GENERAL SECTION

Developing the Creative Abilities and Competencies of Future Digital Professionals

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Abstract—This article describes the development of recommendations for using the project thinking approach in training and university education of future digital economy specialists. An overview of the key design thinking methodologies is presented. Recommendations for implementing the design thinking approach in academic disciplines are given through an example of a step-by-step description of a specific case. The design thinking approach aims to develop a person's creative abilities through empirical rules and experience, emotional intelligence and recognizing the value of other people's opinions. The article describes the methods used in design thinking: visualization tools (empathy, customer journey, and stakeholder maps), Customer Development tools, guerrilla ethnography, POV articulating, and rapid prototyping.
The article also presents the primary tools used in design workshops for developing innovative ideas and adaptive problem solving. A case in formulating design thinking, titled "How can one improve the impression left on the students of professional refresher courses?" is detailed and accompanied by comments on the solutions the participants of presented design workshops.

Keywords: digital economy, information technology, digital competence, competency-based learning, soft skills, design thinking, IT education, innovation

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INTRODUCTION

Introducing new methods of teaching academic disciplines is important in the context of the transformation that higher education in Russia is undergoing in order to support the implementation of the "Digital economy of the Russian Federation" program. Introducing creative methodologies into university activities, applying them to discussing work issues and forming development strategies can help increase employee satisfaction and engagement and enhance the responsibility they take for their decisions [1]. These methodologies include new production technologies and the industrial Internet, Big Data analysis, neural networks, blockchain, artificial intelligence (AI), components of robotics and sensorics, full product life cycle simulation systems, the Internet of Things (IoT), and augmented virtual reality (AR/VR), as well as quantum and cloud computing. The activity plan for the "Formation of research competences and technological reserves" [2] direction of the "Digital economy of the Russian Federation" program involves forming research support systems and creating competence centers, which accumulate information about possible implementations of projects in priority directions of the international scientific and technical cooperation in the field of digital economy.

The main reason for the turn towards the trend of developing people's creative abilities lies in the emergence of new opportunities and challenges associated with the explosive nature of the development of information and communication technologies (ICT) and with the focus on the digital transformation of human activities. Supporting digital projects requires skill sets that are not limited to only technical knowledge and ICT skills. Problem solving under the conditions of uncertainty created by digital space necessitates the development of soft skills: communication, teamwork, emotional intelligence, critical thinking, creativity, and readiness for innovation.

The "Digital economy of the Russian Federation" program includes positions that reflect the importance of taking steps to implement the strategy of lifelong training of personal trajectories in human-resource development. A list of requirements for the descriptions of the top 100 competencies necessary for the implementation of digital transformations in the economy is scheduled to be formed by 2019 [3].

Many scientists have studied the problems of developing people's creative abilities, enhancing empathy, teaching people to establish their thought processes and perceiving other people's ideas as a basis for their own. Herbert Simon, Nobel Laureate in economics, is

considered to be one of the founders of the project thinking, or design thinking, philosophy. His ideas are to this day in demand among engineers, system engineers and software developers for projects related to artificial intelligence, information processing, complex systems. In 1969, Simon first presented his reflections on the nature of organized complexity and on the importance of developing a person's thinking through empirical rules, experience, and their ability to adapt to the conditions of high uncertainty of the environment [4]. Around the same time, Genrikh Altshuller, a Soviet scientist and inventor, published his first works, in which he presented his Theory of Inventive Problem Solving (TRIZ) for discussion. The methodology of this theory is still actively used by engineering laboratories for "creative problem solving" [5]. The theory contains an algorithm for experimental processing of innovative ideas, based on "mental processes of technical creativity" and on establishing thought processes. The issues of developing a person's creative abilities are the subject of the research of G.P. Shchedrovitsky, N.P. Bekhtereva, N.Yu. Khryashcheva, M. Michalko, E. de Bono [6–10], and others.

In 2004, David M. Kelley, founder of the design firm IDEO, and Hasso Plattner, co-founder of the SAP SE software company, presented the design thinking approach, which incorporated the best practices in the fields of developing creative skills, studying customer behavior, generating ideas, and visualization [11, 12].

According to V. Papanek [13], "design is the conscious and intuitive effort to impose meaningful order." Thinking is the cognitive activity of a person. Thus, the definition of design thinking combines the perception of creativity of the term "design" and the systematic approach of the word "thinking."

