

In particular, we argue that through digital transformation within the corporate sector, new concepts and business model have emerged and have come to the forefront in the area of entrepreneurship which have not been incorporated in a comprehensive teaching model so far. As such, this work aims to present and discuss these concepts and to describe its impact on businesses and organizations. The remainder of this chapter is as follows (Figure 7.1).

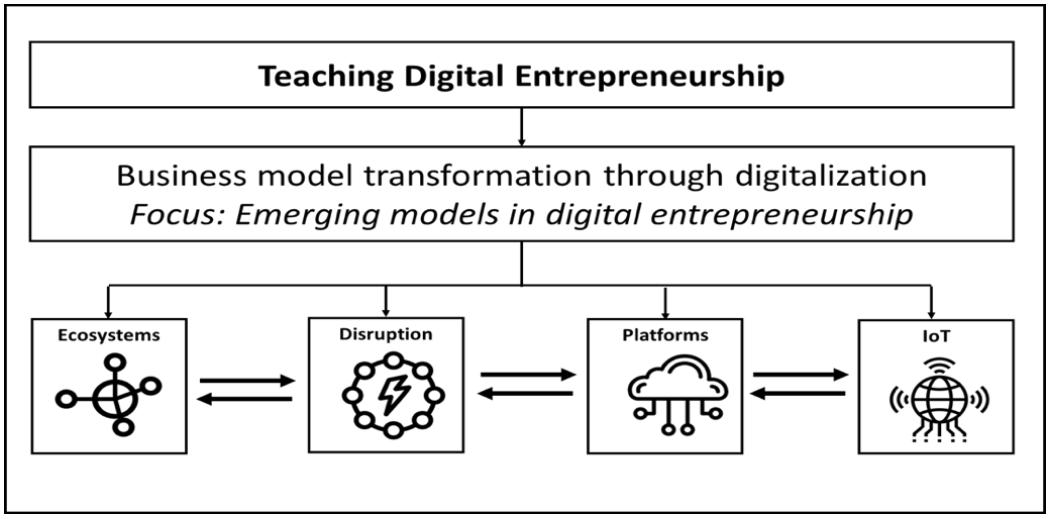


**Figure 7.1. Emerging models and concepts in digital entrepreneurship**

*Source: authors' development*

In the next section, we present the key determinants of a business model and discuss the impact of business model innovation and transformation through digitalization. This is followed by a presentation and discussion of the emerging models/concepts in digital entrepreneurship, namely ecosystems, disruption, platforms and the Internet of Things (IoT). More specifically, key assumptions, concepts and implications of these models are theoretically discussed and are supported by real-world cases to demonstrate their impact on businesses.

## 7.1. The role of the business model

Since the end of the 90s with the emergence of the internet and massive adaption in the e-commerce business the term, 'business model' (BM) has aroused in the managerial literature. In general, the concept refers to the description of the different dimensions or components to establish a model that can create value for the relevant groups of customers and for the company itself. Furthermore, the concept refers on the one hand to a static approach, meaning a BM is a blueprint that fulfils certain functions such as classification and description of a business. At a transformational approach, on the other hand, the BM is regarded as a concept to address changes with a focus on innovations in the company or in the BM itself.

New BMs can be acknowledged as radical innovations with the potential to change whole industries (Demil & Lecocq, 2010). Due to developments in the global economy, new ways of communication and the establishment of open global trade regimes, the traditional balance between customer and supplier had changed. Customers now have more choices, are more diverse and can compare supply alternatives more easily. Often these developments as well as BM innovations are related to digital products and services, thus a closer look at how digitalization transforms companies and industries will provide a better understanding about digital entrepreneurship.

## 7.2. The impact of digitalization on the corporate world

Digitalization or digital transformation are drivers for changes in the corporate world, because they establish new technologies based on the internet with implications for society as a whole (Cichosz et al., 2020). While digitization describes the process of the conversion of analogue and noisy information into digital data, digitalization is used to describe any changes in the organization and in the organization's BM due to their increasing use of digital technologies to improve both the performance and the scope of their services. Scholars interpret the digital transformation as the continuous interconnection of all business sectors and the actor-side adaptation to the requirements of the digital economy, whilst Kiron et al. (2017) define it as the systems-level restructuring of economies, institutions and society that occurs through digital diffusion.