In order to engage in creative thinking, one needs to overcome the barriers of the obvious and the traditional, by challenging the established patterns. It is necessary to be ready to overcome challenges, including mental ones, on the path to creating new things and to constantly search for ideas and words [14]. Designers create many different prototypes in their work process, modeling and evaluating the image of a new product and finding revolutionary ideas through creativity and iteration.

This is what the design-thinking approach is based on: it is a sequence of steps of understanding the problem, from perceiving it, analyzing it, searching for patterns (regularities and relationships) to visualizing our understanding of a solution. Ambiguity and uncertainty are the conditions that make design thinking necessary. These are the situations where rational thinking can lose in its efficiency to our intuitive abilities and imagination.

This approach helps one to acquire the skills of adapting to the conditions of high uncertainty of one's environment. We develop through experience, accepting our mistakes and learning from them. Design thinking makes it possible to play through that experience by using game mechanics and working in a cross-functional team.

How does the philosophy of design thinking help with organizing collective creativity? In the era of digital technology and robotics progress, an era that keeps creating new challenges for humanity, creativity is arguably one of the main traits a person needs to become successful and to survive the race for leadership in any professional activity. The list of skill sets desired by 2020, published at the World Economic Forum in 2016 [15], prioritizes the following: cognitive abilities and creativity, active learning, emotional intelligence and the ability to communicate with others, complex problem skills, and critical thinking [16].

Design thinking is an approach that integrates design, iterativity and research to create breakthrough ideas. It teaches one to structure information, "be more flexible in applying your knowledge" [17], and to see patterns and relationships between objects in complex systems. The key stages of the process, which are empathy, defining (articulating the Point-of-View, POV), ideating (generating ideas), selection, prototyping, and testing, supply the process of generating ideas with a set of tools and techniques. That set is continuously updated by design researchers throughout the world.

The approach teaches one how to establish processes for finding answers through teamwork, game mechanics, and visualization, as well as how to appreciate others' opinions. This approach is necessary in situations when one needs to understand a customer's conflicting requirements and expectations (empathy map, guerrilla ethnography, and POV questions), or to quickly take on the challenge issued by a breakthrough made by competitors (the triads method, as well as positive and the negative customer experience matrix).

Eric Ries places design thinking among the core principles of the lean startup approach [18]. Design thinking forces people to "leave the office" [19, p. 10]; it helps them learn to cooperate with others and be inspired by their ideas, to discover new points of view and unexpected opportunities, and to be able to use one's creative abilities for problem solving.

Leaders can use design thinking as the basis for changing the corporate culture of their organization. Within a company, design thinking can be used in meetings, strategy sessions, brainstorming sessions in cases where employees from different departments hold many meetings with little result, or when they cannot understand the confusing and constantly changing requirements of their supervisors. As a rule, these tools are useful for adaptive problem solving, when there are no predetermined and unambiguously correct solutions and the only way to solve the problem is changing yourself and your outlook, beliefs, and preferences [20]. In those cases design thinking helps to maximize the potential and ideas for business devel-

opment of staff members, and to get them involved in a problem and increase the responsibility they take for changes.

Companies of the future need innovators who are able to think outside the box and find alternative solutions to problems under conditions of uncertainty, who rely on interdisciplinary knowledge and broad skill sets in various sectors of the economy instead of a narrow specialization, who are able to negotiate, work in open teams, and, most importantly, to constantly evolve. Developing a strategy aimed at skill sets, flexibility, and predicativity requires new formats of learning: competence-based learning, learning in different ways (which involves both formal and informal education [21]) and new communication formats. In order to increase the effectiveness of collaboration and create a favorable atmosphere within the team, leading scientific departments organize regularly scheduled workshops that make use of design thinking tools [22].

DESIGN WORKSHOP SETUP

Solving the tasks of a standard case takes 2 to 5 hours of teamwork. One important factor is strict adherence to a pre-planned schedule. A time limit helps to spur creativity and start the process of generating a larger number of promising ideas.