Digitalization as such is developed from a form of technical evolution to a phenomenon that can influence any kind of organization. The physical and digital world are converging increasingly frequently and need to work hand-in-hand, so that manufacturing companies can also become digital (e.g. Industry 4.0). This can happen, for example, by integrating the Internet of Things into industrial processes and generating value by analyzing and managing data that can be used as a source of competitive advantage. As such, many changes led by digitalization are disruptive and threaten existing incumbent business models.

As a consequence, companies that have dominated the market (so-called incumbents) so far, may be confronted by new competitors that redefine the established industries (Bharadwaj et al., 2013; Hooper & Holtbrügge, 2020; Sandström et al., 2009; Sucky & Asdecker, 2019; Tsiulin et al., 2020), so that existing BMs become obsolete and are replaced by new ones – thus companies need to innovate their BMs to maintain their competitive advantage in this new 'digital' environment'.

In particular, scholars have identified and described three different ways in which digitalization influences and changes companies and their BMs: optimization of the existing BM (e.g. cost optimization); transformation of the existing BM (e.g. reconfiguration of existing models, extension of the established business); and development of a new BM (squeezing out established market participants, new products/services). In particular, for the purpose of this task, we found that the transformational potential of business models or the creation of new business models through digitalization is represented by four models/concepts:

- Ecosystems,
- Disruption / Disruptive Innovation,
- Platforms / Gig-Economy,
- Internet of Things (IoT) / Industry 4.0.

In the following sections, we will discuss the key assumptions, concepts and implications of these models supported by real-world cases to demonstrate their impact on businesses. It needs to be emphasized that these models and their actions/consequences are interrelated and interdependent, i.e. it may be that the disruption depends on the ecosystem or that the success of a platform depends on IoT technology. However, for presentation (and later teaching) purposes, each model/concept will be presented and discussed to showcase the theory and the specific implications of each model.

### 7.2.1. Ecosystems

The first model that represents a significant influence for digital products and services and can be regarded as a distinctive factor in digital entrepreneurship are ecosystems. The main argument behind the importance of ecosystems is that innovation – which is crucial for a companies' survival – cannot be attributed a company single processes, but rather to complex processes involving cooperative networks or business alliance: the ecosystem (Moore, 1993). Although only a few authors have linked ecosystems directly to disruption (Ansari et al., 2016; Klenner et al., 2013; Ozalp et al., 2018; Snihur et al., 2018), ecosystems have become an increasingly popular topic among academics to examine business model innovation and digital technologies (e.g. Adner, 2017; Autio et al., 2018; Autio & Thomas, 2014; Annabelle Gawer & Cusumano, 2014; Stank et al., 2019). The original concept of ecosystems can be attributed to Moore (1993) – who used it as an analogy to biological ecosystems – with the aim to extend the concept of the value chain (Porter, 1985) by interacting the co-evolution and the interdependencies of relevant institutional and organizational actors (Phillips & Ritala, 2019).

Scholars broadly acknowledge that ecosystems require providers of complementary innovations, products or services which may be attributed to other and different industries and need not be a bound by contractual arrangements (Jacobides et al., 2018). This complex system of interactions leads to ecosystems that are different from each other, each one with unique relationships and interdependencies.

In fact, ecosystems differ extensively between companies and organizations: For example, incumbent or traditional global logistics service providers (LSP) are often characterized by ecosystems that rely on long-term partnerships and own assets to provide transport capacity (Busse & Wallenburg, 2011; Economist, 2018; Oláh et al., 2018; Reyes, 2011). In contrast, start-ups such as digital freight forwarders (DFFs) rely on ecosystems that focus on promoting their digital platform, owning no transport capacity and no assets, but offering cost-efficient, real-time and on-demand transport arrangements (Elbert & Gleser, 2019; Oláh et al., 2018; Stölzle et al., 2018). Although both companies offer transport services, they rely on different ecosystems that are built around different kinds of technology and what Adner and Kapoor (2016) call the 'old technology' and the 'new technology'.