At our design workshops, we suggest that the participants solve tasks as a team [23]. The participants explore the customer experience of interaction with a product, service or process, develop business ideas, and create prototypes of products or services. In this way they gain empathy skills, develop systems thinking and creativity, acquaint themselves with the tools they can use to boost creativity and to structure information, and accumulate the experience of being a part of a cross-functional team, through project experience. As a result, communication and cooperation build; a willingness to innovate emerges, as well as proactivity; creativity and social intelligence develop. The generated ideas are explored in the intersection of the three innovation spaces: the idea should be feasible technology-wise in the foreseeable future; it should be desirable for the customers and profitable for the business. Working within that innovation space is the most important characteristic of design thinking.

Case: "How to Motivate a University Student to Attend an Evening Class?"

Step 1. Stakeholder mapping of the key participants. Target consumers of the discussed idea can be identified by making a stakeholder map, which records the positions of everyone who comes into contact with the product or service or will do so in the future.

Step 2. Empathy mapping. Making an empathy map helps to reveal the needs of the target audience. Under the experience economy (to which, according to digital visionaries, we have moved from the knowl-edge economy) and imagination economy (to which we are expected to move in the near future [24]), a successful leader is a person who emphasizes with consumers and understands them, as well as their thoughts and desires [25]. Empathy as the basis for most design thinking methodologies helps one to learn how to analyze the context and the customer experiences, emotions, and feelings, as well as to explore the ecosystem in order to identify hidden needs, which opens up new business opportunities. When describing a customer profile, researchers compare their opinion on it with the visions of their colleagues, which lets them supplement it with data they never thought of before. In general, it helps to create the concept of a customer that more closely approximates the real audience.

The empathy map consists of four core blocks. The classic version of the map stores all the information and hypotheses about the potential consumer of the developed solution in the following sections: "Thinks and feels," "Hears," "Sees," "Says and does." An example map, created by the participants of a design workshop while solving an issue titled "How to motivate a university student to attend an evening class?" is presented in Fig. 1. The design workshop was held for the professors of the Financial University under the Government of the Russian Federation. The teams for solving the case tasks were assembled from the professors and associate professors from various student training areas: "Human Resource Management," "Business Informatics," "Corporate Finance," and others. The cases used the problems of the educational field, an area that all participants were familiar with. However, discussing the various issues raised in the case made the design workshop participants consider the problems from other points of view, share their experience with colleagues, and confirm their hypotheses about possible solutions to the (apparently shared) problems.

Step 3. Studying the problem. The hypotheses made at the preliminary desk review stage and while creating various maps must always be tested by in-depth interviewing of people who are directly impacted by a problem. The lean start-up concept, proposed and popularized by E. Ries [18], locates this stage at Customer Discovery (the first step of S. Blank's Customer Development methodology [19]).

The main objective of in-depth interviewing is to achieve the best possible understanding of the customer experiences with the product or service, to clarify the details of their interaction with the product or service, and to reach the level of insight in the process of analysis.

A variety of tools are available for evaluating hypotheses and choosing the best idea for further development and testing. Using participant observation methods, one can learn more about the analyzed object and test the idea with a user's involvement. As
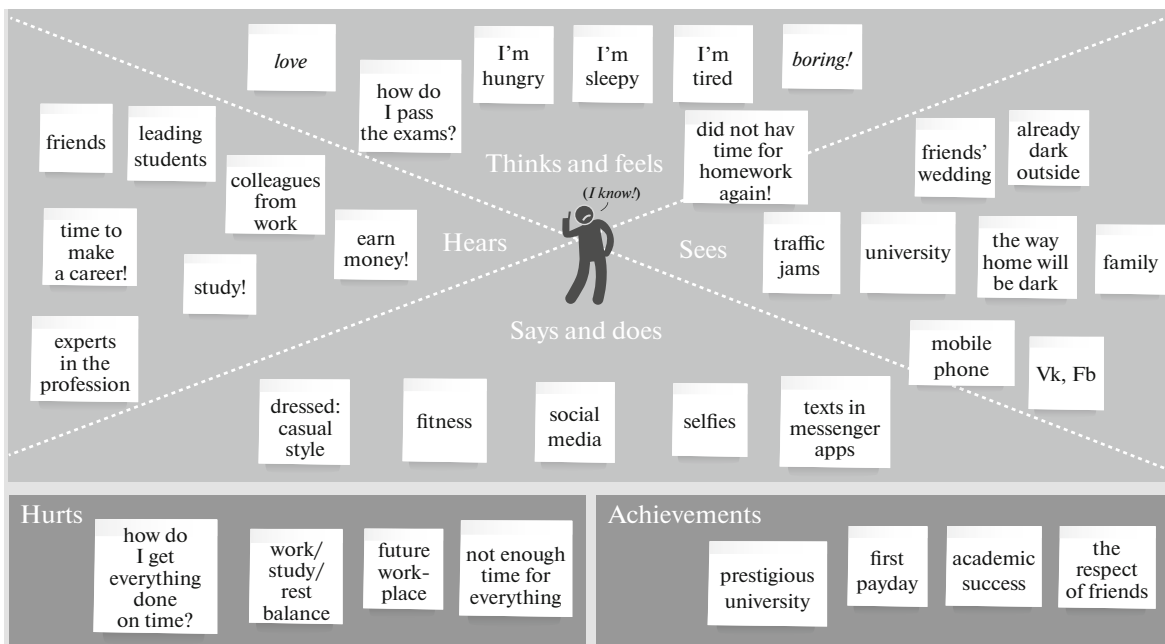
Fig. 1. An example empathy map: a university student as seen by professors (the figure was constructed using the service *realtime-board.com*. Source: *the results of the design workshop*)