The former can be linked to a business ecosystem, while the latter rather represents an innovation ecosystem (Granstrand & Holgersson, 2020; Jacobides et al., 2018). A business ecosystem focuses in an individual company and views the ecosystem as a "community of organizations, institutions, and individuals that impact the enterprise and the enterprise's customers and suppliers (David J Teece, 2007, p. 1325). As such, the ecosystem mirrors the business environment that the company must closely observe and react to in order to build dynamic capabilities to maintain or gain a competitive advantage (Jacobides et al., 2018; D. J. Teece, 2010).

In contrast, new technologies rely on innovative ecosystems, which Granstrand and Holgersson (2020) defines as an "evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors" (p. 3). According to Jacobides et al. (2018), the emphasis in an innovative ecosystem lies in understanding how interdependent actors interact to build and market innovations that benefit an end customer, thus "the anchoring point is the system of innovations that allow customers to use the end product, rather than the firm" (p. 2257). Moreover, an innovation system includes an actor or

an artifact system with 'substitute relations' (Granstrand & Holgersson, 2020), i.e. that an innovation ecosystem has a competitive component that aims to 'substitute' old technologies with new technologies, thus representing a threat to incumbent companies to replace them. In addition, and in contrast to a business ecosystem with old technologies, innovative ecosystems with new technologies take more advantage of digital innovations, which allows the ecosystem to rival the service capabilities of incumbent firms by better coordinating distributed resources and participants (Constantinides et al., 2018).

Good examples for the impact of ecosystems on markets, companies and consumer are companies that rely heavily on their ecosystems, such as Amazon or Apple.

For example, Amazon's product – selling online and shipping - targeted the same customers of brick-and-mortar stores served by incumbents (Wessel & Christensen, 2012), but it can be argued that Amazon's subsequent growth can be explained by the introduction of a robust and agile new business model (C. Christensen et al., 2011; Wieland & Wallenburg, 2012) and its ecosystem. By building a facilitated network connecting worldwide suppliers and consumers, Amazon 'changed the game' (Liebmann, 2013). Eventually, e-commerce attracted traditional consumer and created a new market for 'internet shopping' by challenging traditional brick-and-mortar stores. In other words, Amazon has followed an innovative path by building its ecosystems of suppliers to match or exceed brick-and-mortar store services. In particular, Amazon was able to use the network in its ecosystem to "utilize new operations or financial approach or both to earn attractive returns at the discount prices required to win business at the low-end of the market" (C. Christensen & Raynor, 2013, p. 51). In other words, customers were able to select 'good enough' products at cheaper prices, i.e. the ecosystem was built to target customers which otherwise would have not entered the traditional – more expensive – market. In addition, Amazon was able to use the network in its ecosystem to improve performance in new attributes and to target "customers who historically lacked the money or skill to buy and use the product" (C. Christensen & Raynor, 2013, p. 51). In other words, Amazon not only provided a much greater range of products, but made product deliveries faster, simpler and more convenient, i.e. the ecosystem consists of complex innovation processes involving cooperative networks as well as interacting organizations and individuals (Moore, 1993).

Using another example, Apple's success partly relies on their ecosystem. One specific example within this ecosystem are Apple's Apps and the developing community that develops these Apps. Apple has created an own ecosystem to create value for the customer, and the role of developers has become so central in digital ecosystems that firms have developed strategies to manage third party contributions that have become central to its platform success. Reasons that developers are so important include well-known features of digital technology such as malleability of the code, the low cost of investing in tools to develop code, close to zero cost reproduction, and the potential to profit from application successes while shedding the costs of failures. Put more broadly, developers are key to Apple's ability to scale rapidly because is not limited by the processes of hiring, training, project selection, and coordination. Instead, these processes are distributed outside of Apple's platform, allowing much more rapid growth (G. G. Parker et al., 2016)

Scholars refer to this development as an 'historic shift', driven by rapid improvements in network connectivity and computing power (Brynjolfsson & McAfee, 2014). Using loosely affiliated ecosystems, firms are able to harness a global network of partners they have never met. These partners can connect through digital networks to innovate on top of a platform's core set of resources, thereby creating highly valuable products and services for ecosystem users (G. Parker et al., 2016).

### 7.2.2. Disruption

The second model that represents a significant influence for digital products and services and can be regarded as a distinctive factor in digital entrepreneurship is disruption or disruptive innovations. To examine disruptive innovations, scholars frequently refer to the seminal work of Clayton M Christensen (1997) who distinguishes between 'sustaining' and 'disruptive'

technologies and innovations. 'Sustained' innovations are characterized by improving products with incremental advances or major breakthroughs, thus enabling the incumbent's company to sell more products to their most profitable customers (Clayton M Christensen et al., 2015). In other words, sustaining technologies improve already existing and established products along the dimensions that mainstream customers demand (Sandström et al., 2009). Examples include better mobile reception, a better TV resolution or the fifth blade in a razor.

Disruptive technologies, in contrast, are initially underperforming along the dimension of mainstream customer demand and are considered inferior by most of incumbents' customers (Clayton M Christensen et al., 2015). The low performance and the ancillary performance attributes create a market that is characterized by uncertainty, thus established firms find it irrational to abandon their profitable customers in order to aim for a new, but small market with an inferior technology and customers are skeptical to switch to the new offering only because it is less expensive (Sandström et al., 2009). Only when the performance and the quality of the disruptive technology rises, existing incumbents' customers are willing to abandon the sustaining technology and adopt the new technology.

Christensen and Raynor (2003), expanded on the work of Clayton M Christensen (1997) and divided the initial target market for disruptors into low-end and new-market disruptive innovations. Low-end disruptions make not only a platform more affordable simpler to use, but gain market foothold with the incumbents' least-profitable customers, while new-market disruptions emerge from non-consumers and initially don't challenge incumbents directly (Hang et al., 2015).

**Table 7.1. Disruptive innovation characteristics**

| | **Performance**<br>*Targeted performance of the product or service* | **Customers**<br>*Targeted customers or market application* | **Business Model**<br>*Impact on the required business model* |
|---|---|---|---|
| **Sustaining Innovations**<br>Incumbents typically win | Performance improvement in attributes most valued by the industry's most demanding customers. These improvements may be incremental or breakthrough in character. | The most attractive (i.e., profitable) customers in the mainstream markets who are willing to pay for improved performance. | Improves or maintaines profit margins by exploiting the existing processes and cost structures and by making better use of current competitive advantages. |
| **Low-End Disruptions**<br>Entrants typically win | Performance that is good enough along the traditional metrics of performance at the low-end of the mainstream market. | Over-served customers in the low-end of the mainstream market. | Utilizes new operations or financial approach or both to earn attractive returns at the discount prices required to win business at the low-end of the market. |
| **New-Market Disruptions**<br>Entrants typically win | Lower performance in "traditional" attributes, but improved performance in new attributes - typically simplicity and convenience. | Targets non-consumption: customers who historically lacked the money or skill to buy and use the product. | Business model must make money at lower price per unit sold, and at unit production volumes that initially will be small. Gross margin dollars per unit sold will be significantly lower. |

*Source: C. M. Christensen and Raynor (2003)*

Good and common disruptive innovations are for example Netflix and the blockchain technology.

*Netflix* is an American entertainment company that provides streaming media on-demand. Further produces films and series and distributes them online. With this business model, Netflix changed the way movies and TV shows were brought to the users. By implementing a subscription plan, Netflix gave its users more content than any other provider in the industry. By offering a wide range of content and an "all you can watch" philosophy, low prices, high quality and convenient sales, Netflix has been able to reach Blockbuster's core audience (McAlone, 2015).