an example, the "Shoes" method involves the researcher assuming the role of the future consumer of the product, embodying the "walk a mile in someone else's shoes" metaphor. In December 2016, Herman Gref, the CEO of Sberbank of Russia, used that method to assess the convenience of Sberbank offices for people with disabilities [26].

In order to systematize the results of the previous step, a positive and negative customer experience matrix can be constructed. The matrix has axes or quadrants that correspond to the top five "Actions" performed by users when interacting with the studied product or process and the top five "Actions" that present opportunities for improvement; the top five "User Needs" (what is the product needed for in real life?) and the top five "Unmet User Needs" (what does the product do poorly or not at all?). An example matrix, created using the Realtimeboard service, is presented in Fig. 2. Not all stickers put in the matrix by the team discussion participants will become the basis for further research, but design workshops have a rule that any basic hypothesis can trigger a breakthrough idea. Therefore, all ideas are recorded and saved,and while only the most promising of them are selected, the option to go back and review the backup ones is reserved.

The Customer Journey Map (CJM) is a method of visualizing the results of the analysis of customer interaction with a product, service, or process by stages of its life cycle.

Step 4. Focusing on the problem. Design thinking is a human-centric approach to developing innova-

tions. Thus, the correct wording of the problem statement is "How can we help improve a person's experience of interacting with the product or process and the impression it leaves?"

The POV (Point of View) "How can we help?" question is formulated using the **User−Need−Idea** pattern. As an example: "How can we help **[a user]** to solve **[a problem]** in this way: **[an idea]**." Formulating a question like this is good for triggering the search for ideas and brainstorming. The ways to improve a process or a product can also be studied through this pattern, but it is more correct to focus the problem on the needs of a person.

Step 5. Generating ideas (brainstorming). The triads method is directed at the study of analogous products or solutions that are used in other subject areas. The method involves studying the positive experience of these solutions, describing the differences and similarities, and identifying a customer's emotions. The goal is to find the possibilities of transferring the successful aspects of these known solutions to the plane of a new problem.

When applying the triads method [23, 27], the user is asked first to pick three types of a product and then to describe the differences between one of them and the other two. We propose to record the process of the analysis in a table (Table 1), which makes it convenient to identify the distinctive features of the newly developed idea in comparison to the two analogous solutions. The rows can be set in any order.