The reason for Netflix being disruptive is that when they launched their first service, the mail-in subscription service, they did not go after the core customers of competitors like Blockbuster. Furthermore, Netflix initially addressed only a few customer groups, namely "movie lovers who were not interested in new releases, early adopters of DVD players and online buyers". According to C. M. Christensen et al. (2015) Netflix is therefore a hallmark of disruption, as a disruptive company targets population groups that have not gone unnoticed by its competitors and offers an inferior, but more customized alternative at a lower price. This is how a disruptive company like Netflix eventually begins to establish itself in the marketplace. Initial benefits can be maintained and the things that mainstream customers want are added. The result is that there is no longer a reason to have blockbusters (Ltd., 2018; Rosenstand et al., 2018). Nevertheless, Netflix knew that this would not be enough to maintain their market level. That is why they introduced online video streaming, which brought the change: Netflix was able to reach Blockbuster's audience and Blockbuster collapsed – the main reason would be that disruptive companies can often grow quickly because their competitors don't notice them at first (Clayton M Christensen et al., 2015).

*Blockchain* represents a disruptive threat for the banking industry. The 'blockchain' is basically a database with a transparent protocol for any utilization and is – conventionally – public, i.e. all actors are able to perform a transaction without explicit assignment of write or read rights. Every information is stored across its network via a block. These blocks are permanently recorded, consistently updated, time-stamped and linked together to all transactions (current and past) (Maslova, 2018).

This eliminates the risk of central databases. If valid, a block is added to the existing chain, whose content cannot be manipulated later. The technology operates on a decentralized network, acting on a peer-to-peer basis. It can be used to come to agreements, with untrustworthy parties, without a middleman and on the state of a database (Chen & Bellavitis, 2020). By providing a ledger that nobody can manage, a blockchain can offer certain financial services, such as payments or securitization, without involving a bank as an intermediary. It handles all operations similar to a bank, but has no central authority to monitor all data. This eliminates the middleman and returns power to the owner. Moreover, blockchain allows the use of smart contracts which can automate manual processes. With these properties, blockchain is able to offer key features of banks such as: payments, securities, fundraising, trade finance, loans and credits or clearance and settlement systems (Buitenhek, 2016; Cai, 2018). Therefore, blockchain is characterized as an innovative, technical disruption that can reduce the cost of doing business, making it attractive for industries with increasing regulatory challenges like the financial sector (Cong & He, 2019).

### 7.2.3. Platforms

The third model/concept that represents a significant influence for digital products and services and can be regarded as a distinctive factor in digital entrepreneurship are platforms, in particular digital platforms. Often, new business models rely on digital platforms, with some scholars even referring to a 'platform revolution' (e.g. Ciulli et al., 2019; G. G. Parker et al., 2016). Recent developments show that platforms as a business model have become a real and viable alternative to the integrated company and thus augmented the notion that business competition is no longer about how to control the value chain, but who controls the platform (de Reuver et al., 2018; Tiwana, 2014). In particular, digital platforms such as booking.com, Airbnb or Uber make use of the rapid digitization of distribution and communication systems, thereby connecting global communities and providing them with access and shared knowledge, goods and services in ways that were previously unavailable (Spagnoletti et al., 2015; Tiwana et al., 2010).

Although platforms may have similar characteristics and traits (see de Reuver et al., 2018; Kenney & Zysman, 2016; Schreieck et al., 2016), the literature distinguishes three types of digital platforms (Annabelle  Gawer, 2014; Jacobides et al., 2018; Kyprianou, 2018):

- Product platform,

- Platform ecosystem,
- Market intermediary platform.

*(1) Product platform*: In many industries, product platforms are used to reduce development costs, increase the product development process or to obtain access to multiple market segments by offering different variants of products. The product platform thus represents a lever for gaining competitive advantages. According to Peter E Harland and Uddin (2014, p. 263) a product platform is a "collection of modules or parts that are common to a number of products, and this commonality is developed intentionally to attain certain effects to create customer value". This means that product platforms as Zalando or eBay comprises modular components and elements that are used efficiently to develop an array of products (Kyprianou, 2018). For this reason, this approach is a concept that enables economies of scale by standardization on a module level rather than on a product level. Further economically this module level standardization enables in certain market situations a higher variation of the product level(P.E. Harland et al., 2020).