Table 2 presents an example of comparing the positive and negative aspects of student experiences
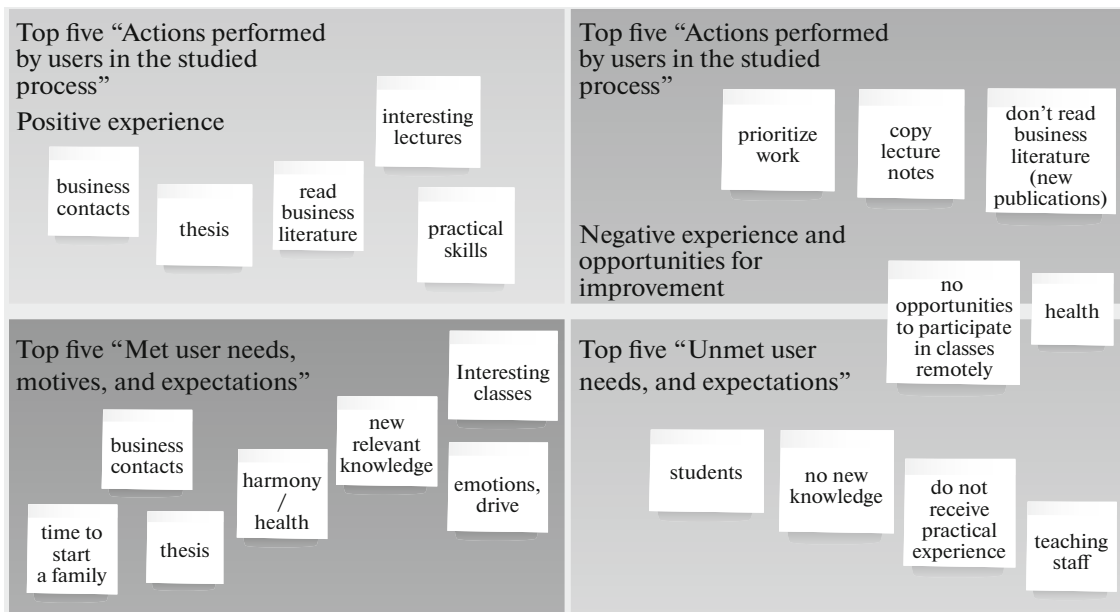
Fig. 2. An example positive and negative customer experience matrix for the "How to motivate a university student to attend an evening class?" case study. *Source: the results of the design workshop*

(impressions) of visiting popular youth work and entertainment events (a marathon, a hackathon, a co-working event—a dance party, a night club, or a ball) and of attending a university.

Solving another case study, "How to improve the impression left on the students of professional refresher courses?" provided an interesting experience of integrating a customer journey map (CJM) with the triads method. The research group chose the practical considerations of organizing a tourist trip as the analogous situation. How does a travel agency create fun and enjoyable moments? Meeting the travelers at the airport and providing transfer to the hotel creates a feeling of security in a foreign country and gives the tourists high expectations for good experiences. A brochure with tour recommendations provides useful information and makes the tourists feel confident that their vacation will be interesting. Comfortable conditions and atmosphere will bolster the client loyalty and they will happily recommend this tour to their friends in the future. At the next stage, the research team created a customer journey map for a student attending a professional refresher course, now taking the key principles of organizing a tourist trip into account.

Step 6. Testing. The World café method [23, 27, 28] involves the representatives of every team that takes part in the design workshop discussing the proposed hypotheses. After 20 minutes of working on one problem, each project team moves on to another project team's problem (this is called "changing tables"). The team captains (the table hosts) have to quickly explain the essence of the problem and the formulated earlier

Table 1. Triads method (research template)*

Characteristics	Analogues description		Differences in the developed product	
	analogue 1	analogue 2	analogue 1	analogue 2
Unique features				
Cons				
Pros				
Motives for purchase				
Customer's emotions				
Promotion channels				
Resources				
Effects				

* Source: created by the author.

Table 2. Triads method: the experiences of young people when visiting popular venues ("How to motivate a university student to attend an evening class?" case)*

Analogue 1: hackathon, hangout, co-working	Analogue 2: student balls	University evening classes
Pros: • broadening your horizons • hanging out with smart people • meeting new people • anonymity Cons: • hard to make friends • constantly changing company	• learning *pick-up* • mixed-gender relationships	• love and family • hanging out with smart people, broadening your horizons, knowledge from different areas • joint events and classes for humanities and STEM faculties • "mixed groups" education method • cross-disciplinary course projects

* Source: the results of the design workshop.

Table 3. The method of grouping and filling with content*

Best ideas	Backup ideas	Worst ideas
• active learning methods, gamification in order to maintain the drive in the evening • project learning and joint seminars for different faculties (humanities and STEM) • a schedule of physical attendance vs. distance participation • a space for relaxing before classes • distance participation in classes • time buffer for evening classes in the schedule • shorten the duration of evening classes	• autofilling the attendance log (face-recognition technology) • changing the regulations for remote participation • developing a recreation infrastructure (fitness, swimming pool) • solving the nutrition issue with organizing coffee breaks between classes • lessening the workload of the distance education teaching stuff (a senior student assistant for seminars) • creating regulations for distance education	• storage spaces for personal belongings • soft skills focused subjects

* Source: created by design workshops participants in the process of solving the case study.

hypotheses to the new participants when they join the discussion at the table. The captains then need to record a new participant's doubts and new ideas. A project group changes tables in three stages: every 20, 15 and 10 minutes, respectively.

Step 7. Evaluating ideas. The idea grouping method principles of choosing ideas are rationality and feasibility of implementing a generated idea. The ideas are sorted into groups: best, backup, and worst. Other selection criteria can be used as well, such as: humor, depth of study, the number of errors (answers); the most impressive, rational, unexpected, exciting, cute, risky; "what do you know?"; "what do you not know and cannot know?"; and "what do you not know, but could know?"

The ideas that the workshop participants suggested for motivating students and professors to perform better during evening classes are presented in Table 3.

Among the results of the discussion are the following ideas: organizing spaces where people who come to the university after work can rest long before their classes start; making it possible to remotely participate in classes (participation effect) without leaving the work-place, with clear regulations on the functionality of such broadcasted learning; creating "time buffers" in the schedule; introducing measures to incentivize professors to create video materials or consult students on video calls; introducing an assistant position (filled with senior students) to support primary professors; using more active learning forms and game mechanics to keep the energy of tired students and teachers up after a long day; setting up recreation centers (cafes, gyms, or swimming pools), thus creating the possibility for informal knowledge sharing; introducing project learning; and reducing the number of classroom sessions.

Step 8. Prototyping. Active prototyping helps one get a feel for a concept at the early stages of creating it. The prototyping process involves creating a sketch or a model developed in the process of generating ideas for solving a focused customer problem. At this stage, the idea is tested for its desirability for the target consumer. Prototyping creates one more chance to refine the idea, to think about it with one's hands (a well-known expression by David Kelley [11, 12, 29]). Prototyping can be carried out in several iterations, which result in discarding the hypotheses that fell short of

expectations, but also in uncovering new ones, which also need to be tested.

Another goal of prototyping is to create an object or environment that can be tested by users in order to receive feedback from the target audience.

One of the main rules is that the prototype has to be created quickly and inexpensively (thinking of minutes and cents [29, p. 105]). The fastest and most accessible way of prototyping is creating a model, a sketch out of cardboard or paper. However, objects made from improvised means are not the only things that serve as prototypes. There are other options, such as a role-playing game or a script. The following methods can be employed: Bodystorming, portraying the service using people, playing out a scene (a user—the service); Stop-Motion, a video that portrays the environment, the conditions under which a non-existent new product will function; Storyboard, a frame-by-frame hand-drawn scenario of using the product, a presentation or a wall of notes and diagrams; Storytelling, presenting the idea in the form of a story, and others.

Business origami [27, p. 153] is a prototype made of paper that can be used to describe interactions of objects (in this case, the links are indicated by arrows, and scenarios or characteristics of the relationships between objects can be written over the arrows), to display artifacts while studying the target audience, modeling the situation, presenting ideas. The method of gamified modeling that uses Lego Serious Play [27, p. 50] can also be used for developing a prototype. The concept of this method was proposed in the mid-1990s by Johan Roos and Bart Victor, who are professors of the International Institute for Management Development in Switzerland. The method is based on the principles of play, constructionism, and imagination: large areas of the human brain are responsible for fine motor skills, and during modeling and conversation brain activity increases and oxygen circulation improves (70—80% of nerve endings connect the brain to the hands). Serious play is intended to create interest in implementing the developed ideas. In the given case, the design workshop participants developed a prototype class of the future, where the class is broadcast to students. The classroom has study spaces that can be transformed into one large table for project work and a variety of screens that can broadcast the class to any connection point. Each study space in the classroom is equipped with chargers for electronic devices, which are necessary in the digital environment.

CONCLUSIONS

The explosive nature of technological progress, the digitizing of production and service provision, the overall digital transformation of companies all not only introduce changes to the labor market by reducing the demand for workers, but also make the contin-

ued preservation of some professions uncertain. A Boston Consulting Group report declared that within the next 10 years up to 50% of professions will disappear. The Boston Consulting Group identified 60 major tendencies that stimulate "a tidal wave of change [...] that will soon make the way we work almost unrecognizable to today's business leaders" [31].