*(2) Platform ecosystems:* Many markets are structured as platform ecosystems with a stable core, mediating the relationship between a variety of complements and prospective customers/end-users (Rietveld et al., 2019). Platform ecosystems (e.g. Video game consol) are characterized by an underlying platform technology and associated standards designed by the platform leader which is complemented by a set of assets offered by third parties (Annabelle Gawer & Cusumano, 2014; Jacobides et al., 2018). When a market is structured in this way, a complex interplay can result from the bundling of the elements and their interaction to create the overall value of the system (Ceccagnoli et al., 2012; Annabelle Gawer & Cusumano, 2014; Pierce, 2009). The platform ecosystem members often have a strong personal interest in the success of others, since the end users are only attracted by the attractiveness of the entire ecosystem. The success of one partner thus depends, at least in part, on the success of the other ecosystem members, even if they are competitors. Due to high platform switching costs, it is often difficult to switch ecosystems. In addition, a platform ecosystem is characterized by relationships which are neither as independent as market contracts nor as dependent as those within a hierarchical organization. It is basically a hybrid form of organization (Rietveld et al., 2019).

*(3) Market intermediary platform:* Market intermediary platforms coordinate and mediate the supply side as well as the demand-side in a two-sided market (Parker & Van Alstyne, 2005; Rochet & Tirole, 2006). These two-side markets aim to bring together supply and demand side whereby the value of one side increases as the number of users on the other side increases (Evans, 2003). By matching both the demand and the supply side, intermediaries create the so-called network effects or network externalities that increase the numbers of platform users (Katz & Shapiro, 1994). For example, start-ups in logistics and supply chain acting as market intermediaries, an increased user base can trigger positive feedback cycles that further increase the usefulness of the platform technology. In other words, start-ups that act as market intermediaries experience direct network externalities as the platform depends on the number of users in the same user group, i.e. "the value of the product increases by other buying, connecting or using the same platform or services provided via the platform" (de Reuver et al., 2018, p. 125).

Uber and Zalando provide good examples for platforms; therefore, they are discussed in the next section.

*Uber* is an on-demand transportation service, market intermediary platform that coordinates the supply and the demand side. In 2018 Uber achieved a revenue of around 14.2 billion US Dollar and had 3 million drivers (Eisape, 2020). The business model of Uber is built upon a digital platform and consists of a two-sided platform that connects passengers looking for a ride and drivers of cars using their mobile app (Täuscher & Laudien, 2018). In the case of Uber Eats it is even a three-sided market because it matches someone who wants to order food with a restaurant and a delivery method. The digital marketplace is used to simplify transactions and create a wide-reaching network that is easily scalable. Like other business models such as

Airbnb or Amazon the aim of the platform is to create demand on the supply- and the demand-side of the platform. Underpinning their business model Uber uses a technology to identify where people are using Goolge maps and matching them to a nearby driver. The value proposition, which describes how you create, deliver and capture value, of Uber is based on the convenience and the whole system is built on simplicity and ease for both parties involved, drivers and passengers (Eisape, 2020). Additionally, they have a dynamic pricing system that adjusts pricing according to demand that is called surge-pricing. This pricing system includes a variation in fees according to the situation and is an important aspect of their business model. Surge-pricing means that the prices always depend on the number of requests made by people and the number of available drivers. This enables real-time price quotations (Cachon et al., 2017).

*Zalando* is an online-store designed as a product platform. Due to high growth rates, Zalando had made it to a market leader in e-commerce fashion in Europe. The business model is highly profitable and offers high revenues. The platform includes a themed world of fashion with several features and tools to strengthen the shopping experience. In differentiation to retail stores the costs for setting up the business, the operation costs and the personnel infrastructure costs are much lower. Further, it is easier to access new markets and reach a wide range of customers at any time of the day. The assortment of Zalando includes over 1,500 international brands, covering the entire range: fast fashion brands, popular brands, local brands, sport brands, private labels and so on (Cadieux & Heyn, 2018). In 2015, Zalando started to include brand stores in their website and thus transforming it in a sales platform. Well-known brands can get their own store within the Zalando online store. Zalando can thereby reach even more customers from different ranges. Further, the innovative technology platform is one of the key success factors to engage customers. The product platform includes several tools such as size guides or product ratings. These technological features, however, imply high investments in R&D, which are important to stay competitive in the fast-developing e-commerce market. With the innovative platform, the emotional shopping experience and the wide range of products Zalando has built a large, solid customer base (Detzel et al., 2016). Moreover, through larger orders the company can buy the products at discounted prices and offer them to the customers quite competitive (Porter et al., 2001).