Concerning the possible changes in the demand for talent, the following two groups of forces were identified [31]:

(1) technological and digital productivity. Automation, including robotics and artificial intelligence (AI), creates replacements for human workers. Big Data and Advanced Analytics provide a foundation for vast customer, operational, and employee insights. The expanding access to information and ideas, crowdsourcing and sharing economy blurs the boundaries of traditional organizations. These trends lead to the development of such competencies as knowledge and skills in data analytics (including data mining, cleansing, processing, and aggregation), app development, and user experience design;

(2) shifts in ways of generating business value: simplicity in complexity, or Smart Simplicity [32]; agility and innovation: introducing agile approaches and creative methodologies; new customer strategies. New, agile work processes call for entirely new skills, attitudes, and knowledge on the part of employees (agile, scrum, kanban, and design thinking), such as creativity, teamwork, readiness for collaboration, and innovation. Employees need to be able to make good decisions on their own.

The changes in the supply of talent influence the workforce culture itself in several ways:

• shifts in resource distribution: a new demographic mix, the aging of the population; skill imbalances, the shortage of skilled workers in some markets and the surplus of less skilled workers in others; and shifting geopolitical and economic power. This creates a demand for specialized digital talent, experience of working in temporary and virtual teams, the ability to take full advantage of cloud computing;

• changing workforce culture and values: diversity, inclusion; individualism and entrepreneurship; a culture based on shared values. A specialist of the future needs to be socially and environmentally responsible, tolerant, and respectful; one needs to be able to build interpersonal communication, be enterprising and creative, to work towards career advancement and self-improvement, to be able to work with individuals, and to understand and appreciate other people's aspirations and values.

These global trends "will revolutionize the way that work gets done in companies and will compel leaders to rethink" their strategies, since "they will need to discover new ways of organizing, performing, and leading, along with new approaches to recruiting, developing, and engaging employees. In fact, nearly

every organizational role will eventually require the use of sophisticated technology," and companies will "have no choice but to invest in massive, ongoing skill development programs" [31]. Professionals of the near future will need an expanded skill set that supplements their knowledge and skills in a particular field with the skills in working with modern digital information processing technologies, knowledge of robotics, skills in machine learning, cloud computing, and other so-called "integrated" technologies. In the words of Herman Gref, "These days there is a huge problem with the workforce... The economy has not yet made a complete pivot to the digital economy... All professions in the future will be supplemented digitally, from managers to the most basic specialties" [33]. This is the reason that projects related to strategic development, to programs of digitizing the social sphere, etc. are so actively implemented at present.

The focus on the customers and the reactive, sometimes unexpected, changes in their needs, tastes, and preferences compels a business to change, to constantly search for what Gartner calls business moments, defined as "transient opportunities, exploited dynamically": a "business moment" can come from nowhere and yet they are increasingly everywhere" [34]. Until recently, the human resource was perceived to be the main participant of all business processes in companies, an integral part of the company's organizational capital. However, robots, bots, drones, and other technologies now begin to replace humans, freeing them from routine work and giving them the opportunity to spend more time and resources on creativity. In the conditions of constant changes, future companies will set business goals that require that employees have the ability to work as a team, to effectively apply their skill sets, to be focused and successful, to think outside the box and find unique solutions, and to apply their accumulated knowledge. All these issue will turn using various techniques of design thinking into an integral part of human activity.

Are these design thinking technologies needed? Definitely yes, even putting aside a certain frivolity of the game aspect. Rational thinking can be taught, but the skills of decision making in unusual situations develop only through personal experience. It is better to obtain that experience from a game and to play it through. The modern economy and its development prospects dictate completely different requirements for the specialists of the future. They must have not only technological skills, but also creativity, imagination, intuition, flexible, and imaginative thinking; they need to be able to quickly navigate environment shifts and easily adapt to rapidly changing conditions. The IDEO laboratory refers to its employees as "T-people," where the horizontal line of the letter T stands for the depth of their knowledge of various fields, and the vertical line stands for their specialization [29, p. 14; 35].

One of the fundamental goals of a higher education institution is to provide its students with the opportunity to become knowledge-oriented, to not just teach them, but teach them to learn how to learn [14]. This requires a high degree of trust and a non-competitive environment for sharing knowledge, which requires profound changes in the educational process and expanding the practice of implementing new forms of education and communication. Design thinking offers closely related tools, which collectively assist higher education in responding to the needs of business and society that are changing in the environment of digital transformation.

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