### 7.2.4. Internet of things

The fourth concept that represents a significant influence for digital products and services and can be regarded as a distinctive factor in digital entrepreneurship is the internet of things (IoT). IoT, which refers to the interconnection of physical objects that can also be equipped with ubiquitous intelligence (Christidis & Devetsikiotis, 2016; Papert & Pflaum, 2017; Tu, 2018), is strongly related to the popular term 'Industry 4.0', a term describing the current upheavals within the production and manufacturing industries, focuses on intelligent production processes in complex environments enabling communication between humans, machines, and products through self-controlled or cyber-physical controlled interfaces. Through the ubiquity of the Internet, networks of devices become highly distributed and allow inter-communication in all directions (Ben-Daya et al., 2019).

The Internet of Things has an enduring effect on business models due to the fundamental properties of digitally transmitted signals without errors, indefinite replicas without degradation, and zero marginal costs after a one-time investment in network infrastructure. The properties improve the scalability of an organization as well as connectivity (Iansiti & Lakhani, 2017). The Internet of Things offers opportunities for new business models and has the potential to change business processes significantly. Physical objects can now be monitored or managed electronically, and data can be used to improve decision-making. Digitally enhanced machines and devices influence the efficiency of the industry's value chain significantly. According to Barua et al. (2004), ICT and the Internet have enabled organizations to improve customer and supplier interactions and processes. Net-enabled business transformation (NBT), as defined by Straub and Watson (2001), allows organizations to

optimize communication and information flow, reduce inventory, enhance satisfaction for all involved parties, understand preferences, and increase turnover, resulting in potential financial benefits.

One industry that has been identified to benefit from IoT is the automotive industry. For instance, according to Manohar (2015), OEMs may lose significant opportunities with respect to product planning, newer services, and time-to-market reaction with the lack of customer/vehicle data feedback. Direct interaction between an OEM and customer/vehicle will help the former understand and gauge customer preferences and reduce several inefficiencies. The consumer piece of the pie is like an Apple Store model, where every transaction can be monetized, and manufacturers will also need to work towards understanding avenues that can have a positive impact on internal savings and ways to improve the bottom line. IoT is expected to bring forth the idea that advances in manufacturing will help the industry focus on key functional pillars such as technology, collaboration, and processes.

The article highlights three megatrends which play an essential role in IoT processes: a) cloud computing, b) cyber security and c) predictive instead of reactive processes.

With regard to first point, cloud computing is one area that could possibly highlight a new era where IOT will not merely be used as a purchase puller, but more as a tool that can impact internal savings and improve OEMs' bottom-line performance. Criticality and latency are the two most important factors that come into play while deploying Cloud in any industrial environment. For instance, a Cloud-based PLM system eliminates supply chain inefficiencies caused by miscommunication. Prototype review and up-to-date information across the supply chain results in significant savings, helping suppliers provide competitive quotations to end customers. A Tier 1 HVAC (heating, ventilation and air conditioning) supplier in North America, for example, was able to achieve a reduction in injection mould tool cost from 33% to 50%, and time-to-procure supplier quotations were reduced by 20%. In addition, manufacturers were able to achieve instant prototype review among the supply chain partners, which results in quicker design change and a reduced development cycle.

With regard to cyber security, security processes should be treated as a part of any design principle parallel to business strategy, and not as an investment concern. For instance, the value of electronics accounts for about 20%-25% of the value of a present-day car; this is likely to increase to 40%-45% or more by 2020. If OEMs ignore cyber security, they would be compromising their users, risking brand value, and drawing financial and moral liabilities.

Last, the analysis of Big Data marks the beginning of the increased potential for the automotive industry to negate existing challenges and look beyond customer expectations. Access to predictive analytics based on real-time data helps manufacturers identify issues before they happen, lower inventory costs, and potentially reduce capital requirements. In effect, some of the key opportunities from analytics across functional areas in the manufacturing value chain are time to market, inventory management, asset utilization, and operational downtime. Supply chain analytics will also lead to planning, scheduling and product traceability within the manufacturing ecosystem. The next step is prescriptive analytics, where a proactive approach is used to find out when and how the equipment might fail prior to actual breakdown; the related benefits are cost, process efficiency and even equipment self-learning from surrounding environments.

Use cases such as 3D printing, robotics, and collaborative IT can aid OEMs to enhance product design and transform traditional production and supply chain inefficiencies. As the automotive industry's needs shift toward complex products, minimal lead times, raw materials and custom products, it is certain that most of the industry participants will adopt this transition. The future development of I4.0 and its effect on the automotive industry will require synergetic efforts from all ecosystem partners (OEMs, policymakers, suppliers, end users, etc.) to boost reliability and deliver massive benefits. Such collaborative efforts will result in wider awareness among end users of the immense potential of IoT, which will ultimately lead to higher demand for newer services and sustainability of the automotive industry beyond the influx of technology disruptors.

# GLOSSARY

***Digital education*** – an education that provides innovative opportunities for communication, exchange of knowledge, ideas and experiences between teacher and student through the use of digital computer technology.

***Digital educational technologies/solutions*** – various digital educational programs, applications, content (including video lectures, e-books) that are designed to achieve ambitious educational goals in terms of teaching digital entrepreneurship or that can be used for these purposes.

***Digitalization of education*** – a way of development, progress and transition to a new civilization stage in secondary and higher education through the use of software and IT solutions that will make learning (education) – better and more interesting, living in cities more comfortable, doing business – easier, and will bring the interaction of the community and the authorities to a qualitatively new level.

***High-tech (High technology)*** – a stylistic trend in modern architecture and design, focused on functionality, science, elite service architecture with the use of high technology.

***Industry 4.0*** – an updated concept of "smart factory", which is identified with the IV industrial revolution and the emergence of cybersystems. Industry 4.0 is one of the highest phases of digitalization, compared to "smart factories", where such technologies as analytics Big Data, machine learning, m2m-communications, artificial intelligence, a new generation of robots.

***Industry X.0*** – a new approach to the organization of production in virtual reality, which is based on highly intelligent integrated new products and digital ecosystems, which form a fully innovative digital value chain, add new competencies and implement profound cultural changes towards a new virtual reality. "Live" devices, smart assets, smart services, data management are the basis of the concept of Industry X.0.

***Institute of Education*** – on the one hand, is a system of ideas, rules, norms, standards of behavior of participants in educational activities in terms of digital entrepreneurship, and on the other – is a set of certain institutions, individuals provided with certain material resources and perform relevant social functions teaching digital entrepreneurship.

***Institute as:*** 1) A set of legal norms in any area of public relations of a particular state (eg, institute of education, institute of science, institute of intellectual property). Such phrases contain the meaning of integrity, a characteristic feature of a particular sphere of life; 2) Activity characteristics of a person or a group of people who represent a certain direction in public life or are a sign of social order: the institute of professorship, the institute of power, the institute of digital entrepreneurship; 3) Scientific institution, educational organization, higher educational institution.

***Institution*** – a guide, an explanation of something and means first of all, in our case, the features of digital entrepreneurship management, the mechanisms of legal norms in any field of public relations.

***Networking*** – a social and professional activity aimed at solving complex digital entrepreneurship problems and business issues as quickly and efficiently as possible with the help of friends and acquaintances (example: finding clients, hiring the best employees, attracting investors). At the same time, the essence of networking is building trust and long-term relationships with people and mutual assistance.

***Smart factory (Smart production)*** – the concept of “digitalization” of industrial production in order to improve their operating activities and business efficiency. Smart factories appeal to technologies such as cloud computing, wireless communications, remote control and service, cybersecurity, integration of management systems, integration and better cooperation in the value chain, 3D printing.

***Teaching digital entrepreneurship*** – an educational activity in which digital technologies are comprehensively applied in all processes of acquiring skills and acquiring competencies in terms of business process digitization skills, namely during teaching, education administration, business planning and forecasting through digitalization and virtual reality, etc.

***Teaching Digital Entrepreneurship Workshop*** – an intensive training event where participants learn primarily through their own active work, the development of their own digitized business.

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